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## Table of contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstracts</td>
<td>5</td>
</tr>
<tr>
<td>Index of topics (English)</td>
<td>1547</td>
</tr>
<tr>
<td>Index of keywords (English)</td>
<td>1607</td>
</tr>
<tr>
<td>Index of authors</td>
<td>1647</td>
</tr>
</tbody>
</table>
Is it necessary to use the entire root as donor when doing contralateral C7 nerve transferring to median nerve?

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Objectives / Interrogation: Previously articles reported that entire harvested cC7 nerve root transfer could obtain significantly better recovery than partial harvested cC7 nerve root transfer. We suppose that the harvesting of the entire cC7 nerve root might be the key factor for the good result of cC7 nerve transfer procedure. In order to confirm it, we conducted the current clinical and experimental study which aimed to determine whether it is necessary to use the entire root but not partial cC7 root to be the donor in the treating total BPAI.

Methods: In clinical study, a retrospective review of 73 patients with total BPAI was conducted. In group 1, the cC7 nerve was used to transfer to median nerve only. Three ways were used to harvest cC7 root which were the entire cC7, the posterior division + the lateral part of the anterior division the anterior or the posterior division alone. In group 2, the cC7 nerve was used to transfer to two nerves simultaneously. The entire cC7 transfer to median nerve and biceps branch in 12 and transfer to median nerve and triceps branch in 10 patients.

In experimental study, 54 SD rats were separated into 3 groups. In Group A: The entire root of cC7 was transected and transferred to median nerve; Group B: Only posterior division of cC7 root was transected and transferred to median nerve; Group C: The entire root of cC7 was transected while only the posterior division was transferred to median nerve. The regeneration of recipient nerve was evaluated post-operatively.

Results and Conclusions: The clinical study showed that entire harvested cC7 nerve root transfer could obtain significantly better recovery than partial harvested cC7 nerve root transfer when repairing median nerve. While if the entire cC7 nerve root was harvested for the transfer to median nerve together with biceps branch simultaneously, in which situation the donor for median nerve was just equal to partial cC7 root transfer, both of the two recipient nerves could achieve good recovery.

In experimental study, the evaluation of median nerve and FDS showed no statistical difference in the regeneration of median nerve between group A and C but significantly better group B.

We concluded that for the same recipient nerve, harvesting of the entire contralateral C7 root achieved significantly better recovery than partial harvesting, even if only part of the entire root was used for transfer. This result indicates that the entire root should be used as a donor when transferring contralateral C7 nerve.

Keywords: brachial plexus, avulsion injury, contralateral C7, nerve transfer
Neural Perforasomes of the Upper Extremity

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Objectives / Interrogation: In the setting of the rapid advancement of integumentary vascular knowledge, we hypothesized that the extrinsic blood supply to the major peripheral nerves of the upper extremity could be categorized into discrete neural "perforasomes".

Methods: Total limb perfusion of the arterial system was performed with gelatin-red lead oxide in cadaveric upper limbs. The perforating vessels to the radial, median and ulnar nerves were identified, confirmed with fluoroscopy and dissected. Distances to major anatomic landmarks of the upper extremity were measured. Additional cadaveric limbs’ nerves were dissected and source arteries were selectively cannulated and injected to assess specific contribution to extrinsic nerve perfusion. The perfusion of each nerve was then calculated among all specimens.

Results and Conclusions: The radial, median and ulnar nerve perforators were mapped. The corresponding neural perforasomes were mapped (Figure 1).
The distal portions of the superficial radial nerve and the posterior interosseous nerve demonstrated a lack of staining. Similarly, at the carpal tunnel and at the proximal 25% of the median nerve (corresponding to the pronator teres), the nerve lacked vascular staining. At Guyon’s canal and the flexor carpi ulnaris (FCU) the ulnar nerve demonstrated a lack of vascular staining (Figure 2).

Map of the perforasomes of the median, ulnar and radial nerves. Yellow areas of the nerves had absent or limited staining. Well perfused areas are colored with their respective source vessel and amount of perfusion labeled.

Peripheral nerves can be divided into neural perforasomes with limited overlap. The extrinsic perfusion of peripheral nerves is highly segmental. Absent staining within the nerves correspond to common sites of compression. It is possible that these sites are watershed areas, between neural perforasomes, and are thus vulnerable to hypoperfusion and at risk for ischemia.

**Keywords:**
- nerves, compression neuropathy, peripheral, angiosomes, perforasomes
Upper Extremity Free Flap Transfers: An Analysis of the National Surgical Quality Improvement Program Database

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Objectives / Interrogation: The hypothesis of this study was that upper extremity free tissue transfers can be performed with a low complication rate.

Methods: This study used the National Surgical Quality Improvement Program (NSQIP) database to identify all patients who underwent upper extremity free flap transfer procedures performed between 2008 and 2016. A total of 111 patients with CPT codes corresponding to free flap transfers with concomitant procedures on the upper extremity were selected. The patients had a mean age of 37 years (range, 18 to 82 years), and were 76.6% men and 23.4% women, and 78.4% were white, 6.3% were black and 15.3% were others. The types of flaps included muscle or myocutaneous free flaps (45.9%), free fasciocutaneous flap (8.1%), fascial flap (2.7%), free vascularized bone graft with microanastomosis (1.8%), free metatarsal flap (10.8%), other free vascularized bone graft with microanastomosis (27.9%), and free osteocutaneous flap (2.7%). Complications, reoperations, and readmissions were queried from the database. Chi-square was used to evaluate differences in sex, race and insurance type. The frequency of complications was reported, and the total reoperation rate and procedures performed, along with readmissions for suspected flap failure and total readmission percentage and corresponding diagnoses were identified.

Results and Conclusions: The 30-day complications included superficial surgical site infection (2.7%), pneumonia (0.9%), deep venous thrombosis (0.9%), intraoperative transfusions (14.3%), and postoperative transfusions (0.9%). The re-operation rate was 4.5%, and most commonly occurred for incision and drainage (1.8%), secondary closure of surgical wound (0.9%), debridement (0.9%), or other procedure of the integumentary system (0.9%). The readmission rate was 3.6% and was for suspected flap failure (0.9%), pleural effusion (0.9%), fever (0.9%), and infected postoperative serosa (0.9%); of note, the mean time from discharge to readmission was 12.5 days. In conclusion, free flap transfers to the upper extremity can be performed with a low rate of complications. The 30-day re-operation rate was 4.5%, and most commonly for incision and drainage, and the readmission rate within 30-days was 3.6%.

Keywords:
NSQIP, free tissue, free flap, upper extremity, complications
Free Gracilis Muscle Transfers Compared with Non-Free Muscle Transfer for Elbow Flexion Reanimation: A Meta-Analysis

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Objectives / Interrogation: The hypothesis of the present study was that free gracilis muscle transfers will have similar results as compared to non-free muscle transfers (tendon transfers, nerve transfers, Steindler procedure, and pedicle muscle transfers) for elbow flexion reanimation.

Methods: A literature search was performed for randomized clinical trials and comparative studies that evaluated free gracilis muscle transfers versus non-free muscle transfers to the elbow published between the inception of the databases to January 2018. The outcomes included failure, which was defined as strength that was ≤ M3 (unable to raise arm against gravity) or acute loss of graft, range-of-motion (ROM), and Disabilities of the Arm, Shoulder and Hand (DASH) score. Studies were included if they had at least one of the outcomes of interest. To compare the two groups, the pooled odds ratios (OR) and 95% confidence intervals (95% CI) were used to calculate the failures, and the pooled mean differences (MD) and 95% CI were used to calculate differences in strength, ROM, and DASH scores.

Results and Conclusions: A total of 5 studies involving 294 patients were included for analysis. Compared to the non-free muscle transfer group, the gracilis free muscle transfer group had a lower failure rate (OR= 0.29; 95% CI, 0.13 to 0.61; p=0.001).

The gracilis free muscle transfer group had better strength compared to the non-free muscle transfer group, but this was not significant (MD= -0.12; 95% CI, -0.37 to 0.14; p=0.370). Also, when DASH scores were evaluated, there was a trend towards better scores in the gracilis free muscle transfer group, but this was not statistically significant (MD= -3.21; 95% CI, -14.01 to 7.59; p=0.560). In conclusion, both gracilis free muscle transfers and non-free muscle transfers to the elbow can have similar outcomes for reanimation of elbow flexion. The use of gracilis free muscle transfers had a significantly lower failure rate, but tended to have better strength and DASH scores compared to the non-free muscle transfer group, however, these were not statistically significant.

Keywords:
elbow, elbow flexion, reanimation, free gracilis, nerve transfer, tendon transfer, steindler
The 100 Most Impactful Papers in Hand and Upper Extremity Surgery over the Last 25 Years: A Bibliometric Analysis

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Objectives / Interrogation: Despite growth in hand/upper extremity investigation, truly impactful studies have not been thoroughly identified. While previous studies were limited to a subspecialty-specific scope, this study sought to identify (by citations) and characterize the most impactful papers in hand/upper extremity over the last 25 years.

Methods: The top 1,000 cited studies published between 1992 and 2018 related to the hand/upper extremity were identified with Thomson ISI Web of Science. Studies were organized in descending order by number of citations, and the title and abstract of each study was screened for relevance. Following exclusion of unrelated studies, the top 100 articles by number of citations were identified and reviewed to identify study type, institutional origin, level of evidence, and journal impact factor.

Results and Conclusions: Among the top 100 studies, all were cited ≥ 100 times, and the mean number of authors and citations were 4.51 and 169.4, respectively. The top five study types were case series (n=52), randomized controlled trial (n=17), prospective cohort (n=16), retrospective cohort (n=8), and basic science (n=4). The topics covered were mostly commonly related to shoulder (n=34), wrist/forearm (n=21), hand (n=17), and elbow (n=14). Among shoulder studies, rotator cuff injuries (n=18) were most common, while distal radius fractures (n=12) were most common among wrist/forearm studies and nerve/nerve repair (n=10) among hand studies. Most studies were published from institutions originating in the USA (n=63). The journal that published the most among the top 100 cited was the Journal of Hand Surgery-American Volume (JHS Am, n=33), with 5,092 citations three among the top 10. Mean journal impact factor was 3.29. The majority of studies were of level IV (n=51) and level II (n=16) evidence. However, the number of level I studies has increased since 1992 (3 in 1992-2006 vs. 5 in 2007-2011). The impact of more recent studies is greater, with mean citations per year in 2011 at 82.7/year, compared to 16.1/year in 1992 (R²=0.54). In conclusion, mean citations per year have progressively increased over the past quarter century. The majority of the top 100 articles were published in the JHS Am, were case series, and focused on the shoulder. The majority were level IV or II, retrospective, and non-randomized studies, emphasizing the call for higher-quality, prospective, randomized trials to bolster evidence-based practice.

Keywords: evidence-based medicine, impact, impactful papers, upper extremity, hand, bibliometrics,
Characterizing Hand Infections in an Underserved Population: The Role of Diabetic Status in Antibiotic Choice and Infection Location

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Objectives / Interrogation: Diabetics (DM) in underserved communities are at greater risk for hand infections compared to the general population. Such infections in the setting of DM can yield devastating consequences without prompt and aggressive treatment. Moreover, vancomycin resistance constitutes a growing challenge for the treatment of infections in both diabetics and non-diabetics. We aimed to determine which features of were suggestive of infection severity by comparing hand infections by diabetic status, presenting to an urban hospital with respect to: (1) inflammatory markers, (2) infection site, (3) microbiology, and (4) antibiotic choice.

Methods: A prospectively collected, single-center database of 53 patients who presented from 2014-2016 with any hand infection was retrospectively reviewed; patients were stratified by presence (n=24) or absence (n=24) of DM and location of infection (Proximal [proximal to digit] vs. Distal [within the digit]). Univariate analyses compared laboratory/culture results. Analysis of variance compared antibiotic regimens within and between disease groups. Multivariate analyses were employed to identify significant predictors of labs or infection location.

Results and Conclusions: Mean ESR was significantly higher in DM (76.2 vs. 51.3 mm/hr); mean WBC, CRP were comparable. Regression analysis showed that diabetics had higher odds of having increased ESR than non-diabetics (OR=1.03) (all p<0.02). Proximal infections had higher mean CRP (136.9 vs. 50.5 mg/L, p=0.001) and WBC (5.2 vs. 3.9 103/µL, p=0.02). Regression analysis showed that proximal infections were associated with increased odds of resulting in higher CRP (OR 1.02, p=0.003). Rates of Staphylococcus aureus, MRSA, and gram-negative organisms were comparable between DM groups. Diabetics received vancomycin/piperacillin/tazobactam (VAN-PTZ) more often (52% vs. 8%). Providers treated DM with VAN-PTZ or any VAN-containing regimen more often than with any other regimen (all p<0.05). In conclusion, this study underlies the need for systematic criteria to aid in risk-stratifying patients for appropriate antibiotic use. The microbiology of hand infections in diabetics may not differ compared to non-diabetics as much as was previously thought. It may not be appropriate to treat both groups differently in urban populations similar to our own; antibiotic selection in this population may be overly-aggressive and contribute to drug-resistance.

Keywords:
hand infection, diabetes, antibiotics, MRSA, finger infection
Eliminating Opioid Use for Postoperative Pain Management following Soft Tissue Surgery Produces Acceptable Outcomes When Performed Using Wide Awake Local Anesthesia No Tourniquet (WALANT)

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Objectives / Interrogation: In recent years, there has been an exponential increase in opioid prescriptions provided to patients, leading to the current “opioid epidemic.” We have instituted opioid-restricting, postoperative analgesic measures. We hypothesized that patients’ reported VAS pain scale would be lower postoperatively, obviating the need for postoperative opioid analgesics, and that patient-specific factors would not impact this hypothesis.

Methods: Consecutive patients from a single, fellowship-trained hand surgeon from July 2017 - January 2018 undergoing soft tissue hand/upper extremity procedures were selected. All patients under 18 years of age were excluded. All surgeries were performed using the Wide Awake Local Anesthesia No Tourniquet (WALANT) technique. Univariate analysis (paired two-tailed t-test) was employed to compare patients' preoperative VAS pain scores to postoperative scores at postoperative day (POD)1 and POD14. Scores were also compared between POD1 and POD14. All statistical testing was performed using IBM SPSS v.24.0. Furthermore, each patient's Charlson Comorbidity Index (CCI) was calculated and reported.

Results and Conclusions: A total of 36 patients underwent 40 soft tissue procedures. The mean age of patients was 49.3 years (range, 14 to 81 years), with a 2:1 female to male ratio and mean BMI of 31.8 kg/m2. A large proportion of patients were African American (n=31, 86.1%) and were insured by Medicaid (n=18, 50%); four patients (11.1%) were insured by Medicare. Mean CCI for these patients was 2.36. The most common procedure performed was trigger finger release (n=12), followed by carpal tunnel release (n=10, 25%). Compared to mean preoperative score (3.36), mean VAS pain scores at POD1 (1.53) and POD14 (0.22) significantly decreased (p<0.001). Furthermore, mean VAS pain score decreased significantly (p<0.001) at POD14 when compared to POD1. Of note, only one patient was prescribed opioid analgesia between discharge and POD14 (from the emergency department). In conclusion, patients' mean reported pain following soft tissue hand/upper extremity procedures with WALANT and opioid restriction declined from pre- to postoperative time-points, with a substantial decrease also found between POD1 and POD14 time-points. In the medically disadvantaged population we serve, this postoperative analgesic regimen had acceptable outcomes and could be employed safely as a possible treatment plan in a medically-underserved area and for patients with considerable morbidity and mortality risk.

Keywords:
opioids, WALANT, pain, upper extremity
Biomechanical testing of the transosseous fixation of the distal radioulnar ligament

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Objectives / Interrogation: We hypothesized that the re-fixation of the deep and superficial fibres of the distal radioulnar ligaments provide improved stability compared to reconstruction of the deep fibres alone.

Methods: Fourteen fresh-frozen cadaver upper extremities were used for biomechanical testing. Transosseous refixation of the deep fibres of the distal radioulnar ligaments alone (single mattress suture group; n = 7) was compared to the transosseous reattachment of the deep and superficial fibres (double mattress suture group; n = 7). Cyclic load application provoked palmar translation of the radius with respect to the rigidly affixed ulna. Creep, stiffness, and hysteresis were obtained from the load-deformation curves, respectively. Testing was done in neutral forearm rotation, 60° pronation, and 60° supination.

Results and Conclusions: The refixation techniques did not differ significantly regarding the viscoelastic parameters creep, hysteresis, and stiffness. Several significant differences of one cycle to the consecutive one within each refixation group could be detected especially for creep and hysteresis. No significant differences between the different forearm positions could be detected for each viscoelastic parameter.

The refixation techniques did not differ significantly regarding creep, hysteresis, and stiffness. This means that the additional reattachment of the superficial fibres may not provide greater stability to the DRUJ. Bearing in mind that the study was a cadaver examination with a limited number of specimens we may suppose that the reattachment of the superficial fibres seem to be unnecessary. A gradual decline of creep and hysteresis from first to last loading-unloading cycle is to be expected and typical of ligaments which are viscoelastic.

Keywords:
biomechanics, DRUJ instability, radioulnar ligament refixation, transosseous refixation technique
Sonographical parameters of the finger pulley system in healthy adults

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Objectives / Interrogation: To establish normative values of tendon to bone distances (TBDs) to evaluate the A2 and A4 annular pulley integrity, we hypothesized that these values correlate with gender, athletic exercise, occupation, individual's age and body height.

Methods: Ultrasonography of 200 healthy individuals was performed prospectively. TBDs for the A2 and A4 pulley sections were measured for all fingers. Evaluation was performed in resting position and active forced flexion. Examination parameters included gender, age, body height, occupation, athletic exercise level, and hand dominance. Assessment of resting position and active forced flexion was done.

Results and Conclusions: No clinically relevant differences of TBDs with respect to the aforementioned parameters were observed. But TBDs were significantly greater in active forced flexion than in resting position for all measured pulley sections. Intraobserver reliability was very satisfactory. Establishing normative values will help to detect injured pulleys more precisely and examination should be performed both in resting position and active forced flexion.

Keywords: A2 annular pulley, A4 annular pulley, ultrasonography
Functional outcome after endoscopic assisted release of the ulnar nerve for cubital tunnel syndrome: mid-to-long term results

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Objectives / Interrogation: The aim of the study was to investigate functional and patient-rated outcome parameters after endoscopic assisted release of the ulnar nerve for cubital tunnel syndrome.

Methods: One hundred of 204 consecutive patients between 2006 and 2011 met the inclusion/exclusion criteria. Fifty-one of these patients were recruited and evaluated clinically and by questionnaire testing retrospectively after a mean follow-up of 82 months (range: 60-116).

Results and Conclusions: Neurological parameters (two-point-discrimination, application of Semmes-Weinstein monofilaments, Tinel's test), grip, and three-point pinch strength were not significantly different from the contralateral extremity at the time of examination, whereas key pinch strength was significantly weaker. Mean Disabilities of the Arm, Shoulder, and Hand score was 20.82. Patients' overall opinion was good/excellent for 78% of the study population.

The examined surgical procedure proved to be as efficacious as open in-situ decompression regarding functional outcome with fewer post-operative complications. Regarding the results it might be postulated that grip strength and three-point pinch strength determination is not necessarily relevant for ulnar nerve evaluation.

Endoscopic assisted release of the ulnar nerve is a reliable and safe treatment option for cubital tunnel syndrome with satisfactory mid-to-long term functional and patient-rated outcomes.

Keywords:
cubital tunnel syndrome, endoscopic assisted release, nerve entrapment, ulnar nerve
Functionality After Arthroscopic Debridement of Central Triangular Fibrocartilage Tears With Central Perforations

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Objectives / Interrogation: To investigate functional and subjective outcome parameters after arthroscopic debridement of central articular disc lesions (Palmer type 2C) and to correlate these findings with ulna length.

Methods: Fifty patients (15 men; 35 women; mean age, 47 y) with Palmer type 2C lesions underwent arthroscopic debridement. Nine of these patients (3 men; 6 women; mean static ulnar variance, 2.4 mm; SD, 0.5 mm) later underwent ulnar shortening osteotomy because of persistent pain and had a mean follow-up of 36 months. Mean follow-up was 38 months for patients with debridement only (mean static ulnar variance, 0.5 mm; SD, 1.2 mm). Examination parameters included range of motion, grip and pinch strengths, pain (visual analog scale), and functional outcome scores (Modified Mayo Wrist score [MMWS] and Disabilities of the Arm, Shoulder, and Hand [DASH] questionnaire).

Results and Conclusions: Patients who had debridement only reached a DASH questionnaire score of 18 and an MMWS of 89 with significant pain reduction from 7.6 to 2.0 on the visual analog scale. Patients with additional ulnar shortening reached a DASH questionnaire score of 18 and an MMWS of 88, with significant pain reduction from 7.4 to 2.5. Neither surgical treatment compromised grip and pinch strength in comparison with the contralateral side. We identified 1.8 mm or more of positive ulnar variance as an indication for early ulnar shortening in the case of persistent ulnar-sided wrist pain after arthroscopic debridement. Arthroscopic debridement was a sufficient and reliable treatment option for the majority of patients with Palmer type 2C lesions. Because reliable predictors of the necessity for ulnar shortening are lacking, we recommend arthroscopic debridement as a first-line treatment for all triangular fibrocartilage 2C lesions, and, in the presence of persistent ulnar-sided wrist pain, ulnar shortening osteotomy after an interval of 6 months. Ulnar shortening proved to be sufficient and safe for these patients. Patients with persistent ulnar-sided wrist pain after debridement who had preoperative static positive ulnar variance of 1.8 mm or more may be treated by ulnar shortening earlier in order to spare them prolonged symptoms.

Keywords: degenerative triangular fibrocartilage lesion, ulna impaction syndrome, ulnar shortening osteotomy.
Intramedullary nail fixation for displaced and unstable distal radial fractures in patients fifty years of age and older

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Objectives / Interrogation: Distal radius fractures are now commonly treated with a volar locking plate. However, flexor tendon problems such as tendon irritation and rupture caused by prominence of the implant have been reported. Intramedullary implants can stabilize distal radius fracture and minimally affect flexor tendons and muscles around the site, but the literatures about radiographic and functional results of placing such implants are limited.

Object of this study was to investigate the radiographic and functional results and complications of distal radius fracture treated with intramedullary implants in patients older than 50 years old.

Methods: From among the patients with extra-articular or simple intra-articular fractures with a sagittal fracture line who we treated, we retrospectively evaluated those over 50 years old treated by intramedullary implant (Micronail, Wright Medical Technology) who had at least 6 months follow up. We investigated fracture type using the AO classification, radiographic parameters, range of motion, grip strength, complications, and the Mayo modified wrist score.

Results and Conclusions: We evaluated 90 patients (11 men, 79 women; mean age 69.5 years, 50-88 years). According to the AO classification, there were 54 type A patients, 36 type C patients. Preoperative mean radial inclination was 18 degrees, volar tilt was -17.5 degrees, and ulnar variance was 2.0 mm. Immediate postoperative average radial inclination was 25.8 degrees, volar tilt 9.3 degrees, and ulnar variance -0.2 mm. At final follow up, all fractures had bony union, and the average radial inclination was 25.1 degrees, volar tilt 11.7 degrees, and ulnar variance 0.2 mm. Average range of motion was 70.6 degrees of dorsal wrist flexion, 61 degrees of palmar wrist flexion, 79.1 degrees of forearm pronation, and 89.6 degrees of forearm supination. Average percentile grip strength of the uninjured side was 95.8%. No patients had flexor tendon irritation or rupture. Two patient had neuritis of a superficial branch of the radial nerve, which resolved within 3 months. The average Mayo modified wrist score at final follow up was 93.4 points, with 56 patients graded as excellent, 29 good, 5 fair.

Conclusions
Intramedullary implants to treat dorsally displaced extra-articular or simple intra-articular distal radius fracture afforded good radiological and functional outcomes. This procedure was free from flexor tendon problems, and specific complications about radial nerve sensory branch were temporary.

Keywords:
Distal radius fracture, Intramedullary nail, Osteosynthesis
Versatility of oblique Neurovascular flap for fingertip amputations with rapid healing and return to work

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Objectives / Interrogation: Fingertip amputations vary widely in mechanism, ranging from sharp lacerations to crush injuries that present with varying degrees of contamination and irregular skin loss. Injuries can be work or non-work related, and in either case rapid return to work without any dressing and rapid recovery of sensation in the fingertip is sought for by the injured. When bone is exposed with preservation of nail matrix a flap is required to restore the contact surface of the pulp. We report on the versatility of the neurovascular advancement flap (initially described by Venkatswami) especially in cases with irregular skin loss where conventional V-Y advancement flaps are tricky.

Methods: Prospective with retrospective study conducted in a large volume tertiary care center, where 22 fingers in 20 patients were studied. All patients had some part of nail bed preserved (Allen 3 and 4 types), but with varied obliquity and irregular skin loss. They underwent homodigital oblique neurovascular advancement flap described by Venkatswami with or without skin grafting for donor defects and no bone shortening of distal phalanx. Patients were assessed for time out of dressing, recovery in sensation and range of motion, patient satisfaction and return to work.

Results and Conclusions: Middle finger was most commonly affected with industrial accidents being the most common cause. All 22 flaps were viable and did not need any dressing by 21 days. Patients were followed up for a minimum of 6 months with the longest follow-up being for 14 months. One patient had stitch abscess which resolved with local measures and oral antibiotics. One patient who had associated uncontrolled diabetes ended with 20 degree flexion contracture at distal interphalangeal joint. One patient with Allen 4 type developed hooking of nail. All patients had preserved sensation, no cold intolerance, no scar tenderness and returned to their original occupation between 3 to 5 weeks. 18 patients were satisfied with the procedure in terms of appearance and function graded on a scale of 1 to 10.

Conclusion: In irregular Allen 3 or 4 fingertip amputations, this oblique homodigital neurovascular advancement flap provides adequate cover with fast recovery to pre-injury occupation and full preservation of sensations in the fingertip.

Keywords: fingertip amputation, neurovascular flap,
Wide-awake surgical operations performed over a 25-month period in Tianjin: Analysis of applications and technical extension

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Objectives / Interrogation: WALANT hand surgery becomes increasingly popular. In this report we analyze our applications of wide-awake hand surgical procedures, especially the use of WALANT in emergency hand surgery procedures.

Methods: From February 2016 to March 2018, a total of 20 hand surgeons in our department performed WALANT procedures in 7673 patients. Among these patients, 5634 patients were operated in emergency settings because of open trauma, 2039 patients were operated as elective cases. In the emergency settings, we performed internal fixation for open digital and metacarpal fractures in 1380 patients. As elective cases, we operated on 340 closed fracture patients with open reduction and internal fixation of the phalangeal and metacarpal fractures. In addition, we performed 110 in situ cubital tunnel releases.

Results and Conclusions: WALANT surgery was predominantly in emergency surgeries in our department. 73% of the patients who we operated with WALANT were in emergency settings. All patients tolerated surgical procedures well in emergency settings. No epinephrine related tissue necrosis was found. We found that WALANT was feasible for internal fixation (including plating) in our 1380 patients treated in emergency settings. WALANT was very satisfactory for in situ cubital tunnel decompression in elective settings.

We conclude from our experience of WALANT surgeries in 7673 patients that this approach benefits our emergency patients greatly. We also conclude that WALANT can be used for internal fixation of phalangeal and metacarpal fractures including plating in needed patients and it provide very satisfactory approach for cubital tunnel release. Our large case series also indicates this approach is safe in both emergency and elective settings. The use of WALANT remarkably increased efficiency of emergency case of patients with hand trauma in our hospital.

Keywords:
Wide-awake surgery; No Tourniquet; Emergency Settings; Elective Settings
Distribution and Surface Projections of Nerve Fascicles Innervating Lumbrical and interosseous Muscles

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Objectives / Interrogation: Many surgeons lack clarity on the branches that innervate the lumbricals and interossei. Their surface anatomical knowledge is essential for designing surgical approach for nerve transfers and predicting lesions. We aimed to (1) determine the surface locations of the nerve fascicles (NFs) that innervate the lumbricals and interossei, (2) re-examine the branching pattern of the deep branch of the ulnar nerve (dUN), and (3) provide detailed information about their origin, entrance, and course.

Methods: Eleven fresh-frozen Chinese adult cadaver hands were investigated. We systematically recorded the origin, entrance, and course of every branch. NFs that innervate the lumbricals, interossei, and surface landmarks including the distal wrist crease and 2-5 proximal finger creases were marked by radio opaque fibers and subjected to X-ray. The images were uploaded and analyzed; we set a quadrant-linked hand surface. Subsequently, we measured the lengths of both axes and the coordinates of the locations of NFs in the quadrant.

Results and Conclusions: The branches that innervated the lumbricals and interossei were located from 29.81 ± 4.10% to 75.89 ± 3.33% and 19.39 ± 4.26% to 67.58 ± 4.13% of the X-axis and from 29.67 ± 2.81% to 60.58 ± 5.11% and 29.67 ± 2.81% to 44.41 ± 1.73% of the Y-axis, respectively. The branches of dUN exhibited a 4-group distribution pattern and two variants of innervation. In 4/11 hands, we found dual innervation of the third lumbrical (innervated by dUN and median nerve).

Novel methods for quantitatively locating the surface anatomy of the NFs that innervate the lumbricals and interossei; systematic description of the origin, entrance, and course of these branches; and the demonstration of a 4-group branching pattern of UN’s deep branch were established.

Keywords:
hand; innervation; lumbrical muscles; interosseous muscles; nerve fascicles;
The Twist X-ray - A Novel Test for Dynamic Scapholunate Instability

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Objectives / Interrogation: Scapholunate instability (SLI) is the most common form of carpal instability. Early detection of SLI is imperative as early reconstructive procedures can potentially prevent the natural history of progressive degenerative arthritis. After wrist arthroscopy, MRI remains the next best non-invasive diagnostic option, however access still remains costly and often limited in many healthcare systems worldwide. In this paper, we describe a novel device that allows for dynamic x-rays to be taken, accentuating the SL widening.

Methods: Twist x-ray views are generated by the patient clenching a device which combines the standard clenched fist views with ulnar deviation and supination. The test is easy to perform and functions by combining a higher grip force with the ulnar deviation and pronation effects of the extensor carpi ulnaris tendon thus accentuating the scapholunate gap in dynamic instability.

We present a series of 4 patients with dynamic SLI and compare the findings of the Twist x-rays with conventional wrist x-rays series, including standard anteroposterior, lateral, radial and ulna deviation, clenched fist and pencil grip views.

Results and Conclusions: In all 4 patients there was substantial dynamic scapholunate widening. The SL interval increased from a mean of 1.8mm (range, 1.5-2.8) on PA x-rays to 6.3mm (range, 4.6-8.2) with the Twist views. Interestingly, on the pencil grip view, the mean widening was only 1.5mm (range, 1-2.8mm).

Here we describe a novel device that allows for improved detection of dynamic scapholunate ligament instability when performing stress x-ray views of the wrist.

Keywords:  
scapholunate instability, x-ray, wrist, scapholunate ligament, SLAC, arthritis
Surgical strategy for angular deformity correction in thumb polydactyly reconstruction

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Objectives / Interrogation: Proposed surgical strategy and analyzed the result of soft tissue reconstruction with or without corrective osteotomy for correction angular deformity in thumb polydactyly surgery.

Methods: Surgical procedures for correction angular deformity of metacarpophalangeal (MCP) and interphalangeal (IP) joint in thumb polydactyly were retrospective reviewed. Classified by degrees of angulation into mild (< 30 degrees) and severe angulation (> 30 degrees), the operations and surgical outcomes were analyzed in terms of surgical procedures (soft tissue reconstructions with/without corrective osteotomy), post-operative complications and residual deformity.

Results and Conclusions: 42 thumb polydactyly were reviewed. Six were skin-tag type and treated by simple excision without complications and residual deformity. Other 36 patients were presented with angular deformity of MCP and/or IP joint.

For MCP joint deformity, there was 25 patients had mild MCP angulation (< 30 degrees). All 25 patients were treated by soft tissue reconstruction alone without osteotomy. The result in this group showed residual deformity only 8% (2/25 patients). In severe MCP angulation (> 30 degrees), there was 11 patients in this group. Only 6/11 patients (54.5%) achieved proper alignment from soft tissue procedure alone and other 5 patients (45.5%) need metacarpal osteotomy to correct MCP angulation. Prognosis of this group showed residual deformity up to 27.3% (3/11 patients).

For IP joint deformity, there was 27 patients had mild IP angulation (< 30 degrees). All 27 patients were treated by soft tissue reconstruction alone without requiring osteotomy. The result in this group showed no residual deformity. In severe IP angulation (> 30 degrees), there was 9 patients in this group. Only 3/9 patients (33.3%) achieved proper alignment from soft tissue procedure alone and other 6 patients (66.7%) need phalangeal osteotomy to correct IP angulation. Prognosis of this group showed residual deformity up to 77.8% (7/9 patients).

In conclusion, soft tissue reconstruction alone was the effective method for correction angular deformity in mild deformity (< 30 degrees) of MCP and IP joint with low residual deformity (8% for MCP and 0% for IP joint). However, severe angulation (> 30 degrees) of MCP and IP deformity need both soft tissue and corrective osteotomy to achieve proper deformity correction and less predictable results especially in IP joint deformity (long-term residual deformity 27.3% for MCP and up to 77.8% for severe IP joint deformity).

Keywords:
angular deformity polydactyly
Extending application of wide-awake surgery: flap harvest and transfer in the hand in 39 patients

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Objectives / Interrogation: It is advised that wide-awake surgery under local anesthetic with epinephrine (WALANT) should not be used for flap surgery. We used WALANT in harvesting flaps in 39 patients. We report our experience of using WALANT in the flap harvest and transfer in the hand.

Methods: From April 2017 to May 2018, we used local anesthetic with epinephrine injection to the hands of 39 patients (18 to 67 years old, 23 man, 16 women) in performing 10 extended Segmüller flaps, 6 homodigital reverse digital artery flaps and 23 Atasoy flaps. The anesthetic with epinephrine was injected to proximal, middle and distal parts of the finger along volar midline before flap harvest. We evaluated intra-operative pain levels, easiness of flap harvest, and observed pulsation of the digital arteries during surgery. We also assessed postoperative flap survival and patient satisfaction.

Results and Conclusions: During the operation, no patients required the use of a temporary tourniquet, and our technique achieved adequate bleeding control. We observed normal pulsation of the digital arteries in all 16 digital artery pedicle flaps. No procedures required termination because of pain. All patients had successful transfer of the flaps with good blood perfusion to the flap 4-5 hours after surgery. All flaps survived completely, except that one extended Segmüller flap had a 3 mm wide strip of skin necrosis, likely caused by tight skin closure, which healed after simple debridement. The patients are satisfied with this approach and stated that they would choose this approach if they had the flap surgery in the hand again.

Our patient series showed that flap surgery in the hand can be performed under WALANT. The digital artery pulsates normally after epinephrine injection. We found digital artery pulsation is not affected by local epinephrine injection and injection of epinephrine does not cause flap failure. The one flap with narrow skin necrosis in one patient was due to tight skin suture, which appears unrelated to the epinephrine injection. WALANT is safe and provides excellent anesthetic in our cases in flap harvesting and transfer in the hand.

Keywords:
Flap; Anesthesia; Tourniquet; Wide-awaeee hand surgery
Comparison of radiological outcomes of closed reduction and percutaneous pinning through or not through the proximal first metacarpal in treatment of Bennett fractures

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Objectives / Interrogation: Percutaneous pinning is used to maintain reduction of the Bennett fracture. However, it is unclear whether surgeons have to pass the K-wire through metacarpal bones. The purpose of this study is to compare the radiological outcomes of treating Bennett fractures with the K-wires passing or not passing the first metacarpals and the middle of the trapeziometacarpal joint.

Methods: From Jan 2014 to May 2017, a total of 28 patients with Bennett fractures were treated by percutaneous pinning with two K-wires. The fracture was reduced manually after traction and reduction under fluoroscopy. Thirteen patients were randomly chosen to have their first K-wires pass through the first metacarpal base to the trapezium and 15 patients were chosen to have their first K-wires passing lateral to the metacarpal base inserting only to the trapezium. After inserting the first K-wire in different ways, we inserted the second K-wires in the same fashion, from the first to the second metacarpal in all the patients. The K-wires were removed four or five weeks after surgery. We assessed the radiographic outcomes of two groups one year after surgery with plain radiographs (anteroposterior, oblique and lateral views).

Results and Conclusions: In both groups, there was no loss of reduction during the period of pinning fixation and no re-displacement of fracture after removal of the K-wires. Statistically, there is no difference in the timing of K-wire removal, the time required to completely heal the fracture and joint congruency (p > 0.05). Radiographically, we found all patients in two groups healed without any difference in reduction. Both methods maintained reduction well and did not show loss of reduction during the pinning periods.

We conclude that the surgeon does not need to pass the K-wire through the first metacarpal base to achieve reliable fracture reduction of Bennett fractures.

Keywords:
Bennett fracture; closed reduction; percutaneous pinning
The effectiveness of engineered miRNAs targeting cyclooxygenases on reducing adhesions and improving strengths of healing flexor tendons

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Objectives / Interrogation: The objective is to deliver anti-inflammation gene to the healing digital flexor tendon to ensure high local gene concentration and to reduce the inflammatory responses of the injured tendon microenvironment to reduce adhesions and improve the healing strengths.

Methods: We designed a novel local sustained gene delivery system by using cyclooxygenases (COX-1 and COX-2) engineered miRNA plasmid/nanoparticles embedded in hyaluronic acid (HA) hydrogel. 64 completely transected digital flexor tendons of the long toes of both feet of 32 white Leghorn chickens were equally randomized into four groups: non-treated; hydrogel; hydrogel containing nanoparticle/negative plasmid complexes and hydrogel containing nanoparticle/COX-1 and COX-2 miRNA plasmid complexes group. At 6 weeks after surgery and gene therapy, severity of adhesions were scored. Gliding excursions, work of digital flexion and ultimate strengths of the healing tendons were tested in an Instron testing machine. We used two-way analysis of variance followed by post hoc Dunnett's t-test to analyze the differences in adhesion scores, gliding excursions, work of flexion and ultimate strengths.

Results and Conclusions: This local sustained gene delivery approach down-regulated COX-1 and COX-2 gene expression in tendons and surrounding subcutaneous tissues. At 6 weeks after treatment, adhesion scores in the COX-1 and COX-2 miRNA plasmid/nanoparticle group were significantly smaller than in the negative plasmid/nanoparticle group (p=0.028), unloaded hydrogel group (p=0.006) and non-treatment group (p=0.038). The gliding excursions were significantly increased in the COX-1 and COX-2 miRNA plasmid/nanoparticle group than in the negative plasmid/nanoparticle group (p=0.027), unloaded hydrogel group (p=0.028) and non-treatment group (p=0.009). However, there were no significant differences in the work of flexion among four groups. More importantly, the healing strengths in the COX-1 and COX-2 miRNA plasmid/nanoparticle group was significantly greater than that of negative miRNA plasmid/nanoparticle group (p=0.002), unloaded hydrogel (p=0.001) and non-treatment group (p=0.039).

Inhibition of the cyclooxygenases COX-1 and COX-2 was found to have remarkably increased the tendon healing strengths to 160% of the control and decreased adhesions in term of adhesion severity and gliding excursions. This approach may offer an effective therapeutic strategy to increase tendon healing strength and reduce adhesions.

Keywords:
Flexor tendons; miRNAs; adhesions
Nanoparticles-coated sutures to provide sustained delivery of growth factors significantly increased tendon healing strengths at multiple time-points

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Objectives / Interrogation: Rupture of the tendon is a common injury and often requires surgical treatment due to limited tendon healing capacity. The objective of this study is to test effectiveness of our designed nanoparticles-coated sutures carrying growth factors in accelerating tendon repair.

Methods: In this study, we developed a novel therapeutic approach to apply nanoparticles loaded with bFGF and VEGFA to sutures, and the effects of bFGF and VEGFA releasing sutures were tested in the chicken flexor tendon healing model. 72 toe flexor tendons were completely transected and repaired with bFGF and VEGFA-releasing sutures, bFGF-releasing sutures, VEGFA-releasing sutures and non-treatment control sutures. At 2, 4 and 6 weeks after surgery, ultimate strengths of healing tendons were evaluated in an Instron mechanical testing machine. Adhesions were scored and tendon gliding excursion and work of digital flexion were measured at week 6. We used two-way analysis of variance followed by post hoc Dunnett's t-test to analyze the differences in the ultimate strengths of repaired tendons, adhesion scores, gliding excursions and work of digital flexion.

Results and Conclusions: The ultimate strengths of repaired tendons treated with bFGF and VEGFA-releasing sutures (8.5±0.8N, 28.4±8.0N, 76.2±22.5N, at week 2, 4, 6, respectively) was significantly greater than the tendons repaired with non-treatment control sutures (5.7±1.5N, 13.7±6.8N, 48.6±9.2N, at week 2, 4, 6, respectively) at their corresponding time-points (p < 0.05 or p < 0.01). At 6 weeks, adhesion scores in the bFGF and VEGFA-releasing suture group (3.1±0.4) were significantly smaller than those of the non-treatment control suture group (3.9±0.4) (p=0.005). Tendon gliding excursions were significantly greater in the bFGF and VEGFA-releasing suture group (15±3mm) than in the unmodified control sutures (11±1mm) (p=0.006). Work of digital flexion was significantly decreased in the bFGF and VEGFA-releasing suture group (0.01±0.004J) than in the non-treatment control group (0.04±0.019J) (p=0.005).

We developed a novel platform for local and sustained delivery of growth factors based on the nanoparticles-coated sutures, which can effectively deliver growth factors to tissues and control the release of growth factors. Dual growth factors loaded nanoparticles-coated sutures can significantly promote tendon healing. This growth factors delivery system is an attractive therapeutic tool to repair injured tendons.

Keywords:
Tendon; nanoparticles-coated sutures; healing strengths
The WALANT approach to distal radius ORIF

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Objectives / Interrogation: TO verify that open reduction and internal fixation of distal radius fractures is feasible, financially beneficial and safe for the patients

Methods: We present four cases that we performed using wide awake local anaesthesia no tourniquet in two countries (UK and Cyprus). We also present our injection technique

UK patients were operated as part of the NHS which offers universal free-for-all healthcare and patients in Cyprus were operated in a private healthcare setting with patients paying for their care from their budget.

In Cyprus, patients that receive their surgery wide awake, had the injection of the LA in the office, walked to theatre to receive their procedures and then were discharged immediately from theatre with no stay in a day case ward.

In the UK, patients received their LA injections in the ward, had their procedure in the clean air theatre and then discharged from the day case ward.

Results and Conclusions: Of the four patients the three had the procedure with no problem, tolerating it very well. Of the three, one of the patients had to have her distal radius osteotomised as three and a half weeks passed from the day of injury, tolerating it with no problems. For all patients, either the Medartis Aptus Adaptive or the Medartis FPL plate were used.

One of the patients expressed discomfort during surgery, but surgery was concluded without any further problems and without any sedation. No tourniquet was used.

All four patients went on to have their fractures healed and recovered a complete range of motion. No one developed any kind of infection or wound healing problems and returned to their pre-injury activities or occupations

Financial benefits for self-paying patients were in the range of 1000 euros, as this amount included the fees of the anaesthetist, the day case bed, the intraoperative medication as well as the increased stay in recovery.

In the NHS, the possibility to carry on with surgery without an anesthetist and the increased turn around time led to increased theatre utilization

Conclusion: The WALANT approach for the open reduction and internal fixation of distal radius fractures is a feasible and safe alternative to other methods of anaesthesia that can be utilised in developing countries with no universal healthcare as well as in overcrowded healthcare systems to maximise theatre and staff utilization.

Keywords:
WALANT, ORIF, distal radius, fracture, local anaesthesia, no tourniquet

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**Suture Tape Stabilization of the Fifth Carpometacarpal Joint in an Elite Athlete**

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**Objectives / Interrogation:** Treatment of CMC fracture-dislocations is usually surgical and includes open reduction and pinning. Post-operative immobilization is required for several weeks and may result in stiffness and muscular atrophy, which can be detrimental for athletes. This report is a description of a novel treatment (suture tape stabilization) used for a professional basketball player who sustained a fourth metacarpal fracture and concomitant fifth CMC joint dislocation of the dominant hand (Figure 1a & b).

Methods: After surgical exposure, the fourth metacarpal fracture was repaired with a plate and screw construct; however, rather than pinning the reduced fifth CMC joint, we proceeded with suture tape stabilization. The tape spanned the fifth CMC joint and was secured with two SwiveLock anchors (Figure 2a & b).

Drawing and Intraop Picture of Suture Tape Stabilization

Stable reduction of the fifth CMC joint was confirmed by fluoroscopy and direct observation.
At three days post-surgery, x-rays revealed a stable plate and screws on the fourth metacarpal and a congruent fifth CMC joint. Physical examination also revealed a stable fifth CMC joint. Hand therapy was initiated. By four weeks post-surgery, he achieved full, pain-free motion of his wrist and fingers. By five weeks post-surgery, grip strength was found to be 96% of the left, non-dominant hand. He was allowed to return to full basketball activities at this time, including dunking.

**Results and Conclusions:** Suture tape stabilization is a technique where joints are stabilized using synthetic materials. In this elite athlete, this technique allowed for shorter post-operative immobilization and earlier return to sport, without the disadvantages associated with Kirschner wire fixation and post-operative immobilization.

**Keywords:**
suture tape; internal brace, carpometacarpal; dislocation; athlete
Modified Eaton-Littler's reconstruction for chronic instability of the carpometacarpal joint of the thumb: A report of 2 cases

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Objectives / Interrogation: Chronic instability of the carpometacarpal (CMC) joint is an injury rarely reported in the literature. We present two patients with that lesion, very similar between them, treated with modified Eaton-Littler's ligament reconstruction.

Methods: Two patients, aged 46 and 49, presented to external consultation with pain on the base of the thumb and instability of CMC joint of their dominant hand. Both of them related their pain to their work. Clinical examination revealed in the two cases deformity of the CMC joint with a reduced and painful range of movement. Radiographs of the hand showed CMC subluxation of the thumb without associated fractures and with no signs of osteoarthritis. The study was completed with a CT scan in one case and with a MRI in the other case. Reconstruction was undertaken using a modified Eaton-Littler technique as described by Iyengar et al (J Hand Microsurg 2013): a FCR slip 2 to 2.5cm short of its insercion is directed in an oblique manner to reproduce the direction of the anterior oblique ligament and, by passing it through a bonny tunnel in the metacarpal base and under the APL, and suturing it back on to itself, it is ensured a reinforcement of the dorsoradial ligament.

Results and Conclusions: At 1 year follow-up evaluation, the patients were pain free with satisfactory thumb functions. They had no radiological evidences of instability or arthritic changes.

Keywords:
thumb, carpometacarpal joint, instability, ligament reconstruction
Posttraumatic boutonnière deformity of the thumb: A case report

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Objectives / Interrogation: Boutonnière deformity of the thumb is common in rheumatoid arthritis, but it is very rare when it is caused by a traumatism in a non-rheumatoid patient.
We present a case report of a patient who developed a boutonnière deformity of the thumb after a closed injury.

Methods: A 27-year-old women, massage therapist, hit her right hand (dominant extremity) with a box she was carrying. She presented 2 months after the injury, and complained of pain and deficit of extension of the metacarpophalangeal (MCP) joint. Radiographs of the thumb showed normality of the MCP joint. Magnetic resonance showed integrity of the extensor pollicis longus (EPL) tendon and disruption of the dorsal capsule.
Surgical findings included disruption of the dorsal capsule, partial detachment of the extensor pollicis brevis (EPB) tendon and ulnar luxation of the EPL tendon. The partial injury of the EPB tendon was sutured, as well as the dorsal capsule, with reduction of the EPL luxation. The MCP joint was immobilized with a cast for 4 weeks.

Results and Conclusions: After the immobilization, range of motion was started, but unfortunately only two weeks after she returned to the emergency room with boutonnière deformity of the operated thumb. She was reoperated, finding this time a new disruption of the dorsal capsule, an ulnar subluxation of the EPL tendon and integrity of the EPB tendon. We re-sutured the dorsal capsule, with reduction of the EPL tendon, and immobilized the MCP joint with a cast for 6 weeks. After that period of time, we started range of motion. At one year of follow-up, she complains of partial deficit of extention with normal flexion and reduced key pinch strength compared with contralateral hand.
Boutonnière deformity of the hand is an uncommon injury that should be recognized. There are few cases in literature, but we can observed that the results are worse when there is a long delay between the lesion and the surgery, and it is observed in the case report we present.

Keywords:
COMPLETE COMPLEX TYPE-4 SYNDACTYLY OF ALL DIGITS WITH ASD(L>R) : A Rare Case Report

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Objectives / Interrogation: Syndactyly is defined as the failure of separation of the digits during early gestation. It is one of the most common congenital anomalies. The incidence of syndactyly is uncertain, but estimates range from 1 in 2,500 live births. During development, the fingers are webbed. This remains so, until apoptosis and skin recession allow for formation of the digital interspaces. Full inter-digital spaces are usually present by the end of the 6th week of gestation. Here we present a patient who presented to us with syndactyly of all fingers of both upper and lower extremities. The patient, who was a 3-year-old girl, had complete complex type-4 syndactyly of all fingers and toes of both upper limb and lower limb. She underwent complete body workup and it was found associated with Ostium Secundum type (L>R).

Methods: 3 year old Female child presented to our clinic with all five fingers fused together in both hands and all the toes in both feet were also fused together. (Fig. 1). She was first born child of normal parents born out of non-consanguineous marriage. The perinatal history and family history were not contributory. On examination there was complete complex Type-4 syndactyly of all fingers and toes with ASD(L>R) (Fig. 2). No active movements were present in all digits. Rest of the sensory system, motor system were normal. All other developmental milestones were normal. X-Ray findings revealed evidence of bony anomalies & fusion in the Fused digits.

Results and Conclusions: The case reported here is a live born baby with complete complex Type-4 syndactyly. On observation this case was found to have all digits fused of both hand and foot. On gross examination of the extremities, it was seen that (Fig. 1) all five fingers were fused together in both hands and all the toes in both feet were fused together(Fig.2). It was associated with ASD Ostium Secundum type (L>R) which was detected on 2-D Echo (Fig. 3) and no other associated anomalies were found in this case. X-ray of the hand and feet showed bony fusion (Fig. 4).

Keywords: Webbing, ASD, Apert's syndrome, congenital hand anomaly, Syndactyly
REDUCTION OF DELAYED PRESENTED MALUNITING FRACTURE BOTH BONES FOREARM IN A YOUNG CHILD USING JESS FIXATOR - AN INNOVATIVE TECHNIQUE

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Objectives / Interrogation: ABSTRACT
Fracture of both bones forearm is a very common injury presented to orthopaedic trauma OPD worldwide. These fractures usually managed conservatively using closed reduction techniques followed by cast application as mentioned in multiple paediatric orthopaedic books. Closed reduction is difficult in cases where there is a single bone fracture forearm with overriding and fracture both bones forearm with severe overriding/bayoneting. There is no established technique available in literature to reduce such fractures with ease. Hereby we are presenting our case series of such cases (delayed presenting maluniting fracture forearm bones) which we have reduced with our new innovative technique of using simple JESS fixator for reduction

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Keywords:
fracture; both bones forearm; JESS fixator; closed; reduction.
Extensor tendon rupture in non-traumatic osteoarthritis of distal radioulnar joint - A rare case report

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Objectives / Interrogation: Abstract:
Osteoarthritis of DRUJ with rupture of extensor tendon is a rare problem seen in elderly, though it is commonly found in patients with rheumatoid arthritis. A rupture of dorsal capsule of DRUJ causes a dorsal dislocation of ulnar head. Tendon transfer with excision of ulnar head is a viable option. One should look out for 'scallop sign' in order to do surgery before the rupture of extensor tendon is possible. We present a case of extensor tendon rupture of 4th and 5th fingers in a patient with non-traumatic osteoarthritis of distal radioulnar joint.

Methods: A 60 year old right hand dominant woman presented in our OPD with complaints of inability to extend her right little and ring finger for three months. Initially little finger was involved and a month later the ring finger also got involved. There was no history of any trauma or any associated pain prior to it. Patient worked in a button making factory for thirty years. Thorough examination revealed a swelling over the dorsal aspect of wrist on the ulnar side. Patient was unable to actively extend her right little and ring fingers at the metacarpophalangeal joint (Figure 1). DRUJ was found to be unstable as per load and shift test. Blood cell count, erythrocyte sedimentation rate, and C-reactive protein were within normal parameters. Rheumatoid factor as well as Anti-CCP were negative. A study of the plain radiographs revealed osteoarthritic changes at the DRUJ. Deepening and widening of the sigmoid notch and radial shift and dislocation of the ulnar head with positive ulnar variance was suspected.

Results and Conclusions: In our case, we observed a definite scallop sign, a radial shift of the ulnar head, and a roughened ulnar head and positive ulnar variance. Our operative findings showed that the cause of the dorsal capsular perforation and extensor tendon rupture was mechanical friction with the dislocated roughened ulnar head. As far as treatment is concerned end-to-end repair of tendon is not possible because of the frayed margin and the gap between the ends. Tendon graft is also not a viable option as the patients are mostly elderly. Tendon transfer is only available option in these cases with good results as reported elsewhere and in our case also. In addition the dislocated ulnar head also needs to be excised to prevent the recurrence of and further rupture.

Keywords:
Extensor tendon rupture, Osteoarthritis of DRUJ, Scallop sign
Postoperative immobilization in forearm pronation protects any scapholunate surgical repair. A kinetic study in cadavers.

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Objectives / Interrogation: To analyze: 1) if there are significant changes in the alignment of the unstable scaphoid relative to the rest of the proximal carpal row alignment during forearm rotations and 2) if there is one forearm rotation that best reduces scapholunate misalignment.

Methods: The changes in the alignment of both, scaphoid and the tandem lunate-triquetrum, were assessed in 8 fresh cadaver wrists using an electromagnetic motion tracking device. The wrists were isometrically loaded in three forearm rotations: 45° supination, neutral and 45° pronation. The experiment was subsequently repeated after complete scapholunate ligament (SLL) sectioning. The results were assessed using ANOVA with repeated measures. Significance was set at $p<0.05$.

Results and Conclusions:

<table>
<thead>
<tr>
<th>Forearm</th>
<th>SLL Intact</th>
<th>SLL Sectioned</th>
<th>SLL Intact</th>
<th>SLL Sectioned</th>
</tr>
</thead>
<tbody>
<tr>
<td>45° Pronation</td>
<td>2.3 ± 4.2</td>
<td>3.4 ± 4.1*</td>
<td>1.4 ± 2.5</td>
<td>2.5 ± 2.7*</td>
</tr>
<tr>
<td>45° Supination</td>
<td>-1.2 ± 2.7</td>
<td>-2.4 ± 3.5**</td>
<td>----</td>
<td>1.0 ± 2.8</td>
</tr>
</tbody>
</table>

¹ In this presentation, only rotations in the transverse plane (degrees ± standard deviation). Positive values: supination; negative values: pronation. *$<0.05$, and **$<0.01$ relative to neutral forearm rotation.
Forearm pronation increases both the scaphoid and triquetrum supination, whereas forearm supination accentuates the scaphoid pronation and the lunate-triquetrum supination/extension tendency seen in wrists where SLL is torn.

Consequently, forearm pronation reduces scapholunate misalignment and protects any type of surgical SLL repair.

**Keywords:**
scapholunate instability; scapholunate ligament surgical repair postoperative protection
Origami Medial Femoral Condyle Flap for Finger Joint Reconstruction

**List of authors:**
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**Objectives / Interrogation:** Finger joint reconstruction is challenging for hand surgeons, especially when accompanied by severe soft tissue damage. Accordingly, we adopted use of a vascularized medial femoral condyle (MFC) flap. In our procedure, a finger joint is fabricated with origami-like folding of vascularized periosteum. We report our experience with this origami MFC flap for finger joint reconstruction.

**Methods:** Four woman and two men underwent finger joint reconstruction with an origami MFC flap. The affected joints were as follows: two metacarpophalangeal (MCP), one thumb interphalangeal (IP), and three proximal interphalangeal (PIP) joints. The mean age of the patients was 52. Original diagnosis of the patients was benign bone tumor in distal phalanx of the right thumb, incomplete amputation of left ring finger, and septic arthritis in the left middle finger. The mean follow-up period was 40 months. Two cases lost hemi-articular surfaces in each joint, and another four cases lost a bilateral articular surface, complicated with loss of soft tissues; skin, subcutaneous tissue, such as ligament, volar plate, and tendon attachment. The mean follow-up period was one year (six months to five years).

The results of surgery were evaluated retrospectively based on clinical course, plain X-rays, range of motion (ROM), functional Disability of the Arm, Shoulder and Hand (DASH) score, pinching power, and complications at the donor site.

**Results and Conclusions:** Joint spaces and joint function were maintained in all cases. Average ROM was 49° (range four to 100). Pinching power was achieved in 100% of the non-affected side in all cases. The average DASH score was 5.8 (range 0 to 21), and all patients returned to their original work, including heavy manual labor. No cases had complications at the donor site.

An origami MFC flap can reconstruct a functional IP joint with motion and stability. Donor site complications are minimal in this procedure. This procedure can be a solution in finger joint reconstruction for adult patients.

**Keywords:**
Medial femoral condyle, Finger joint, Microsurgery, and Reconstruction.
External Validation of the 2nd Metacarpal Cortical Index As A Simple Screening Tool for Osteopenia

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Objectives / Interrogation: Osteopenia, is a known risk factor for sustaining hand and wrist fractures. Secondary prevention of further fractures has obvious clinical and economic advantages; however screening all patients using a DEXA is unfeasible. We wished to externally assess the use of the 2nd metacarpal cortical index (2MCI), as a simple screening tool for identifying patients at high risk of having osteopenia, and requiring treatment.

Methods: We retrospectively collected radiographic data on 206 patients who had a simple radiograph of the hand and dual energy X-ray absorptiometry (DEXA) within one year of each other, and from our picture archiving and communication system (PACS) database. The 2MCI was calculated for all patients. As data was parametric, a Pearson's correlation was performed to assess for an association between T-scores and the 2MCI. Further analysis involved the construction of receiver operating characteristic curves (ROC) to identify a 2MCI index, which would give the most appropriate sensitivity and specificity for identifying the presence of osteopenia.

Results and Conclusions: There was a statistically significant and moderate correlation between DEXA T-scores and 2MCI values (r=0.54, n=206, p<0.001). Further ROC curve analysis of normal and osteopenic subjects identified that a 2MCI of 41.5 had a sensitivity of 100% and specificity of 53% for detecting osteopenia.

Conclusion: Our results support the use of the 2MCI as a simple screening tool for identifying patients at risk of osteopenia.

Keywords: Osteopenia, Osteoporosis, Hand, Radiograph, X-ray
Corrective Osteotomies of Forearm Bones in Distal Radioulnar Joint Instability by Three-dimensional Analysis and Surgical Navigation

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Objectives / Interrogation: Malunions of forearm bones can result in reduced pronosupination and/or in instability of the distal radioulnar joint. Despite several studies investigating the outcome of soft tissue repairs, limited data exists for stability restoration by isolated corrective osteotomies. Although a precise preoperative plan is of paramount importance to restore forearm bone alignment in corrective osteotomies, conventional deformity analyses are imprecise; especially rotational deformities are poorly assessed compared to analysis in 3D bone models. So far, preoperative 3D analysis of the forearm bones deformities and distal radioulnar joint incongruence has not been evaluated in patients with joint instability. Consecutively, we hereby present the outcome of corrective osteotomies performed by 3D printed patient-specific instruments.

Methods: Ten patients (age: 17.2 - 43.1 years) were included, treated at our institution between 2013 and 2018, with corrective osteotomies of the forearm bones by patient-specific instruments. Simultaneous corrective osteotomy of ulna and radius was performed in 6 cases and in the remaining 4 cases a corrective osteotomy only of the radius. Bone deformity analysis was performed by superimposing the malunion to the contralateral healthy bone models with the realignment of distal radioulnar joint congruency. The preoperative plan was executed by 3D printed patient-specific cutting and reduction instruments. Intraoperative length adaption along the long bone axis was ensured by an adaptable reduction guide to intraoperatively adjust the distal radioulnar joint congruity during pronosupination of the forearm.

Results and Conclusions: A volar instability was addressed in 8 patients and a dorsal instability/radioulnar impaction in the remaining 2 patients. In total, 7 out of 10 patients were clinically stable following a corrective osteotomy of the forearm. The residual error between the 3D preoperative plan and the postoperative result was similar to previously published results of navigation by patient-specific instruments (translational error +/- 1 mm, rotational error +/- 5°).

In the majority of the cases (7 out of 10), isolated corrective osteotomies of the forearm bones fully addressed distal radioulnar joint instability. Accurate execution of the preoperative plan considering three-dimensional analyses of bone deformities and joint incongruences was facilitated by patient-specific instruments.

Keywords:
Osteotomy, Distal radioulnar joint, Instability, Computer-assisted, Patient-specific Instruments
The Hypothenar Fat Pad Flap Surgery for End Stage Carpal Tunnel Syndrome

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Objectives / Interrogation: "End Stage Carpal Tunnel Syndrome" (ECTS) is occasionally seen in an elderly population. In this condition, there is no neurophysiological continuity of the median nerve at wrist level and it is classified as the last grade in the electrophysiological scale of Bland.

Methods: A prospective study was made of 20 patients with ECTS who were treated with the "Hypothenar Fat Pad Flap" surgery. This surgery was initially described by Cramer for treating recurrent CTS. Our patients did not have a history of carpal tunnel release. Assessments of sensibility, strength, symptoms and functional status were made pre-operative and post-operative after 3, 6, 12 months. Strength tests were grip force (Jamar), key-, tripod- and tip pinch recording the maximum/average strength. The Semmes Weinstein Monofilament Test and the Shape Texture Identification were used for the sensibility assessments. The Boston Carpal Tunnel Questionnaire (BCTQ) evaluated the symptoms and functional status. A control EMG was suggested after 1 year. One sided paired statistical analyses were made with the t-test or Wilcoxon test according to their normal distribution and the results were significant if p < 0.05.

Results and Conclusions: Significant results were found for all sensibility tests on every post-operative test moment. Loss of protective touch was seen before surgery but improved after one year to a level between diminished protective touch and diminished light touch. The maximum and average key- and tripod pinch were significant better after one year. The results for maximum- and average tip pinch were already significant after 6 months. The Jamar did not reveal any significant results. On every post-operative test moment the BCTQ scores for symptoms and functional status were significantly better. After one year ending with a score close to one, which is the minimum score. A limited number of cases agreed to an EMG control at one year and improved electrophysiological values were demonstrated. The hypothenar fat pad flap provides a valid and safe solution in the treatment of patients with end stage carpal tunnel syndrome.

Our study showed that sensibility and strength of the hand were significant improved, moreover the hand function returned to a nearly normal level.

Keywords: carpal tunnel syndrome, hypothenar fat pad flap, strength, sensibility, symptoms, functional status, end stage CTS
Single cell analysis of the fibrotic landscape in Dupuytren's Disease

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¹ NDORMS (Oxford)

Objectives / Interrogation: Fibrosis is a major cause of morbidity and mortality. However, despite intense research efforts little progress has been made in clinical treatment across several diseases. In all forms of fibrosis, myofibroblasts are the key effector cell and drive pathogenesis through the secretion and remodeling of excess matrix proteins. We study Dupuytren's disease, a common fibrotic condition of the hand, as it provides an excellent human model to investigate mechanism behind fibrotic disease. This condition provides an abundant supply of primary human fibrotic tissue at a relatively early stage and through two distinct structures allows us to map and compare the early myofibroblast rich and later matrix rich stages of fibrosis.

Methods: We have completed a large scale single cell RNA-seq of Dupuytren's disease and built a molecular census of the complex cellular ecosystem in fibrosis. In addition, we have validated our gene expression data at the protein level using immunohistochemistry and flow cytometry. Moreover, through a novel live cell imaging assay we have quantified the force profiles of distinct stromal cell subsets.

Results and Conclusions: We have uncovered the molecular signatures of fibroblasts and myofibroblast and report novel gene markers of distinct stromal cell populations. Moreover, by integrating bulk and single cell transcriptome profiling we elucidate how the fibrotic microenvironment may influence stromal cell phenotypes. Finally, novel stromal cell populations have been interrogated with traction force microscopy, a live cell imaging assay that enables the dissection of mechanical force at single cell resolution. This has provided a unique lens into the biophysical signature of novel stromal cells in fibrotic disease.

This study is the first ever single cell RNA-seq of a human fibrotic disorder and provides a new perspective on musculoskeletal disease.

Keywords:
single cell dupuytren translation
Advanced Techniques in Percutaneous Needle Fasciotomy and Collagenase - Going Beyond the MP Joint

List of authors:
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Objectives / Interrogation: 1) Learn to apply the advanced techniques discussed to perform PNF and Collagenase on patients with severe Dupuytren Contracture.
2) Analyze contractures to predict the location of cords.
3) Assess a hand and formulate a plan to release severe contractures
4) Diagnose hidden cords that need to be released to achieve correction of the contracture

Methods: Percutaneous needle fasciotomy (PNF / NA) and Collagenase are newer minimally invasive techniques used to treat Dupuytren Contracture. Most Hand Surgeons are confident in using one of the two procedures for mild MP joint contractures. However, many surgeons do not feel it is safe to utilize either treatment for PIP joint contractures or combined MP and PIP joint contractures. Patients with severe contractures are often only offered open fasciectomy for treatment.

This presentation will demonstrate specific techniques that can be applied to perform PNF and Collagenase on patients with severe Dupuytren contracture. Attendees will be able to assess a hand and formulate a plan to release the severe contractures.

The surface and deep anatomy of Dupuytren cords and the neurovascular bundles will be reviewed. Contractures will be analyzed so that the location of cords causing the contracture can be predicted and then treated. Advanced tips and pearls for PNF and Collagenase will be discussed, including the diagnosis of hidden cords that need to be released to achieve full correction of the contracture. Step by step instructions for correction of severe contractures will be illustrated through the presentation of the most difficult cases.

Results and Conclusions: Experience performing over 7,000 PNF and 1,000 Collagenase procedures has revealed that severe Dupuytren contracture can be released successfully using minimally invasive techniques. It is important for doctors to learn these advanced techniques so minimally invasive alternatives for the treatment of severe Dupuytren contracture can be offered.

This presentation can be modified to only discuss PNF / NA, instead of both PNF / NA and Collagenase. It can also be offered as an instructional course or symposium with multiple experts collaborating together for the presentation.

Keywords: needle fasciotomy, collagenase, needle aponeurotomy, dupuytren contracture
Efficacy analysis of the dorsal approach into the double miniature locking plate in a comminuted fracture unstable dorsally displaced distal radius fractures

List of authors:
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2 Xi'an honghui hospital (Xi'an)

Objectives / Interrogation: To study the dorsal approach into the double miniature locking plate in a comminuted fracture unstable dorsally displaced distal radius fractures of the clinical curative effect.

Methods: 17 cases distal radial fractures, male in 7 cases, female 10 cases; Age 23 to 67 years, average 36.5 years; The left 6 cases, right 11 cases. According to the AO fracture classification: B2 type 8 cases, C1 type 4 cases, 5 cases of C2. All cases took dorsal approach, all use open reduction double L form tiny lock plate fixation treatment, patients were followed up the radius length, palm obliquity, feet Pianjiao and wrist activities.

Results and Conclusions: patients with 17 during 10 to 24 months, mean 16 months, all of the patients to anatomical reattachment, good fracture healing. According to Gartland-Werley curative effect evaluation standard, optimal 14 cases “good” in 3. All cases without inner fixed loose, fracture shift complication.

Keywords:
Distal radial fractures ;Dorsal approach; Effectiveness
Conservative treatment for refracture of post-operative mallet fractures. 2 case reports.

List of authors:
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Objectives / Interrogation: Mallet fractures are common injuries in the finger, but refracture of post-operative mallet fracture is rare. Traditionally, surgeons recommended surgery for injuries involving more than one-third of the DIP joint articular surface and those with subluxation or displacement. If the patients who have mallet fracture involving more than one-third of the DIP joint articular surface don't want to choose the operative treatment, only the conservative treatment should be chosen. We reported the conservative treatment for two rare cases of refracture of post-operative mallet fracture in childhood.

Methods: case1: 13 y/o female injured her left ring finger during balleyball. 4 days after injury, closed pinning (Ishiguro method) was performed. X-ray showed good bone healing after 5 weeks, k-wires were removed and she started finger exercise. 3 months after operation, she injured same finger during balleyball. This time she refused the operative treatment, conservative treatment was started.

case2: 13 y/o female injured her right index finger during basketball. 5 days after injury, closed pinning (Ishiguro method) was performed. X-ray showed good bone healing after 5 weeks, k-wires were removed and she started finger exercise. 4 months after operation, she injured same finger during basketball. As the mallet bone fragment was little bit small compared to case1, so conservative treatment was chosen.

X-ray and ROM of injured DIP joint assessment were done. Milford criteria was used for clinical assessment.

Results and Conclusions: X-ray showed bone union at 4 months period for two cases. Each case of the ROM of DIP joint was almost full. Clinical assessments by Milford criteria were excellent in case1, and good in case2. But case 1 showed swan-neck deformity slightly. Conservative treatment for mallet refracture took 4 months period for bone union and showed almost good clinical results, if the DIP joint subluxation was not exist.

Keywords:
1000000a
Clinical efficacy of collagen wrap following neurorraphy

**List of authors:**
Randy Bindra*  
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**Objectives / Interrogation:**
Tension-free epineural repair is the accepted treatment of a peripheral nerve injury. Neuroma formation and scarring to surrounding structures can adversely affect outcome of repair. Collagen nerve wraps (NeuraWrap, Integra Life Sciences, Plainsboro, NJ) are available for clinical use to cover the site of repair and potentially minimise these complications. We report a retrospective clinical series of 2 groups of forearm nerve repair - direct neurorraphy with and without a collagen wrap. The objective is to detect any difference between the two groups in clinical outcome and ultrasound appearance of the repaired nerve.

**Methods:** A retrospective review of our institutional records revealed 45 patients who underwent primary end-end forearm nerve repair. 13 patients (16 nerves) returned for follow up evaluation. There were 10 primary repairs (3 Median, 3 Ulnar, 3 Superficial Radial Nerve and 1 posterior cutaneous nerve) and 6 repairs (4 Median, 1 Ulnar and 1 superficial radial nerve) augmented with wrap in the study. Clinical examination was done to determine sensory recovery and grip strength and patient reported outcome was measured using the DASH score. Circumference and cross-sectional area of the nerve at the repair site was measured using ultrasound performed by a radiologist who was blinded to the type of repair performed.

**Results and Conclusions:** 3 of the 10 patients who had nerve repair without wrap had ongoing analgesic requirements whilst none of the 6 patients who had a repair with collagen wrap needed analgesia. There was no clinically significant difference on clinical examination (Sensation testing - no wrap 2.20 vs wrap 2.67 and grip strength - no wrap 26.99 vs wrap 30.68) or DASH score (no wrap 24 vs wrap 24.6). Circumference and cross-sectional area of the repair site on ultrasound when compared to the contralateral nerve was bigger for primary repair compared to wrap suggesting that the using of wrap reduces neuroma formation (Circumference - no wrap 302% bigger vs wrap 256% bigger). The sample size was too small to reach statistical significance. The study has demonstrated that the use of a nerve wrap leads to a smaller diameter of the repaired nerve and less pain and therefore decreased neuroma formation. Further prospective studies with larger numbers are required to demonstrate if this translates to improved clinical outcomes.

**Keywords:**
neurorraphy, nerve conduit, neuroma
Forearm rotation modifies the scapholunate joint muscle control. A kinetic study in cadavers.

**List of authors:**
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6. Catedra de Anatomia Universitat de Barcelona (Barcelona)

**Objectives / Interrogation:**
Abductor Pollicis Longus (APL), Extensor Carpi Radialis Longus (ECRL) and Extensor Carpi Radialis Brevis (ECRB) are the scapholunate joint stabilizer muscles in neutral forearm rotation. Extensor Carpi Ulnaris (ECU) is the destabilizer one. Forearm rotation modifies these muscles spatial anatomy.

Does forearm rotation modify ECRL, ECRB, APL and ECU scapholunate joint stabilizing role? Is there any forearm rotation in which the muscle-controlled scapholunate joint stability is impaired?

**Methods:**
The changes in the alignment of both, the scaphoid and the triquetrum, were assessed in 8 fresh cadaver wrists using an electromagnetic motion tracking device. APL, ECRL, ECRB, ECU were individually isometrically loaded in three forearm rotations: supination, neutral and pronation. The experiment was subsequently repeated after complete scapholunate ligament (SLL) sectioning. The results were assessed using ANOVA with repeated measures to compare the scaphoid and triquetrum rotation and elevation position data with those in neutral forearm rotation. Significance was set at p<0.05.

**Results and Conclusions:**

<table>
<thead>
<tr>
<th>FOREARM</th>
<th>Scaphoid rotation</th>
<th>Triquetrum rotation</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLL INTACT</td>
<td>SLL SECTIONED</td>
<td>SLL INTACT</td>
</tr>
<tr>
<td>ECRL</td>
<td>-0.43 ± 1.42</td>
<td>0.85 ± 0.78</td>
</tr>
<tr>
<td>ECRB</td>
<td>-0.37 ± 0.42</td>
<td>-0.53 ± 2.03</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FOREARM</th>
<th>Scaphoid elevation</th>
<th>Triquetrum elevation</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLL INTACT</td>
<td>SLL SECTIONED</td>
<td>SLL INTACT</td>
</tr>
<tr>
<td>APL</td>
<td>-0.38 ± 2.39</td>
<td>-1.43 ± 0.54</td>
</tr>
<tr>
<td>ECRB</td>
<td>0.23 ± 1.18</td>
<td>0.63 ± 0.82</td>
</tr>
</tbody>
</table>

In this presentation, only the statistically significant rotations in the transverse plane and elevations in the sagittal one (degrees +/- standard deviation) relative to neutral forearm rotation. Positive values in rotation: supination; negative values: pronation. Positive values in elevation: flexion; negative values: extension.

- Forearm rotation modifies the scapholunate joint stabilizing muscles role.
- Forearm supination impairs the worst the muscle-controlled scapholunate joint stability capacity.
-The ECU muscle destabilizes the scapholunate joint in all forearm rotations.

**Keywords:**
scapholunate instability; scapholunate muscle control; forearm influence on scapholunate joint stability.
Patient-reported outcomes and utility of trapeziectomy with ligament reconstruction and tendon interposition

List of authors: Johnny Ionut Efanov1, Ali Izadpanah1, Alain Michel Danino1, Patrick Harris1
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Objectives / Interrogation: Trapeziometacarpal joint osteoarthritis can illicit a significant burden for afflicted patients. Amongst different treatment options, trapeziectomy with ligament reconstruction and tendon interposition (LRTI) has been shown to produce positive outcomes in terms of pain relief and function. Although considered safe by most surgeons, postoperative complications persist and the decision to undergo this procedure should take into account the patient’s characteristics, baseline function and expectations. This study aims to gain more knowledge on the patient-reported functional outcomes and the utility measures of trapeziectomy with LRTI in the treatment of thumb osteoarthritis.

Methods: A survey was administered on consecutive patients who had underwent trapeziectomy with LRTI. Collected data consisted of demographic characteristics, the natural history of disease, the type of treatment received, the postoperative rehabilitation, the brief Michigan Hand Outcome Questionnaire (bMHQ) and the utility assessment questionnaires including the visual analogue scale (VAS), the time trade-off (TTO) and the standard gamble (SG) techniques. Quality adjusted life years (QALYs) were derived from these measures.

Results and Conclusions: In total, 32 patients were enrolled in this study, with a mean age of 60.8 years. Right-hand dominance was reported in 84% of patients, and the operated hand was the same as the dominance in 37.5%. Occupation was equally distributed between manual laborers and office/other at 25% each, whereas the other half was retired. A similar proportion of patients took more than two months of work leave (40.6%) and did not take any time off (34%). A significant majority of patients (84%) considered their operation to have been successful.

The mean normalized measure for patient-reported hand function on the bMHQ was calculated at 83.01. For utility measures, the VAS, SG and TTO produced a score of 0.2708, 0.7546, and 0.8350, respectively. The VAS, TTO and SG utility measures were significantly higher when patients perceived their operation to be successful (p=0.001). These utility health values translated into a mean of 37.73 QALYs for SG and 41.75 QALYs for TTO.

This is the first to study to quantify patients’ reported outcomes and utility measures after undergoing trapeziectomy with LRTI. Reporting these health burden values will serve as comparison with other disease states and provide further insight for policy makers to advocate for this type of procedure.

Keywords: trapeziectomy, utility, PRO
DOCUMENTARY PHOTOGRAPHY IN DUPUYTREN'S DISEASE SURGERY

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Objectives / Interrogation: Due to the rapid development of technology in the 21st century, the creation and processing of images became available to everyone. High-quality photos is now possible to do with a regular smartphone. A high level of modern photos allow to use such images in medicine to create reporting documents, conduct remote consultations, and to evaluate the results of patient treatment.

The main task of the work was to describe the rules and introduce standards for the performance of digital photos in Dupuytren's disease surgery for creating high-quality photo documents.

Methods: The materials for our study were represented by more than 60 000 digital photos for the period from 2003 to 2017.

Results and Conclusions: After studying, organizing and processing received images, optimal conditions, standard projections and principles of photographing hands of patients with Dupuytren's disease were revealed to obtain the most reliable data. We can estimate the stage of the disease; the number of palmar aponeurosis involved in the pathological process; the presence of changes on the skin (postoperative scars, skin retractions, nodes of the palmar aponeurosis); function of flexion of fingers when learning the received photo documents. Conformity analysis of the data obtained from the photo and in-person examination was carried out.

Conclusion. The described methods and standards will help in creating a high-quality personal photo and video archive, which is necessary for each practicing surgeon for systematization of observations, evaluate long-term results, and also to demonstrate their achievements to colleagues as evidence. The authors are sure that in the near future we will become witnesses and participants in the creation of a unified world database of clinical observations of patients. The appearance of such a resource will allow to unite the efforts of surgeons from all over the world in the fight against a common enemy - Dupuytren's disease.

Keywords:
Dupuytren's disease, documentary photography, palmar aponeurosis.
Preliminary result of simultaneously bilateral perilunate dislocation- A Case report

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Objectives / Interrogation: Perilunate dislocations (PD) and perilunate fracture dislocations (PFD) are uncommon, challenging, generally high energy injuries that carry a guarded prognosis. These injuries are commonly missed in up to 25% cases due to other associated injuries requiring urgent attention and delayed or chronic injuries have worse outcomes as retrospective analysis demonstrating.

Methods: We present a case of simultaneous perilunate dislocation in right wrist and transcapoid perilunate dislocation in the contralateral wrist which occurred simultaneously in a young male following a two wheeler accident. Meanwhile, the patient sustained right fronto-temporal subdural hemorrhage, right parietal subarachnoid hemorrhage, right temporal bone fracture and comminuted facial bone in the primary survey. In the emergent room, upon diagnosis, we performed close reduction for the bilateral perilunate dislocation but failed. One week later, after stabilizing the patient’s condition, delayed operation of open reduction and internal fixation along with ligament repair was performed.

Results and Conclusions: The operation includes bilateral open reduction and internal fixation for the perilunate dislocation with pinning and ligamentous repair by transosseous maneuver for SLIL rupture; concurrently, open reduction and fixation with headless screw (Depuy Synthesis, PA, USA)) for left scaphoid fracture was performed. The pins were removed at approximately 8 weeks post-operatively and ROM exercise was initiated after the removal of cast. Nowadays, the patient was subsequently followed up for a period of two months and the preliminary results revealed good and progressing clinical and radiological outcome.

These injuries occurring simultaneously in bilateral wrists are exceptionally rare. These are high-velocity injuries and are often missed, particularly in presence of other major injuries. Accurate early diagnosis is essential and early intervention should be arranged to optimize the prognosis; delayed treatment worsens outcomes. Initial gentle, closed reduction is performed, followed by delayed open reduction, ligamentous and bony repair, and internal fixation. Despite optimum treatment, this injury carries a guarded prognosis, with permanent partial loss of wrist motion and grip strength.

Keywords: perilunate dislocation fracture
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Objectives / Interrogation: Tendon grafting to the digital sheaths of the hand sometimes does not give good results. One factor affecting the results may be that the grafts are usually from extracapsular tendons such as palmaris longus or plantaris tendons. The aim of this study was to analyze the outcomes of intracapsular tendon grafting harvested from toe flexor for secondary flexor tendon reconstruction.

Methods: From 2010 to 2015, I treated 7 patients. The intracapsular tendon harvested from the second or third toe. Three digits were staged tendon reconstructions. The tendons were sutured into the appropriate FDP tendon proximally using a Pulvertaft weave; the distal end of the graft was sutured to the base of the distal phalanx. The operations were performed by only one surgeon. Postoperative rehabilitation was active flexion and extension exercise with dorsal extension block splint.

Results and Conclusions: The finger TAM was 92.0% (range: 78.5-100%), the recovery rate was 94.2% (80.6-100%). The tenolysis did not undergo. One patient failed at the proximal suture site in the palm associated with infection at 3 weeks. Three months later, I transferred the ring flexor tendon to the proximal stump of the grafted tendon in the palm. All patients had residual limited flexion of the donor toe. However, gate was apparently normal.

This technique is feasible and gives a good result.

Keywords:
flexor tendon reconstruction, toe flexor tendon, intracapsular tendon
Current Trends in Operative Treatment of Carpometacarpal Osteoarthritis: A Survey of European Hand Surgeons

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Objectives / Interrogation: We explored the prevailing surgical procedures and ultimate last resort surgical management for isolated carpometacarpal (CMC-1) osteoarthritis (OA) among hand surgeons in Europe.

Methods: An online survey was distributed to hand surgeons of participating member states of the Federation of European Societies for Surgery of the Hand. Respondents were asked about the country of practice, years of surgical experience, preferred surgical procedures for isolated CMC-1 OA, the last resort procedure if all other surgical procedures have failed, and considerations for choosing this particular procedure as last resort. Statistical analysis of correlations between demographic and treatment data was performed using Pearson chi-square test.

Results and Conclusions: We received 444 replies across Europe, representing an estimated response rate of 18%. Trapeziectomy with ligament reconstruction and tendon interposition was opted by 46% of the respondents as a procedure of first choice, followed by prosthetic joint replacement (25%) and trapeziectomy with interpositional arthroplasty (23%). Several differences in the choice of preferred surgical treatment between the countries of practice, and between junior and senior surgeons were found to be statistically significant. Regarding the ultimate last resort surgical procedure, 36% chose suspensionplasty, followed by trapeziectomy with or without complementary procedure (21%) and arthrodesis between the base of the first and second metacarpal (17%).

This is the first European-wide study providing insight in the prevailing surgical management for isolated CMC-1 OA. The current surgical practice for isolated CMC-1 OA is still largely based on experts’ experience and local tradition, rather than on evidence. Future prospective randomized studies comparing different techniques for (failed) CMC-1 surgery may help in validating one surgical procedure over another.

Keywords: carpometacarpal, CMC osteoarthritis, trapeziometacarpal, survey
Current Trends in Operative Treatment of Scaphotrapeziotrapezoid Osteoarthritis: A Survey among European Hand Surgeons

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Objectives / Interrogation: We present the results of an online survey, distributed in 20 participating member states of the FESSH to explore the prevailing surgical practice for isolated STT OA among European hand surgeons.

Methods: Respondents were asked about their country of practice, surgical experience, preferred surgical procedure, frequency of performing this procedure, factors in decision-making and other performed surgical procedures.

Results and Conclusions: We received 465 replies across Europe. The estimated response rate was 19%. Trapeziectomy with partial trapezoidal excision is the surgical treatment of choice among the participating hand surgeons in Europe (38%), followed by STT joint fusion (30%), and distal scaphoid excision (14%). Most surgeons performed less than 5 of the chosen preferred procedure in the last year. Patient characteristics and familiarity or training are considered to be the two most important factors in reasoning behind the surgeons' decisions for the surgical treatment of isolated STT OA.

This is the first survey that provides insight in the yet controversial surgical management of isolated STT OA among hand surgeons in Europe. A wide variety in preferred treatment techniques was found. Evidence concerning the optimal surgical treatment is yet scarce. Future prospective randomized studies comparing different techniques are warranted.

Keywords: scaphotrapeziotrapezoid, STT osteoarthritis, wrist, survey
Survival analysis of the replantation for avulsion of upper arm

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Objectives / Interrogation: To analyze the reasons for the failure of the upper arm replantation of avulsion injuries, summarized upper arm replantation's indications and improved the replantation methods.

Methods: 2014-1 – 2016-1, our department had treated 17 cases of upper arm torn off from trauma patients, two cases had been amputated in period I, the upper arms had been replanted in 15 cases. Rapid debridement, simple and effective external fixation and internal fixation using microsurgical methods to repair blood vessels, nerves. Postoperation giving anti-inflammatory, anti-spasm, anticoagulation, rehydration and analgesic treatment, pay close attention to the blood supply situation.

Results and Conclusions: The postoperative patency rate: 100%, the incidence of skin necrosis: 73.3%; muscle necrosis rate: 80%; period II amputation rate: 20%; 1 case of upper arm torn off injuries replantation patients died; one case of postoperative acute renal failure, emergency amputation; one case after 10 days of discharge, hospital medication, muscle necrosis debridement rupture of blood vessels, amputation. Patients were followed up for 6-12 months, an average of 9 months. After 6 months of upper arm's function assessed according to the Chinese Medical Association limb amputated limb functional trial standards: The average score of 21.5 points, function deteriorated.

The upper arm torn off from traumatic injury for microsurgery is still a very difficult problem, without the forming upper extremity replantation guide, hemodynamic instability, multiple trauma, combined injuries are the high risk of replantation. From injury to the blood through needs a long time is the reason of surgical failure, period II amputation. Skilled microsurgical techniques can improve the successful rate of replantation.

Keywords:
upper arm; avulsion injuries; microsurgery; failure analysis
Triquetral motion is limited in vivo after lunocapitate fusion.

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Objectives / Interrogation: Lunocapitate fusion (LCF) and four-corner fusion (4CF) are motion-preserving salvage procedures for painful wrist arthritis due to e.g. scaphoid nonunion advanced collapse (SNAC) and scaphoid lunate advanced collapse (SLAC). In LCF, the fusion is limited to the capitate and the lunate. Theoretically this maintains the adaptive motion of the triquetrum. It has not been shown in vivo if the triquetral motion really is sustained after LCF. Our aim was to test if computed tomography motion analysis (CTMA) can be used to assess individual motion of the carpal bones and to examine if triquetral mobility is sustained after LCF.

Methods: CTMA is a non-invasive method developed to detect early loosening of joint replacement implants. By comparing sequential standard CT scans, very small movements can be identified between bone and implants. In this study, CTMA was used to detect motion between the carpal bones. We analyzed eight patients operated at least one year earlier with a LCF. Bilateral CT wrist scans were obtained in two positions, extension-radial deviation and flexion-ulnar deviation (i.e. the end-positions of the dart-throwing motion) and the images were analysed using the volume fusion tool denominated CTMA provided by SectraTM. Using this tool, the lunatocapitate complex was brought into spatial alignment, i.e., "registered as fixed". Thereafter, the triquetrum would shift position between the two scans only if it moved relative the lunocapitate complex during the dart-throwing motion. In the non-operated wrists, the capitate was registered as the fixed segment. Motion was measured as degree of motion in space.

Results and Conclusions: CTMA could detect relative motion of individual carpal bones. The triquetrum showed mobility in vivo after LCF in 7/8 patients but the degree of motion was small compared to the non-operated wrist. Unexpectedly, mobility could also be demonstrated of the hamate relative the lunatocapitate complex. CTMA has potential to be used as a tool in wrist diagnostics.

Keywords:
SNAC-/SLAC-wrist, partial carpal fusion, lunocapitate fusion, triquetrum, computed tomography motion analysis, dart-throwing motion.
The surgical treatment strategy of congenital clasped thumb according to pathological characteristics

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Objectives / Interrogation: The aim of this study was to evaluate the pathological characteristics of congenital clasped thumb, and the results of surgical procedure selection according to these characteristics.

Methods: We reviewed 34 congenital clasped thumbs between 2010 and 2017. The pathological characteristics were ascertained through preoperative examination and intraoperative surgical exploration. The most common pathological change was skin and soft tissue contractures at levels of the first web and thumb palmar in 94.1% cases, while 88.2% cases showed hypoplasia of Extensor Pollicis Brevis (EPB), which are threadlike or absent tendon, with occasional abnormal reinsertion. The contracture of Adductor Pollicis (deep head) and Flexor Pollicis Brevis (transverse head) were seen in 64.7% and 47.1% cases, respectively, often associated with abnormally stronger tendon. The characteristics of Abductor Pollicis Brevis (APB) hypoplasia (58.8%) were similar to EPB hypoplasia. The collateral ligament hypoplasia of MP joint in 38.2% cases was characterized as MP joint instability, ligament laxation, occasionally concurrent with palmar capsule contracture and dorsal capsule laxation, while 14.7% cases were EPL hypoplasia.

Results and Conclusions: Our surgical strategy was as follows: 1. Satisfactory passive motion and no active motion of MP joint was considered to result from extensor and concurrent APB hypoplasia. Tendon transfer was performed (EIP to EPB, one strand of FDS transferred to APB, the other strand transferred to EPL and EPB). 2. MP joint had poor passive and active motion. The first web space and thumb palmar skin was widened using our modified Z-plasty, which was followed by: a. improvement of passive extension and abduction of MP joint (refer to Item 1). b. no improvement of passive motion. Contractures of palmar intrinsic muscle and/or MP joint required attention. We preferred modified tendon lengthening on deep head of Adductor Pollicis and FPB transverse head, and MP joint arthrolysis. 3. Unstable MP joint caused by collateral ligament hypoplasia was provided imbricated ligament in mild cases and chondrodesis in severe cases. MP joint fixation with K-wire was needed. Tendon transfer was performed in the second stage. According to Gilbert assessment, the outcomes of our strategy were excellent/good in 70% cases, fair in 26.5% cases, and poor in 2.9% cases.

Surgical preference based on pathological characteristics of congenital clasped thumb is effective in improving thumb function and cosmetic appearance.

Keywords:
Congenital clasped thumb, Pathological characteristics, Surgical strategy
MULTIPLE TUMOURS ON THE THUMB

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Objectives / Interrogation:
Objectives This work aims to characterize the presence of multiples tumours in the hand, with specific affectation in the thumb through case report. This study seeks to contribute to the specialized knowledge of these severe lesions in the hand.

Methods:
Descriptive analysis of a clinical case: male 49 years old, who refers a bulky zone on his thumb by two years, with pain in the last six months, and limitations on the extension function of the affected finger, without paresthesias.
Physical examination: Patient has a subcutaneous bulk, indurated on dorsal zone of his left thumb with affectation of interphalangeal joint and proximal phalanx. There is some swelling on the metacarpophalangeal joint. No affected skin.
Radiological examination: The lesion causes a soft tissue mass with cortical pressure erosion and calcifications on the proximal phalanx and there is a lytic lesion on the metacarpal metaphyseal arising in the medulla with a geographic pattern of bone destruction, bony expansion with cortical thinning.
MRI reveals a typical lobulated pattern suggestive of a cartilage tumour with soft tissue extension in the distal lesion.
Treatment: wide resection en-bloc for the distal lesion. Proximal lesion required simple curettage and bone grafting. After 3 weeks post op, a physical therapy program was carried out to recover full mobility of the involved joints.

Results and Conclusions:
Patient was carried out after 8 months, with good osteointegration of the graft and full function of the thumb. No pain and without infection. Biopsies: periosteal chondroma (distal lesion) and enchondroma (proximal lesion).
Although very uncommon, periosteal chondroma is a benign cartilaginous tumor arising at the periosteal surface of bone. It represents only the 20% of the total condromas. This lesion can arise in both long and small tubular bones. If it is situated close to a joint it is called juxta-articular chondroma. The mass is palpable and can be painful. To Histology in periosteal chondroma increased cellularity as compared to enchondroma is seen. The major differential diagnoses are periosteal osteosarcoma, periosteal chondrosarcoma and giant cell tumour of the tendon sheath. The recurrence rate is rather low (1-5%) for both types of tumours found. Discarding Ollier's disease, the coexistence of both tumours described is uncommon, presenting a diagnostic challenge for correct therapeutic management. This paper highlights the importance of increasing knowledge in this specific area of hand surgery and oncology.

Keywords:
Thumb, Bone Tumours, Chondroma
Can we make a difference? The impact of handsurgery in chronic humanitarian conflicts and violent crisis

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Objectives / Interrogation: Since decades the Gazastrip suffers continuously from outbreaks of acute war violence within a chronic conflict setting. Acute or chronic sequelae of hand- and burntrauma are omnipresent and deteriorates the victim’s social life substantially. As an international NGO we provide since 1998 hand and burnsurgical treatment. Our aim is twofold: (1) on the individual level, the victim's ability to participate in the social life should be improved through adequate handsurgical treatment, and (2) a sustainable optimization of the handsurgical support should be achieved by investing in continuous handsurgical capacity building.

Methods: International hand - and plastic surgical teams and anesthetists with broad experience in child anesthesia were continuously providing support. Operations and postoperative treatment were undertaken either in inflatable OT tents or in a hospital setting. Postoperative physiotherapy was ensured by qualified local personnel. Supervision and training of the local surgeons was integrated in the daily routine.

Results and Conclusions: In acute war phases, handsurgery is secondary. During post-war and chronic conflict periods, handsurgical interventions became predominant. In 2015 in total 390 operations in hand - and burnsurgery were performed. Contracture release was done by low risk procedures like skin graft, local or fasciocutaneous flaps. Separation of syndactylie was performed, treatment of complex dysmelia, amelia or macrodaytylie is too resource demanding in the given context. Gunshot lesions of the radial nerve with persisting motoric deficit were treated by tendon transposition, those of the ulnar or median nerve by nerve interposition and/or tendon transposition. 2500 burn patients were treated with 35000 sessions of physiotherapy. 50 % did heal without functional sequelae, and a participation in their social life was achieved. In total, 39 % of all patients were younger than 5 years.

Hand - and burnsurgery are essentially in the portfolio of the humanitarian surgery in chronic conflicts. Offering handsurgical treatment has the potential of social life saving surgery, especially for children. Training of local personnel assures sustainability of qualified care. Preconditions for offering continuous support and capacity building are: acceptable security conditions, availability of experienced international handsurgical and anesthetic personnel and qualified physiotherapy.

Keywords:
humanitarian surgery, chronic conflict, hand and burnsurgery
Diagnostic Significance of Median Nerve Strain and Applied Pressure Measurement after Carpal Tunnel Release

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Objectives / Interrogation: Characterization of the changes of ultrasound parameters after carpal tunnel release may be useful for clarifying recovery process of the carpal tunnel syndrome (CTS) treatment. We hypothesized that the strain and pressure around the median nerve may differ before and after carpal tunnel release in CTS patients. The aim of this study was to evaluate the diagnostic significance of median nerve strain and applied pressure measurement for clinical recovery after carpal tunnel release.

Methods: Twenty-six wrists from 23 idiopathic carpal tunnel syndrome patients (17 females and 6 males; age range 37-89, mean age 67.2 years), who underwent open carpal tunnel release, were evaluated by ultrasound. The pressure monitor ultrasound system were developed to apply pressure to the tissue with a pre-determined cycle and displacement of the transducer. Median nerve strain, applied pressure to the skin, and pressure-strain ratio were measured at the proximal carpal tunnel level. In addition, distal motor latency in an electrophysiological test was measured. The parameters were compared before and after carpal tunnel release. According to patient recovery, the receiver operating characteristic curves were calculated to determine the diagnostic value of the parameters. The areas under the receiver operating characteristic curves were compared among parameters.

Results and Conclusions: Before carpal tunnel release, the median nerve strain, pressure, and pressure-strain ratio were 0.15±/-0.04%, 87.1±/-13.0 gf, and 538.1±/-134.6 gf%, respectively. After carpal tunnel release, the median nerve strain, pressure, and pressure-strain ratio were 0.23±/-0.09%, 73.8±/-11.9 gf, and 331.9±/-153.6 gf%, respectively. There was a significant increase of strain after carpal tunnel release (P<0.01), and significant decreases of pressure and pressure-strain ratio (P<0.05: pressure, P<0.01: pressure-strain ratio) after carpal tunnel release. Before carpal tunnel release, distal latency was 7.3+/-.2.6ms. After carpal tunnel release, distal latency was 5.6+/-.1.9ms. There was a significant decrease in distal motor latency (P<0.01). The areas under the curves were 0.762, 0.691, 0.746, and 0.709 for the strain, pressure, pressure-strain ratio, and distal motor latency, respectively.

The median nerve strain and the pressure-strain ratio showed relatively higher relevance with clinical recovery after carpal tunnel release. The results of this study may be useful when considering median nerve recovery after carpal tunnel release.

Keywords:
median nerve; strain; pressure; carpal tunnel syndrome; ultrasound
Autologous Cancellous Bone Graft and Headless Compression Screw Fixation for Treatment of Scaphoid Waist Nonunion

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Objectives / Interrogation: The authors performed an autologous cancellous bone graft from the iliac crest and headless compression screw fixation for the treatment of Mack-Lichtman type II scaphoid waist nonunion. The purpose of this study was to determine whether this procedure is effective in achieving bony union and restoration of alignment.

Methods: We retrospectively reviewed medical records and radiographs of 36 patients who underwent an autologous cancellous bone graft and headless compression screw fixation for scaphoid waist nonunion. There were 34 men and 2 women with a mean age of 33.1 year-old (range, 22-64 year-old). The mean time to surgery from initial injury was 9.6 months (range, 4-26 months) and the average follow up duration was 32.9 months (range, 12-53 months). The authors analyzed bony union, lateral intrascaphoid angle (LISA), scapholunate angle (SLA), radiolunate angle (RLA), and scaphoid length in radiographs and evaluated the modified Mayo wrist score (MMWS) as a functional outcome.

Results and Conclusions: Results: Bony union was achieved in all cases. The lateral LISA improved from 42° to 31° (P < 0.001). The SLA also improved from 62° to 53° (P = 0.009). The RLA changed from 8° to 4° (P = 0.048) and the scaphoid length changed from 21 mm to 27 mm (P < 0.001) postoperatively. The MMWS improved from 71.2 to 92.0 (P < 0.001) significantly at the last follow-up.

Conclusions: Non-structural autologous cancellous bone graft from the iliac crest and headless screw fixation provided reliable results for the treatment of scaphoid waist non-union. This method can be one of the effective treatment options for patients with symptomatic Mack-Lichtman type II non-union in the mid-third of the scaphoid.

Keywords: Scaphoid, nonunion, Cancellous bone graft, headless compression screw
Wrist replacement of keramik implantates

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Objectives / Interrogation: We have accumulated 10 years experience of endoprosthetics of the wrist joint. In Novosibirsk RNITO named Tsivyan used whole ceramic unbonded endoprosthesis Moje keramik MBW. The model uses one short distal stalk inserted into the capitatum bone and one short proximal leg inserted into the radial bone. The configuration of the distal ceramic component is circular, while the proximal component is elliptical. Such a construction feature allows to initially exclude cutting forces when moving in the wrist joint. The installation of the distal component in the capitatum allows preserving the interaction of the locomotor apparatus of the distal row of the bones of the wrist and carpometacarpal joints, which performs the damping function of the entire wrist joint.

Methods: In the traumatologic and orthopedic department ###6 of the Novosibirsk RNITO named Tsivyan in the period from 2010 to December 2017, performed 52 total endoprosthetics of the wrist joint using the Moje MBW ceramic implant. Patients admitted for surgical treatment can be divided into three groups. The first, the most numerous, included patients who underwent traumatic injury of the wrist joint (n = 38). The second group included patients with osteochondropathy of the wrist joint (n = 9). The third group includes patients suffering from rheumatoid arthritis (n = 5). The latter group, in our opinion, is the most problematic in view of the pronounced osteoporosis and systemic lesion of the ligamentous apparatus. For this reason, 5 operations were performed with minimal changes from the soft tissue side.

Results and Conclusions: In the preoperative period, patients underwent X-ray examination of the affected area in standard straight and lateral projections. Patients with severe deformity and osteolysis performed a tomography study to determine the extent of bone tissue damage. Patients with rheumatoid arthritis, in addition to clinical examination, densitometry was performed to determine the degree of osteopenia. In the detection of osteoporosis, surgery was not performed. Operative intervention was carried out according to the rules of technology.

A year after surgery, patients clearly understand the presence of an endoprosthesis of the wrist joint and assess changes in the quality of life. On average, on a ten-point scale of pain intensity decreases from 9 to 4. According to the Mayo wrist score, an increase in scoring from 30 to 70 is noted.

Keywords:
Wrist, replacement, ceramic.
Prospective Cohort Study of the NuGrip CMC Implant for Carpometacarpal Osteoarthritis

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Objectives / Interrogation: Osteoarthritis of the carpometacarpal (CMC) joint of the thumb is a common type of osteoarthritis of the hand. Complaints can consist of pain, swelling and loss of strength and movement. Multiple operative techniques have been described for the treatment of CMC-1 osteoarthritis. So far, none of these techniques have shown superior outcome. To date, implants as a treatment option for CMC 1 joint osteoarthritis still are a matter of great debate. We investigated the outcome of the hemiarthroplasty Pyrocarbon implant called the NuGrip CMC Implant.

Methods: Between 2011 and 2017 we conducted a single surgeon, single center, prospective observational cohort study including 131 patients (mean age 58 years) with CMC 1 osteoarthritis who were treated with the NuGrip implant. Clinical outcome parameters were available at 12 months for 46 patients and at 24 months for 38 patients. They consisted of the DASH score, NRS pain score, movement of the MCP and IP joint, palmar abduction, Kapandji score, key pinch force, tip pinch-index finger force and grip strength. Outcome parameters were determined preoperative, at 12 and 24 months postoperatively.

Results and Conclusions: Mean follow up time was 23.8 months. During the course of the study 63 complications were registered in 47 patients (36%), including the removal of 11 NuGrips implants (8%). Most common complication was osteophyte formation (56%) which needed surgical removal. Further details on the complications will be discussed during the presentation. After 12 months, patients showed improvement in DASH score (40.5 to 26.7 points; P<0,001) and NRS pain score (5.7 to 2.5 points; P<0,001). A decrease was found in the total active range of motion of the MCP joint (66.3 to 59.5 degrees; P<0,05) and key pinch force (5.3 to 4.6 Newton; P<0,05). After 24 months, patients showed improvement in DASH score (41.3 to 25.5 points; P<0,001), grip strength (21.1 to 23.7 kg; P<0,05) and NRS pain score (5.6 to 2.0 points; P<0,001). A decrease was found in total active range of motion of the MCP joint (64.6 to 52.9 degrees; P<0,05).

The NuGrip CMC Implant shows an acceptable survival rate and relatively high number of complications, although not all complications are directly related to the implant. The NuGrip CMC Implant provides improvement in DASH score and NRS pain score after 12 and 24 months and grip strength after 24 months. A decrease was seen in key pinch force after 12 months and in active range of motion of the MCP joint after both 12 and 24 months.

Keywords:
Hand surgery, CMC 1 joint, Osteoarthritis
Efficacy of endoscopic neurolysis for the motor (recurrent) branch of the median nerve during endoscopic carpal tunnel release surgery using the USE system

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Objectives / Interrogation: Until now, there have been no studies regarding endoscopic neurolysis for the motor (recurrent) branch of median nerve. During endoscopic carpal tunnel release (ECTR) surgery, we identified the motor branch and performed endoscopic neurolysis using the Universal Subcutaneous Endoscope (USE) system, which consists of a transparent closed sheath and an arthroscope. The same external neurolysis principles used in open surgery are applied with this system. To evaluate the efficacy of this procedure, we analyzed and compared clinical and electrophysiological results between the "with" and the "without" endoscopic neurolysis groups.

Methods: From November 2016 to December 2017, we performed endoscopic neurolysis during ECTR surgery for 226 hands. To more precisely evaluate postoperative motor recovery, we selected patients with both "zero" preoperative abductor pollicis brevis muscles using MMT (APB-MMT) and undetectable distal motor latency (DML) of the median nerve for this study. Twenty-four hands of 24 patients followed-up for more than six months were analyzed.

The USE system was inserted along the median nerve toward the thenar muscle during our ECTR procedure. We were able to identify the motor nerve branching and the branch was released from surrounding tissues with an external neurolysis procedure using the USE sheath.

For the non-neurolysis (control) group, we selected patients with the same preoperative clinical and electrophysiological conditions (195 hands) and matched follow-up periods (from 6 to 18 months). Patients in this group had received ECTR without endoscopic neurolysis before November 2016. We analyzed and compared pre- and postoperative APB-MMT and DML results between two groups.

Results and Conclusions: APB-MMT recovery rates showed better improvement in the neurolysis group with a statistical difference (p<0.05). Recovery periods to manual APB-MMT [5] showed shorter improvement periods in the neurolysis group with a statistical difference (p<0.01). Electrophysiological testing results of DML showed no statistical difference.

From those results, we conclude that endoscopic neurolysis for the motor branch of the median nerve combined with ECTR is effective treatment for severely atrophied thenar muscles.

Keywords:
carpal tunnel syndrome, neurolysis, endoscopic carpal tunnel release
Incision directly above versus Distal incision in Open Carpal Tunnel Release. Does the incision, which is avoided directly above the flexor retinaculum, lead to faster relief of the carpal pain? - A prospective randomized controlled trial -

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Objectives / Interrogation: To compare postoperative carpal pain of incision directly above the flexor retinaculum with that of incision avoiding directly above (=distal) in patients with carpal tunnel syndrome and to prove that there is no difference concerning duration and cite of postoperative carpal pain between the two incisions.

Methods: The number of enrolled hand were 170 (220 hands were recruited, follow up rate 77%), 70 males and 100 females. The mean age was 73 years (24 to 95). In all cases, surgery was performed by the same surgeon. An original post-operation assessment sheet was developed and every four weeks after surgery, it was used to measure carpal pain by four hand therapists randomly. Patients who could attend follow up consultations, until tenderness had been lost, were enrolled into the study. Time when spontaneous pain has disappeared, time when tenderness has disappeared and location of tenderness were assessed. In all surgery, there was no attempt to identify or preserve the palmar cutaneous nerves.

Results and Conclusions: There were no significant differences between the two incisions in respect of time when spontaneous pain has disappeared (95% confidence interval [-0.8week, 0.8week], P=0.93) and tenderness has disappeared (95% confidence interval [-2.7week, 3.0week], P=0.80). The distribution pattern and ratio of tenderness location were very similar between the two incisions (Figure 1 & 2).
In open carpal tunnel release surgery, difference of incision site and preserving palmar cutaneous nerves are not factors that have influences on duration and location of carpal pain after surgery. It is supposed that division of the flexor retinaculum itself is a cause of carpal pain after carpal tunnel release.

**Keywords:**
carpal tunnel syndrome, open carpal tunnel release, carpal pain, scar tenderness
Comparison of clinical and functional outcomes of two type of homodigital neurovascular flaps for fingertip reconstruction: a six year follow up.

List of authors:
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Objectives / Interrogation: The fingertip is a highly specialized structure, with prehensile and tactile functions that can be importantly reduced after an injury. The goal of the treatment of this injuries is to maintain the length, sensitivity and mobility of the finger, with a painless and padded stump.
There are many techniques described to treat these lesions, from simple regularization or v-y local flaps, through homodigital neurovascular flaps, to heterodigital, thenar or other flap alternatives.
The aim of this study is to compare clinical and functional outcomes of two surgical techniques: homodigital direct flow flaps (DFF) and homodigital reverse flow island flaps (RFF) to cover fingertip injuries in tri-phalangeal fingers performed between 2012 and 2018 in a workers insurance trauma center.

Methods: We reviewed the operative protocols performed between April 2012 and April 2018 by the hand surgeons of our institution and selected those who described homodigital neurovascular flaps to cover fingertip injuries.
Epidemiological data were collected, such as age, gender, laterality, finger involved and mechanism of injury.
The cases were classified by Allen's level of amputation, direction of injury [1], type of intervention (primary or secondary) and type of flap performed (DFF or RFF).
The outcomes we measured were time to labor, functional results (range of finger motion, strength, two points discrimination and sensibility) and the presence of complications and reinterventions.

Results and Conclusions: We obtained 43 cases, 92% of these were men, 77% were by crushing and 53% on the right hand.
The most frequent fingers involved were index (40%) and middle finger (35%). The most frequent diagnosis was amputation (62%) in a palmar oblique coronal direction (60%). The most frequent Allen's levels were II (42%) and I (37%). These data are consistent with the literature.
In 53% of cases a RFF was performed and in 47% it was a DFF. There were no epidemiological or functional differences between these groups.
Time to labor was 4.1 months in the DFF group and 5.4 months in the RFF group*.
A 41% of complications were observed; the most frequent ones were retractable scar (14%) and flap necrosis (11%).
The presence of complications was 3.4 times higher in the RFF group* and this group required 7 times more interventions*.
Based on ours results, we dare to recommend the DFF, since they are simpler to perform and have less complications, reinterventions and recovery time.

(*This differences were statistically significant)

Keywords: fingertip injuries, homodigital direct flap, homodigital reverse flap

References:
Evaluation of altered little finger sensation in patients with carpal tunnel syndrome treated with median nerve surgical release

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Objectives / Interrogation: Symptoms of altered sensation are frequently observed in patients with the diagnosis of carpal tunnel syndrome (CTS). The majority of these patients present with paresthesia and/or numbness in the median nerve distribution. We have observed that some of the CTS diagnosed subjects also reported the same symptoms in the little finger. The aim of this study was to evaluate the follow-up of altered sensation in the little finger in patients who underwent carpal tunnel surgical release.

Methods: One hundred and seventy patients with CTS and little finger paresthesia and/or numbness have been analyzed. Clinical exam and electrodiagnostic studies were performed in all patients and no signs of ulnar nerve compression were found. The sensory evaluation was assessed with Semmes-Weinstein nylon monofilaments both preoperatively and postoperatively (with two weeks, one month, three months and six months-time).

Results and Conclusions: The results were statistically analyzed and reviewed. We observed that there was improvement of little finger monofilament sensory findings from the first postoperative evaluation only two weeks after the procedure of carpal tunnel release, and that the major sensory gain in relation to preoperative values was noticed six months postoperatively. We concluded that in patients with CTS and decreased little finger sensation evaluated by Semmes Weinstein nylon monofilaments, the median nerve surgical decompression causes improved little finger sensation.

Keywords: carpal tunnel syndrome; little finger sensation; nylon monofilament assessment; Semmes-Weinstein assessment
Ten-year follow-up results of rheumatoid wrist surgery without prosthesis.

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Objectives / Interrogation: With the advent of biological therapy, an early diagnosis and early treatment with tight control have become increasingly important for the treatment of rheumatoid arthritis (RA). Many patients with RA can live a normal life without joint deformity. With the more widespread use of various biological agents, the number of large joint surgeries has decreased, while the number of small joints has increased in our center hospital of rheumatic diseases. The objectives of this study is to investigate the long-term outcome of the rheumatoid wrist surgery without prosthesis.

Methods: We investigated the results of ten years after wrist surgeries without prosthesis in our hospital. All procedures were performed from November 2006 to December 2008. There were 84 wrists in 80 patients (male, n=15; female, n=65). The average age at operation were 61 years, the average duration of RA were 11 years. The operative procedures were as follows: limited arthrodesis (59 wrists), Sauvé-Kapandji's operation (7 wrists), Clayton's tendon transfer (16 wrists), and arthroplasty at the midcarpal joint using the palmaris longus (PL) tendon ball (18 wrists).

Ten years later, we obtained data from 48 wrists in 46 cases. We assessed the DASH score, grip power (GP), range of motion (ROM) and carried out a questionnaire survey. The questionnaire investigated the perioperative memory, current state and satisfaction with the operation.

Results and Conclusions: The mean age was 66 years, the mean duration between the onset of RA to the operation was 9.5 years, the mean DAS28-ESR(4) was 2.63, the mean of CRP level was 0.32mg/dL. The MTX medication ratio and its mean dose was 33/48 (67%), 8.3 mg/week. The PSL medication ratio and its mean dose was 26/48 (54.2%), 3.4 mg/day. Twenty-two patients were using biological agents. The average arc for extension/flexion had worsened (56.5±28.9 to 32.0±27.8), while the average arc for supination/pronation had improved (145.8±28.6 to 148.6±23.5). The average GP (139.0±67.8mmHg to 175.3±68.1 mmHg) and average DASH score (34.8±17.8 to 28.3±24.1) both showed improvement. The results of questionnaire showed that most patients were satisfied with their wrists at 10 years after the operation. Patients who were highly satisfied with the operation had a shorter disease duration and shorter interval between the onset of disease and their operation.

A long-term favorable outcome of rheumatoid wrist surgery without prosthesis is expected under the good medical control of the disease.

Keywords:
Rheumatoid Arthritis, Wrist,
WristArt is the new concept of the total wrist joint prosthesis based on a fractal theory of the biomechanics of the wrist joint.

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**Objectives / Interrogation:** Wrist joint osteoarthritis for any reason is difficult to treat as condition especially in the end stage of the disease. Theoretically, total wrist replacement seems to be the preferred option for wrist joint surgical treatment as the issue to wrist motion and pain relief. However, practically it has not happened. The explanation is that most existing implants do not accurately reflect the biomechanics of the wrist. The wrist joint is nonlinear in their visual appearance. However, it is possible to find linearity of nearly all nonlinear biological systems on the base of the fractals. Autor finds linearity of the healthy human wrist joint according to the mathematical processing of the anthropometric data. With the help of the fractals, Fibonacci Golden section and spirals, a new opportunity was opened to explain the biomechanics of a human wrist joint. This opportunity logically can be defined as "A fractal theory of the biomechanics of the wrist joint" and help design and built the optimal and universal total wrist joint prosthesis called WristArt.

**Methods:** According to the fractals and spirals of Fibonacci, a linear model of the wrist joint built. That model determined two centers of rotation into the capitate bone. Universal one size and no side difference universal prosthesis were constructed. WristArt consists of three main parts: capitate, radial and articular. Articular part design allows for double motion. The capitate component connects to the Capitate bone only thru the plate-like fixation. Radial component reconstructs articular surface with the resurfacing plate and links to the distal radius as a dorsal radial plate. Two oblique locking screws connect between the dorsal radial plate and lower part of resurfacing plate and create strong Pyramid like structure.

**Results and Conclusions:** WristArt avoids conversion polyarthrodial joint into a diarthrodial. That prevents excessive shearing, and bending forces on the joint and potential fatigue and insufficiency of the exist prosthetic wrist devices. Conclusions: The Universe inside you. It is easy to find the solution when one has an open mind to explore our world and employ Universe and Nature's own design to create a solution. Perfection exists the knowledge and beauty solution exist in perfection. And the beauty solution for wrist replacement is the correct and ideal prosthetic design. WristArt design closed to Nature's design and may give hope return the patients fine movements without pain for a long time.

**Keywords:**
fractal theory, Fibonacci Golden section, total wrist replacement,
Prevalence of Osteoporosis in Patient with Distal Radius Fracture from Low-Energy Trauma

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Objectives / Interrogation: Osteoporosis is a devastating problem leading to significant morbidity and mortality. Patients usually present with fractures from low-energy trauma and falls, which may precede more severe fractures like a fracture of the neck of femur. The distal radius is one of the common fracture sites in osteoporosis patients but data from Thailand are limited. We aimed to determine the prevalence of osteoporosis in patients with distal radius fracture from low-energy trauma.

Methods: This was a descriptive retrospective study, performed at our institution from January 2011 to June 2017. Patients aged ≥ 50 years with distal radial fractures from low-energy trauma and a bone mineral density result were included. Patients with known secondary causes of osteoporosis were excluded. Patients were grouped by age, sex, and bone mineral density status (normal, osteopenic and osteoporotic).

Results and Conclusions: 100 of 351 patients had bone mineral density data but 79 (73 females) met the inclusion criteria. Most patients were aged 60-69 years old (n=31, 42.5%). 47 (59.5%) patients were osteoporotic, 23 (29.1%) osteopenic, and 9 (11.4%) were normal (Table 1 and 2). 7 (6 osteoporotic) patients suffered a subsequent more severe fracture. No deaths were recorded.

Our small study found a high rate of osteoporosis in mostly females, consistent with the published literature. Assessing bone mineral density is an essential investigation in middle age/elderly patients with fractures to better manage osteoporosis and prevent more severe fractures in the future.

<table>
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<tr>
<th>Sample</th>
<th>Total</th>
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<th>Osteopenia</th>
<th>Osteoporosis</th>
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<td>6</td>
<td>2 (33.3%)</td>
<td>3 (50%)</td>
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<tr>
<td>Female</td>
<td>73</td>
<td>7 (9.6%)</td>
<td>20 (27.4%)</td>
<td>46 (63.0%)</td>
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<tr>
<td>Total</td>
<td>79</td>
<td>9 (11.4%)</td>
<td>23 (29.1%)</td>
<td>47 (59.5%)</td>
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</table>

Bone Status Shown by Sex.

<table>
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<tr>
<th>Age group</th>
<th>Sex</th>
<th>Average age</th>
<th>Normal</th>
<th>Average BMD</th>
<th>Osteopenia</th>
<th>Average BMD</th>
<th>Osteoporosis</th>
<th>Average BMD</th>
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<tr>
<td>50-59 (n=19)</td>
<td>Male</td>
<td>55</td>
<td>1</td>
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<td>0</td>
<td>0</td>
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<tr>
<td></td>
<td>Female</td>
<td>56 ± 3</td>
<td>2</td>
<td>-0.80 ± 0.28</td>
<td>7</td>
<td>-1.97 ± 0.42</td>
<td>9</td>
<td>-3.37 ± 0.77</td>
</tr>
<tr>
<td>Total</td>
<td>56 ± 3</td>
<td>3 (15.8%)</td>
<td>-0.80 ± 0.20</td>
<td>7 (36.8%)</td>
<td>-1.97 ± 0.42</td>
<td>9 (47.3%)</td>
<td>-3.37 ± 0.77</td>
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<td>60-69 (n=31)</td>
<td>Male</td>
<td>62</td>
<td>1</td>
<td>-0.2</td>
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<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>64 ± 3</td>
<td>5</td>
<td>-0.28 ± 0.51</td>
<td>9</td>
<td>-1.86 ± 0.38</td>
<td>16</td>
<td>2.98 ± 0.56</td>
</tr>
<tr>
<td>Total</td>
<td>64 ± 6</td>
<td>6 (19.5%)</td>
<td>-0.27 ± 0.46</td>
<td>9 (29.0%)</td>
<td>-1.86 ± 0.39</td>
<td>16 (51.6%)</td>
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<td>70-79 (n=20)</td>
<td>Male</td>
<td>74 ± 1</td>
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<td>1</td>
<td>-3.7</td>
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<tr>
<td></td>
<td>Female</td>
<td>75 ± 3</td>
<td>0</td>
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<td>-2.10 ± 0.28</td>
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<tr>
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<td>4 (20.0%)</td>
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<td>16 (80.0%)</td>
<td>-3.08 ± 0.38</td>
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<tr>
<td>≥ 80 (n=9)</td>
<td>Male</td>
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<td>1</td>
<td>-1.6</td>
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<tr>
<td></td>
<td>Female</td>
<td>82 ± 2</td>
<td>0</td>
<td>2</td>
<td>-2.10 ± 0.14</td>
<td>6</td>
<td>-4.15 ± 1.25</td>
<td></td>
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<tr>
<td>Total</td>
<td>82 ± 2</td>
<td>0</td>
<td>3 (33.3%)</td>
<td>-1.93 ± 0.31</td>
<td>6 (66.7%)</td>
<td>-4.15 ± 1.25</td>
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</table>

Bone Mineral Density Data Presented as T-scores by Age Category and Sex.

Keywords:
Radius; Radius fractures; Osteoporosis; Prevalence; Accidental falls
Endoscopically assisted distal biceps tendon repair

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Objectives / Interrogation: This paper aims to describe a surgical technique for endoscopic distal biceps tendon repair and analyse the outcomes.

Methods: With the forearm supinated a 2 cm volar incision approximately 3 cm distal to the elbow crease, medial to the extensor mass is utilised. The fascia is incised, and the lateral cutaneous nerve of the forearm is protected. A Karl Storz Hopkins wide angle Forward- Oblique telescope with optical dissector with distal spatula was utilised with when required a Cottle speculum. The radial tubercle is located using blunt dissection. The passageway for the tendon is identified and enlarged if required. A Zimmer Biomet Toggleloc anchor and placement equipment was create a bone tunnel and anchor for repair. The proximal end of the tendon is located via the single incision using the endoscope. The tendon end is delivered out of the incision, tendinopathic tissue removed and a healthy tendon end of appropriate dimensions created for repair. The tendon is sutured into the anchor and repaired into the radial tubercle tunnel.

Results and Conclusions: Results
Over the last six years, 50 patient’s distal biceps were repaired using this technique. The mean age was 52 years with 47 males and 3 female having surgery. Time from injury to surgery was on average 3 weeks with 40% having surgery within one week of injury. Follow-up was for at least three months for all patients. All patients regained full extension and flexion. The mean DASH was 11 with an average grip strength of 47 kg. There were no permanent neurological injuries but 16% of patients suffered minor transient sensory disturbance of the lateral cutaneous nerve of the forearm. Two patient suffered re-avulsion of the tendon, both of whom were non-compliant with their restrictions, and who went on to revision surgery and gained an excellent result following their second operation. One patient suffered from a superficial wound infection which responded to oral antibiotics and one patient suffered from a wound haematoma which resolved spontaneously. The mean incision length was 19 mm.

Conclusions
The above procedure is a straightforward procedure with low rate of complication, high patient satisfaction and short operative time. The results seem to be similar to previous open surgical technique utilised by the author but with a lower lateral cutaneous nerve of forearm neuropraxia rate.

Keywords:
Distal biceps, tendon, endoscopic, repair
Wartenberg’s Syndrome: Case Series

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Objectives / Interrogation: Wartenberg's syndrome, a mononeuropathy of the superficial branch of the radial nerve, is uncommon and the natural history and treatment outcomes are uncertain for individual patients. This study documents a case series of patients with chronic Wartenberg's syndrome, their investigations, treatment and outcomes.

Methods: Patients with isolated non-sharp trauma related superficial radial nerve dysfunction of greater than three months’ duration and of sufficient severity to justify treatment were retrospectively collected in practice over a ten-year period. Patient demographics, aetiological factors, investigation results, treatments initiated and treatment outcomes were recorded.

Results and Conclusions: RESULTS
Eleven patients, seven female and four males, were treated for chronic Wartenberg's syndrome. The patients' ages ranged from 27 to 64 years. Apparent causative factors included distal radial fracture, blunt hand or forearm trauma, excessive occupational forearm rotation with no cases related to the use of hand cuffs. Two patients responded adequately to hand therapy alone. The remaining nine patients went on to formal ultrasound assessment of the superficial radial nerve by musculoskeletal radiologists with universally a normal appearance of the nerve but an ultrasound guided corticosteroid injection resolved symptoms in all patients, with resolution of symptoms in five patients and transient response in the other four patients. One of these four patients chose to accept his symptoms and the remaining three underwent surgical decompression, one open and two endoscopic, with two making a complete recovery and one patient making a good partial recovery with a follow-up of over a year.

CONCLUSIONS
Despite ultrasound being able to define the superficial radial nerve with accuracy there have not been previous publications reporting on ultrasound in Wartenberg's syndrome and this study suggests ultrasound is not a reliable diagnostic tool for this condition. This study represents a relatively small case series of this uncommon condition. However, the author could identify few larger case series and no randomized studies for this condition. This study has demonstrated a good recovery for the majority of patients with a step-wise approach to treatment of hand therapy, followed by corticosteroid injections if required and surgery should steroid injection not produce a sufficient resolution of Wartenberg's syndrome.

Keywords:
Superficial radial, nerve, neuropathy, compression
Minimally invasive plate fixation of distal radial fractures

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Objectives / Interrogation: Displaced distal radial fractures are commonly internally fixed with a volar locking plate using a moderate sized incision with pronator quadratus raised at its radial insertion. Minimally invasive techniques have evolved using a small incision and sliding the plate under pronator quadratus. The study's aimed to document a series of minimally invasive distal radial fracture fixations, assess the patient's results and comment on the potential relevance of this technique to wrist trauma practise.

Methods: The author performed distal radial fracture fixation of displaced distal radial fractures deemed optimally managed by a volar locking plate over a period of 24 months using a previous published technique with a 15-mm incision and sliding the plate deep to pronator quadratus. Following surgery, patients were provided with a thermoplastic splint for optional use as determined by comfort, and underwent hand therapy.

Data collected included: patient demographics, fracture morphology, fracture reduction, post-operative grips strengths, visual analogue pain scales, DASH scores and complications.

Results and Conclusions: Results

In this series, 25 minimally invasive distal radial fixations occurred. There were 16 females and 9 males with a mean age of 45. Reduction appeared satisfactory with a mean radial inclination post-operatively of 21 degrees and volar tilt of 10 degrees. At six weeks, the average grip strength was 55% of the contralateral side and at 12 weeks it was 70%. One patient ruptured extensor pollicis longus post-operatively with a well reduced fracture and no protruding dorsal metalwork, requiring tendon transfer. Three other patients had their plates removed due to patient preference. No other complications were noted.

Conclusions

The minimally invasive volar plate internal fixation technique is a relatively straightforward technique and with good results. The relevance of this technique modifications for non-hand surgeon practise will be discussed.

Keywords:
Distal radius, fracture, minimally invasive, internal fixation
Tetanus Prophylaxis in Open Hand Injuries: are the guidelines fit for purpose?

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Objectives / Interrogation: To audit compliance of tetanus prophylaxis in open hand injuries with Public Health England guidelines

Methods: Retrospective audit on 60 patients with open hand injuries referred to the Plastic Surgery department. Two data collection windows of 2 weeks each consisting of 30 patients each. There was a departmental presentation between the two windows to educate and help improve compliance. Parameters included mechanism of injury, tetanus immunisation status and whether tetanus vaccine and/or prophylactic immunoglobulin was administered.

Results and Conclusions: In the first window, 18 patients didn't require a tetanus vaccine booster and 100% (18/18) of patients didn't receive it, 12 patients required a tetanus vaccine booster however only 83% (10/12) received it, 11 patients also required prophylactic tetanus immunoglobulin and it was only administered to 9% (1/11). In the second cycle after the intervention, 9 patients didn't require a tetanus vaccine booster and 100% (9/9) of patients did not receive it, 21 patients required a tetanus vaccine booster however only 71% (15/21) received it, 3 patients also required prophylactic tetanus immunoglobulin and none of them received it 0% (0/3).

Hand injuries are commonly referred to the Plastic Surgery Department. Tetanus is a life-threatening vaccine preventable infection with a total of 4 cases and no deaths reported in England in 2016. Five doses of tetanus vaccine should provide long lasting immunity against tetanus however if the wound is considered 'high risk' prophylactic tetanus immunoglobulin should be administered for immediate protection irrespective of immunisation history. Our audit highlights the poor compliance with prophylactic tetanus immunoglobulin and the importance of educating and raising awareness of the appropriate management guidelines amongst healthcare practitioners in the Plastic Surgery department as well as in the Emergency department and Minor injuries setting. Extrapolating our findings, it is likely that compliance rates are likely be similar across the country and despite this tetanus infections remain extremely rare. Prophylactic tetanus immunoglobulin is costly at £125 compared to a single Revaxis vaccine which costs £6.50 and currently a shortage of it in the NHS for management of tetanus prone wounds has led to an urgent review by Public Health England in 2018 to prioritise its use for susceptible individuals who have sustained high risk injuries and are at greatest risk.

Keywords:
Tetanus Prophylaxis
Extensor pollicis longus tendon reconstruction by extensor indicis proprius transfer or free tendon graft using a novel 2 cm retroposition tension method

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Objectives / Interrogation: In extensor pollicis longus (EPL) tendon reconstruction, 3 factors are important to obtain optimum post-operative thumb motion: the reconstruction method of either extensor indicis proprius tendon transfer (EIP TT) or free tendon graft (FTG), the tension applied to the EPL tendon and the muscle selection for the power source. Based on these, we have hypothesized that: 1) results are similar between EIP TT and FTG, and 2) our novel 2 cm retropulsion tension method is reliable for consistently deciding optimal tension.

Methods: Twenty-five consecutive patients with chronic rupture of the EPL tendon were treated by EIP TT or FTG between 2006 and 2014 by 3 different surgeons. EPL tendon rupture occurred after distal radius fracture in most cases. For all patients, tendon reconstruction was performed using a novel retropulsion tension method, in which we reconstructed the EPL tendon keeping the center of the thumb nail raised 2 cm above the operating table while the palm was pressed against the operation table with the elbow in extension, forearm in pronation, and wrist in a neutral position. FTG was carried out using the palmaris longus tendon within 3 months from episode to surgery in 7 patients. EIP TT was done in 13 patients after more than 3 months from episode to surgery. We examined 20 patients directly a minimum of 12 months after tendon reconstruction to assess Total Active Motion (TAM) of the thumb, elevation deficit of the thumb compared with the opposite thumb in active retropulsion position, flexion deficit of the thumb interphalangeal and metacarpophalangeal joints, and disabilities of the arm, shoulder and hand (DASH) scores.

Results and Conclusions: Mean TAM improved from preoperative 50% (range: 18-78%) to postoperative 90% (range: 60-100%). Mean elevation deficit was 1.2 cm (range: 0-2.5 cm) and mean flexion deficit was 10 degrees (range: -12-45 degrees) at follow-up. Mean DASH score improved from 28.6 to 7.7. There were no significant differences in clinical outcome between EIP TT and FTG or among the results of individual surgeons.

Various tension-deciding techniques have been proposed for EPL tendon reconstruction. By raising the thumb by 2 cm, we believe our new retropulsion tension technique is easy, reliable, and applicable for both EIP TT and FTG. With results comparable to EIP TT, FTG is recommended for patients within 3 months after tendon rupture to preserve independent index finger motion.

Keywords:
Extensor pollicis longus, tendon rupture, tendon transfer, extensor indicis proprius, free tendon graft
Examination on the clinical test of de Quervain's disease through tendon excursion of each test

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Objectives / Interrogation: Purpose: de Quervain's disease which is tenosynovitis of the 1st extensor compartment is very common. de Quervain's disease has several clinical tests. We conducted a clinical test at the actual surgery and measured the tendon gliding distance of EPB and APL and considered its clinical significance.

Methods: Methods: Eight cases of de Quervain's disease was examined. Both an EPB and an APL tendon sheath were opened by local anesthetic surgery and five clinical tests were performed to measure tendon gliding distance. The clinical test is Finkelstein test, Nozue - Iwahara test, Aso test, the EPB test, the APL test. In Nozue - Iwahara test, pain is occurred when the thumb is active palmar abduction while the patient's wrist joint is palmar flexion. In Aso test, pain is occurred when the thumb is active extension while the patient's wrist joint is dorsal flexion. In the EPB test, pain is occurred when the MPj strongly passive flexion at neutral position of wrist joint. In the APL test, pain is occurred when the CMj strongly adduction at slightly ulnar deviation of wrist joint. The EPB and the APL test is my originally.

Results and Conclusions: Results: The gliding distance of EPB was 11.1 mm (range: 10-15) and APL was 9.3 mm (range: 5-15) on Finkelstein test. Nozue - Iwahara test was 9.1 mm (3-15) of EPB and 8.5 mm (3-15) of APL. Aso test was 10.9 mm (5-15) and 2.0 mm (0-5). The EPB test was 7.9 mm (5-10) and 1.1 mm (0-2). The ALP test was 1.8 mm (0 - 5) and 4.9 mm (4-6), respectively. Conclusions: Finkelstein test and Nozue - Iwahara test seemed to cause large gliding distance of both tendons and clinically it was difficult to distinguish between tendon sheaths of either tendon. In the Aso test and the EPB test, the movement of EPB was larger than that of APL, and it was considered to be a "Selective EPB test". The only one, the APL test was bigger than APL compared to EPB. In terms of thinking this as a "Selective APL test", the gliding distance and its difference were small.

Keywords: de Quervain's disease, clinical examinations, tendon gliding distance
Reconstruction of Low-Hand Syndrome with Tendon Transfer in Patients Injured in Syrian Civil War

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Objectives / Interrogation: Radial nerve is one of most war-related injuries due to drilling cutter tool injury or gunshot wounds, resulting Low-Hand Syndrome. We aimed to evaluate the outcomes of tendon transfer in the patients with Low-Hand Syndrome who injured in Syrian Civil War.

Methods: We evaluated the results of 13 patients who injured in Syrian Civil War between 2015 and 2017 years. Palmaris longus tendon was used for transferring to extensor pollicis longus for thumb extension. Pronator teres was transferred to extensor carpi radialis brevis for wrist extension. The flexor carpi radialis were transferred to the extensor digiti communis for the 2th, 3th, 4th and 5th finger extension. All outcomes of thumb abduction and extension, wrist extension, wrist flexion and fingers extension were assessed.

Results and Conclusions: There was a high level of radial nerve injury in all patients included in the study. Post-injury transfer period was 1.5 months at the earliest and 9 months at the latest. Among the injuries, the gunshot wound was the most reason observed in 8 cases (61.5%). Drill cutter injury (n:3; 23.1%) and humerus fracture (n:2; 15.4%) followed the gunshot wounds. As a result, radial nerve injury may achieve successful results with the tendon transfer. All patients regained their thumb abduction as much as around 60 degrees. They have the ability of wrist bending and gripping, as all can extend their fingers in the positions of wrist flexion, neutral wrist and wrist extension. Although the reason for radial injury varies, the common point was that postoperative outcomes and rehabilitation period moved successfully in patients who underwent early repairs than 90 days.

Keywords:
Low-Hand Syndrome, Tendon Transfer, Syrian Civil War
Mid-to-long term Outcomes of Convertible Total Elbow Arthroplasty for Patients with Rheumatoid Arthritis

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Objectives / Interrogation: Total elbow arthroplasty (TEA) is commonly performed in patients with rheumatoid arthritis (RA). Convertible systems provide the capability to choose between linked and unlinked designs intra-operatively using the same stems. There is a paucity of research comparing linked and unlinked designs in the rheumatoid population. We compared outcomes of linked and unlinked TEA arthroplasty using a single convertible implant in patients with rheumatoid patients.

Methods: All patients with RA who underwent total elbow arthroplasty at a single center and had a minimum of 2 years follow-up were reviewed. Exclusion criteria included patients with less than 2 years follow-up. Patient demographic information, outcome scores, functional assessment and radiographic parameters were evaluated.

Results and Conclusions: Eighty-two patients were evaluated. Mean age at index procedure was 60.9±10.5yrs with a mean follow-up of 5.6±4years. Twenty-seven unlinked and 55 linked TEAs were performed. Mean demographics were similar between linked and unlinked cohorts with the exception of follow-up (8±4years for unlinked & 5±3years for linked, p=0.001). No difference in range of motion or elbow strength compared to the contralateral elbow was noted between linked and unlinked cohorts other than pronation strength which was significantly better in the linked cohort (74±8% vs. 100±8%, p=0.03).

The mean patient reported outcome scores were MEPI (83±16), PREE (15±18), QuickDASH (34±20). There were no differences in outcome scores, incidence of radiographic lucency's or rates of reoperation (17% vs. 24%, p=0.4) complications (32% vs. 31%, p=0.4) and revision (13% vs. 17%, p=0.3) between the linked and unlinked cohorts (p>0.05). Ten patients developed post-operative infections (7 deep and 3 superficial) including 5 patients requiring 2-stage revision and 2 who were placed on suppressive antibiotics after I&D with implant retention. Superficial wound dehiscences were successfully treated without surgery. Four unlinked prosthesis were converted to a linked design for instability. 6 patients had ulnar nerve dysfunction postoperatively with 3 patients sustaining either partial or complete nerve transection.

TEA using a convertible implant provides good patient reported outcomes at mid-term follow-up in patients with RA. The lack of differences between these two designs suggests surgeons may elect to use either linked or unlinked designs as dictated by clinical and intra-operative findings.

Keywords:
Total Elbow, Rheumatoid Arthritis, arthroplasty
Factors associated with surgical intervention in osteoarthritis of the thumb carpometacarpal joint

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Objectives / Interrogation: It is unclear which patients will require future surgery for osteoarthritis of the thumb carpometacarpal (CM) joint. This study aimed to analyze factors associated with surgical intervention in osteoarthritis of the thumb CM joint noted at the first visit.

Methods: Patients who visited our hand surgery outpatient clinic between May 2012 and January 2015, were diagnosed with osteoarthritis of the thumb CM joint, and were followed up for >3 years were included in this study. A total of 47 patients (80 thumbs; 10 men [15 thumbs], 38 women [65 thumbs]; mean age, 63 years) were included. Patients were divided into a group that had surgery within 3 years or a group that did not have surgery within 3 years. Sex, age, age at onset, disease duration, dominant hand, pain visual analog scale (VAS) score (resting and during use), night pain, Eaton classification, presence of orthosis, number of injections, tender part, range of motion, grip strength, pinch strength, Kapandji abduction index, palmar abduction distance, grind test results, CM joint shape on an X-ray, dorsal subluxation ratio, volar tilt, CM joint space distance, osteophyte presence, osteophyte size, and presence or absence of ossicles were extracted as variables. Univariate analysis was performed of the variables described above and a logistic regression was performed of the variables with values of p < 0.05 with the objective variable being whether surgery was performed.

Results and Conclusions: Results
Resting pain VAS (p = 0.021), during use pain VAS (p = 0.043), dorsal subluxation ratio (p = 0.006), and presence of ossicles (p = 0.048) were significantly associated with surgical intervention on univariate analysis. Logistic regression analysis using these factors as explanatory variables revealed that resting pain VAS and dorsal subluxation ratio were significantly associated with surgical intervention.

Conclusions
In patients with osteoarthritis of the thumb CM joint, resting pain VAS and dorsal subluxation ratio at the first visit were associated with future surgical intervention within 3 years. This information may be useful for predicting future surgery during the first visit.

Keywords:
osteoarthritis of the thumb carpometacarpal joint, Logistic regression analysis, surgery
**Prognostic factors for simultaneous arthroscopic repair of deep and superficial TFCC portion for Atzei class 2 tear: prospective one-year follow-up study**

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**Objectives / Interrogation:** Detachment of deep portion of TFCC from the ulnar fovea induces DRUJ instability. According to biomechanical studies, superficial portion of TFCC, rather than the deeper portion, contributes toward stabilization of DRUJ in pronation; therefore, it would be reasonable to repair not only the deep but also superficial portions. We hypothesized that simultaneous arthroscopic repair of both portions would be effective for Atzei class 2 tear. This prospective study examined the postoperative outcomes and prognostic factors in patients who underwent the procedure.

**Methods:** We conducted a prospective study which included 33 patients [mean age, 31 years (range, 13-59 years)]; all patients were diagnosed with Atzei class 2 tears by physical examinations, MRI and DRUJ arthroscopy. The mean ulnar variance was +1.1 mm (range, -1 to +4 mm) on radiographs. Arthroscopic TFCC repair was performed using meniscus mender instruments; using 2-0 Fiberwire®, the deep portion was repaired into the fovea through radiocarpal and two dorsal DRUJ portals. Simultaneously, the superficial portion was repaired to the capsule using 3-0 PDS®. Postoperative subjective data were collected every 3 months until a year by Quick DASH score; Mayo wrist score; and grip strength.

**Results and Conclusions:** 3 cases required ulnar shortening osteotomy later. Another 2 cases stayed unsatisfied scores at a year, so 5 cases were categorized the poor. Mean Mayo wrist scores increased from 61 points to 77, 86, 90, and 93, respectively. Mean Quick DASH scores improved from 33 points to 22, 12, 7, and 6. For percentage of grip strength of the contralateral side, the preoperative average improved from 72% to 70, 82, 91, and 98.

As a result of univariate analysis between two groups depending on the results, high ulnar variance and workers compensation insurance users were associated with poor outcome, but the other points were unrelated, such as age, gender, preoperative subjective and objective score and smoking.

Considering the outcomes were excellent, this anatomical reconstructive procedure is recommended for the patients with Atzei class 2 TFCC tear except for workers compensation insurance users and high ulnar variance cases.

**Keywords:**
Clinical Outcomes With the Amandys® Wrist Implant: Results of Seven Patients

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Objectives / Interrogation: The Amandys is a free interposition pyrocarbon implant that is designed to replace the lunate, proximal one-third to two-thirds of the scaphoid and the proximal capitate. It preserves bone in the carpus and radius and it does not compromise other options such as total fusion, total wrist replacement or proximal row carpectomy with capitate resurfacing. The design allows for a good range of stable movement whilst preserving the "dart-throwing motion". Its three axes of movement allow it to act as a mobile and adaptive spacer which can slide, roll and rotate. This study examined clinical and patient-reported outcomes of the Amandys implant in seven patients.

Methods: In our unit we treated seven patients with interposition arthroplasty using the Amandys implant. One of these patients had a primary diagnosis of Kienböck's disease. Median age at surgery was 58 years (range 41 - 67 years). Five patients had surgery on the dominant side. The median follow-up period was 24 months (range 3 - 73 months).

Results and Conclusions: Patients reported a median improvement in pain from 56 at pre-operative assessment to 36.5 at most recent follow up. Median PRWHE score decreased from 58.5/100 to 46.5/100. Median QuickDASH score decreased from 64/100 to 42/100. Median grip strength was 23 kg (61% of the contralateral side) before surgery versus 22 kg (70% of the contralateral side) at most recent follow-up. Patient satisfaction at most recent follow-up ranged from 66/100 to 95/100. No adverse events such as infection, subluxation or dislocation were reported.

The Amandys implant provides an alternative surgical option to wrist fusion and total wrist arthroplasty. Additionally, the minimal bone resection required allows for preservation of the important dorsal and volar extrinsic ligaments and motion at the radiocarpal and midcarpal joints.

Keywords:
Lunate, Wrist, Kienböck's disease, Pyrocarbon, Implant
Treatment of severe traumatic hand injuries

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Objectives / Interrogation: Introduction: Severe traumatic hand injuries are difficult to treat, even for experienced hand surgeons. This study evaluated treatment outcomes. Severe traumatic hand injuries were defined as bone and joint injuries involving the carpal and metacarpal bones, with associated soft tissue injuries, or soft tissue defects with and without bone and joint injuries.

Methods: Materials: We reviewed 21 cases (men, 17; women, 4; average age, 46.1 years) of severe traumatic hand injuries treated between 2009 and 2017. The injuries included: amputation at a metacarpal or carpal bone (8), bone and joint injury between carpal and metacarpal bone, with associated soft tissue injury (4), and soft tissue defect with and without bone and joint injury (9).

Results and Conclusions: Results
Osteosynthesis and arthroplasty were performed in 13 and 5 cases, respectively. Tenorrhaphy, vascular anastomosis, and nerve suturing were performed in 13, 9, and 7 cases, respectively. A free or pedicled flap and skin grafting were needed in 10 and 13 cases, respectively. Amputated hands were saved in 6 of 7 cases. Microsurgical technique was needed in 13 cases. For functional recovery, joint mobilization, tenolysis, and free or local flaps were performed in 12, 9, and 13 cases, respectively. The average number of procedures for each case was 5.8.
Summary
Most cases of severe traumatic hand injury require multiple operations, leading to prolonged treatment, and functional disorders, such as contractures, tend to persist. Optimal treatment requires evaluation of the injured hand at the first visit and determination of the treatment goal in each case. Additional operations, such as joint mobilization, tenolysis, and free or local flaps must be effectively performed.

Keywords: severe traumatic hand injuries, microsurgery
Predictors of outcome in untreated carpal tunnel syndrome: results of a longitudinal cohort study

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Objectives / Interrogation: Several prognostic studies have been published which identify predictors for success in carpal tunnel syndrome (CTS) treated either operatively or by steroid injection. However, not all patients undergo surgical or non-surgical treatment or indeed need it. The purpose of this study was to describe the outcome of untreated CTS and explore what factors assessed at baseline are predictive of symptom severity at 18 months follow-up.

Methods: We conducted a prospective cohort study of patients diagnosed with CTS between 2013 and 2017 and followed up every 6 months up to 1.5 years. Data were collected through patient reported questionnaires including sociodemographics, clinical symptom severity using the shortened Boston Carpal Tunnel Questionnaire (BCTQ), hand function, general, physical and psychological health and quality of life. A general linear model was used to identify independent, baseline predictors of BCTQ symptom score at 18 months.

Results and Conclusions: A total of 626 patients were enrolled into the study. Of these 161 (25%) did not receive a steroid injection or surgery for their CTS over an 18 months follow-up and were included in this analysis. The median electrodiagnostic severity in this sub-group was grade 2 (mild). Mean baseline symptom severity assessed by shortened BCTQ was 2.4 (SD=0.82) decreasing to 1.8 (SD=0.83) by 18 months. The majority (68%) were female and the mean age was 58.5 years (SD=12.3). Over 41% had reported symptoms for more than a year.

Four independent baseline predictors of higher BCTQ at 18 months were identified: higher BCTQ scores at baseline (p<0.001), higher levels of comorbidity (p=0.009), female sex (p=0.005), and the absence of diabetes (p=0.027).

Where patients decline treatment or surgical intervention has become subject to restrictive policies, the predictive factors identified from this study will help to inform likely prognosis and aid shared decision-making.

Keywords:
Can We Use Clinical Radiographs and Three-dimensional Computer Tomography (CT) Scans to Evaluate Intracarpal Measurements?

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Objectives / Interrogation: In articulations, the morphology of the joint dictates the way forces will travel through it. Understanding wrist structure and consequently function is complicated by multiple joints and ligamentous structures leading to a limited ability to diagnose and treat wrist conditions. Our purpose was to assess the associations between intracarpal measurements performed on radiographs (2D) to measurements performed on clinical 3-dimensional (3D) computed tomography (CT).

Methods: Retrospective review of normal wrist radiographs and corresponding normal wrist CT scans. Only imaging pairs with normal carpal alignment and technically optimal imaging were included. Evaluations included lunate, capitate and wrist type, capitate circumference and area, percent capitate circumference and area that articulates with the lunate, scapholunate ligament, scaphoid, hamate, trapezoid, base of the index and middle and ring metacarpal bones.

Results and Conclusions: There were more lunates type 1 than 2. Lunate and capitate type were correlated between X-rays and CT scans (lunate: r=0.78 p<0.001, capitate: r= 0.75 p<0.001). Lunate type 2 was seen more often on CT scan. Percent lunate-hamate contact on CT was a significant predictor of lunate type 2 on X-rays p<0.001. 7.8% contact on CT scan between lunate and hamate provided a sensitivity of 100% and specificity 79.4% for type 2 lunate. Other measurements correlated between 2D and 3D measurements were capitate -base of index and ring metacarpals and capitate-hamate contact area. Other measurements were not correlated or correlated weakly. Table 1

Conclusions:
1) This study supports the use of plain films and CT scans in the clinical setting especially to evaluate lunate and capitate type.
2) The retrospective nature of this study limited the technical quality of the measurements.
3) Further study using different methods may aid in a more exact evaluation of surface contact area.

Keywords:
lunate; capitate; type; intracarpal measurements; radiograph, CT scan
Radioscapholunate fusion under Wide Awake Surgery

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Objectives / Interrogation: Scaphoid-non-union-advance collapse (SNAC) or scapholunate-advance collapse (SLAC) is one of the associated conditions following neglected unstable scaphoid fracture. Surgical treatment for degenerative joint disease of the radioscapholunate joint is arthrodesis. We document a radioscapholunate fusion done under wide awake surgery. The reason was due to limited general anaesthetic time.

A 39-year-old male sustained a motor vehicle accident and fell onto his outstretched right hand. Three months later he presented with worsening right wrist pain and limited range of motion for the past 3 months. He initially did not seek treatment as he thought it was just a sprain until his wrist pain had worsened considerably.

Methods: The RSL joint arthrodesis was done under local anesthesia using the "Walant" technique, also known as "wide-awake-local-anesthesia-no-tourniquet". Tumescent anesthesia technique was used to infiltrate the surrounding surgical field. Four different regions were injected with 10cc of anaesthetic solution beginning from 1) the subcutaneous area over the incision site surrounding the dorsal area of the wrist, 2) subperiosteally to the distal radius, 3) into the radial-scaphoid-lunate joint and 4) surrounding the carpal region. The solution comprised of normal saline, lignocaine, sodium bicarbonate and adrenaline with the adrenaline at a diluted strength of 1:100 000.

Results and Conclusions: The surgery was successfully completed within 1.5 hours with a NPRS (numerical pain rating score) of 0/10. There was no requirement for top-up injection. Thus, it is possible to utilize wide-awake-local-anesthesia-no-tourniquet (walant) for limited wrist fusion such as in RSL arthrodesis. As this is an elective surgery, it can be done earlier under daycare surgery saving potential cost for the patient and providing earlier pain relief.

Keywords: Scaphoid, Scapholunate advanced collapse, Radioscapholunate joint, fusion, local anaesthesia, arthrodesis, wide awake surgery, WALANT, osteoarthritis
Radiographic characteristics of wrists in idiopathic carpal tunnel syndrome patients.

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Objectives / Interrogation: Radiographic characterization of the wrist in idiopathic carpal tunnel syndrome (CTS) patients has received little attention. To determine the radiographic characteristics of wrists in idiopathic CTS patients, we compared the radiographic parameters of the wrists between CTS patients and non-symptomatic controls.

Methods: Ninety-four wrists of 62 idiopathic CTS patients and 94 wrists of 94 asymptomatic controls were evaluated. The patients and controls were age/gender matched. CTS was diagnosed by clinical findings and nerve conduction studies. The lack of symptoms was confirmed with the medical record for the controls. Patients who had a history of osteoarthritis, rheumatoid arthritis, any upper extremity trauma or hemodialysis were excluded from both groups. X-ray images of the postero-anterior and lateral views of the wrist were taken by radiology technicians who were blinded to the clinical symptoms. The postero-anterior and lateral views were obtained with wrist neutral position. Using the obtained X-ray images, the indices of radial inclination (RI), ulnar variance (UV), volar tilt (VT), scapholunate angle (SLA), and transverse and antero-posterior diameters of the wrists were measured. The radiographic parameters were measured separately by two raters. Intraclass correlation coefficient (ICC) was evaluated for the inter-rater reliability. Average of the parameters of two raters measurements were compared between CTS patients and controls.

Results and Conclusions: The ICCs of the postero-anterior view parameters were 0.58, 0.77, and 0.99 for the RI, UV, and transverse diameter, respectively (P<0.01). The ICCs of the lateral view parameters were 0.60, 0.63, and 0.91 for the VT, SLA, and antero-posterior diameter, respectively (P<0.01). UV was significantly larger in the CTS patients compared to the controls (1.7 ± 1.8mm and 0.8 ± 1.5mm for the patients and controls, respectively, P<0.01). SLA was significantly smaller in the CTS patients compared with the controls (56.0 ± 8.8 degrees and 60.0 ± 6.4 degrees for the patients and controls, respectively, P<0.01). There were no significant differences in the RI, VT, transverse and antero-posterior diameters.

In this study, significant differences in the ulnar variance and scapholunate angle were observed. This suggests that the imbalance of radioulnar bone length and the lower carpal tunnel height were characteristic factors of CTS. The results may be useful for identifying the preclinical conditions of CTS.

Keywords:
carpal tunnel syndrome, Radiographic characteristics, Xp, ulnar variance
Corrective intra-articular osteotomy after malunion in Bennett fractures: surgical technique and first results

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Objectives / Interrogation: A malunion with an intra-articular gap after a Bennett’s fracture can lead to a painful trapeziometacarpal (TMC) joint and patients can develop early osteoarthritis of the thumb base. We hypothesized a correction through an intra-articular osteotomy to be a valid procedure for those patients who present with pain and impaired strength.

Methods: Three patients were seen with a painful and debilitating malunion after a period of minimum 8 months that did not respond to conservative treatment. The malunion was diagnosed using conventional radiographs and confirmed with a cone beam CT scan. A Gedda-Moberg incision was used to expose the TMC joint and the intra-articular gap was identified. A closing wedge osteotomy was then performed under fluoroscopic control, thus excising the intra-articular gap and restoring joint congruency. The osteotomy was fixed with 3 1.5 mm screws. Patients were immobilized for a period of two weeks before active movement was initiated. Pain, mobility of the thumb and strength were assessed before the intervention and 6 months postoperative. A cone beam CT scan was used to control union of the osteotomy after 6 months.

Results and Conclusions: Mean pain according to the visual analogue scale decreased from 88/100 to 7/100. Opening of the first web, MP mobility, opposition and retropulsion did not change. Mean grip strength improved from 34 kg to 40 kg (42 kg contralateral), mean key pinch improved from 4 kg to 10 kg (10 kg contralateral) and mean precision pinch improved from 5 kg to 7 kg (7 kg contralateral). All three fractures showed union and restoration of the joint congruency after 6 months.

Intra-articular osteotomy of the first metacarpal base is a new technique to treat a malunited Bennett’s fracture. The first results show excellent pain relief, preservation of the joint mobility and restoration of strength to a near normal level. Larger studies with longer follow-up are needed to evaluate whether the procedure can prevent the natural progression towards osteoarthritis of the TMC joint.

Keywords:
Bennett’s fracture, malunion, trapeziometacarpal joint, osteoarthritis
Early active mobilization after flexor tendon grafts using extrasynovial tendons

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Objectives / Interrogation: Early active mobilization (EAM) is rarely performed after tendon grafting because of healing process of grafted tendon and weakness of junction between the distal end of the graft and the base of distal phalanx. We evaluated the outcomes of EAM after flexor tendon grafting using extrasynovial tendons.

Methods: Between 2008 and 2017, the flexor digitorum profundus (FDP) tendons of seven digits in seven patients were reconstructed using extrasynovial tendons, including the palmaris longus, plantaris, and extensor digitorum longus via single- or two-stage procedures. Six of the seven patients were male, and the average patient age was 48 (range, 30-66) years. The injuries involved two middle, two ring, and three little fingers. Three patients underwent single-stage reconstructions to treat a neglected FDP avulsion injury, a neglected zone 1 FDP laceration, and a subcutaneous FDP rupture caused by infection (one patient each). Four patients underwent second-stage reconstruction to treat flexion contractures developing after flexor tenolysis or tendon grafting (one patient each) and flexor tendon rupture after zone 2 primary repair (two patients). The tendons were proximally sutured into appropriate FDP tendons via end-weave anastomoses; the distal end of the graft was anchored using small bone anchor, interlacing suture to the distal stump of the FDP, and pull-through technique. For the first 3 postoperative weeks, the digits were mobilized with a combination of active extension and passive and active flexion in a protective splint. The follow-up period averaged 18 (range, 7-45) months.

Results and Conclusions: The passive range of motion of the proximal and distal interphalangeal (PIP and DIP) joints prior to flexor tendon grafting averaged 144 (range, 115-172)°. The mean active range of motion of these joints at final evaluation was 123 (range, 65-170)°. Using Strickland's formula to assess staged flexor tendon reconstruction, the mean recovery of active motion was 83 % (range, 50-100%). Using the Tang criteria, reconstruction of one digit was graded excellent; reconstructions of three were graded good, two fair, and one poor at final evaluation. We encountered no tendon rupture and no finger required tenolysis.

SUMMARY POINTS: The results indicate that extrasynovial tendons can survive and heal during EAM, with few adhesions of functional significance. We believe that our distal juncturing technique allows stresses encountered during EAM to be withstood.

Keywords:
Early active mobilisation; extrasynovial tendon; flexor tendon injury; tendon grafting
Avoiding vein grafts for arterial repair in avulsion amputations of thumb - Case series

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Objectives / Interrogation: The first replantation of a complete thumb amputation using microvascular anastomosis in a human was successfully conducted by Komatsu in 1968. Avulsion amputations of the thumb at the level of metacarpophalangeal joints pose a tedious task for direct arterial repair, even with adequate bone shortening. Owing to the short length of princeps pollicis from the deep arch, tight working space in the first web under microscope and the associated intimal injuries, we advise transposing the radial indices artery in such cases which gives adequate length and non-injured artery for a tension free repair.

Methods: Four cases with avulsion amputations at the level of thumb metacarpophalangeal joint were followed up for a period of 11 to 14 months.

Results and Conclusions: All four were avulsion type of amputations with one occurring in a female due to rodeo type injury where the thumb was avulsed while playing a tug of war game. All four cases of avulsed thumbs survived and were followed up for a period of 12 months. K wires were removed at 5 weeks and put on physiotherapy. All patients regained a useful protective sensation with 2 point discrimination of 7 to 9 mm, with good range of movements and were able to oppose the thumb to little finger.

Conclusion: In Avulsion amputations of thumb using this method of transposing radial indices artery avoids the tedious task of vein grafts for arterial repair, reducing the operating time and improving successful outcomes in thumb reimplantations.

Keywords: thumb reimplantation, avulsion, radial indicis artery
Predictive factors for union time in adult diaphyseal forearm fractures

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Objectives / Interrogation: Although open reduction and internal fixation (ORIF) by plating is the treatment of choice of diaphyseal fractures of the forearm, delayed union and non-union remain existing complications. The goal of our study was to analyze predictive factors for union time in these fractures.

Methods: We present a retrospective study on 55 patients with 86 diaphyseal forearm fractures (31 patients had both bone forearm fractures). Union times have been distributed into 2 groups (3 months or less, or more than 3 months) and then compared through a multivariate regression analysis and Fisher's exact tests in order to stress out a statistical correlation with patient demographics, fracture pattern and characteristics, associated injuries, type of fixation used, and quality of postoperative reduction.

Results and Conclusions: Overall 65.1% of the fractures achieved union within 3 months, and 34.9% did not. Among these last, 31.3% did achieve union in more than 3 months, and 4.6% had an established non-union. The use of a locking plate was statistically associated with a higher chance of union within 3 months. Moreover, the gap width in the fracture site on post-operative Xrays also appeared significantly correlated with union time. None of the other parameters showed any correlation with union time.

Conclusion: The use of locking plates in ORIF of diaphyseal forearm fractures in adults increases the chance of achieving union within 3months postoperatively, even though exempting from postoperative immobilization. Furthermore, gap width in fracture site after reduction is qualitatively and quantitatively correlated with the probability of not achieving union within 3 months.

Keywords: non union, forearm fracture, locking plate, fracture gap
Surgical technique: about a new total and isoelastic wrist implant (Prosthelast®)

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Objectives / Interrogation: This study describes a new total wrist implant (Prosthelast®) designed to reduce the risk of distal migration of the carpal component.

Methods: The Prosthelast® implant consists in a one-block radial implant replacing the metaphysis and the articular surface fixed to a radial elastic centromedullar wire and a carpal component in titanium with an articular condylar surface in polyethylene.

Results and Conclusions: We operated on five patients (3 male patients and 2 female patients) and followed them up for 12 months on average. Two of the patients presented with rheumatoid arthritis of the wrist and an ulnar osteotomy (Darrach procedure) was carried out at the same time of the arthroplasty. All clinical variables improved post-operatively (Quick DASH score, pain score, range of motion) except from wrist flexion which was reduced. No patients underwent revision surgery. Two patients presented with a periprosthetic radiolucent loosening around the radial component but no implant migration was observed.
Overall, the preliminary results of our case series show that the new Prosthelast® implant presents comparable short-term results to those described in literature. We will follow up the patients to verify that long-term results are as satisfactory as the short terms results.

Keywords:
implant; wrist; isoelastic; carpal implant; radial implant
Designing a minimally-invasive, ultrasound-guided, percutaneous technique of washout of the flexor tendon sheath: an anatomical study

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Objectives / Interrogation: The goal of this study was to develop a minimally-invasive, ultrasound-guided technique of percutaneous washout of flexor tendon sheath on an anatomical model.

Methods: Two catheters were inserted using ultrasound guidance at the proximal and distal ends of the tendon sheath of 20 fingers of cadaveric forearms. A percutaneous injection of saline solution colored with methylene blue enabled an anterograde washout of the flexor tendon sheath.

Results and Conclusions: The technique was successful in 13 out of 20 cases. The proximal catheter was in the right position in 17 cases and in 15 cases for the distal catheter. The flexor tendons were uninterrupted in all cases and bore puncture wounds in 9 cases.
Our results showed that this minimally-invasive, ultrasound-guided technique of percutaneous washout of the flexor tendon sheath was efficient in 65% of cases and safe in 100% of cases. In case of failure of the technique it is always possible to switch to a conventional open technique.

Keywords: minimally-invasive; percutaneous washout; flexor tendon sheath
Posterior interosseous nerve to the superficial terminal branch of the ulnar nerve transfer at the distal third of the forearm through a single anterior approach: Anatomical feasibility study

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Objectives / Interrogation: The purpose of this study was to determine on an anatomical model, if transfer of the posterior interosseous nerve (PIN) to the superficial terminal branch (STB) of the ulnar nerve by a single approach was feasible.

Methods: The experiment was carried out on 5 fresh cadavers. Their ulnar nerves were splitted into

Results and Conclusions: All sutures were without tension and technically possible with PINs all at least 50% of the STB's diameter.
Our results demonstrate feasibility of the PIN to STB transfer through a single anterior approach on anatomical model.

Keywords:
nerve transfer; ulnar nerve; posterior interosseous nerve; interosseous membrane; ulnar nerve lesion
Injection therapy for base of thumb osteoarthritis: a systematic review and meta-analysis

List of authors:
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Objectives / Interrogation: To evaluate the effectiveness of injection based therapy in base of thumb osteoarthritis.

Methods: Design: Systematic review and meta-analysis.

Data sources: The MEDLINE and EMBASE via OVID, CINAHL and SPORTDiscus via EBSCO were searched from database inception to 22nd May 2018.

Study selection: Randomised controlled clinical trials (RCTs) of adults with base of thumb osteoarthritis investigating an injection based intervention with a comparator.

Data extraction and analysis: Data were extracted and checked for accuracy and completeness by pairs of reviewers. Primary outcomes were pain and function. Comparative treatment effects were analysed by random effects at all time points.

Results and Conclusions: In total, nine RCTs involving 504 patients were identified for inclusion after screening. All these studies compared different injection based therapies with each other, while no prospective study comparing an injection based therapy with a non injection based intervention was identified. Twenty injection based intervention groups were present within these nine trials, consisting of hyaluronic acid (9), corticosteroid (7), saline placebo (3) and dextrose (1). Only limited meta-analysis was possible due to the heterogeneity in the injections and outcomes used, as well as incomplete outcome data. Meta-analysis of two studies (92 patients) demonstrated no statistically significant difference in pain or function with corticosteroid versus hyaluronic acid in the short and medium term. Overall the available evidence does not suggest that any of the commonly used injection therapies are superior to placebo, one another or a non-injection based comparator.

Current evidence is equivocal regarding the use of injection therapy in base of thumb osteoarthritis, both in terms of which injection based therapy is the most effective and in terms of whether any injection based therapy is more effective than other non injection based interventions. Given limited understanding of both the short and longer term effects, there is a need for large, methodologically robust multicentre RCTs investigating the commonly used injection therapies.

Keywords:
base of thumb, osteoarthritis, corticosteroid
Therapeutic interventions for osteoarthritis of the wrist: a systematic review

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Objectives / Interrogation: To evaluate the effectiveness of interventions for osteoarthritis of the wrist in adults.

Methods: Design: Systematic review and meta-analysis.
Data sources: The MEDLINE and EMBASE via OVID, CINAHL and SPORTDiscus via EBSCO were searched.

Study selection: Randomised controlled clinical trials (RCTs) and any prospective studies of adults with wrist osteoarthritis investigating any intervention with a comparator.

Data extraction and analysis: Data were extracted and checked for accuracy and completeness by pairs of reviewers. Primary outcomes were pain and function. Comparative treatment effects were analysed by random effects at all time points.

Results and Conclusions: Three RCTs were identified for inclusion after screening and all had a high risk of bias. Two compared proximal row carpectomy (PRC) with four corner fusion (4CF) for post-traumatic osteoarthritis, while the other compared leather with commercial wrist splints in patients with chronic wrist pain, of which a small group had wrist osteoarthritis.

There is no prospective study comparing operative to non-operative treatment for wrist osteoarthritis, while there is a paucity of prospective studies assessing the effectiveness of both non-operative and operative interventions. Further research is necessary in order to better define which patients benefit from which specific interventions.

Keywords:
wrist, osteoarthritis
What is wrong with the total wrist arthroplasty? The alternative understanding of wrist biomechanics according to the mathematical conversion of a non-linear biomechanical system to linear one.

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Objectives / Interrogation: Only about 1200 wrist joint replacements are carried out annually in the United States compared approximately 1.2M knee joint replacement and approximately 670K hip replacement surgeries. The simple calculation based on the number of patients with degenerative wrist disease for any reason shows that patients requiring surgical wrist replacement can reach one million per year only in the United States. So, the question is: "What is wrong with the total wrist replacement?" The author of the study assumes that a concept of all existing implants ignores the rules of Nature. According to the new vision and mathematical processing of the anthropometry of the joint may be possible to convert the non-linear biomechanical system to the linear one. That will allow creating a solution for wrist replacement closed to Nature's design.

Methods: Anthropometric measurements of the wrist joint structures made on the base of the PA radiograms 210 healthy wrist joints of the adult patients. Three distances evaluated in the measurements. The first is the distance between the base of the ulnar styloid to the apex of the interfacetal ridge. The second is the distance between the apex of the interfacetal ridge and the base of the radial styloid. The third is the distance between the base of the capitate and the apex of the interfacetal ridge. The ratio between the first and second distances and the ratio of the first plus second distances and third distance were determined.

Results and Conclusions: All determined ratios were measured close to 1.5 and 1.6 with the deviation of ±0.1. The results come very close to the number of Golden Section of Fibonacci (Phi-1.618). The same proportions data accepted on the Leonardo da Vinci paintings of the wrist anatomy. According to the fractals, linear model of the wrist joint was built. Two spirals of Fibonacci were drawing according to the fractals and determined two centers of rotation in the capitate bone. The wrist joint may be described on the base of the fractals and Fibonacci golden section as are the spiral appearance of the most galaxies and the DNA spirals. Autor finds linearity of the human wrist joint. A new opportunity was opened to explain the biomechanics of the wrist joint. This opportunity logically can be defined as "A fractal theory of the biomechanics of the wrist joint." That conversation will help design and built the optimal and universal wrist joint prosthesis similar to the structure created by Nature.

Keywords: wrist arthroplasty, Golden Section of Fibonacci, non-linear biomechanical system, linear system, fractals.
Cross-Sectional International Multicenter Study on Quality of Life and Reasons for Abandonment of Upper Limb Prostheses

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Objectives / Interrogation: The purpose of this cross-sectional multicenter study was to examine prosthesis use and abandonment among patients with upper limb deficiencies in the USA and Japan. We determined the most common reasons for abandonment and compared prosthesis users and nonusers according to a variety of demographic and clinical characteristics. We hypothesized that prosthesis users would have higher QOL than nonusers, and that patients who used myoelectric prostheses were more likely to be employed full-time. We also compared EQ-5D scores between patients and live-in proxies to determine the agreement in QOL between patients and their close relationships, hypothesizing that patient-reported QOL would be superior to proxy-reported values.

Methods: Three rehabilitation centers in Japan and one academic medical center in the USA participated. Patients aged between 12 and 75 years with unilateral or bilateral upper limb absence from the level of wrist to shoulder disarticulation were included. Two questionnaires were used, an original questionnaire on prosthesis use and the EQ-5D, which was completed by both the participant and by a live-in proxy on the participant’s behalf.

Results and Conclusions: Among 367 patients invited, 174 patients with upper limb loss participated in this study. Male patients made up 65% of the study population. The most common amputation level was trans-radial. Trauma was the most common cause of limb loss. The prosthesis rejection rate was 9% (n=16). The most common reason for abandonment was prosthesis functionality. Ten of 16 prosthesis nonusers (63%) and 59 prosthesis users (38%) were unemployed, whereas only 5 prosthesis nonusers (31%) and 87 prosthesis users (56%) were working full-time or part-time. There were no significant demographic differences between prosthesis users and nonusers including age, gender, dominant or nondominant hand involvement, cohabitation status, or health status. The mean EQ-5D utility score of prosthesis users was significantly higher than that of nonusers (p<0.01). Live-in proxies significantly overestimated and underestimated the QOL in male and female patients, respectively.

It is beneficial for society to provide intensive rehabilitation to upper limb prosthesis users and minimize prosthesis rejection because prosthesis users have greater productivity than nonusers. Furthermore, particular attention should be given to avoiding the overestimation of QOL in male patients with upper limb deficiency.

Keywords:
Upper limb prosthesis; abandonment; quality of life; proxy
New Developments in the Minimal invasive Treatment of Severe Dupuytren's Recurrences

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Objectives / Interrogation: Both needle fasciotomy (PNF) and the extensive needle fasciotomy with skin graft (PNF+) are minimal invasive treatments for severe recurrent Dupuytren's contractures which follow a partial fasciectomy (PF). It is not always possible to straighten the fingers completely. Sooner or later, depending on the patients individual fibrosis diathesis a further recurrence occurs. This work presents a completely new dynamic finger splint that can permanently correct a remaining contracture after a PF or PNF/PNF+.

Methods: Two test persons both with a high fibrosis diathesis and both suffering severe recurrences following partial fasciectomy were treated by PNF+ and PNF respectively.
A 56-year-old male patient underwent PNF+ with skin graft.
The contracture in the middle joint of his small finger, left hand, was reduced from 90 degrees (Tubiana 2) to 40 (Tubiana 1, fig. 1).
The contractures in the small finger of his right hand (Tubiana 4) were eased from 50 to 0 degrees in the base joint, and 90 degrees to 50 (Tubiana 2) in the middle joint (fig. 2).
The patient designed and fabricated his own completely new dynamic splint (video 1), which he wore 2-3 times a day for 2-3 hours at a time over a duration of 8 months.
A 32-year-old female patient suffered from a contracture of 90 degrees in the middle joint of her small finger, right hand. PNF released the contracture by a mere 15 degrees and only for the short time of 4-6 weeks (fig. 3a+b). The patient wore the newly developed dynamic splint several times a day for 1-3 hours at a time and during the night she wore a more comfortable dynamic splint (video 2) to prevent fist closure.

Results and Conclusions: After 8 months using his self-designed dynamic splint, the 56-year-old patient achieved a complete release of the contractures on both small fingers to stage 0 on the Tubiana scale (fig. 4+5). This condition has remained constant since October 2017 up until today. To maintain this status, it is essential that the dynamic splint is worn for 2-3 hours every day. After just 5 months, the 32-year-old patient achieved an almost complete straightening of the finger, 83 degrees, almost Tubiana stage 0 (fig. 6).
She continues to wear both dynamic splints, day and night, but for a shorter duration.

Both fibrous cords and scars resulting from a partial fasciectomy can be stretched.
The newly developed dynamic splints can release severe recurrent Dupuytren's contractures permanently.

Keywords:
Dupuytren's recurrences, severe contracture, dynamic splint
The vitamin D receptor expression in skeletal muscle of women with distal radius fracture

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Objectives / Interrogation: We aimed to evaluate the relationship between the VDR expression in the muscle cell and the muscle mass in women with a distal radius fracture (DRF).

Methods: We prospectively recruited 45 women over 50 years of age (mean age, 66 years) with DRF and acquired biopsy of the forearm flexor muscle. The muscle cross-sectional area (CSA) and VDR expression were measured using immunohistochemistry staining. The clinical parameters including grip strength, gait speed, body mass index (BMI), bone mineral density (BMD), and serum vitamin D levels were compared between patients grouped by appendicular lean mass index and were correlated with the VDR expression.

Results and Conclusions: Twelve patients (27%) showed a decreased appendicular lean mass index, less than the cut-off value of 5.4 kg/m\textsuperscript{2} which was suggested by the Asian Working Group for Sarcopenia. Patients with a low appendicular lean mass index had significantly lower muscle CSA (p = 0.037), but a higher VDR expression (p = 0.045) than those with higher indices. VDR expression was negatively correlated with BMI (r = -0.417, p = 0.004) and appendicular lean mass index (r = -0.316, p = 0.044). DRF patients with low appendicular lean mass index presented high VDR expression and low CSA in forearm muscle cells. This suggests that the VDR expression might be upregulated in the attempt to compensate for the decreasing muscle mass. Further studies are necessary to explore the role of VDR in the progression of sarcopenia

Keywords: Vitamin D . Vitamin D receptor . Distal radius fracture . Sarcopenia . Skeletal muscle
Repairs the donor site of the free anterolateral thigh flap.

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Objectives / Interrogation: To explore and summarize the method of repairing the donor site of the free anterolateral thigh flap.

Methods: From March 2014 to May 2015, 8 patients suffered soft tissue defects of hand, foot, including 6 males and 2 females, which were repaired by the free anterolateral thigh flap, the area of donor flap was 9.0cm×6.0cm–14.0cm×8.0 cm. The defects of donor flap were repaired by the "Reading Man" Procedure technique, the perforated and the V-Y propulsion flap, the relay flap. Avoiding to damage the perforated vascular pedicle for ensuring the blood supply of flap, and to increase the movement distance of the flap, the vascular pedicle should be released and separated appropriately and adequately. The large tension of sutured wound increased the edema and the large tension of wounds, the sufficient drainage of wound improved the blood supply of flap, raising the chance of closing the wound directly, avoiding the necrosis of flap and skin grafting.

Results and Conclusions: Results: All free anterolateral thigh flaps and all donor flaps survived, except one the relay flap whose the distal part was bruising and necrotic then. Necrotic wound healed by the flap of local transposition.

Conclusion: trying not to add the trauma of the new donor when cutting flaps, the donor of the free anterolateral thigh flap was repaired by such methods of relay flap, kiss flap, local perforation advance, the "Reading Man" Procedure, the area of the donor flap was closed directly, without skin graft. Such methods are an efficient and quick repair methods for the small defect area of such donor flap.

Keywords:
Skin defect; anterolateral thigh flap; perforator flap
A free vascularized tibia graft for the infectious bony defect of upper limb

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Objectives / Interrogation: To explore the clinical application and effect of a free fibular transplantation in the treatment of the infectious bony defect of upper limb.

Methods: Form April 2009 to January 2015, the infectious bony defect of upper limb was treated by a free vascularized tibia graft. 11 patients suffered such bony defect, including 2 humeral shafts, 6 radial backbones and 3 Ulnar backbones. The infection was confirmed by sinus secretions preoperatively and bacterial culture at the lesion intraoperatively. After debridement, the length of bone defect was 5-20 cm. 6 cases were suffered by emergency surgery, 5 cases by elective surgery, bone defects were repaired with single fibular graft for all patients. The blood supply of the free vascularized tibia graft was monitored by the fibular flap in 9 cases. All the persons, fibulas were fixed by plates, the survival of the transplanted fibula and the healing of the bone were performed by imaging assessment postoperatively.

Results and Conclusions: Results: All cases were followed up for 12 months to 39 months, with an average of 24.5 months. All transplanted fibula survived and bone defect site achieved bone healing, the averaged length of transplanted fibulas was (6 ± 20) cm. The mean healing time of graft and bone graft was (5.5 ± 1.2) months, the supplyment of bone and reception of bone were no dysfunction, no infection recurrence and no stress fracture occurred for transplantation of fibulas.

Conclusion: It is conducive to treat the infectious bony defect of upper limb by the free fibular transplantation, the bony defect of upper limb achieved high bone healing rate, it is the ideal treatment.

Keywords: bony defect, infectious, upper limb, fibular transplantation
Modified reconstruction of the defect of the distal thumb

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Objectives / Interrogation: Reported clinical effects of the hallux nail flap, the part of the second phalange, the part of the third phalange, the fibular flap of the toe transplanted for remodeling and reconstructing of the defect of the distal thumb or the mid and proximal segment defect of the distal thumb.

Methods: According to the appearance of the toe, the hallux nail flap, the part of the second phalange, the part of the third phalange, the fibular flap of the toe were chosen as the donor. In 45 cases the blood circulation was reconstructed by the use of the artery of the thumb anastomosed to the artery of toe, the vein of the thumb anastomosed to the vein of toe. there were 48 cases of the defect of the distal thumb or the mid and proximal segment defect of the distal thumb.

Results and Conclusions: Results: 47 reconstructed thumb all survived. The fibular flap of the toe was necrosis in one case, which was reconstructed by the Neighbour's flap of phalange. The patients were followed-up from 1 year to 3 years (averaged 1.5 years). According to the upper limb function of the Chinese Medical Association Hand Surgery Society, excellent in 40 cases, good in 5 cases, fair in 4 cases, the excellent rate was 93.8%.

Conclusion: According to the demands of the patients, flexibly choosing the hallux nail flap, the part of the second phalange, the part of the third phalange, the fibular flap of the toe transplanted for reconstruction the defect of the distal thumb or the mid and proximal segment defect of the distal thumb. What is the principle is "what is missing, what to fill", to achieve good functions and appearance. The transplantation of four kinds of free flap from the great toe was the optimal way to reconstruct the defect of the distal thumb or the mid and proximal segment defect of the distal thumb.

Keywords:
the hallux nail flap, modified reconstruction, flap, thumb
The classification of mutilated injuries of the hand and the methods and the clinical outcomes of such injuries reconstructed.

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Objectives / Interrogation: To investigate the classification of mutilated injuries of the hand and the methods and the clinical outcomes of such injuries reconstructed.

Methods: From October 1996 to October 2011, a retrospective study of 195 cases of mutilated injuries of the hand was carried out, including 341 fingers. The injuries were divided into two types, including simple type and complex type. The simple type of mutilated injuries of the hand was reconstructed by the following methods of the hallux nail flap, the part of the second phalange transplanted, modified reconstruction, and full-shaped reconstruction. The complex type was divided into seven subtypes, which were reconstructed primarily by the composite methods of the free anterolateral thigh flap, the hallux nail flap, the part of the second phalange transplanted, dorsalis peals flap.

Results and Conclusions: Results: Venous crisis happened in 14 cases, thrombus formed in anastomosis, venous crisis was solved by vascular grafted and the blood vessels re-matched. Arterial crisis happened in 8 cases, thrombus formed in 2 cases, arterial crisis was solved by vascular grafted and the blood vessels re-matched. Vascular pedicle reversed in 3 cases, arterial crisis was solved by re-adjusting the place of the blood vessels and re-anastomosis. Soft tissue tension is too large in 3 cases, arterial crisis was solved by re-stitching the wound and skin grafted. The distal part of the flap was necrosis in 6 cases, the wound healed by debridement and skin grafted, the rest of the organization survived primarily. According to the upper limb function of the Chinese Medical Association Hand Surgery Society, the upper limb partial function of the evaluation trial standard; reconstructed thumbs were excellent in 60 cases; good in 33 cases, fair in 16 cases, reconstructed fingers were excellent in 87 cases; good in 114 cases, fair in 23 cases, poor in 8 cases.

Conclusion: The classification of mutilated injuries of the hand is useful for the selective of proper operative procedures, it guides and regulates the reconstruction of mutilated injuries of the hand, the clinical outcome is satisfactory with a good appearance and function after reconstruction.

Keywords:
mutilated injuries, hand, combined transplant
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Objectives / Interrogation: Since the introduction of arthroscopic refixation methods for ulnar avulsion lesions of the TFCC (Palmer IB) minimal invasive treatment has been continually gaining importance over the past two decades. A crucial progress was the anatomically correct transosseous reinsertion of the foveal attachment as described by Nakamura and others. From 2007 to 2018 we treated close to 100 patients by a modification of Nakamura's technique, achieving promising results in short-term follow-up. Interestingly most of our patients are concerned "chronic lesions" with >6 month of symptoms. There is still little data about long-term results of arthroscopic foveal refixation why we decided to clinically review an early sample of our collective.

Methods: Our operational technique is arthroscopically assisted transosseous refixation by opening the 6th extensor sheath, drill the holes on the floor of the sheath and tie the knot there. After refixation we gather the 6th extensor sheath, because especially in chronic cases it is commonly widened.

For this study we reexamined 10 patients with the longest follow-up times with modified Mayo-Wrist- and QuickDASH-score and clinically checked stability of the DRUJ. The average postoperative interval was 97 months (range 82-119 months). Average time since trauma / onset was 12 months (range 1-30 months, with 7 patients with >6 months of symptoms).

Results and Conclusions: Consistent with our former data every patient showed good stability of the DRUJ and satisfying to good pain relief. Pain at rest (or with load) was reduced from preoperative VAS 2,8 (6,5) to 0,5 (2,4). Average strength in pro-/supination and grip was equal in comparison to the contralateral side. Range of motion in pro-/supination was equal as well. Interestingly in an earlier follow-up (average 29 month after the operation) extension-flexion ROM was reduced (89%) but recovered in the long-term follow-up (97%).

An average modified Mayo-Wrist-score of 92 and a QuickDASH value of 14 points shows a good functional outcome.

Conclusions
Our data confirms the long-term efficacy of transosseous refixation of the TFCC on the floor of the 6th extensor sheath combined with a gathering of the sheath, even in patients with >6 months of symptoms.

By now it is well known, that refixation back to the bone is an important issue in the repair of foveal disruptions of the TFCC. Maybe the gathering of the 6th extensor sheath plays an additional important role for long-term stability, especially in the chronic cases.

Keywords:
arthroscopy, TFCC, transosseous
Treatment of coronal fracture of the hamate with fixation of titanium miniplate crossing carpometacarpal joint

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Objectives / Interrogation: To evaluate the treatment effects of coronal fracture of the hamate with fixation of titanium miniplate crossing carpometacarpal joint.

Methods: From December 2011 to June 2015, 17 patients suffered from coronal fracture of the hamate were treated with fixation of titanium miniplate crossing carpometacarpal joint. The patients were all males, aged from 18 to 43 years, average (28.9±7.0) years. According to the classification of Ebraheim's hamate body fracture, 2 cases were type A, 5 cases were type B, 10 cases were type C. All the hamate fractures were exposed by dorsal approach. After the reduction, the fractures were fixed with titanium miniplate crossing carpometacarpal joint dorsally. The Disabilities of the Arm, Shoulder and Hand (DASH), visual analogue scale (VAS), MAYO Wrist Score, grip strength and ring and small fingers total active motion (TAM) were employed to evaluate the functions. All patients took X rays during follow-up.

Results and Conclusions: All 17 patients were followed up from 13 to 42 months, average (18±7) months. Hamate fractures were healed from 6 to 10 weeks, average (7.1±1.1) weeks. Except two cases, all titanium miniplates and screws were removed at 3 to 4 months post-operatively. At final follow-up, DASH scores were from 0 to 10.8, with an average 1.9±3.5. MAYO Wrist Scores were from 65 to 100, with an average 93.8±10.7. Grip strength averaged (42.4 ± 4.8) kg on the injured side and averaged (41.6 ± 2.9) kg on the contralateral side. TAM of the ring and small fingers were 280°±5° and 271°±6° on the injured side, meanwhile 281°±3° and 272°±4° on the contralateral side. Grip strength and TAM of both sides showed no statistical significance. Conclusions Coronal fracture of hamate could be fixed with titanium miniplate crossing carpometacarpal joint. The procedure could provide stability and allow early motion, which could help maintain joint reduction and obtain reliable fracture healing and good hand function. This technique may be an optional choice in clinical practice.

Keywords: Hamate; Fractures; Fracture fixation, internal
Pyrocarbon Interposition Arthroplasty (Amandys ® ) for the Wrist: A Prospective Case Series

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Objectives / Interrogation: Post-traumatic, arthritic or degenerative destruction of the midcarpal and radiocarpal joint is difficult to treat. An arthroplasty with a free interposition pyrocarbon implant, Amandys ® , is proposed for the treatment of extensive destruction of midcarpal and radiocarpal joints. The purpose of this study was to evaluate the clinical and patient-rated outcome.

Methods: From October 2014 to March 2018, 17 Amandys ® interposition arthroplasties were performed. Patients were assessed preoperatively (baseline), at 3, 6, 12 and 24 months after surgery. Radiographs, range of motion and grip strength were evaluated. In addition, patients rated their pain using a numeric rating scale (NRS) as well as function and overall assessment of their condition and satisfaction using the Disabilities of the Arm, Shoulder and Hand (DASH) questionnaires.

Results and Conclusions: One patient died in the early follow-up period. Thus 16 patients were followed up with a mean of 18 months (rang 6-36). 12 (75%) patients were male and the median age was 56.5 (range 54.8 - 61.8) years. The indication to perform the operation was in 6 cases a SNAC in 5 cases a SLAC and in 3 cases a SCAC wrist. Another case was due to rheumatoid arthritis and one due to avascular necrosis of the scaphoid. 63 % of the patients had previous surgery. At last follow-up the mean pain score decreased from NRS 6.6/10 preoperatively to 2.4/10 postoperatively, the DASH score from 46 to 37 points respectively. 69% of the patients were satisfied or very satisfied. The postoperative mean range of motion (ROM) for flexion/extension was 56° (range 15-110), for pro-/supination 157° (range 115-180) and for radial-/ulnarduction 25° (range 10-40). The mean grip strength was 19kp (range 8-38), which averaged 64% of the unaffected side. All implants remained intact but there were two early dislocations with the need of revision and reposition of the implant. 3 patients developed a subsequent arthrosis with the need of revision and reposition of the implant with an average of 2.6 years (range 2-3) after primary surgery. After revision two of the patients were satisfied, the third followed a total wrist fusion. There was no infection.

Patients experienced a significant reduction in pain and DASH Score. Therefore, despite a 31% revision rate, preserving wrist mobility, Amandys ® interposition arthroplasty can still be a reasonable alternative for the treatment of extensive destruction of midcarpal and radiocarpal joints.

Keywords:
wrist, pyrocarbon, arthroplasty
Treatment of mallet fractures with a transverse two-hole mini plate

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Objectives / Interrogation: To evaluate the clinical results of the transverse two-hole mini plate for the mallet fractures.

Methods: We investigated 155 patients (157 fingers) who suffered from the mallet fracture and treated with a transverse two-hole mini plate. The series comprised 122 men and 33 women with an average age of 33.2±10.9 years (range: 16-62 years). The injury occurred in the right hand in 90 patients and in the left hand in 65. The little finger was the most commonly injured digit (66 cases), followed by the ring finger (48 cases), long (30 cases), index (11 cases) and thumb (2 cases). The acute cases (the time between the injury and operation was less than 2 weeks) were 126 while the chronic cases were 29. Preoperative anteroposterior and lateral radiographs were obtained in all cases. On the lateral view, the articular surface of the fragment was measured as a percentage of the entire joint surface.

Results and Conclusions: The average articular surface of the fragment was measured at 39% (range: 12-67%) of the joint surface with subluxation occurred in 31 injured fingers. Mean follow-up was 5.0±3.9 months. The extensor rupture was only found in 6.3% acute cases. All the patients got bone union. The average flexion of the distal interphalangeal joint was 66.5°±14.0°, and extensor lag was 2.3°±3.6°. According to Crawford's criteria, 47 out of 157 fingers got excellent results, 95 got good results, and 15 got a fair result. The complication rate 8.9%, including superficial infection, skin irritation and joint steps. Statistical analysis only showed a negative correlation between age and range of motion with a coefficient of -0.293 (p=0.026).

Keywords:
mallet fracture; internal fixation; transverse two-hole plate; distal interphalangeal joint
Histopathology findings of the lunate in stage III Kienböck's disease

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Objectives / Interrogation: The etiology of Kienböck's disease is unclear so far. Usually it is described as avascular necrosis of the lunate. Although histological research of the whole Kienböck lunate has been reported, the focus was put on comparing the histological pictures with their correlated MRI images. The authors hypothesize that the progress of Kienböck's disease can be speculated by analyzing different tissue types in different parts of the Kienböck lunates.

Methods: Five lunates from patients with stage III Kienböck's disease and one normal lunate were sampled. They were sectioned, H&E stained, and observed with an Olympus Brightfield microscope. The whole lunate was recorded with the NanoZoomer Digital Pathology system for further analysis.

Results and Conclusions: Results In the normal lunate, the bone trabeculae had a uniform distribution with fatty marrow filling the interspace between the trabeculae. In Kienböck lunates, the trabeculae fracture and necrosis were located in the central part with massive fibrous granular tissue proliferation. There was also some chondroid metaplasia at the palmar and dorsal ends. The trabeculae of the KD lunates were significantly thicker than in the normal lunates. The necrosis was localized around the fracture sites instead of in the whole lunate. Such focal necrosis is very common in different types of fracture ends. Even in stage III Kienböck lunates, the vessels were quite abundant. There was no sign of avascular necrosis for the whole lunate. Conclusions There is neither massive bone necrosis nor obvious avascular sign in our histopathology observations. We suggested that Kienböck's disease should be described as lunate nonunion advanced collapse instead of avascular necrosis.

Keywords:
Kienböck's disease, lunate, collapse, histopathology
Risk factors contributing to the early implant fracture of AVANTA silicone implant for the treatment of MP joint arthroplasty

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Objectives / Interrogation: Flexible hinge arthroplasty has been the most accepted and widely performed technique for the treatment of MP joints deformities in rheumatoid arthritis (RA), however, the rate of implant fracture remains considerable. The purpose of this study was to identify the risk factors that affect the early implant fracture of AVANTA silicone implant using multiple logistic regression analysis.

Methods: We performed a retrospective review of all patients with MP joint arthroplasty in RA patients between 2008 and 2012. One hundred and thirteen fingers in 31 patients with a minimum follow-up period of 3 year were included in this study. The affected joints were index 29, middle 26, ring 29 and little 27. The average age at the time of surgery was 62 (range 37-86) years and all cases were female. The apparent implant fracture or severe deformity in either the coronal or the sagittal plane by plain radiographs within three years after surgery was regarded as the early implant fracture. Patient records were reviewed for the following potential risk factors: age, affected fingers, preoperative ulnar deviation angle, MP joint ROM before surgery and one year after surgery. Univariate regression analyses by Mann-Whitney test or Kruskal-Wallis test were performed. Multiple logistic regression analysis was conducted to identify the association between early implant fracture and selected risk factors.

Results and Conclusions: The early implant fracture was detected in 29 fingers (26%). Univariate analysis showed there to be significant association between the early implant fracture and MP joint ROM before and one year after surgery, especially for flexion angle (P<0.001). Multiple logistic regression analysis showed MP joint flexion angle one year after surgery as an independent risk factor for the early implant fracture (odds ratio 1.07, p<0.01). The cut off value of MP joint flexion calculated with ROC curve was 60 degree (sensitivity 0.48, specificity 0.91). Our study suggested that postoperative flexion angle correlates with the early implant fracture of AVANTA silicone implant. The flexion angle should be limited no less than 60 degrees.

Keywords:
rheumatoid arthritis; arthroplasty; silicone implant
The Thompson procedure for treating chronic mallet finger with swan neck deformity

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Objectives / Interrogation: To evaluate the outcomes of treating chronic mallet finger with swan neck deformity with Thompson procedure.

Methods: Eighteen cases of chronic mallet finger with swan neck deformity were treated with the Thompson procedure from June 2013 to December 2017. Ranges of motion of the distal interphalangeal (DIP) and proximal interphalangeal (PIP) joints were measured both pre-and postoperatively. The treatment outcomes were evaluated using Abouna and Brown criteria.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Summary (18)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at surgery (years)</td>
<td>45 (28-64)</td>
</tr>
<tr>
<td>Gender (male)</td>
<td>15</td>
</tr>
<tr>
<td>Surgery time (weeks)</td>
<td>14 (3-29)</td>
</tr>
</tbody>
</table>

Patients characteristics
Thompson procedure for mallet finger
Results and Conclusions: Results: All the patients were follow-up for 4 to 22 months with an average of 12.5 months. At the final follow-up the average extension lag of the DIP joint was -6° (range, -10° to -5°), while that of the PIP joint was -4° (range, -30° to 0°). Flexion was 61° (range, 45° to 85°) for the DIP joint and 90° (range, 80° to 110°) for the PIP joint. The swan neck deformity was corrected in all the cases. 2 cases were seen mild Boutonniere deformity and a dimple at the proximal tied end of the tendon graft was seen in 1 case. Assessment by Abouna and Brown criteria revealed that 15 of 18 patients were recognized as cured and 3 as improved.

Conclusions: Thompson procedure provides a predictable method for correcting loss of DIP joint extension with PIP joint hyperextension. It is an effective technique for treating chronic mallet finger with a swan neck deformity.

Keywords:
Tendon injuries; Mallet finger; Swan neck deformity; Thompson procedure
Traumatic Brachial Plexus palsy: How Accurate is the Pre-operative Diagnosis?

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Objectives / Interrogation: Brachial plexus injuries are devastating injuries and the pre-operative diagnosis can be difficult despite current imaging techniques and other diagnostic modalities. Purpose of this study was to assess at the individual nerve root level the accuracy of pre-operative diagnosis following evaluation by physical examination, imaging (CT, MRI) and electrophysiologic (EMG).

Methods: Consecutive patients with non-penetrating traumatic brachial plexus injury requiring surgery by the same surgical team between 2005 to 2016 were included in the study. Pre-operative assessments of nerve root injury were made at individual nerve root levels using physical examination, MRI, CT myelogram, and EMG. The results were compared to intraoperative findings. Patient demographics were also recorded.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Summary (60)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at surgery (years)</td>
<td>38 (12-27)</td>
</tr>
<tr>
<td>Gender (Male)</td>
<td>51 (85%)</td>
</tr>
<tr>
<td>BMI</td>
<td></td>
</tr>
<tr>
<td>&lt;25</td>
<td>21 (35%)</td>
</tr>
<tr>
<td>25-30</td>
<td>22 (36.7%)</td>
</tr>
<tr>
<td>&gt;30</td>
<td>17 (28.3%)</td>
</tr>
</tbody>
</table>

Patient characteristics

Results and Conclusions: Results: Sixty patients were included in the study. Fifty-four patients had CT myelogram, MRI or both. Fifty-five patients had EMG. All patients had a physical examination. Overall, the accuracy of CT myelogram/MRI was 77.8%, physical examination was 76.7% and EMG was 73.1%. The greatest accuracy of each of the tests was for injury diagnosis at the T1 nerve root: CT/MRI 88.9%, Physical Examination 81.7% and EMG 76.4%. CT/MRI and EMG were least accurate at C5 (64.8% and 69.1) while physical examination was least accurate a C7 (60.7%). When considering combinations of tests, the greatest accuracy was again seen at T1. Injury status of the T1 nerve root was also the most accurately diagnosed level among patients with a BMI > 30. CT myelogram/MRI and physical examination were equally accurate in the pre-operative diagnosis among the >30 BMI subgroup.

Discussion and conclusion: Based on the results of this study, CT myelogram/MRI is more reliable in the pre-operative assessment of patients with brachial plexus injuries than either physical examination or EMG. The pre-operative status of the C8 and T1 nerve roots were more accurately assessed in this study compared to other nerve roots regardless of the type of testing performed suggesting that lower trunk abnormalities were easier to diagnose.

Keywords:
Brachial Plexus Injury; Physical Examination; Imaging; Electrophysiologic Study; Diagnostic Accuracy;
Treatment of scaphoid non-unions by an anterior graft of the 1,2-intercompartmental supraretinacular artery vascularized bone graft

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Objectives / Interrogation: Scaphoid non-union is a frequent complication that affects up to 15% of scaphoid fractures and leads to loss of strength and mobility which burdens the healthcare system directly and indirectly. One of the available treatments is the vascularized bone graft from the distal radius, pedicled on the intercompartmental supraretinacular artery 1-2 (1,2 ICSRA), and grafted on the scaphoid by a dorso-radial approach as described by Zaidemberg. This technique is however limited to the treatment of non-unions of the proximal pole, without significant bone loss or carpal collapse.
This thesis evaluates the feasibility and the functional and radiological outcomes of a palmar graft of the vascularized bone graft pedicled on the 1,2 ICSRA for the treatment of non-unions of the neck, waist, or body of the scaphoid.

Methods: An anatomical study on eleven wrists evaluated the feasibility by measuring the pedicle length and the arc of rotation between the radial donor site and the palmar graft site on the scaphoid.
A monocentric, retrospective, clinical study included patients presenting a non-union of the neck, waist or body of the scaphoid operated between 2011 and 2018. The primary outcome measurements were the union rate and the simplified "disabilities of the arm, shoulder and hand questionnaire " (QuickDASH).

Results and Conclusions: The average length of the pedicle was 20.4 mm (16-26 mm). The arc of rotation of the graft was 122° (91-155°).
Eighteen patients were included with an average follow-up of 33.9 months (6-75 months). The average QuickDASH score was 10.4 (0-45). The union rate of the grafts was 88.9% without any displacement or failure of fixation.
Several vascularized bone grafts have been described for the treatment of scaphoid non-unions but there is no consensus on the best therapeutic choice.
The palmar graft of the vascularized bone graft pedicled on the 1,2 ICSRA is feasible and offers good clinico-radiological results for the treatment of non-unions of the neck, waist or body of the scaphoid. By expanding the classical indications of the vascularised bone graft described by Zaidemberg, this thesis provides new elements for the understanding and treatment of scaphoid non-unions.

Keywords:
non-union; scaphoid; wrist; intercompartmental supraretinacular artery 1-2; Zaidemberg; vascularized bone graft
Risk Factors of Carpal Tunnel Syndrome for Male Patient Undergone Carpal Tunnel Release

List of authors:
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2 CHA Bundang Medical Center (Seongnam-si)

Objectives / Interrogation: Although the major cause of carpal tunnel syndrome (CTS) remains idiopathic, many male CTS patients are clinically different from female patients and often have specific risk factors associated with their conditions. An accurate analysis of such propensity has yet to be established. The purpose of this study is to compare male and female patients by analyzing the risk factors associated with CTS patients who underwent surgical treatment, with focus on their occupation.

Methods: retrospective chart review of 818 patients with CTS was performed to identify the associated risk factors. Patients were stratified by gender: female (n = 707, 86.4%) and male (n = 111, 13.6%). The mean patient age was 54.5 (range: 16-85 yr.) for all groups. The medical history and risk factors of each patient was thoroughly reviewed by medical charts and telephone survey. We categorized the risk factors of CTS into 7 categories: anatomic, neuropathic, inflammatory, alteration of fluid balance, distal radius fracture associated, occupational risk factor related, and idiopathic. Occupations of CTS patients were divided into high-risk occupations (vibratory tools, assembly jobs, and food processing and packaging jobs, and other occupations of repetitive wrist motion and forceful gripping) and non-risk occupations. All variables were analyzed with chi-square or Fisher's exact test for differences between men and women.

Results and Conclusions: The number of individuals with known risk factors of CTS was greater in male, compared to that of female patients; 97 (87.4%) male patients had the risk factors of CTS, while 361 (51.1%) female patients (p < 0.001) did. In subgroup analysis of risk factors, male patients had frequent risk factors in neuropathic, inflammatory, and alteration of fluid balance (p < 0.001). Occupational risk was strongly associated with male gender (p < 0.001).

Male CTS patients who underwent surgery are more likely to have a reason and have many occupational risk factors than women.

Keywords:
carpal tunnel syndrome, risk factors, male patients, carpal tunnel release
Combination foot flaps for digit reconstruction: A prospective analysis of 37 cases

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Objectives / Interrogation: Traumatic digit amputations could compromise pinch and grasp functions of the digits. Combination foot flaps for digit reconstruction was previously introduced by our group as an alternative method for toe-to-hand transfer[1]. The aim of this study was to analyze our experience with the combination foot flaps and to present the surgical refinements that were introduced.

Methods: Between 2009 and November 2017 a total of 37 combined flap digit reconstructions were performed on 37 patients with a median follow-up of 27.4 months (range 11 - 78). Of the 37 combined flap digit reconstructions, thumbs were reconstructed in 23 patients, index fingers in 8 patients, middle fingers in 3 patients, ring fingers in 2 patients and small finger in one patient. 21 combination flaps were based on one pedicle while the others were on two pedicles (Finger1). 12 cases were done in the first stage and the remaining 25 in the second stage. The median operation times were 6.7 (range 3.5 - 13) hours.

Results and Conclusions: The shape and size of the reconstructed thumbs or fingers were comparable to the corresponding thumb and fingers on the uninjured side, except for two, which required debulking. The MHQ score of the repaired hand was 80.3 ± 5.2 points. The sensation of the reconstructed digital pulp was 10.0 ± 3.1 points. Partial necrosis occurred in three flaps (4.1%). Two palmar flaps (2.7%) were bulky. Contracture of first web occurred in two cases (2.7%). Wound dehiscence of donor site was observed in three patients (8.1%). Toe nail deformity occurred in one case (2.7%). The combination foot flap is a good option for digit reconstruction with minimal donor-site complications.

Keywords:
Thumb defect; Finger defect; Reconstruction; Toe.

References:
Suspension of the humerus to the acromion provides stability to the shoulder following a brachial plexus palsy

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² Millesi Center (Vienna)

Objectives / Interrogation: Upper or complete brachial plexus lesions can lead to a severe weakness of the shoulder muscles. Following the denervation and atrophy of these muscles, the maximum range of motion, especially abduction, is impaired. Inferior subluxation of the humerus head in the resting position of the shoulder develops consequently, leading to a flail shoulder. Unfortunately, there are limited therapeutic options to improve this condition. We have developed a surgical procedure for the re-suspension of the humerus head to the acromion, and this study aims to evaluate the efficacy of this method retrospectively.

Methods: Between 2008 and 2014, 13 patients suffering from a paralysed upper limb and, consequently, flail shoulder were treated with this procedure. The humerus head was re-suspended from the acromion using an artificial ligament. In 6 patients, an additional supraspinatus to trapezius muscle-tendon transfer was performed due to complete supraspinatus wasting. The mean age was 30 years (±11) and the mean follow-up was 36 months (±14). All patients were male, and the right side was affected in 85%. The grade of subluxation was determined by measurement of the distance between the lower border of the acromion and the upper border of the humerus head clinically. Abduction was measured as the maximum possible thoraco-humeral angle using a goniometer, with the patient standing upright in front of the investigator. Pain was measured using a visual analogue scale. Furthermore, the ASES, the UCLA, and the Simple Shoulder Scores were obtained postoperatively.

Results and Conclusions: Abduction was improved from 11° (±18) preoperatively to 54° (±17) postoperatively, p<0.05. Pain was reduced from 3.3 (± 3.8) preoperatively to 1.7 (± 2.8) postoperatively, p<0.05. The grade of subluxation was improved from 3.9cm (±0.6) preoperatively to 0.5cm (±1.2) postoperatively, p<0.05. The mean postoperative ASES, Simple Shoulder and UCLA Shoulder Score were 60.8 (±13.7), 2.6 (±0.9), and 18.2 (±3.6), respectively. All patients reported a highly satisfying stability of their shoulder. No foreign-body reactions or wound healing disorders occurred.

In this article, we present a novel procedure to suspend the humerus head from the acromion in the case of inferior subluxation of the humerus head. Subluxation can be reduced with this procedure, and existing muscle strength can be used exclusively for movement. Restoring dynamic shoulder stability can treat the pain arising from a flail shoulder as well.

Keywords:
brachial plexus palsy, humeral suspension, flail shoulder, stroke
Comparison among plate fixation, K-wire pinning, and conservative treatment for distal metacarpal fractures

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Objectives / Interrogation: Although several treatment options have been reported for distal metacarpal fractures, no definitive superiority or inferiority among the various treatment options were identified to date. This study aimed at comparing the outcomes of treatments for distal metacarpal fractures, such as conservative treatment, K-wire cross pinning or intramedullary fixation, and plate fixation.

Methods: We evaluated 50 fingers of 48 patients with distal metacarpal fractures who were treated at our hospital between April 2009 and September 2018. We compared the outcomes of three representative treatment options for these fractures; conservative treatment, K-wire fixation, and plate fixation. We defined the active range of motion (AROM) of the metacarpal phalangeal (MCP) joint at the final follow-up as the primary outcome, as well as compared the degree of volar or lateral angulation of the distal part of the fractured fragment before surgery and at the last follow-up among the three cohorts.

Results and Conclusions: The sample sizes for conservative treatment, K-wire fixation, and plate fixation were 19, 20, and 11 fingers, respectively. Although these cohorts included 7 open fractures and 18 intraarticular fractures, their distribution ratio did not significantly differ depending on the treatment. The average MCP joint AROM after plate fixation was 59°, which was significantly lower than that after conservative treatment (78°) and K-wire fixation (77°). Three of 11 patients with plate fixation underwent plate removal and stereoarthrolysis. Although preoperative volar and lateral angulation did not differ depending on the treatment option, postoperative volar angulation after conservative treatment was significantly larger than that after other treatments.

Conclusions
We compared the three representative treatments in our study, and suggested characteristics associated with each. Although postoperative reduction in position after plate fixation was better than that after conservative treatment, our study identified a negative effect of plate fixation on postoperative MCP joint AROM. As functional outcome is far more important than radiographic reduction, the indications of plate fixation for distal metacarpal fractures should be limited and other treatment options should be chosen instead.

Keywords:
Distal metacarpal fracture, plate fixation, K-wire fixation, conservative treatment
study of muscle redistribution technique in signal recognition of intelligent bionic hand

List of authors:
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2 College of engineer, Peking University (Beijing)

Objectives / Interrogation: To investigate the value of muscle redistribution technique (MRT) in the recognition of human motion intention by intelligent bionic hand.

Methods: Between December 2016 and April 2017, 3 patients with upper limb amputation were treated with muscle redistribution technique procedure. All patients were males, average age were (42.7±4.5) years. The amputation levels were located at the distal 1/3 of the forearm, midcarpal joint and carpometacarpal joint. In MRT, 4-6 muscles and tendons in the stump of upper limb were transferred and the tendons were anchored in different areas of the skin. When the muscle actively contracted, the tendon pulled the skin resulting in obvious skin deformation in different areas. The evaluating indicators included skin deformation, capacitive signal data and postoperative complications.

Results and Conclusions: All the 3 patients were followed up averaged (5±2) months. There were 14 MRT procedures site. 3 months after surgery, patients were able to actively control the transferred muscle contraction and produce skin deformation. At the final follow-up, the effective deformation rate was 85.7%. Two kinds of classifiers were identified by linear discriminant analysis (LDA) and quadratic discriminant analysis (QDA) respectively. The overall recognition accuracy were 97.27% and 100% respectively, and the recognition accuracy of each action was 100%.

Conclusion MRT procedure can effectively output the motion intention of human body and increase the number and intensity of motion signals. The procedure provided a novel way for better control the intelligent bionic hand.

Keywords:
Muscle transfer; Intelligent bionic hand; Capacitive signal
Trans-scaphoid perilunate dislocation in a pediatric patient: a 10-month follow up

List of authors:
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¹Hospital Universitario Infanta Elena (Valdemoro)

Objectives / Interrogation: Transcarpal fractures and dislocations are uncommon in the pediatric population, although studies suggest that the incidence is increasing.
Both conservative treatment and surgery are described in these particular cases.
To the best of our knowledge, no clear guidelines exist to treat these injuries in pediatric patients, due to its uncommonness.

Methods: We present the case of a 12-year-old boy who sustained a trans-scaphoid perilunate dislocation due to fall on the outstretched hand from a motorbike.

The patient was sedated in the ER and a closed reduction was accomplished. The wrist was immobilised with a closed cast including the proximal phalanx of the thumb and with the wrist in slight flexion.
A radiography and a CT scan post-reduction were performed, validating a correct alignment of the carpal bones. The CT clarified the fracture pattern, showing an undisplaced fracture of the waist of the scaphoid and a marginal fracture of the radial proximal pole of the triquetral bone.

**Results and Conclusions:**

The cast was removed at six weeks. At 8 weeks, the patient started the rehabilitation program. At 12 weeks, radiography showed a dorsal intercalated segment instability (DISI) of the scaphoid, with a scapholunate angle of 76° and a normal radiolunate angle of 37°. At 7 months follow up, the patient presented an asymptomatic non-union of the scaphoid fracture. Physiotherapy was prescribed. At final follow up of 10 months, the fractures healed well with a full return of good wrist function.

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**Keywords:**

Scafoid Perilunate dislocation Pediatric traumatology Hand Triquetral DISI
Modified abdominal flaps for reconstruction of degloving injuries of multiple fingers

List of authors:
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1 Ruihua affiliated hospital of Soochow University (Suzhou)

Objectives / Interrogation: Treatment of multiple finger degloving injuries is one of the most difficult problems in hand surgery. Although many methods of reconstruction that preserve function and reduce deformities have been described, none provide a satisfactory solution to this problem. The purpose of this report was to explore the results of treatment of degloving injuries of multiple fingers using modified random abdominal flaps.

Methods: From 2009 to 2016, five patients with hand degloving injuries were treated using modified random abdominal flaps. Based on Yamada's technique[1], the flap was designed over the abdomen with the fingers separated and marked on the abdominal skin. The skin was incised transversely at the basal border, which initiated the growing process of the finger flap. The dissection was done on superficial fat above Scarpa's fascia and a pocket was created for each finger separately (taking utmost care not to tunnel into the undersurface and into Scarpa's fascia). This created a tunnel in the superficial fascia layer into which each finger was inserted separately (Figure 1).

Results and Conclusions: All the flaps survived. Wound unhealing occurred in one finger in case One and in case Five. All the wounds healed well after full-thickness skin grafts were used. The modified method required 1-2 operations and the duration of time was 2.5-3.5 months (Average, 3.1 months). All the patients were followed for more than 8 months. The appearance of the repaired fingers in modified group was not bulky without defatting. All the fingers were shorter than the normal fingers without finger nails. The thumb could be opposed to all of the fingers except the small one. The repaired hand gained grip and write function, and could be used for daily life activities (Figure 2). Unfortunately, the sensation of the repaired finger was poor and was graded as S3.

Keywords:
Degloving injury; Hand injury; Reconstruction; Abdominal flap.

References:
Reconstruction of the dorsal and palm defects of hand with anterolateral thigh flaps from one donor site

List of authors:
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Objectives / Interrogation: The anterolateral thigh flap is becoming the flap of choice for reconstruction of soft tissue defect with primary donor-site closure. The purpose of this report was to review the reconstruction of dorsal and palm defects of hand by the anterolateral thigh flaps from one donor site.

Methods: From 2016 to 2017, eight patients with dorsal and palm defects of hand were reconstructed with the anterolateral thigh flaps from the one donor site. At least two separate cutaneous perforator vessels are identified on Doppler before the operation and dissected in a retrograde fashion back to the descending branch of the lateral circumflex femoral artery. The skin paddle is then divided between the two cutaneous perforators to give two separate paddles. The cutaneous perforators of the two paddles were from a common vascular supply in seven cases. One cutaneous perforator was anastomosed to the branch of the other cutaneous perforator of the paddle to make a common vascular supply in one case.

Results and Conclusions: All flaps survived completely. There were 16 flaps. The area of the flap was from 18cm×8cm to 7cm×4cm. Arterial crisis occurred in one case and finally the flaps survived after another surgery. The flap was bulky in 2 cases. The contracture of first web and flap bulky both occurred in three cases. These five cases were satisfactory with the functional and appearance results after another surgery. The sensation of the flaps was S2. All of the donor sites healed well in one stage.

It is a good method to use the anterolateral thigh flaps from one donor site to repair the dorsal and palm defects of hand with minimal donor site morbidity.

Keywords: Anterolateral thigh flap; Hand defect; Microsurgery; Soft tissue defect.
Flexor Digitorum Superficialis Tendon Transfer for Multiple Finger Extensor Tendon Reconstruction

List of authors:
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Objectives / Interrogation: Tendon transfer and tendon graft reconstruction are the surgical procedures used for extensive tendon injury with difficulty in repair of proximal and distal tendon ends primarily. Tendon transfer is favored by some surgeons for only one tendon repair site with less chance of tendon adhesion and tendon rupture. For multiple finger extensor tendon rupture with poor quality of proximal musculotendinous units, tendons of wrist flexor and finger flexor digitorum supercials (FDS) could be used for tendon transfer reconstruction. FDS tendon is used for finger extensor tendon reconstruction in patients of rheumatoid arthritis and radial nerve palsy. It is rare to use FDS tendon transfer in traumatic extensor tendon injury reconstruction. We will report three cases of multiple finger extensor tendon reconstruction using FDS tendon transfer in special situations.

Methods: Three patients suffered from severe multiple finger extensor tendon injury which could not be repaired primarily. The causes of injury including extensive mycobacteria tuberculosis infection and traffic accident injury. Tendon transfer reconstruction using long finger FDS tendon was performed. The donor finger FDS tendon was transferred to forearm dorsal aspect via radial side at sub-muscle fascia layer. Splint protection for 3 weeks and rehabilitation program for 2 months were undertaken after the surgery.

Results and Conclusions: < Results >
The patients received regular follow up at our clinic. The patients could extend finger completely. The donor finger of FDS tendon could flex well. There were no complications during clinic follow up.

< Conclusions >
FDS tendon transfer could be used for multiple extensive finger extensor tendon injury reconstruction. After meticulous rehabilitation and regular follow up, the patient could have good finger extension function recovery with no obvious donor site morbidity.

Keywords:
Tendon Transfer, Flexor Digitorum Superficialis, Extensor Tendon
Half Extensor Digiti Minimi Transfer for Thumb Extension Reconstruction

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Objectives / Interrogation: Tendon transfer is the favored surgical procedure when extensor pollicis longus (EPL) rupture is chronic or poor quality of ruptured tendon ends. The extensor indicis proprius (EIP) is the most common used donor tendon for EPL reconstruction. Several other tendon transfer donors have been reported; including extensor pollicis brevis (EPB), extensor carpi radialis longus (ECRL), and palmaris longus. We reported a successful reconstruction of thumb extension by half extensor digiti minim (EDM) transfer in a patient with traumatic loss of EPL and EIP. A literature review failed to identify any English reports regarding thumb extension reconstruction using half EDM transfer. Only two total EDM transfers have been reported previously.

Methods: The 66-year-old lady suffered from left wrist crush injury. Painful sensation and swelling without superficial wound was noted. She went to local traditional Chinese medicine hospital for treatment. Lack of left thumb extension was noted after pain and swelling subsided. She came to our clinic 2 months after the injury. Ultrasonic examination showed EPL complete rupture and partial tear of EIP. Surgical reconstruction with tendon transfer was undertaken 2.5 months after injury. The patient had past history of Sjogren's syndrome with immunosuppression medication usage. During surgery, EPL total rupture and EIP almost total rupture was noted at metacarpal bone level. EDC to small finger was very small and no small finger extension during traction of the EDC. Other donor tendon was not used due to the need of tendon graft and poor soft tissue condition of the patient under immunosuppression medication. We transferred ulnar half of EDM (for preserving extension function of small finger) to EPL using Pulvertaft technique. Splint protection for 3 weeks and rehabilitation program for 2 months were undertaken after the surgery.

Results and Conclusions: < Results >
The patient received regular follow up at our clinic. The patient could extend her left thumb interphalangeal and metacarpophalangeal joints completely. The small finger extension function is intact. There were no complications during clinic follow up.

< Conclusions >
Half extensor digiti minim (EDM) transfer in a patient with traumatic loss of EPL is an alternative option for EPL reconstruction if no other potential tendon donors is suitable. After meticulous rehabilitation and regular follow up, the patient could have good thumb extension function recovery.

Keywords:
Trapeziometacarpal and scapho-trapezoid-trapezoidal pyrocarbon "burger arthroplasty" for early peritrapezial osteoarthritis

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Objectives / Interrogation: Trapezo-metacarpal and scapho-trapezotrapezoid arthroplasty based on pyrocarbon resurfacing implants is known as “burger arthroplasty”. This technique was proposed in 2014 for the treatment of early stages of symptomatic and debilitating peritrapezial osteoarthritis. This study presents the mid-term clinical results of the initial series.

Methods: This prospective monocentric study included consecutive patients who underwent a “burger arthroplasty” between 2009 and 2017. The surgical technique followed the original description. The epidemiological data of the population was analyzed. Results were evaluated according to the standardized QuickDASH and the PRWE functional scores at the time of the last follow-up. Thumb mobility, strength (pinch and grip), rest pain and maximum pain were assessed by standardized means.

Results and Conclusions: Thirteen patients were included. Ten women (77%) and three men (23%). Their average age was 60 (50-70 years). Average follow-up was 53.3 months (9-95 months). QuickDASH and PRWE scores were respectively 28.8 (2.3-72.7) and 27.8 (0-63.5) at the last follow-up. Average grip strength was 25.2 kg (15-42 kg). Average pinch strength was 5.9 kg (2.7-10 kg). Average pain at rest was 0.7 / 10 (0-3) and the average maximum pain was 4.7/10 (0-10) according to the visual analogue scale. Kapandji's thumb mobility averaged 9.9 (9-10). At the last follow-up, no displacement or instability of the implants was demonstrated either clinically or radiologically.

"Burger arthroplasty" is indicated for early peritrapezial osteoarthritis with no trapezoidal collapse or significant structural bone involvement. This is a conservative and minimally invasive technique compared to conventional trapeziectomy. It reduces pain, preserves pinch and grip strength, and improves thumb mobility.

This arthroplasty is a promising surgical technique for the treatment of early stages of peritrapezial osteoarthritis and should be find its place in the arsenal therapeutic of hand surgeons.

Keywords:
peritrapezial ; osteoarthritis ; thumb ; trapeziectomy ; scapho-trapezotrapezoid ; trapezo-metacarpal
Availability of radiographs in suspected hand fractures - a tertiary referral center experience.

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Objectives / Interrogation: This is a retrospective study assessing the availability of adequate radiographic views of suspected phalangeal and metacarpal fractures in a busy emergency plastic surgery clinic. Furthermore, the study demonstrates how significant improvements in the availability and quality of radiological investigations available at the time of assessment in clinic can be obtained with a few simple interventions.

Methods: Patient data was retrospectively collected from electronic medical records over a two separate one-month periods - December 2017 and January 2018. The suspected diagnosis and availability of adequate radiological investigations were recorded. After the first month of data collection the results were presented at a departmental meeting and interventions were introduced to improve the quality of the service. The second data collection cycle was performed one month later to establish if the interventions improved the quality of the radiological investigations present at the time of outpatient assessment.

Results and Conclusions: In December 2017, 95 patients were seen in the trauma clinic with suspected phalangeal (68) and metacarpal (27) fractures of which 75% and 52%, respectively, had inadequate radiographic views for the correct examination of the underlying pathology. Furthermore, 62% of all XRs taken had inappropriate views.
In January 2018, 81 patients were seen in clinic with phalangeal (61) and metacarpal (20) fractures of which 48% and 45% respectively had inadequate XR views (mean 47%). 37% of XRs taken this month had inappropriate views.
X-rays are indispensable in hand fracture assessment and their absence leads to inadvertent delays in patient management. A significant number of patients attending the clinic who need radiographs for accurate assessment either do not have them taken in referring center or they are not sent on time. These situations lead to preventable delays in patient care by waiting for the transfer of images or result in unnecessary irradiation as the radiographs are repeated. Our study demonstrates that significant improvements in the availability and quality of radiological investigations at the time of the preoperative assessment can be made by introducing two simple interventions.

Keywords:
fractures, hand trauma, radiographs
Trapezium bone resection arthroplasty and suspension with suture-button for the treatment of trapezium-metacarpal osteoarthritis: long-term follow-up in a Colombian cohort

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Objectives / Interrogation: Objective: Osteoarthritis of the trapezium-metacarpal thumb joint, the most common and debilitating degenerative osteoarthritic condition of the hand, occurs in approximately 25% of postmenopausal women; it requires management in case of severe pain and decreased function. Surgical options include arthrodesis versus arthroplasty; the latter uses complete or partial trapeziectomy. However, the tendency to collapse hinders prompt rehabilitation. The suspension with suture-button avoids the use of tendon grafts and favors early rehabilitation.

Methods: Methods: Retrospective study of clinical results of a cohort of patients with osteoarthritis of the trapeziometacarpal joint of the thumb, treated with a trapezium resection arthroplasty plus suspension with suture-button. In the study, we included a total of 25 patients (30 thumbs). Functional recovery and pain level were assessed objectively through the grip and pinch strength tests, the range of motion, Quick DASH and Kapandji scores, and visual analog scale (VAS) of pain.

Results and Conclusions: Results: The average age was 62.2 ± 8.3 years; 23 women and two men; there was bilateral involvement in 5 patients. The preoperative Eaton classification was II in six, III in thirteen, and IV in eleven thumbs. The medians of follow-up times and Quick DASH scores were 24 months (range, 6-96) and 20.5 (range, 0-61.4), respectively. The grip and pinch strengths were 90% and 96.3%, of the non-surgical side, respectively. The average of palmar and radial abduction was 84.1% and 92.3%, of the non-operated thumb, respectively. The average Kapandji score for all operated thumbs was 9.25. Three cases presented long-term complications; there was one case of sensory branch neuroma, one of regional pain syndrome, and one fracture of the second metacarpal.

Conclusions: In our population, trapeziometacarpal arthroplasty with suture-button provides good functional results for patients with osteoarthritis of the trapeziometacarpal thumb joint, especially in pain relief, satisfaction, and early reincorporation to work and daily activities.

Keywords:
Arthroplasty; Osteoarthritis; Suture button; Trapezium Bone; Thumb
Manufacture of PDA/ RGD coated graphene loaded PCL nanoscaffold via integration multilayered printing

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Objectives / Interrogation: The nerve guidance conduit can connect two nerve ends, guide axonal regeneration and offer a neurotrophic environment to Schwann cell aggregation and proliferation. Two major factors are involved in fabricating an excellent nerve conduit, material selection and surface modification. As a conductive nanomaterial, graphene has huge potentials in nerve function restoration by promoting electrical signal transduction and metabolic activities with unique topological properties. Polydopamine (PDA) and arginylglycylaspartic acid (RGD) are peptides that can improve cell adhesion in tissue engineering. We intend to evaluate the surface-modified graphene nanoscaffold in the restoration of severe peripheral nerve defects.

Methods: We evaluated single-layered graphene (SG) and multi-layered graphene (MG) in the peripheral nerve repair. We used polycaprolactone (PCL) as the substrate scaffold and fabricated the PDA/RGD-SG/PCL and PDA/RGD-MG/PCL nanoscaffold using layer by layer casting (LBLC) method. We examined the surface morphology and conductive capacity. We performed in vitro assays to evaluate Schwann cell (SC) proliferation, adhesion, neural expression on different nanoscaffolds. For in vivo studies, we created a 15-mm sciatic nerve defect model in Sprague Dawley (SD) rats. We evaluated their functional, electrophysiological, morphological performances at 6, 12 and 18 weeks after injury.

Results and Conclusions: The inner-most and outer-most layers of RGD and PDA were beneficial to cell adhesion and proliferation. The graphene/PCL double layers intensified the tubular structure and allowed certain stiffness in vivo. Our multi-layered macroporous nerve conduit allowed exchanges of nutrients and oxygen via excellent permeability, strong mechanical support, appropriate biodegradation rate, and flexibility for complete nerve regrowth. The glial fibrillary acidic protein (GFAP), beta tubulin (Tuj1) and S100 expression of Schwann cells was enhanced by graphene nanoscaffold, indicating the beneficial effects in improving neural activity. The number of myelinated axons, thickness of myelin sheath, regenerated axon area and average myelinated axon diameter of the regenerated nerves from graphene conduit were significantly higher than pure PCL conduit group. Nerve conducting velocity, distal compound motor action potential and sciatic function index were also better in the graphene conduit group. In addition, PDA/RGD-SG/PCL and PDA/RGD-MG/PCL conduits also promoted myelin sheath and axonal regeneration.

Keywords: graphene; polycaprolactone; peripheral nerve regeneration; nerve conduit; 3D fabrication
Regulation of neural stem cell fate by three-dimensional gold nanocomposite channels

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Objectives / Interrogation: Peripheral nerve injury (PNI) is a common origin of motor and sensory dysfunction and leads to discontinuity of electrical conductivity. Nerve guidance channels are invented for large nerve gaps as alternative implants. New trends have shifted to a more completed and faster nerve regeneration, calling for a thorough investigation into conductive materials. Gold is investigated widely concerning its potential roles in promoting peripheral nerve repair. Bone marrow mesenchymal stem cells (BMSC) are increasingly significant for PNI. They were highly proliferative and capable of promoting sensory and motor system recovery, axon sprouting as well as Schwann cell (SC) proliferation and migration. In this study, we intend to evaluate BMSC and SC loaded gold nanocomposite channels in severe PNI repair.

Methods: We fabricated a polydopamine (PDA) coated gold/polycaprolactone (PCL) nanoscaffold via multilayer molding method. We examined the surface morphology and elastic modulus. We evaluated the proliferative, adhesive and neural differentiation potential of gold nerve channel for BMSCs and SCs in vitro. We established a 15-mm sciatic nerve defect model of Sprague Dawley (SD) rats. We thoroughly investigated the functional, electrophysiological and morphological performances in BMSC loaded gold/PCL conduit, SC loaded gold/PCL conduit, gold/PCL conduit, PCL conduit and autograft.

Results and Conclusions: We fabricated nerve scaffolds via 3D multilayer molding method. A multilayer structure of PDA coated gold/PCL nanocomposite channel increased rigidity of the scaffold wall. Multiporous and multilayer design improved biodegradation because pores and space between layers allowed body fluid to enter the internal channel freely. Macropores permitted oxygen and water exchange for nutrition supply. BMSCs and SCs were cultured on different nanoscaffolds and their proliferation, adhesion and viability were greatly improved by gold nerve channels. In addition, BMSCs were induced into Schwann-like cells on PDA-gold/PCL nanosheets and the neural expression was evaluated in vitro. The supportive ability of two cells were believed to diffuse growth factors, oxygen and other nutrients. We noticed morphological, functional nerve recovery, and angiogenesis at 6, 12 and 18 weeks postoperatively. CD34 expression was significantly higher in gold conduit groups than PCL group. The myelin sheath and axonal regrowth was also markedly elevated by gold nanoparticle application, which was further enhanced using BMSC seeding.

Keywords:
gold; peripheral nerve regeneration; 3D printing; bone marrow mesenchymal stem cell
open arthrolysis on tuberculosis oriented elbow stiffness

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Objectives / Interrogation: In the past decades, tuberculosis (TB) has posed a great threat to people worldwide, especially in developing regions. Bone and joint TB is one of the most common types of extrapulmonary TB, with elbow TB comprising a small proportion of these cases. The treatment for elbow stiffness associated with TB has been rarely reported.

Methods: We retrospectively analyzed six patients (four females and two males) with tubercular elbow stiffness during a 7-year period. All of them received open arthrolysis and hinged external fixation to restore functional extension, flexion, supination and pronation. Mayo Elbow Performance Score (MEPS) and range of motion (ROM) were evaluated preoperatively and at final follow-up.

Results and Conclusions: At final follow-up after surgery, we evaluated the average active ROM, which was 111.7° (90°-135°). The average extension was 11.7° (0°-30°), while the average flexion was 123.3° (115°-135°). At the same time, the average supination was increased to 70° (40°-90°) and the average pronation was increased to 68.3° (45°-80°). The MEPS was elevated to 92.5 (85-100). Three patients displayed complications and were treated and cured with dressing changes and antibiotics.

We conclude that open arthrolysis and hinged external fixation are useful for the treatment of nontraumatic elbow stiffness with tuberculosis.

Keywords:
open arthrolysis; hinged external fixation; non-traumatic; heterotopic ossification
The Effect of Age on Healing of Fractures in the Adult

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Objectives / Interrogation: Studies in animals suggest that older mice and rats heal fractures more slowly. In adults, as opposed to the pediatric population, the effect of age on fracture healing is unclear. With increasing population age, it is imperative to understand differences in healing according to age for optimal fracture treatment including surgery, immobilization, and therapy.

The purpose of this study was to evaluate metacarpal fractures for age related differences in healing time.

Methods: A retrospective review of patients treated for metacarpal fractures was performed. Patients with incomplete charts or inadequate follow-up were excluded. One-hundred and ninety-eight charts were analyzed. Demographic information and patient factors were documented including background disease, smoking status, hand dominance, and occupation. Fracture characteristics and treatment type were documented. Outcome variables were time to healing and complications. Plain radiographs and clinical examination were used to determine fracture stability and healing.

Results and Conclusions: Age was not associated with fracture healing as a continuous and categorical variable (p=0.09, 0.58 respectively). Minimally displaced and comminuted fractures healed faster than oblique, spiral or transverse fractures (p = 0.05). Patients undergoing surgery healed faster than those without surgery (p = 0.05). Renal failure was negatively associated with fracture healing p=0.03. Diabetes, hypothyroidism and gender were not associated with healing time.
Complications were not associated with age or other patient or fracture related factors.
Conclusions:
1) Age does not affect clinical fracture healing/stability in the adult.
2) Older patients do not require distinct treatment of fractures.
3) Other fracture related factors and considerations such as functional demand and availability of support systems might influence treatment decisions in fracture care.

Keywords:
age; fracture; healing; metacarpal; complications
Denervation of the MCP and the PIP joint - An effective treatment of osteoarthritis in the hand

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Objectives / Interrogation: In many cases, patient see us with relatively moderate pain in finger osteoarthritis (OA). Arthrodesis or joint replacement are often refused by these patients as too invasive. We have investigated on the effectiveness of selective denervation of these joints as a cost-effective, simple soft tissue procedure which preserves mobility.

Methods: Between 2005 and 2018, 23 metacarpophalangeal and 129 proximal interphalangeal joints were treated by denervation at our hospital. We investigated on pain, mobility, patient satisfaction, subsequent operations and complications.

Results and Conclusions: Preliminary results show full pain relief in 68.4 % of denervations of MCP or PIP joints. If we consider that a pain reduction of more than 50 % pain relief is a relevant reduction, then 87.5 % success rate could be found. Mobility has been unchanged or improved in 77.9 % of cases compared to preoperative range of motion. We observed for 14.8% of cases sensory disturbances. 4.6 % of joints needed subsequent operations such as arthrodesis or joint replacement. Finally, 82.3 % of patients are satisfied with the results of the operation.

Denervation of the metacarpophalangeal and proximal interphalangeal joint of the hand is an effective and low risk alternative for treatment of osteoarthritis. It preserves mobility and reduces pain. Furthermore, a denervation operation does not limit further treatment options.

Keywords:
denervation, osteoarthritis
Endoscopic Assisted Exploration of the Axillary Nerve through a Posterior Open Approach: first clinical experience

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Objectives / Interrogation: We present the first two cases using an endoscopic assisted approach to explore the whole AN through a posterior approach.

Methods: Two patients with a potential AN injury were included. Dry arthroscopy was performed through a standard posterior approach in an attempt to visualize all segments of the AN. Photographs and videos were performed in order to evaluate the intraoperative visualization of the AN and provide long-term clinical follow-up.

Results and Conclusions: The whole AN was visualized with the scope avoiding the deltopectoral approach. No AN injury was found during the nerve exploration. A more proximal injury (upper trunk) was visualized in both patients during the standard supraclavicular dissection and a triceps branch to AN transfer using the previous posterior approach was performed. After 9 months both patients achieved a shoulder flexion and abduction above 140º. The endoscopic assisted exploration of the AN through a posterior open approach was a useful strategy to visualize the whole AN without the combination of a deltopectoral approach. We believe this technique has a role in selected cases of AN injury.

Keywords:
open-endoscopic approach; axillary nerve exploration; blind zone.
IFSSH19-215

Ossification of a Dupuytren's Cord Following Xiapex (collagenase clostridium histolyticum) Injection. A Case Report

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Objectives / Interrogation: In this case we present a previously unpublished outcome in Dupuytren's disease following collagenase treatment - ossification of the Dupuytren's cord, complicating secondary redo surgery.

Methods: A 67 year old right hand dominant male presented to the hand clinic with a seven year history of Dupuytren's contracture affecting his left index, middle and ring fingers. For primary management he was offered collagenase injection to the little finger. Despite initial improvement he had an early relapse prompting formal dermofasciectomy. Intraoperatively an ossified cord was identified complicating the resection process.

Results and Conclusions: To our knowledge this is the first reported case of Dupuytren's cord ossification following collagenase injection. On literature review no causal link was identified between the treatment and the pathology. However given the increasing use of collagenase in primary Dupuytren's management it is possible further cases may present.

Keywords: dupuytrens ossification collagenase
Addition-subtraction osteotomy with ligamentoplasty for symptomatic trapezial dysplasia with metacarpal instability: a 10-year follow-up.

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Objectives / Interrogation: Symptomatic trapezial dysplasia with metacarpal instability can lead to a disabling condition, which is characterized by pain, decrease in mobility and strength. Radiographic changes are initially often absent. Different techniques have been described based on soft tissue balancing or osteotomies around the joint. In dysplastic joints a bony correction is required, because soft tissue correction is insufficient to stabilize the trapeziometacarpal joint.

Methods: We combined two techniques described in the past, an abduction/extension osteotomy of the first metacarpal and an opening wedge osteotomy of the trapezium, to which we added a ligament reconstruction with the hemi Flexor Carpi Radialis. This combination corrects the anatomy and the forces acting across the joint. Between 2003 and 2007 we have done this procedure 21 times in 18 patients. The operation was only done when conservative treatment was unsuccessful (night splinting and nonsteroidal anti-inflammatory medication). Seventeen thumbs were reviewed prospectively with a mean follow-up of 12,2 (+/-0,94) years (range: 10,9 - 14,4). 3 patients were lost to follow-up.

Results and Conclusions: In our results we found very good mobility, strength, pain-relief, function and radiographic evolution. There was an improvement of the key pinch with 1,1 kg (+/-1,8) (range: -2 - 5) and of grip strength with 4,5 kg (+/-7,4) (range: -6 - 18) after 10 year follow-up. Key pinch of the operated thumb is similar to the preoperative situation. The QuickDASH improved by 43,9 points (+/- 19,1) (range: -5 - 68,1). Radiographic evaluation showed a significant correction of the so called Dévers angle (slope of the trapezium), with a mean correction of 9,1° (+/-6,7) (range: 2 - 22). When comparing the postoperative radiographs with those made more than 10 years ago, there was a stable Dévers’ angle. One patient had a trapeziometacarpal arthroplasty one year after the previous operation. One other patient had to be operated on twice more for pseudarthrosis due to entrapment of the ligament into the osteotomy. There was no damage to the articular surface due to iatrogenic fracture or other perforation into the joint. Even in this long-term follow-up no complications were observed.

This technique has a positive long-term effect on symptomatic trapezial dysplasia with metacarpal instability. It protects the trapeziometacarpal joint from further wear and allows other techniques to be used if painful arthritis develops in the long term.

Keywords:
Trapezial dysplasia, metacarpal instability, osteotomy, addition-subtraction, ligament reconstruction
Examination of soft tissue tumors in the hand

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Objectives / Interrogation: [Introduction] The bone and soft tissue tumors that occurred in the hand may be troubled with deciding whether to send to the facility specializing bone and soft tissue tumors or hand surgery. Our hospital has doctors specializing in bone and soft tissue tumors and hand surgery, so there are many opportunities to treat tumors and tumorous lesions that occurred in the hand. Characteristics of the lesion, results of treatment and so on will be examined.

Methods: [Patients and Method] Of the 837 bone and soft tissue tumors who underwent surgical treatment at our hospital during the 10 years from 2008 to 2017, 168 tumors in the hand of 160 cases that occurred beyond the wrist joint were examined. We analyzed the site of occurrence, pathological diagnosis, local recurrence, complications.

Results and Conclusions: [Results] The age was 1 to 83 years old, and the average was 54.0 years old. There were 69 males and 99 females. The right hand was 80 and the left was 88. The site of occurrence was a wrist joint 6, a palm 55, a hand dorsal 9, and a unique finger part 98. Malignancy was only one case of finger nerve metastasis of malignant melanoma, other than that were benign (99.4%). The postoperative observation period was 17.4 months on average. Pathological diagnosis is most frequent in GCTTS 36, ganglion 35, fibromatosis 22, epidermal cyst 16, hemangioma 19, Schwannoma 8, glomus tumor 6, fibroma of tendon sheath 6, angioleiomyoma 3, myopericytoma 2, fibroma 2, venous thrombosis 2, and 1 in other cases. Local recurrence was in 4 cases, GCTTS was 3 cases, and epidermal cyst was 1. Postoperative complications occurred in 3 cases with sensory decline and 2 cases with limited joint range of motion.
[Discussion] In the various reports, the occurrence frequency of soft tissue tumors in the hand region is most frequent, in the order of ganglion, GCTTS, epidermal cyst, lipoma, but in our series GCTTS was the most frequent. This is limited to the cases in which surgery was performed, and it was inferred that there were many cases that did not performed surgery at the time of diagnosing as ganglion. Recurrence occurred in 3 cases in GCTTS, and it was considered that GCTTS tends to invasively expand within joints, bones, and tendon sheaths, so recurrence was occurred. Three patients with postoperative sensory decline appeared. They were 2 Schwannomas and 1 GCTTS. Treating GCTTS, we must pay attention to a possibility that postoperative sensation decline may appear even after microscopic operations.

Keywords:
Soft tissue tumor, hand, wrist
Handsurgery under limited Conditions - Sense or Nonsense?

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Objectives / Interrogation: In the last 35 years INTERPAST-Germany, as a non-profit organization for plastic surgery in developing countries, operated on 95,000 patients in more than 1,300 missions all over the world. About 10% of the patients were handsurgery cases with partly extreme burn contractures, syndactilies or other malformations who need more than only a skin graft for correction. Although in many developing countries only limited facilities are available a variety of plastic reconstructive procedures could be performed safely.

Methods: The design of reconstructive procedures will be discussed under the aspect of safety, effectiveness and recurrence of contractures. The therapy management differs from the experience in our country due to the lack of post-op compression and physiotherapy which often could not put into practice.

Results and Conclusions: Longterm results show that even under poor condition improvement could be achieved, but often secondary surgery is necessary to restore better function. The major problem remains the post operative management. Woundhealing of skingrafts, temporary arthrodesis and flap necrosis need specialized after care. Differential immobilisation and mobilisation are usually not under professional control possible. To begin an operation without thinking of the post op care should be avoided.

Regular INTERPLAST camps with handsurgery specialized colleagues are a meaningful help for many patients who get no chance of any operation elsewhere. Repeated camps at the same place allow us to follow up many patients even with severe deformities. Learning from poor results we developed basic principles which we can teach the local surgeons to enable them to help their own people. Humanitarian aid in the field of hand surgery should not only remain a national task. A worldwide collaboration with many other charitable organizations like MSF show us the effectiveness of our efforts.

Keywords: Interplast, humanitarian aid, handsurgery camps, complications
Clinical Manifestation of Symptomatic Fishtail Deformity

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Objectives / Interrogation: Aseptic necrosis of the distal humerus seldom occurs after pediatric elbow trauma. We experienced five cases, then report clinical manifestation and their surgical outcomes.

Methods: Five cases included 4 boys and 1 girl with an average age of 11.8 years. Past history revealed that all patients had had elbow trauma at an average age of 4.5 years (range 3.0 - 7.4). Three cases of supracondylar fracture had been treated per-cutaneus pinning in two and another was conservatively. Two cases of lateral condyle fracture had been treated by open reduction and fixation. All of them had been dismissed because of smooth recovery. All patients returned clinic with elbow pain and restricted motion and X-rays showed fishtail deformity. One case was treated close observation with restriction of sports activity. Two cases with atypical medial condyle fracture were treated screw fixation. Other two cases which showed osteochondral dissecans of the capitellum were treated by osteochondral bone peg grafting.

Results and Conclusions: An average follow-up is 1.5 year. Range of motion improved in all patients. Pain was subsided all but one case which had shown the radial head subluxation preoperatively. Regardless severity of the initial trauma, aseptic necrosis occurred after pediatric elbow trauma. It became symptomatic several years later and X-ray showed fish-tail deformity. Although short time outcomes were good, all elbows already showed osteoarthritic changes. There is no fundamental treatment for fish-tail deformity. Early detection of aseptic necrosis might prevent severe progress of fishtail deformity.

Keywords:
fish-tail deformity, pediatric elbow trauma
Endoscopic carpal tunnel release with or without a suture. Is there a difference?

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Objectives / Interrogation: In our department surgical treatment of Carpal tunnel syndrome is performed using, the single incision technique described by Agee. It is a transverse incision of about 1 cm carefully placed into the skinfold of the palmar wrist. In our practice, we faced 2 cases where the skin suture was removed accidently the day following surgery. We left the wound open and protected it with wound closure strips. The skin healed remarkably well. We therefore set up, after approval of the ethics committee, a randomized study to compare the evolution of wound healing with or without skin suture in patients undergoing an endoscopic carpal tunnel release as treatment for carpal tunnel syndrome. Primary outcome is the Manchester Scar Scale (MSS).

Methods: 159 patients were recruited between April 2016 and April 2017. Inclusion criteria were patients with clinical and electrographic confirmation by the Canterbury NCS Scale of a carpal tunnel syndrome. Age, gender, occupation, predominant hand and the side of the operation were noted.

In the first group (64 patients) the skin was not sutured. In the second group (44 patients) the skin was intracutaneously sutured with ethilon 5-0. Data from 108 patients till 3 months postoperatively could be acquired.

Results and Conclusions: Since the data were not normally distributed the analysis was done with the Independent Samples Mann-Whitney U test (MWU).

There is no significant difference in age (p=0.496), gender (p=0.670) and occupation (p=0.725). The scar assessment using the MSS did not differ significantly between both groups: The MWU test is used, p=0.607. In the non-suture group, the MSS was 6.59 (standard deviation 1.294) and in the suture group the MSS was 6.45 (standard deviation 1.088).

Postoperatively wound healing and scar appearance with or without a suture is a topic that has not yet been addressed in the literature. In this study, the outcome of the scar 3 months postoperatively using the MSS is similar in both groups.

Wound closing without a suture can be considered as a valuable option in treating carpal tunnel syndrome using a single portal endoscopic technique

Keywords:
Wound healing, endoscopic carpal tunnel treatment, scar assessment
Advances in Ulnar Collateral Ligament Reconstruction of the Elbow: A Biomechanical comparison.

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Objectives / Interrogation: Ulnar Collateral Ligament (UCL) tears keep on increasing in overhead throwing athletes. The original and modified docking reconstruction techniques have been used since described by Dr. Jobe. We present a novel and optimized technique, which it might enhance the strength, stability and recovery of the reconstructed ligament. The comparative biomechanical results are discussed.

Methods: Ten matched pairs of human cadaveric elbows were loaded to failure at a flexion angle of 30 degrees and compressive rate of 14 mm/s. The specimens underwent reconstruction with an autologous palmaris longus graft using a standard Tommy John Technique and modified internal brace technique with a forked tip 4.75mm PEEK suture anchor.

Results and Conclusions: The average stiffness of the standard docking UCL technique was 27.3 ± 2.8 N/mm and FiberTape internal brace docking repair using a 4.75mm PEEK SwiveLock was 42.3 ± 8.5 N/mm. The mean stiffness of the FiberTape internal brace docking repair using a 4.75mm PEEK SwiveLock was statistically greater (p=0.044) than the standard docking technique. The average ultimate moment for the standard docking UCL technique was 29.7 ± 7.7 N-m and FiberTape internal brace docking repair using a 4.75mm PEEK SwiveLock was 42.6 ± 11.8 N-m. These biomechanical results are encouraging, with significant improvement of the strength, which they might allowed for a faster recovery without compromise on the stability.

Keywords: Elbow, Ulnar Collateral Ligament, Reconstruction
PSYCHOLOGICAL IMPACT OF HAND INJURIES AMONG FOREIGN WORKERS IN SINGAPORE

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Objectives / Interrogation: Foreign workers are essential to Singapore, contributing to a significant portion of her workforce through a range of vocations. They are mostly low-skilled and face multiple challenges in order to work in Singapore. In addition to these stressors, an injury to the hand, a primary means of interacting with one's surroundings, may have a profound psycho-social impact. Our study, a first in Singapore, aims to shed light on the psychological impact that hand injuries have on an integral, yet vulnerable and neglected population.

Methods: This is a single-centre prospective study evaluating the psycho-social impact and functional outcomes of hand injuries among foreign workers in Singapore. Foreign workers were consecutively recruited from the Hand Surgery clinic. A single encounter interview was conducted for eligible patients. Psychological impact was measured with the DASS-21, symptom severity and limitation of daily function with the Quick DASH score, pain experienced with the VAS. Injury-specific and demographic data were collected as well.

Results and Conclusions: There were 36 foreign workers were recruited into this study. The mean age was 32.6 years [standard deviation (SD) 7.2]. Majority of them were male (94.4%), married (58.3%), and had salary less than SGD1000 per month (58.3%). The most common mechanisms of work-related injuries were cut (58.3%) and crush (25.0%). Stress, anxiety, and depression were positively associated with limitation of daily function (p<0.001). Multivariate analysis found that limitation of daily function was independently associated with stress (95% CI 0.12-0.34; p<0.001), anxiety (95% CI 0.03-0.23; p=0.017) and depression (95% CI 0.04-0.26; p=0.008)

Our study has for the first time shown that there is a significant psychosocial impact of hand injuries among foreign workers in Singapore. In light of this, there is potential for the development of screening and support programmes for at-risk workers to cater to their mental well-being, a basic human right. We recommend that the psychological impact of hand injuries must be factored into the holistic management and rehabilitation with adequate time and resource allocation. An ancillary benefit of this comprehensive strategy is the improvement of productivity and overall contribution to Singapore's economy. For this reason, this data may be useful to employers and the Ministry of Manpower.

Keywords:
Visualizing the pharmacological delay effect of botulinum toxin A on the flap donors by the infrared thermography in a rat pedicled flap model

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Objectives / Interrogation: Experimental evidence suggests the positive effect of botulinum toxin A (BTX-A) on pedicled flaps' viability, but few focus on how to identify preoperatively the delay effect induced by BTX-A.

Methods: Fifty-two Sprague-Dawley rats were divided into the control and delay groups. A pedicled flap of 11×3 cm was marked on the rat unilateral dorsum. In the delay group, 15 IU of BTX-A was injected subcutaneously along the flap boundary and then the flaps were elevated at 2, 3 and 4 weeks after BTX-A injection, respectively. Before flap harvest, both the infrared (IR) thermal imaging and temperature of the flap donors were recorded, and both the number of the dilated choke vessels and microvessel density in the choke zones were evaluated by postmortem arteriography and CD31 staining. The survival area of the flaps was measured on postoperative day 7.

Results and Conclusions: After BTX-A injection, IR thermography of the flap donors showed that the independent white hotspots of the angiosomes enlarged and fused; both the temperature of the flap donors and number of the dilated choke vessels in the choke zones increased significantly within 3 weeks, but no significant difference was detected between the 4-week delay group and the control. The microvascular density manifested a continuously increased trend over time. No significant difference was detected in the survival area of the flaps among the delay groups, although it increased significantly when compared to the control.

Combined use of IR thermography and temperature of the flap donors can identify preoperatively the maximal delay effect of BTX-A.

Keywords:
botulinum toxin A, infrared thermography, vasodilation, angiogenesis, pedicled perforator flap
Visualized identification of the maximal surgical delay effect in a rat flap model

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Objectives / Interrogation: Currently, experimental evidence suggests that the surgical delay can increase flap survival area, but its effect may decrease if the optimal delay period is missed. The aim of this study is to establish a sensitive and objective modality based on the visualized and individualized infrared thermography for identifying the maximal surgical delay effect.

Methods: A rectangular three-angiosome flap was designed on the unilateral dorsum of the rat. Ninety-six rats were randomly divided into 6 groups according to the various delay time. Both the relative temperature and the relative temperature ratio were measured by the infrared thermography. Arterial density, number of vessels >0.1mm in diameter, microvessel density, VEGF concentration, and flap viability were measured. Receiving operating characteristic (ROC) curve with the highest Youden-Index was used to detect and identify an optimal cut-off point of the relative temperature ratio in the maximal surgical delay effect.

Results and Conclusions: The criteria for identifying the flap maximum delay effect based on the visualized and individualized infrared thermography imaging were that included (1) the surface of the post-delayed flaps presented white color (higher temperature) instead of the red and white pattern of the normal red area representing colder temperatures between the adjacent angiosomes was converted into the white area representing warmer temperature, and the surface of the post-delayed flaps formed a larger white area; skin and (2) the optimal cut-off point of the relative temperature ratio was more than 1.17 with a sensitivity of 84.6% and a specificity of 77.3%. Instead, the sensitivity and the specificity of the conventional method of based on the conventional delay time for identifying the maximum delay effect were 38.5% and 90.9%, respectively.

Infrared thermal imaging can accurately identify the flap maximum delay effect when combined with the relative temperature ratio.

Keywords:
Infrared thermography; flap surgical delay; perforator flap
Role of Anconeus in the Stability of a Lateral Ligament Deficient Elbow: An In Vitro Biomechanical Study

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Objectives / Interrogation: The role of anconeus in elbow stability has been a long-standing debate. Anatomical and electromyographic studies have suggested a potential role as a stabilizer. However, to our knowledge, no clinical or biomechanical studies have investigated its role in improving the stability of a lateral collateral ligament (LCL) deficient elbow.

Methods: Seven cadaveric upper extremities were mounted in an elbow motion simulator in the varus position. An LCL injured model was created by sectioning of the common extensor origin, and the LCL. The anconeus tendon and its aponeurosis were sutured in a Krackow fashion and tensioned to 10N and 20N using a transosseous tunnel placed through the lateral epicondyle. Varus-valgus angles and ulnohumeral rotations were recorded using an electromagnetic tracking system during simulated active elbow flexion with the forearm pronated and supinated.

Results and Conclusions: Results
During active motion, the injured model resulted in a significant increase in varus angulation (5.3°±2.9°, P=.0001 pronation; 3.5°±3.4°, P=.001 supination) and external rotation (ER) (8.6°±5.8°, P=.001 pronation; 7.1°±6.1°, P=.003 supination) of the ulnohumeral articulation compared to the control state (varus angle -2.8°±3.4° pronation, -3.3°±3.2° supination; ER angle 2.1°±5.6° pronation, 1.6°±5.8° supination).

Tensioning of the anconeus significantly decreased the varus angulation (-1.2°±4.5°, P=.006 for 10N in pronation; -3.9°±4.0°, P=.001 for 20N in pronation; -4.3°±4.0°, P=.0001 for 10N in supination; -5.3°±4.2°, P=.0001 for 20N in supination) and ER angle (2.6°±4.5°, P=.008 for 10N in pronation; 0.3°±5.0°, P=.0001 for 20N in pronation; 0.1°±5.3°, P=.0001 for 10N in supination; -0.8°±5.3°, P=.0001 for 20N in supination) of the injured elbow.

Conclusions
In the highly unstable varus elbow orientation, anconeus tensioning restores the in vitro stability of an LCL deficient elbow during simulated active motion with the forearm in both pronation and supination. These results may have several clinical implications. Our results suggest that strengthening of the anconeus may play a role in improving the varus and posterolateral instability of an LCL deficient elbow and reducing the "sagging" of the elbow in patients with radiographic drop sign after an elbow dislocation. Finally, in the surgical approaches used in the management of patients with pre-existing elbow instability secondary to LCL injury, the origin of the anconeus and its innervation should likely be protected.

Keywords:
anconeus; elbow; instability; lateral collateral ligament; PLRI; kinematics
Percutaneous stabilization of scaphoid fractures with headless compression screw fixation

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Objectives / Interrogation: Scaphoid fractures, being the most common carpal fractures, are associated with functional deficiencies of the wrist in a generally young population. In the treatment of those fractures, percutaneous scaphoid stabilization with headless compression screw fixation is a well-established procedure allowing early mobilization, shortened time away from work combined with high consolidation rates.
Our aim was to evaluate our clinical, radiological and functional results of percutaneously stabilized scaphoids.

Methods: We applied a set of in- and exclusion criteria, such as a minimal age of 15, no relevant other wrist lesions, no perilunar luxation mechanism (B4 fractures) and a minimal follow-up time of one year. Out of 107 consecutively treated scaphoid fractures with a headless compression screw (Acutrak ™) in the years 2000-2017, a total of 81 patients was incorporated in the study. Following parameters were analyzed: time of consolidation, immobilization time, return time to work, pinch and grip strength, radiological classification, Disability of the Arm and Shoulder Score (DASH) and the Patient Related Wrist Evaluation (PRWE).

Results and Conclusions: A mean age of 26 years (range: 15-79) was observed in a predominantly male (84%) population. Mean follow-up time was 4.5 years (range 1-17). With 63.8% the B2 fracture was the most commonly observed fracture. We achieved a consolidation rate of 98.8% with only one case of scaphoid nonunion. Three additional cases of delayed union were observed, yet all of those cases achieved full consolidation within 4-7 months after surgery. Mean consolidation time was 12 weeks with an average DASH of 0.98 and a PRWE of 0.2.

The treatment of scaphoid fractures with percutaneous headless compression screw fixation is a convenient treatment option, allowing satisfying consolidation rates with good functional outcome.

Keywords: scaphoid wrist fracture carpus Herbert Russe Acutrak nonunion percutaneous headless screw
Open reduction and internal fixation for dorsal fracture dislocation of the proximal interphalangeal joint: a series of 35 cases

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Objectives / Interrogation: We describe a surgical technique for unstable fracture dislocations of the proximal interphalangeal (PIP) joint using a low-profile mini-plate, review of 35 patients treated by this technique, and discuss the factors affecting patient outcomes.

Methods: After reducing the dorsal subluxation of the PIP joint, the depressed articular surface was reduced and the volar fragment was fixed using a low-profile mini-plate through the volar approach. Postoperative motion exercise was started after a few days. Active motion of the PIP joint, total active interphalangeal joint motion, and Strickland's scoring scale, and Gaine's outcome assessment were used to evaluate the results. Clinical assessments were considered satisfactory when they were either excellent or good. Analysis of the categorical factors was performed using Fisher's exact test with p-values set at 0.05.

Results and Conclusions: Bony union was obtained in all cases. Twelve patients had persistent postoperative swelling of the PIP joint, which was managed with short-term steroids. Dynamic splints were applied 4 weeks postoperatively for patients with delayed recovery. The articular involvement was averaged 54.6%. Six patients had concomitant injuries. The mean age was 38.1 years (range, 13-82 years). The mean periods from injury to operation was 11.3 days (range, 1-60 days) and postoperative follow-up period averaged 11.5 months (range, 6-24 months). Active motion of the PIP joint averaged 85.5° (range, 45°-104°), flexion contracture averaged 10.8° (range, 0°-40°), and total active interphalangeal joint motion averaged 81.0% (range, 41.7%-100%) after surgery. Overall, 22 patients had satisfactory outcomes and 13 had unsatisfactory outcomes. Patient age, the time from injury to surgery, and concomitant injuries, such as an associated mallet injury, were found to be significantly associated with outcomes. Additionally, the control of persistent postoperative swelling was important for joint function. This technique catches the volar fragment rigidly between the dorsal cortex and the mini-plate, allowing the possibility for early joint motion. Several factors were associated with poor functional results, including older age, delayed surgery, and concomitant injuries. Additionally, the management of early PIP joint swelling improved joint motion.

Keywords:
proximal interphalangeal joint, dorsal fracture dislocation, open reduction and internal fixation, outcome
Collateral ligament injuries of the metacarpophalangeal joint in long fingers. Results of a series of 20 patients. Presentation of a new clinical test.

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Objectives / Interrogation: Collateral ligament injuries of the metacarpophalangeal (MP) joint in long fingers are rare conditions and mostly treated conservatively in comparison to the thumb. Clinical examination is essential to diagnose the gravity of the ligamentous injury. The aim of our study was to report results of surgical management of a series of 20 patients and to focus on a new clinical test.

Methods: 20 patients, mean age 48 years (22-70), were managed surgically for grade 3 injuries of the radial collateral ligament (RCL) of the middle finger (9), ring (4) and small finger (7). The mean delay between accident and surgery was 59 days (0-180). Preoperatively the new laxity test (Meyer's test) was positive in all cases. Surgical intervention found 2 Stener lesions. Postoperatively the MP joint was protected by an extension orthoses for one month, followed by a syndactyly for two months. Patients were reviewed by an independent examiner with a mean follow of 20 months (6-34). Total active motion (TAM) was measured, comparative MP laxity tests were performed at 0°, 30° and 90° of flexion, the Meyer and Bellemere tests were compared to the normal hand and strength measurements were realized.

Results and Conclusions: 15 patients were reviewed for clinical examination. One complication was noted (CRPS type 1). Mean Quick Dash was 16.2 (0-61). Mean TAM was 251° (218-308°) with mean active MP flexion-extension of 86-11° (72-99°/0-29°). The mean radial MP laxity at 0°, 30° and 90° of the injured digit was respectively of 22°, 15° and 13° compared to the normal side 18°, 17° and 14°. The mean ulnar MP laxity at 0°, 30° and 90° of the injured digit was respectively of 30°, 25° and 12° compared to the normal side 31°, 22° and 12°. Meyer's test shows a mean MP laxity of 17° (7-34°) of the injured digit and 13° (9-16°) on the normal side. Bellemere's test to radial and ulnar side on the injured digit shows a mean MP laxity of 12° and 11° compared to 24° and 10° on the normal hand. The mean global strength (Jamar) of the operated hand was 29 kg and 35 kg on the opposite side. Distal and lateral pinch measurements on the injured digit revealed a mean strength of 7 kg and 3 kg compared to 9 kg and 3 kg on the normal side.

Clinical results after RCL repair on the MP joint of long fingers are good despite some residual ligament distension demonstrated by our laxity tests measurements. Our new laxity test is a simple and painless clinical test allowing to diagnose grade 3 RCL injuries necessitating surgical repair.

Keywords:
MP joint, long finger, collateral ligament injuries, new clinical test
Application of a Porcine SIS Nerve Cap for Prevention of Neuromas and Associated Pain

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Objectives / Interrogation: Painful neuroma formation is a common and debilitating sequela of traumatic or oncologic nerve amputation. Studies suggest that isolating the nerve-end within a protective cap either at the time of amputation or during revision procedures may assist in the prevention of nerve-end neuromas. This study evaluated the local effects of novel porcine small intestine submucosa (pSIS) nerve caps with internal chambers on a terminal nerve end in an animal model.

Methods: The tibial nerves of fifty-seven (57) Sprague Dawley rats were transected, transposed and secured in a subcutaneous pocket of the lateral hindleg. The nerves were treated with a pSIS Nerve Cap (NC), pSIS Open Tube (OT), or were non-treated Surgical Controls (SC). Weekly pain response testing was performed by observing animals and assigning a semi-quantitative score (0-2) after mechanically stimulating transposed nerve ends, where zero was no response and two was a brisk withdrawal or vocalization. Samples were explanted at 8 and 12 weeks and stained with Hematoxylin and Eosin, Masson's Trichrome, or Neurofilament-200. Sample analysis included axonal swirling, axon optical density (OD), nerve width, cap remodeling, and tissue response.

Results and Conclusions: The NC group had significantly lower axonal swirling and pain response scores compared to the SC and OT groups. Nerve width was notably greater in the SC group compared to the NC group. The nerve caps and open tubes were considered non-irritants and exhibited similar remodeling. The SC group showed significantly lower axon optical density compared to all other groups. A lower axon optical density suggests a higher concentration of collagenous tissue, which is a characteristic of neuromas. Application of pSIS nerve caps in this animal model demonstrated increased axon optical density and decreased axonal swirling, distal nerve stump width and behavioral pain response. This suggests that nerve caps with internal chambers may support fibrin cable formation to facilitate axonal alignment; therefore, more reliably reducing the likelihood of painful neuroma formation.

Keywords: Neuroma formation, traumatic neuroma, painful neuroma, neuroma prevention, nerve capping technique, porcine small intestine submucosa nerve cap
Clinical outcome of the radial head and neck fracture treated by headless screw fixation

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Objectives / Interrogation: We treated the combined fracture of the radial head and neck by headless screw fixation only. The purpose of this study is to report the clinical and radiographic outcome.

Methods: This study included the patients who were suffered combination of the radial head and neck fracture, treated by headless screw fixation only, followed more than nine months. They are four men and four female. Average age at surgery was 40 years-old (19-62), Average number of the radial head was 3.3 (2-5). Associated injuries were none in four patients, ulnar styloid fracture in one, lateral collateral ligament injury of the elbow in one, olecranon fracture in one, scapholunate dissociation in one. In surgical treatment, the multiple fragments of the radial head was taken to the outside and fixed by screws. When the bone defect was found at radial neck, the bone graft was harvested form proximal ulna. After then, radial head was fixed to the radial neck by screw. Immobilization of the elbow and forearm was performed for two weeks postoperatively. From third week postoperatively, the elbow and forearm were started to exercise. Clinical outcome was examined by the range of the elbow and forearm motion at final follow-up. Mayo elbow performance score was also assessed. Radiological examination was performed for bone union, arthritic change. Postoperative displace of the bony fragment was assessed by the angle between bony axis of the proximal metaphysis of the radius and articular surface of the radial head.

Results and Conclusions: Average postoperative follow-up period was 418 days. Bone graft was performed in 2 patients. Average range of motion was as following; elbow flexion: 139° (130-145), elbow extension: -4° (-15-0), forearm supination: 88° (80-90), forearm pronation: 84° (60-90). Average Mayo elbow performance score was 98.1 (85-100). On radiographical examination, bony union was obtained in all patients and arthrosis was found in none. Postoperative displace was minimal because there was no significant difference in the angle between just after operation and final follow-up. Our study showed that the headless screw fixation for radial head and neck fracture maintained reduced position of the fracture site and did not cause the limited motion of the forearm rotation significantly. For the case with good quality of bone, the headless screw fixation could be one of the surgical fixations.

Keywords:
radial head fracture, radial neck fracture, headless screw
The Threat of Longitudinal Cracking after Distal Radius Fracture Treatment with Volar Locking Plate

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Objectives / Interrogation: Despite the increasing prevalence of longitudinal crack following volar locking plate fixation in our clinical experience, research on the topic remains sparse. The aim of this study was to examine the occurrence rate of the fine cracks and associated characteristics following volar locking plate fixation of the distal radius.

Methods: Using case records from Shizuoka Saiseikai General Hospital dated between March 2008 and March 2015, a total of 419 eligible adult distal radius fracture patients were identified. Standard anteroposterior postoperative radiographs were evaluated to classify longitudinal crack occurrence. The following data were recorded: plate type, surgeon experience at the time of surgery, patient age, sex, fracture type, and postoperative complications from the crack. Fractures were classified according to the AO/OTA classification system. Documented variables were compared between patients with longitudinal cracking and those without. Univariate analyses were conducted among each plate group.

Results and Conclusions: There were 38 confirmed cases of cracking (Acu-Loc: n=25, Acu-Loc 2: n=11, VA-TCP: n=2). Acu-Loc and Acu-Loc 2 were most common with rates of 13.0% and 27.5% respectively. Neither patient age nor gender was significantly associated with a particular type of plate. Along with patient age and sex, plate type was significantly associated with the occurrence of a longitudinal crack (p<0.05). Surgeon experience level did not affect the fine crack rates. All cracks healed within 4 to 6 weeks after the operation without any symptoms. Although we observed no severe complications following longitudinal cracks after volar plate fixation, surgeons and manufactures should still be cognizant of the potential complication. Intervention may not be necessary, but rare, severe implications may exist. Further study is required to understand the mechanism of the fine cracking and implement appropriate prevention techniques.

Keywords:
distal radius fracture, volar locking plate fixation, complications
Treatment of Prolonged Chronic Monteggia Lesion by Corrective Osteotomy of Ulna with Radial Shortening

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Objectives / Interrogation: Chronic Monteggia lesion in children is often treated by open reduction of the radial head and corrective osteotomy of the ulna. However, the treatment of long-standing radial head dislocation may possibly cause poor outcomes of re-dislocation, limited forearm rotation and restriction of elbow flexion. The treatment of chronic radial head dislocation remains controversial. Despite the risk of complications, surgery is recommended for active children. In these cases, we designed radial shortening along with corrective ulnar osteotomy. The purpose of this study is to assess the clinical outcomes of our procedure.

Methods: All cases were retrospectively reviewed. Six elbows in 6 patients who were diagnosed with chronic Monteggia lesion were included in this study. All the elbows showed valgus instability and anterior radial head dislocation. The mean age at the time of operation was 13 years (range 6 to 19 years). The mean period of dislocation was 7.5 years (range 4 to 13 years and 2 cases uninjured). As surgical procedure, radial shortening at the level of proximal diaphysis and anterior capsulotomy for intracapsular observation were carried out first through anterior approach to the proximal forearm. Then corrective ulnar osteotomy and posterolateral capsulotomy if necessary were conducted through posterior approach. Finally, the annular ligament and capsules were tightened and repaired.

Results and Conclusions: In all cases, dislocated radial heads were reduced and osteotomized sites were united, and there were no cases of re-dislocation of radial head during mean follow-up periods of 17 months (range 9-36 months). Compared to preoperative conditions, all the elbows obtained good stabilities and a mean of 12 degrees of elbow flexion (range -5 to 30 degrees). Mayo elbow performance score was increased from a mean of 87 (range 70 to 90) to a mean of 97 (range 80 to 100). Meanwhile, the patients lost a mean of 13 degrees of elbow extension (range 10 to 28 degrees), 12 degrees of pronation (range -20 to 20 degrees) and 8 degrees of supination of the forearm (range 0 to 20 degrees), respectively. There were no major surgical complications. In this study, we demonstrated the short-term results of corrective ulnar osteotomy with radial shortening for long-standing chronic Monteggia lesion. Radial shortening made it easy to reduce and keep radiocapitellar congruity. Although further investigation should be needed to prove long-term effectiveness, it appears to be one of the surgical options.

Keywords:
Monteggia, chronic, dislocation, reduction
The Learning Curve in Arthroscopic Scaphoid Resection and Midcarpal Arthrodesis

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Objectives / Interrogation: Scaphoid resection and arthrodesis of the midcarpal joint is traditionally performed from an open dorsal arthrotomy. More recently an arthroscopic procedure has been introduced. The artroscopic approach is time-consuming and technically challenging. We wanted to find out the incidence of complications during the learning phase in a single surgeon case series.

Methods: We retrospectively identified 8 patients with 9 cases of arthroscopic scaphoidectomy and midcarpal arthrodesis (6 cases of scapholunate advanced collapse, one case each of Preiser disease, radioscaphoid or capitolunar osteoarthritis) in 2014-2017. All patients were operated by the same surgeon (Level of expertise 3; >10 years of experience in wrist arthroscopy). Osteosynthesis was performed with cannulated screws placed under fluoroscopic guidance. The follow-up time was 5-14 months.

Results and Conclusions: Results
The operating time for the first surgery was 198 minutes. For the last surgery in the series, the operating time was 132 minutes. Fusion was achieved in all patients. Three (33%) patients required a reoperation: scaphoid remnant removal for impingement and two cases of screw removal due to screw malposition. In one of the latter cases a tendon repair was also performed due to tendon laceration caused by a retracted screw. One patient suffered a superficial radial nerve injury.

Conclusions
There is a steep learning curve associated with demanding arthroscopic procedures. We observed a high rate of complications and reoperations among patients operated by an experienced and motivated wrist surgeon. Some of the findings of this study should be taken into consideration when arthroscopic wrist fusion is adopted in an institution for the first time. Performing both total scaphoidectomy and the midcarpal arthrodesis via arthroscopy may lead to long operating times in the first procedures, but the operating time will eventually decrease. It is an option to perform an open scaphoidectomy from a volar incision in the first procedures to reduce operative time, but this was not utilized in this series. To avoid complications relating to hardware, we recommend special attention to the placement of the cannulated screws. Meticulous removal of the scaphoid may reduce the risk of impingement. A structured wrist surgeon training protocol with live surgical demonstrations might be useful in reducing complications.


Keywords:
arthroscopy;SLAC;SNAC;midcarpal arthrodesis
Preservation of metacarpophalangeal joint function in traumatic defects by metatarsophalangeal osteochondral transplantation

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Objectives / Interrogation: The integrity of the metacarpophalangeal (MCP) joints is essential for finger and hand function. Preservation of range of motion is one of the aims in reconstruction of complex injuries to these joints. Avascular transplants of whole joints are prone to resorption and deterioration of function, whereas osteochondral transplants have shown to be reliable in reconstruction of various joint defects. This series presents three patients with traumatic injuries to four MCP joints, which were reconstructed by seven avascular osteochondral transplants of metatarsophalangeal (MTP) joints. The joints were examined for radiographic signs of resorption or joint space narrowing, and if this would affect the joints' function.

Methods: Between 09/2009 and 01/2015, in three patients (age of 40, 45 and 48 years) with complex injuries to their MCP joints (one milling, two saw injuries), four joints were reconstructed by seven osteochondral transplants of their toe MTP joints. Thereby, three metatarsal head and four osteochondral transplants of the base of the proximal toe phalanges were used. Beside the joint itself, various soft tissue defects were to be reconstructed in each patient. The patients were clinically and radiographically examined after 3, 6, respectively 9 years.

Results and Conclusions: None of the patients complained of pain, neither in the involved joint of the reconstructed finger, nor at their toes. All patients were satisfied with the result of reconstruction. DASH score was 13, 29, and 24, respectively. Range of motion in the four affected joints were 25, 60, 75, respectively 90°. Radiographic examination revealed moderate joint space narrowing in one of the four joints. In another patient, localized osteolysis was found around the screws heads, so that the screws were removed seven years post-op.

Osteochondral transplants for reconstruction of MCP defects are able to preserve function in severely injured joints in the mid and long-term. Joint space narrowing may occur, but this does not cause pain. Since localized osteolysis can cause screw head prominence, midterm radiographic follow-up is necessary to prevent further damage to the joint. In the long-term, remaining bone stock may be adequate for total joint replacement.

Keywords: Joint defects, osteochondral transplants, metacarpophalangeal defects, finger function
Single-stage radialization and pollicization for radial longitudinal deficiency with thumb hypoplasia

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Objectives / Interrogation: For children who had radial longitudinal deficiency with thumb hypoplasia, problems of unable to afford cost of multiple follow-up, transportation, and multiple operations, lack of distraction device or small-size external fixator and poor patient's compliance for taking care these devices made us develop surgical procedure that combine multi-stage reconstruction into single-stage radialization and pollicization. The advantages of this technique was to reduce number of surgical operations and anesthesia, shortening time for wound recovery, reduced frequency of follow-up, and decrease cost of transportation for patients.

Methods: Surgical technique for single-stage radialization and pollicization was explained steps-by-steps. Medical record in 2 patients who treated by this technique were reviewed.

Results and Conclusions: Two children with radial longitudinal deficiency and unreconstructable thumb hypoplasia were operated by single-stage radialization and pollicization without postoperative complication. At 1-year follow-up, wrist positions were improve from 95° to neutral and 90° to 15° radial-angulation. Both pollicized thumbs stayed in proper opposition and started function. Special considerations for this technique were 1.) Dorsal vertical midline incision was used for radialization because benefit in proximal extension for ulnar osteotomy and less interfered with pollicization incision, 2.) Ulnar shortening osteotomy should be done in case of difficulty in reposition carpus over distal ulnar, overlapping bone, or wrist flexion deformity after complete soft tissue released, 3.) Recommended K-wire technique including pre-drill and retrograde insertion should be followed for easy osteotomy fixation, 4.) Exit point of K-wire at the palmar site of base index metacarpal bone was less interfered with pollicization procedure, and 5.) Preserved dorso-radial skin bridge between pollicization incision and radialization incision for adequate venous draining and prevent postoperative swelling.

In conclusion, single-stage radialization and pollicization can be done in severe radial longitudinal deficiency (Bayne and Klug type III and IV) with unreconstructable hypoplastic or absent thumb (Blauth and Schneider-Sickert type II, IV, V) to reduce number of surgical operation and risk of multiple anesthesia.

Keywords: Radialization, Pollicization, Radial longitudinal deficiency, Thumb hypoplasia
Outcome of Proximal Row Carpectomy in a cohort study with 12 months follow up

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Objectives / Interrogation: Proximal Row Carpectomy (PRC) is a surgical salvage procedure for treatment of severe pain in e.g. a SLAC or SNAC wrist. After the PRC procedure patients were submitted to a standardized rehabilitation protocol. The objective of this study was to monitor functional outcomes of PRC and the subsequent rehabilitation in a 12 months follow up period.

Methods: Fifty patients (30 male, 20 female) underwent a PRC. The mean age was 56±12.1 years, and the side of operation was right (56%) and left (44%). The SLAC/SNAC wrists were due to primary radio-carpal osteoarthritis (46%), trauma in the past (18%), wrist fracture (16%), scaphoid fracture (14%) and other (6%). The primary outcome of the study was pain (NRS 0-10), secondary outcomes were wrist mobility (goniometry), grip strength (JAMAR), disability in daily live (DASH/PRWHE 0-100) and patient satisfaction with the operation (0-24;the higher the better). Differences over time were analysed with a Paired T-test (pre-operative-12months follow up). We applied an intention-to-treat analysis. Effect sizes (EF) and the corresponding confidence intervals (CI) were calculated using Cohen-d.

Results and Conclusions: The primary outcome showed a strong statistically significant (p<=0.001) decline in pain intensity at 12 months of 4 points (62%) in comparison with the initial pre-surgery measurement (EF(d)=2.3, CI=-2.9-2.4). On the disability/participation scales patients showed a statistically significant (p<=0.001) improvement of 42.9 points (75%) (EF(d)=3.5, CI= 0.1-6.9) with the initial pre-surgery measurement. Both the improvement on pain and disability/participation can be considered clinically important.
For mobility (EF(d)=0.6, CI=-4.4-5.6) and grip strength (EF(d)=-0.3, CI=-2.9-2.4) no statistical significant differences with pre-surgery status were detectable after 12 months follow up.
The mean post-operative rehabilitation time was 8.1±3.1 hours, and patient satisfaction with operation after 6 months was very high (20.6±4.0). Re-operation was needed in 4 patients, with one arthrodesis and 3 carpal tunnel releases within 12 months follow up.

PRC surgery and the subsequent rehabilitation resulted in a strong decline in pain in patients with a SLAC or SNAC wrist. Additionally, patients clearly perceived less disability problems in daily life after 12 months follow up. Gradually improvement and relief of symptoms occurred during the first 6 months follow up period, and stabilized or slightly further improved in the subsequent 6 months.

Keywords:
The experience of psychological distress in hand injured patients

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Objectives / Interrogation: The two aims of this study were to 1) identify levels of distress in patients presenting with hand injuries 2) assess what access patients have to a psychologist nationally in UK plastic surgery units.

Methods: Methods:
1) To identify the level of distress experienced by hand trauma patients, 163 patients attending a tertiary referral centre were surveyed using a distress thermometer. Patients were asked about their experience of distress secondary to their hand injury a) at time of presentation and b) at 4 months follow up.
2) A national survey of all plastic surgery hand units in the UK was undertaken to identify availability of a psychologist for patients with hand injuries.

Results and Conclusions: Results:
1) Over half of surveyed hand trauma patients reported that they experienced distress levels at time of first presentation. Of those reporting distress, 57% reported a significant level of distress. The four month follow up survey demonstrated varying responses in distress levels with a majority of patients experiencing a reduced distress level whilst a smaller number experienced the same or worse levels of distress.

2) The vast majority of UK units have access to a psychologist for hand trauma patients.

Conclusion:
Hand injuries can cause significant distress secondary to inability to work, sudden loss of income and worry. A significant proportion of patients in our unit reported high levels of distress associated with their hand injuries with a smaller number reporting continued or worse levels of distress at four months follow up. Such psychological burden can in turn lead to prolonged consultations between patients and their consultants and hand therapists leading to inefficient use of time and resources. This study highlights the need for the availability of access to psychology services for hand trauma patients. Availability would likely improve affected patient outcomes and service efficiency.

Keywords:
USE OF BOTULINUM TOXIN A IN MANAGEMENT OF A COMPLEX VOLAR THUMB WOUND IN A SYSTEMIC SCLEROSIS PATIENT: CASE REPORT

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Objectives / Interrogation: Patients with systemic sclerosis endure poor wound healing especially in the hand and digit fingertip wounds are a common problem. This disease process typically is associated with immune-mediated vascular injury and unopposed vasoconstriction of the hand's small vessels. There is limited data on the efficacy of botulinum toxin A in the non-surgical treatment of digit fingertip wounds. But, it is still thought of as a viable pharmaceutical option. Its use in systemic sclerosis patients for healing of digit wounds not on the fingertip is undocumented. This case report showcases botulinum toxin A unconventional use for a thumb wound in a systemic sclerosis patient.

The objective was to assess wound healing and monitor for immediate, early and late effects of botulinum toxin A use on digit wounds in a systemic sclerosis patient.

Methods: Informed consent was taken. A median nerve block was performed. 100u of botulinum toxin A was reconstituted and 20u was injected around the thumb radial and ulnar digital nerve(10u each), at the level of the right thumb A1 pulley.

Right thumb SpO2 was taken before and immediately after the procedure. The patient was followed clinically for wound healing and side effects of Botulinum toxin A over the next 9 months.

Results and Conclusions:
This patient presented with a 3 x 2.5cm wound over the volar aspect of her right thumb interphalangeal joint and an exposed flexor pollicis longus tendon was seen in the base of the wound. SpO2 before and immediately after botulinum toxin A injection was 88% and 94% respectively. The patient experienced pain relief in 24 hours. Complete wound healing was noted 25 days after injection. 54 days after injection full thumb range of motion with Kapandji score 10 was noted. No side effects of botulinum toxin A were identified.
Right thumb wound before (A-C), 21 days postop (D,E), and 29 days post op/ injection day (F-H). Healed wound 25 days (I,J) and 9
Botulinum toxin A may be used as an alternative treatment option in healing of wounds to the digits of systemic sclerosis patients where:
1) Surgery is contraindicated
2) Delay in surgery is expected
2) A salvage option where amputation is highly likely.

Keywords:
botoxulin toxin, systemic sclerosis, digit wounds, therapeutic

References:
Analysis of Carpal Malalignment in Distal Radius Fractures Following Volar Locking Plate Fixation

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**Objectives / Interrogation:** PURPOSE: To clarify whether postoperative carpal alignment recovered anatomically after open reduction and internal fixation with a volar locking plate for the treatment of distal radius fractures, the change in carpal alignment, more specially dorsal displacement of the capitate, was evaluated.

**Methods:** METHODS: Sixty-three patients (mean age, 59 years) underwent volar locking plate fixation with a single type of plate (DVR plate; Zimmer Biomet) within 1 week after injury. The fracture type according to the AO/OTA classification was A3 in 16 patients, C1 in four, C2 in 29, and C3 in 14. Radio-capitate distance (RCD), defined as the relative position of the capitate to the radius, was measured in addition to volar tilt (VT), radio-lunate angle (RLA), radial inclination (RI), volar prominence height (VPH), and volar cortical angle (VCA) using standardized radiographs of the uninjured and postoperative wrists. Each variable was compared statistically.

**Results and Conclusions:** RESULTS: Mean values of the variables for the uninjured wrists were, respectively, 1.4 mm for RCD, 8.5° for VT, 6.9° for RLA, 29.3° for RI, 9.9 mm VPH, and 50.0° for VCA. RCD for the uninjured wrists was not correlated with age and sex or laterality. RCD was moderately related to VPH, RLA, and VT, weakly related to VCA, and not related to RI. Mean values of the variables for the postoperative wrists were, respectively, -1.2 mm for RCD, 4.8° for VT, 1.6° for RLA, 27.2° for RI, 9.2 mm for VPH, and 34.7° for VCA. Each variable decreased significantly, which indicated a persistent dorsal shift of the distal carpal row. The change in RCD was strongly related to that in VPH, moderately related to that in VCA and RLA, weakly related to that in VT, and not related to that in RI.

CONCLUSIONS: Anatomical recovery of carpal alignment was not routinely achieved with the use of a single type of plate. RCD should be further evaluated as a parameter for use in distal radius fracture treatment because of its comprehensive association with the parameters such as VPH, VCA, and VT which indicate displacement of the distal fragment.

**Keywords:**
distal radius fracture; carpal alignment; volar locking plate
Three-dimensional MRI-CT fusion images of osteochondritis dissecans of the elbow: A novel technique for preoperative evaluation and surgical planning

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Objectives / Interrogation: In osteochondritis dissecans (OCD) of the elbow, severity of the lesion affects prognosis and selection of treatment. It is difficult to precisely evaluate lesions even with magnetic resonance imaging (MRI) or computed tomography (CT). We developed a novel technique to construct three-dimensional (3D) MRI-CT fusion images. It enables the detailed evaluation and surgical simulation of OCD of the elbow. We aimed to validate the fusion images against intraoperative findings to clarify their usefulness.

Methods: We enrolled 10 patients with OCD of the elbow who underwent surgery. For preoperative CT, a 320-row detector imager (TOSHIBA©) was used to obtain 1-mm thick slices and to generate a 3D model of the humerus. A 3 Tesla imager (SIEMENS©) was used for preoperative MRI. Images were obtained using a 3D double-echo steady sequence, with 0.4-mm thick slices. 3D models of the humerus and articular cartilage were constructed. To widen the humeroradial joint space and clarify the articular cartilage outline, 7 kg of axial traction was applied to the elbow during MRI. Images were fused for further evaluation and surgical simulation, using software manufactured by Materialise©. The International Cartilage Repair Society (ICRS) classification was predicted based comprehensively on articular cartilage shape (normal or irregular), and the existence of cartilage fissure or defect and segmented subchondral bone lesion. Average distance error of fusion images was examined. Preoperative ICRS classification expected from fusion images was compared with intraoperative ICRS classification. The applicability of preoperative simulation of surgery was evaluated.

Results and Conclusions: Average distance error of the fusion images was 0.87 (range 0.74-1.00) mm. The expected ICRS classifications were classes II, III, and IV in 1, 4, and 5 cases, respectively. Intraoperative ICRS classification accurately matched the imaging-based predictions in all patients. As operative planning, subchondral drilling for a class II and class IV case, free body removal in a class IV case, and costal osteochondral autograft for 4 class III cases and 3 class IV cases were simulated. Surgeries were conducted based on the simulations.

The 3D MRI-CT fusion images provide the exact positional relationship between bony and cartilaginous lesions, an accurate evaluation of lesion severity, and a precise simulation of the surgical procedure. In conclusion, this is a novel and useful technique for the treatment of OCD of the elbow.

Keywords: osteochondritis dissecans, elbow, MRI, CT
Clinically relevant outcome thresholds to enhance indication quality in patients with thumb carpometacarpal osteoarthritis

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Objectives / Interrogation: In order to enhance indication quality, it is useful to know at which level of symptoms patients should be operated to achieve the potentially best postoperative result. The objective of this study was to define clinically relevant preoperative thresholds at which patients with thumb carpometacarpal osteoarthritis (CMC I OA) have the greatest chance to achieve a relevant symptom improvement and an acceptable symptom state after surgery.

Methods: In a prospective study, 151 patients with CMC I OA and indication for surgery were included. Patients were examined before and 3, 6 and 12 months after surgery. The Minimal Important Difference (MID), Minimal Important Change (MIC) and the Patient Acceptable Symptom State (PASS) for pain at rest, pain during activities and the brief Michigan Hand Outcomes Questionnaire (brief MHQ) were determined as well as the preoperative thresholds, which are predictive to achieve the MIC and PASS. Anchor-based approaches and receiver operating characteristics (ROC) curves were used.

Results and Conclusions: The MID for pain at rest, pain during activities and the brief MHQ was 1.4, 1.0 and 12 and the MIC was 1.9, 3.9 and 16, respectively. The PASS was 1.5, 2.5 and 70. Regarding the preoperative thresholds, patients with baseline pain at rest of 3.5 or greater were most likely to achieve the MIC, and patients with a preoperative score of 5.5 or less were most likely to achieve a PASS. For pain during activities, the thresholds were 6.5 for achieving the MIC and 7.5 for the PASS. For the brief MHQ, the threshold to achieve the MIC and PASS was equal with 47 points.

We suggest that patients should be operated if they have preoperative pain values between 3.5 and 5.5 at rest and between 6.5 and 7.5 during activities and a brief MHQ score of about 47. Within these reference values, patients have the greatest chance to achieve a subjectively relevant improvement and an acceptable symptom state.

Keywords:
minimal important difference, minimal important change, patient acceptable symptom state, thumb carpometacarpal osteoarthritis
Giant cell tumors of the tendon sheaths in the hand

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Objectives / Interrogation: Giant cell tumor of the tendon sheath (GCTTS) is the second most common tumor of the hand after ganglion cysts. However, the local recurrence after excision has been reported in 5-30% of cases. The purpose of this study is to evaluate the clinical results of patients and to determine the risk factor of recurrence.

Methods: From 2002 to 2017, 32 patients [17 males, 16 females, mean age 50, ranging from 13-77 years] underwent excision of GCTTS of the hand. The average follow-up time was 15 months (3-180), the disease duration was 19 months (1-60), and the size of tumor was 14.5 mm (11-25). We always used the operating microscope during resection of tumors. We evaluated size of tumor, disease duration, bone erosion, pseudocapsule, and tumor-occupying factor.

Results and Conclusions: Recurrence was noted in only one case, who was successfully managed by a second excision. 2 cases were recurred after resection in other hospitals. Recurrence group (n=3) and control (n=29) were compared, but we could not find the risk factor for recurrence with a statistically significant difference. 2 cases were recurred in the proximal interphalangeal (PIP) joint.

Discussion: The local recurrence of GCTTS was caused by incomplete resection or satellite lesion. GCTTS in or around PIP joint was difficult to remove adequately, because the neurovascular structures are quite close to tumor margins. To prevent recurrence, some literatures suggested postoperative radiotherapy or use of imatinib. However, they have been still controversial. We guess the pre-operative planning and microscopic resection are important to prevent recurrence.

Conclusion: GCTTS in the hand are a common benign soft tissue tumor. Incomplete resection and satellite lesion seem to be the main factors influencing the rate of recurrence.

Keywords:
Robot-Assisted of Volar Percutaneous Scaphoid Screw Placement: initial clinical experience

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Objectives / Interrogation: To investigate a robot-assisted technique for volar insertion of a percutaneous scaphoid screw and compare insertion time, accuracy, and radiation exposure to the traditional technique. We hypothesize that robot-assisted navigation of volar percutaneous scaphoid screw placement would improve accuracy, require less time, and diminish radiation exposure when compared to the free hand technique.

Methods: 16 patients with acute Herbert B2 scaphoid fracture were randomized to computer-assisted versus traditional volar percutaneous scaphoid screw placement. Time of the overall procedure, set-up time, time for ideal guide wire placement, and radiation time were recorded. Number of guide wire attempts was also recorded. Finally, accuracy of planned screw axis and actual screw axis were compared. Student’s t-tests were used to determine whether the differences in outcome variables between computer-assisted and free hand techniques were significant. Postoperative outcome measures included time to union based on computed tomography, patient-reported pain and range of motion.

Results and Conclusions: Results Sixteen screws were placed in 8 patients in the robot-assisted group and 16 screws in 8 patients in the freehand group; no postoperative complications or revisions were reported. The overall time of the 2 procedures and the set-up time were not different between the 2 groups, the time for placement of the K-wire was 60% in the robot-assisted percutaneous scaphoid fixation group, and the number of K-wire attempts needed for accurate screw placement approached clinical significance. Although the radiation exposures of set-up time were higher in robot-assisted group, the radiation exposures for global time of the procedure and guide-wire placement were clinically lower in robot-assisted group. Conclusions Robot-assisted navigation of volar percutaneous scaphoid screw placement takes no more time that traditional methods and significantly reduces the amount of radiation exposure to the patient. This technique also significant reduced the number of incorrect placement of the guide wire compare to free hand guide wire insertion.

Keywords: scaphoid; fracture; robot-assisted surgery
Comparison of extension splint and temporary pinning for acute tendon mallet injury

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Objectives / Interrogation: Purpose: This retrospective study was designed to evaluate conservative and surgical treatment for acute closed tendon mallet injury.
Methods: Methods: A total of 59 patients with acute closed tendon mallet injury were enrolled in this study (29 patients in conservative treatment and 30 patients in surgical treatment). Conservative treatment was performed using two types of splinting and surgical treatment was conducted with oblique K-wire fixation of the distal interphalangeal (DIP) joint. The DIP joint was immobilized for eight weeks in both treatments. Active ranges of motion of the affected finger and clinical results from Miller’s classification were evaluated postoperatively.
Results and Conclusions: Results: The mean extension lag of the DIP joint in the surgical treatment group was significantly better than it was with conservative treatment (2.1° vs 13.8°, p < 0.001). The surgical treatment group also showed significantly better results on Miller’s classification (p = 0.007). Three patients who were noncompliant with the splint showed poor results, while no patients in the surgical treatment group had a poor result.
Conclusions: Surgical treatment with temporary K-wire fixation leads to satisfactory postoperative results for acute tendon mallet injury.
Keywords:
tendon mallet,
Current algorithms for obstetric palsy are too aggressive. A practical and conservative approach using triceps and wrist extension assessment.

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Objectives / Interrogation: Current algorithms for surgical indications for obstetric brachial plexus injury (OBPI) use recovery of biceps at 3 months or 4 months. We know the plexus is damaged sequentially with downward traction. Therefore C5 and 6 are more affected than C7 which is worse than C8 etc. C7 can be assessed by measuring triceps and wrist extension. If there is no C7 at 4 months then the chance of C5/6 recovering is slight. Surgery is indicated. If there is good wrist extension and triceps at 4 months then the decision can be delayed to 6 months as some infants will still recover.

This study will compare our algorithm to those in the literature that advise surgery at 3 months if there is no deltoid or biceps recovery.

Methods: All babies referred to our OBPI clinic over a 9 year period were assessed. Those that presented after 3 months were excluded from this study as were those that were complete palsies and those that had good biceps at 3 months. 57 met the inclusion criteria.

Follow up was monthly with assessment of muscle recovery.

We performed a retrospective review comparing the outcome of babies managed by our algorithm (operative and non-operative), to those in the literature that would have received surgery at 3-4 months where there was no recovery of deltoid/biceps.

Results and Conclusions: Our results show that 52.6% of our infants managed to avoid surgery and have a good outcome, that would have been performed at centers using recovery of biceps/deltoid at 3 months.

31.6% of our infants avoided surgery that would have been performed at centers using 4 months as the surgical trigger.

We believe that current algorithms are too aggressive and present our algorithm where triceps and wrist extension are assessed at 4 months. Those that do not have these functions are booked for surgery. Those that do are observed for a further two months. If partial recovery of biceps is observed then a cookie test is performed at 9 months. If there is no biceps at 6 months or they fail the cookie test at 9 months then surgery is booked.

Keywords:
Obstetric brachial plexus injury, OBPI, Erb's palsy
Long-term (5-15 years) clinical outcome after titanium lunate arthroplasty for Kienböck’s disease

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Objectives / Interrogation: Titanium lunate arthroplasty (TLA) for Kienböck’s disease was introduced in 1984 to address the silicone-wear particle problem common to silicone lunate implants. We sought to study the outcome of TLA.

Methods: We identified 11 patients who had undergone TLA between 2001 and 2010. All subjects were male, age at surgery 47.3 (31-65) years and were followed for mean 11.0 (5.4-15.3) years. Seven patients had suffered traumatic low energetic sprains. Time from the onset of symptoms to surgery ranged from 5 to 45 (median 19) months. Seven patients had the disease in the right, eight in the dominant hand. Six patients had Stage IIIA and five stage IIIB disease. All patients had fracture or fragmentation of the lunate bone. We evaluated pain, ROM, function, and radiological outcome at a mean 11 years after surgery. We compared preoperative ROM and radiological findings to final follow-up in the ipsilateral wrist and made comparisons to the contralateral wrist.

Results and Conclusions: No implants were removed, and no wrist joints were fused. Pain on the visual analog scale averaged at rest 0.5, at night 0.3, and during heavy exertion 2.7. Seven patients had no pain at rest and 9 had no pain at night, but only two had no pain with exertion. None had tenderness to palpation or swelling. When compared with the contralateral wrist, the preoperative range of motion reached in extension 65%, in flexion 63%, in radial deviation 45%, and in ulnar deviation 70% that of the contralateral side, but grip strength was only 55%. After mean 11 years, extension, flexion, and radial deviation of the affected wrists reached 71% of that of the contralateral wrists, and radial deviation 62%. These differences between affected and unaffected wrists were significant for all, p < 0.05. Grip strength was significantly better than before surgery, p<0.05, but still significantly inferior (81%) in the operated hand, p<0.05. DASH score averaged 9.6, optional DASH 9.7, and Mayo wrist score 67.7. Radiologically, only Ståhl, and arthrosis indexes differed significantly between affected and unaffected wrists. Two patients had a dorsally dislocated implant, meaning that around 20% of our cases probably meet the criteria for failure. The results of titanium lunate arthroplasty for Stage III Kienböck’s disease are promising. More study is needed to improve the implant stability.

Keywords: Kienböck’s disease, lunatomalacia, titanium implant arthroplasty, outcome, complications
International comparison of the current practices of the management of post-axial accessory digits on a stalk

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Objectives / Interrogation: Background
Birmingham Children's Hospital has an established service for referral of all children with post axial accessory digits at the time of birth. The service is a one stop clinic, where the child is seen and if suitable immediately treated with a surgical resection under local anaesthesia. A comprehensive literature review was carried out and does not advocate any clear recommendations.

Aim
To compare the current clinical practice in the management of post axial accessory digits on a stalk internationally.

Methods: We have distributed a standardized online questionnaire's via 'survey monkey' to pediatric hand surgeons in Europe and the US to compare the current practice in the management of post axial accessory digits across other units.

Results and Conclusions: There are various techniques used, we will present the results of the survey monkey and discuss advantages and disadvantages.

Keywords:
Revisiting "Sandwich" Plating of AO type C3 Distal Radius Fractures - Our Friend or Foe? A case series.

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Objectives / Interrogation: In complex distal radius fractures, combined volar and dorsal plating has been a less favourable option historically to many due to its complications. Our goal was to evaluate radiological and functional outcome of combined dorsal and volar "sandwich" plating of distal radius using low-profile, titanium, fixed angle locking plate system (Variable angle LCP two-column volar/volar rim distal radius plate, DePuy Synthes;Acu-Loc dorsal distal radius plate,Acumed) in AO type C3 fractures.

Methods: 5 patients with closed distal radius fractures AO type C3 due to motor-vehicle accidents from September 2016 to September 2017 were managed surgically via combined dorsal and volar plating using the above implants (single volar and broad dorsal plate engaging radial and intermediate columns of the distal radius). Patient with brain injury was excluded. All cases were done by a single senior hand surgeon. Pre-operative CT wrist were performed. Pre- and post-operative wrist X-rays were evaluated. Clinical assessment of range of movement of the wrist, grip strength, QuickDASH questionnaire, Patient-rated Wrist and Hand Evaluation(PRWE) and Modified Mayo Wrist Score(MMWS) were done at 12 months post-op.

Results and Conclusions: Median age was 37 years (range 32 to 53). There were 4 males and 1 female. Mean follow up was 16.8 months. Mean time from trauma to surgery was 20.2 days. Mean pre-operative radial height was 3.6mm, radial inclination 8.8°, sagittal tilt -0.4°, intraarticular step was 3mm. Mean post-op radial height was 11mm, radial inclination 22.4°, sagittal tilt 1°, intra-articular step was 0mm. No patient required bone grafting. Mean wrist movements post-op 1 year were flexion 62°, extension 58°, radial deviation 14°, ulnar deviation 15°, supination 78°, pronation 87°. Mean grip strength was 82% of the unaffected hand, corrected according to the 10% rule. QuickDASH score was 4.96. PRWE was 16.6. MMWS was 81 (good). At 1 year follow-up, there was no loss of reduction noted. No hardware-related complication was reported and thus none required removal of implant. Patient self-reported average return to work with similar intensity was 6 months, mean self-reported satisfaction on visual analogue scores(0-10) was 7.4 (Good).

We recommend "sandwich" plating for complex AO type C3 distal radius fractures. Both these plates provide excellent stability in maintaining the normal alignment of distal radius. We believe this is the first series reporting the "sandwich" technique using these two different plates.

Keywords:
Double plating, Sandwich plating, distal radius fractures, combined dorsal and volar plating

References:
Medial Elbow Exposure: A Comparison of 5 Approaches

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Objectives / Interrogation: Several surgical approaches to the medial elbow have been described however it remains unclear which exposure provides the optimal view of relevant medial elbow structures. The purpose of this anatomic study is to determine the visible surface area of the coronoid process, distal humerus and radial head through five described approaches to the medial elbow; the muscle splitting approach to the ulnar collateral ligament of the elbow, the medial "Over the Top" approach, the extended medial elbow approach, the floor of the ulnar nerve approach, and the Taylor and Scham approach.

Methods: Eight fresh frozen cadaveric upper extremity specimens were dissected. Five surgical approaches were performed on each specimen, the muscle splitting approach to the ulnar collateral ligament of the elbow, the medial "Over the Top" approach, the extended medial elbow approach, the floor of the ulnar nerve approach, and the Taylor and Scham Approach. The sequence was standardized, moving from least to most invasive. After completing each exposure, the intervals were closed prior to the next interval being exposed. The muscle splitting approach to the ulnar collateral ligament was performed first, followed by the medial "Over the Top" approach, the extended medial elbow approach, the floor of the ulnar nerve approach, and the Taylor and Scham Approach. After each surgical approach was performed, standard retractors were placed and imaging of bony visualization was performed using a laser surface scanning system (Artec Space Spider, Artec 3D, Santa Clara, California) and digitized. The radius, ulna and humerus were then stripped of all soft tissue and laser surface scanned in the same manner. The scans were then segmented using commercially available digital software (Geomagic Wrap, 3D Systems Corporation, Rock Hill, South Carolina) and the surface area visualized was determined.

Results and Conclusions: The extended medial elbow approach showed the highest proportion of the total elbow joint (coronoid, distal humerus and radial head) from the medial side, with a surface area of 13.9cm\(^2\), or 15\% of the joint. It also provided the best visualization of the coronoid (3.2cm\(^2\) or 26\% of the surface area), and distal humerus (9.9cm\(^2\) or 15\%), while the medial "Over the Top" approach was best at visualizing the radial head (0.8cm\(^2\) or 7\%). In conclusion, the extended medial elbow approach provides the greatest surface area visualization of the distal humerus and coronoid process from the medial side.

Keywords: elbow, approaches, anatomic, over the top, extended medial elbow approach, Taylor and Scham, coronoid, distal humerus, radial head, trauma
Prothetic Arthroplasty of the proximal interphalangeal joint using a modular surface gliding implant: A retrospective study

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Objectives / Interrogation: To evaluate the postoperative outcome after prothetic arthroplasty of the proximal interphalangeal (PIP) joint regarding improvement of range of motion, reduction of pain and postoperative function of the hand.

Methods: 20 Patients (16 female, average age 64 years) with primary osteoarthritis of 1 or 2 PIP joints were assessed preoperatively and postoperative after prothetic arthroplasty of the proximal interphalangeal joint using a modular surface gliding implant (CapFlex, Fa. KLS Martin, Tuttlingen).
Considered factors were improvement of range of motion, postoperative pain using the visual analog pain scale (VAS) and clinical outcome of the hand judged by the quick disabilities of the arm, shoulder and hand score (quickDASH).

Results and Conclusions:
Results:
A total of 25 joints were evaluated after a mean time of 11.3 months postoperative. The mean active range of motion of the joint improved from 56° to 72°. Patients reported a good reduction of pain to VAS 1 (during rest) and VAS 3 (during stress). The average postoperative quickDASH was 18, showing a good condition of the hand. There were no signs of postoperative lateral instability, axial deviation or implant fracture. All implants showed complete osteointegration without radiological evidence of migration.

Conclusion:
Prothetic Arthroplasty of the proximal interphalangeal joint using a modular surface gliding implant is a good option for patients with primary osteoarthritis to improve the range of motion with an acceptable pain relief, decent stability and good clinical outcome of the hand.

Keywords:
osteoarthritis, proximal interphalangeal joint, arthroplasty
Arthroscopic treatment for isolated traumatic lunotriquetral ligament injury without triangular fibrocartilage complex lesion

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Objectives / Interrogation: To evaluate the clinical results of patients treated by arthroscopic debridement and thermal shrinkage of the isolated traumatic lunotriquetral (LT) ligament tear without triangular fibrocartilage complex (TFCC) tear.

Methods: We retrospectively reviewed the results for 12 patients (10 men, 2 women; mean age, 30 years) who underwent arthroscopic debridement and thermal shrinkage for the treatment of isolated traumatic LT ligament membraneous portion tear at our hospital.

The patients were followed for a mean of 9 months. The patients had isolated traumatic LT ligament tear caused by: sprain (N=6); falls (N=5); and boxing (N=1). All the patients underwent MRI. The radiographs for ulnar variance (UV), ulnar dorsal subluxation, and function of the wrist using grip power, DASH score, and Mayo wrist score were examined in all the patients both preoperatively and postoperatively.

Results and Conclusions: For the preoperative MRI, LT ligament tear was not definitely observed in all cases excepting distal radioulnar joint (DRUJ) subluxation in 8, lunate bony contusion in 2, ulnar styloid bony contusion in 1 and occult ganglion of dorsal scapholunate ligament in 2. The average duration from trauma to surgery was 5 months. Preoperative ulnar stress test was positive in 8, DRUJ stress in 7, ballottement test in 7 and supination limitation in 1 case. The average values for the preoperative simple radiographic findings were: UV, 2.6 mm; and dorsal subluxation at the distal ulna, 1.0 mm. Arthroscopically LT tear type was flap tear in 10 and bucket handle tear in 2. In all the cases, the pain improved postoperatively (VAS: from 4 to 1.5). Grip power (compared to the uninvolved limb) was 66% preoperatively and 81% postoperatively. The DASH scores were 36.8 points preoperatively and 7 points postoperatively. The Mayo wrist scores were excellent in 3 cases, good in 8 cases, and fair in 1 cases, and the average score improved significantly from 68 points preoperatively to 87 points postoperatively. Two patients experienced ECU tendinitis.

LT ligament tear should be differentiated from TFCC lesion when the patients is presented with ulnar wrist pain because MRI cannot detect LT ligament tear. Arthroscopic debridement and thermal shrinkage for the treatment of isolated traumatic LT ligament tear can reduce pain.

Keywords: lunotriquetral ligament, triangular fibrocartilage complex, arthroscopic debridement, thermal shrinkage
Arthroscopic wafer resection for ulnar impaction syndrome

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Objectives / Interrogation: To evaluate the clinical results of patients treated by arthroscopic wafer resection for ulnar impaction syndrome

Methods: We retrospectively reviewed the results for 16 patients (5 men, 11 women; mean age, 48 years) who underwent arthroscopic wafer resection for ulnar impaction syndrome at our hospital. The criteria for inclusion were: 1) persistent ulnar-sided wrist pain after conservative treatment over a 3-month period; 2) more than 6 months of follow-up postoperatively. Associated condition was radial head old fracture in 2, triangular fibrocartilage complex (TFCC) foveal avulsion in 2, scapholunate ligament injury in 1, carpal tunnel syndrome in 1, cubital tunnel syndrome in 1, and lateral epicondylitis in 1.

The patients were followed for a mean of 19 months (6~48). The patients symptom was caused by: repetitive overuse (N=8), slip down (N=4), falls (N=3); and sprain (N=1). All the patients underwent MRI. The radiographs for ulnar variance (UV) and ulnar dorsal subluxation and function of the wrist using grip power, DASH score, and Mayo wrist score were examined in all the patients both preoperatively and postoperatively.

Results and Conclusions: For the preoperative MRI all patient had TFCC central wear, a lunate high signal change in 6, triquetrum high signal change in 1. We checked follow up MRI in 3 and CT in 7. The average duration from symptom onset to surgery was 15 months. Preoperative ulnar stress test was positive in 14, fovea sign in 2. For working portal, 4-5 portal was used in 12 and distal radioulnar joint portal in 4. In 5 cases ulnar shortening osteotomy (USO) was needed for persistent pain. UV was changed from 1.7 mm preoperatively to 0 mm postoperatively. Dorsal subluxation of the distal ulna was changed from 2.3 mm preoperatively to 1.5 mm postoperatively. Difference in postoperative dorsal subluxation of the distal ulna was significant between wafer only (0.2mm) and secondary USO (2.7mm). Grip power (compared to the uninjured limb) was 72% preoperatively and 74% postoperatively. The DASH scores were 46 points preoperatively and 35.3 points postoperatively. The Mayo wrist scores improved from 70 to 86 points, excellent in 2, good in 12 and fair in 2. 2nd look arthroscopy was performed in 4 cases and showed fibrocartilage regeneration in resected ulnar head distal pole. Arthroscopic wafer resection is useful procedure for ulnar impaction syndrome. However patients with postoperative dorsal subluxation of the distal ulna may require secondary USO.

Keywords:
Diagnostic Value

Distal Radio-ulnar Joint Configurations in Patients with Idiopathic Ulnar Impaction Syndrome: A New Classification System

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Objectives / Interrogation: Development of arthritis in the distal radioulnar joint (DRUJ) is a major concern after ulnar-shortening osteotomy. The configuration of the DRUJ is an important predisposing factor for arthritis. Here we suggest a new classification of the morphology of the DRUJ.

Methods: We retrospectively reviewed 26 wrists of 26 patients diagnosed with idiopathic ulnar impaction syndrome and assessed their preoperative three-dimensional computed tomography (CT) findings. We measured the slopes of the sigmoid notch and ulnar head in the middle of the DRUJ. We also simulated the changes in the joint space in the DRUJ after 2 mm ulnar shortening.

Results and Conclusions: The average ulnar variance was 3.4 mm. The slope of the sigmoid notch and that of the ulnar head were not parallel. The slope of the sigmoid notch ranged from -23.9° to 19.3° and that of ulnar head from -24.0° to 17.0°. There was a significant correlation between the slope of the ulnar head and the changes in the joint space of the DRUJ at the center of the sigmoid notch after 2 mm ulnar shortening.

The slope of the ulnar head might be as important a predisposing factor as that of the sigmoid notch for the progression of DRUJ arthritis after ulnar-shortening osteotomy. In our new classification system, we considered the slope of both the sigmoid notch and ulnar head.

Keywords: Sigmoid notch; Slope; Ulnar head; Ulnar impaction syndrome
Volar transfer of the lateral band with transverse retinacular ligament is effective for the correction of swan-neck deformity caused by volar plate injury of the PIP joint.

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Objectives / Interrogation: Several surgical methods have been performed for the correction of swan-neck deformity. We introduce a novel surgical method for swan-neck deformity caused by volar plate injury of the proximal interphalangeal (PIP) joint.

Methods: A 61-year-old woman presented with swan-neck deformity of her right little finger. She injured her little finger 45 years ago and was diagnosed with volar plate injury of the PIP joint. Snapping of the lateral band was observed when she flexed her finger. Active range of motion was 25° extension of the PIP joint and 20° extension loss of the distal interphalangeal joint (DIP). Passive correction of the deformity was possible and intrinsic tightness test showed no contracture of the lateral band. Conservative treatment with brace was not effective for the correction of the deformity and surgical treatment was selected.

A dorsal incision is made on the PIP joint and both lateral bands were released from the central slip. Bilateral transverse retinacular ligaments were released from the dorsal attachment and elevated with volar base flap. Lateral bands were transferred to the volar side and transverse retinacular ligaments were sutured slightly volar to the original attachment. Intraoperatively, improvement of snapping was confirmed with active flexion of the finger. The PIP joint was immobilized and active motion of the finger was initiated 2 weeks postoperatively.

Results and Conclusions: One year postoperatively, snapping of the lateral band improved with no appearance of swan-neck deformity. Active range of motion of the little finger was 0° of extension and 100° of flexion at the PIP joint, and 0° of extension and 70° of flexion at the DIP joint.

Transfer of the lateral band using transverse retinacular ligament is minimally invasive surgery and effective for swan-neck deformity caused by volar plate injury of the PIP joint.

Keywords:
transverse retinacular ligament, lateral band, swan-neck deformity, volar plate injury
DISPLACED DORSAL LUNATE FACET FRACTURE TREATED WITH A VOLAR LOCKING PLATE. IS IT ADVANTAGEOUS TO CAPTURE THE FRAGMENT WITH A FULL LENGTH LOCKING SCREW?

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Objectives / Interrogation:

PURPOSE
Stability of fixation of an extraarticular distal radius fracture using a volar locking plate can be achieved with screw lengths 75% of the height of the bone avoiding dorsal tendon problems. Is this valid with dorsal lunate facet fragment displacement? This study will demonstrate the safety and efficacy of capturing the displaced fracture with a full length screw using variable angle implants

Methods: MATERIAL AND METHODS
From the ICUC data base of 203 distal radius fractures, we identified 10 cases of intraarticular fractures featuring a displaced dorsal lunate facet which was stabilized with a full length locking screw through a variable angle volar plate. Eight patients were female and 2 male with an average age of 66.5 yrs (range 50-85). All fractures were analyzed by both preoperative and postoperative CT specifically documented the placement of the volar ulnar screw, the alignment of the sigmoid notch, and the position of the volar plate. Patient follow up emphasized forearm function and stability of the distal radioulnar joint.

Results and Conclusions: RESULTS
The average follow up was 104.6 weeks (range 26-343). The postoperative CT scans demonstrated stable reduction and fixation of the dorsal lunate facet in all but one case. The sigmoid notch reduction was within 1mm step off in all but one which had 1 mm impaction and 1.5 mm gap. The position of the plate was Soong 0 in 7 and Soong 1 in 3. There were no dorsal or volar tendon problems noted. The forearm rotation was full in all 10 patients

CONCLUSIONS:
The angular stable plate construction allows the fixation of a dorsal lunate facet fracture as well as the sigmoid notch while maintaining the plate in a safe position and without extensor tendon irritation.

Keywords:
distal radius; lunate facet fracture

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Objectives / Interrogation: PURPOSE
The seminal investigation by Soong et.al. identified radiographic criteria for the risk of tendon irritation post volar plate application. Using the ICUC data base of consecutively treated distal radius fractures with volar plate treatment, we evaluated both standard x-rays and postoperative CT scans to address several questions:
(1) Which critical point on the volar rim of the radius should be used?
(2) Is loss of the normal volar tilt a risk factor?
(3) Should prominent plates be removed even without symptoms?

Methods: Material and Methods
203 consecutive patients treated for a distal radius fracture with a volar plate identified 6 with flexor pollicis injury (4 complete and 2 incomplete rupture). Four patients were female and 2 male with an average age of 62.5 years (range 55-80 yrs). 3 surgeons independently evaluated the x-rays and CT scans.

Results and Conclusions: Results
The average time from plate placement to tendon disruption was 115 weeks (range 29-251 weeks). Of note, 3 patients presented very late at 116, 168, and 251 weeks respectively. Two of the 6 patients were asymptomatic prior to rupture. The CT scan proved more accurate than standard x-rays when measuring the Soong criteria due, in part, to two volar points of the volar rim of the radius with Soong 2 seen in each CT while the x-rays were rated as Soong 1 in 3 and 2 in 3. Three patients had 0 deg volar, 1 8 deg, and 2 dorsal of 2 and 10 deg.

Conclusions
Plate prominence especially combined with loss of volar tilt should be a warning sign of risk of tendon rupture and we believe those patients should have elective plate removal.

Keywords:
distal radius; tendon rupture
Spasticity-reducing hand surgery for patients with upper motor neuron injuries: a prospective study of 30 patients with a one-year follow-up

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Objectives / Interrogation: Spasticity is common in patients with upper motor neuron injuries, with a prevalence reported between 30 to 90% in patients with stroke, traumatic brain injury, incomplete spinal cord injury and cerebral palsy. While pharmacological spasticity therapy has been applied for decades, surgical procedures remain fairly uncommon in adults with spasticity. The objective of this prospective cohort study was to evaluate the outcome of spasticity-reducing surgery in the upper extremity.

Methods: Thirty patients suffering from spasticity in the upper extremity with transient or little effect of BoNT-treatment were included in the study. Between March 2015 and January 2017, all patients had spasticity reducing surgery, which included a tailored set of procedures including lengthening of tendons, tenotomies and correction of deformities according to the specific spasticity pattern in each patient. Active motion exercises were initiated the first day postoperatively with splints used between exercises for three weeks, and patients were also taught a home-training program. All 30 patients were assessed after three weeks, three and six months and after a year.

Results and Conclusions: At one-year follow-up all outcome measures had improved significantly compared to baseline. Spasticity as measured by the modified Ashworth scale (0-5) had decreased by a mean 1.4 (p<0.001), and all but two patients were found to have reduction in spasticity by at least one scale unit. Pain and general hand function (as measured by VAS-scale) had decreased by 1.3 (p<0.05) and 2.1 (p<0.001) respectively. The patients prioritized activity as measured by Canadian Occupational Performance Measure (COPM) had also increased significantly (performance by 3.4 and satisfaction by 3.6 (p<0.01). Passive range-of-motion had increased significantly.

Spasticity-reducing surgery combined with immediate postoperative functional rehabilitation can reduce spasticity, reduce pain and improve hand function in patients with upper motor neuron injuries. The beneficial effects of these surgical procedures are consistent one year postoperatively, and surgery should be considered a treatment option for this large group of patients.

Keywords:
spasticity, tendons, stroke, upper motor neuron injuries
Needle fasciotomy for Dupuytren's contracture- a prospective cohort study of 58 fingers with a median follow-up time of 6.5 years

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Objectives / Interrogation: Needle fasciotomy (NF) is a well-established, minimally invasive treatment option for mild to moderate Dupuytren contractures (DC). The procedure requires limited resources, and multiple contractures can be treated during the same session. However, long-term results have indicated a high recurrence rate. This prospective study was initiated to monitor the safe introduction of NF in a context where limited fasciectomy had been the only treatment option for DC, and to investigate the long-term results.

Methods: The inclusion criterion was a palpable cord with an MCP and/or PIP contracture in one or more fingers. 58 fingers in 43 patients were treated by needle fasciotomy between November 2010 and March 2012, and were followed for a median of 6.5 years. Four patients (with 8 treated fingers) died during the follow-up period, and two patients (with two treated fingers) declined follow-up. At the final follow-up of the remaining 52 patients, 29 fingers had had no further treatment for Dupuytren contracture. Nineteen had undergone another (10) or were scheduled for a secondary procedure of the finger (9).

Results and Conclusions: The median total passive extension deficit (TPED) decreased from 52° (range 20-166°) to 10° (range -25°-119°) postoperatively. No severe adverse events such as nerve or tendon injuries were reported. At final follow-up the median TPED was 20° (range -35° - 135°) for all fingers.
A total of 12 fingers (20%) had a recurrence of the contracture defined as an extension deficit of >20° in a previously straightened finger. Six patients had had or were planned for secondary procedures in the same MCP joint, one by partial fasciectomy, five by another NF treatment as preferred by the patients. The median TPED in the remaining 29 fingers was 6° (range -35° - 105°).

Needle fasciotomy is a simple and safe procedure for Dupuytren's contracture, with excellent immediate reduction of the joint contracture but with a recurrence rate that has to be taken into account. However, 29 fingers retained a straight finger at the final follow-up, and repeated NF was preferred in all but one of the patients with recurrence.

Keywords: -
Functional reinnervation of the lower limb after contralateral lumbar to sacral nerve transfer for hemiplegic patients

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Objectives / Interrogation: Contralateral C7 nerve transfer has been successfully applied to improve upper-limb motor function for patients who had arm paresis that had ceased to improve after rehabilitation. Similar strategy possibly exists in the lower limb. This study was designed to explore a new procedure for unilateral lower limb dysfunction due to stroke and traumatic spinal cord injury.

Methods: Four patients were enrolled in the study. The first suffered from permanent muscle weakness in his left leg after right cerebral infarction. The second had spasticity and hemiplegia in both upper and lower limbs on the right after a left cerebral hemorrhage. The other 2 patients are with incomplete lower limb paraplegia due to traumatic spinal cord injury caused by spinal fracture. After spinal canal decompression procedure, these two patients mainly manifested as unilateral lower limb dysfunctions. All four patients underwent contralateral lumbar to sacral nerve transfer to improve lower-limb motor function. The procedure mainly consists of transferring 50% of the proximal contralateral lumbar ventral L5 to 50% of the distal ventral S1 nerve (or S1+S2). Selective posterior rhizotomy was performed together in 1 patient with spastic lower limb paralysis. Motor function of lower limb was assessed preoperatively and postoperatively.

Results and Conclusions: Results: 20 months after surgery, all these patients experienced significant improvement in ambulatory status. Motor function of unaffected lower limb was not impaired by transferring 50% of the proximal lumbar ventral L5.

Conclusions: This pilot study demonstrates the possible benefits of contralateral lumbar to sacral nerve transfer for hemiplegic patients. This surgical approach could provide a new means for lower-limb motor functional recovery. Further research, including long-term follow-up and a randomized controlled trial, is required.

Keywords: Hemiplegia, Nerve Rerouting, Nerve Transfer, Spasticity, Stroke
Results of finger extension reconstruction in hemiplegic patients after stroke by transferring the flexor carpi radialis branch to the posterior interosseous nerve

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Objectives / Interrogation: Transfer of contralateral C7 nerve has been successfully applied to reconstruct motor function of affected upper limb in chronic central neurological injury. However, in certain patients, finger extension still remains difficult. One possible mechanism is the fiber distribution of C7. The flexor carpi radialis (FCR) is mainly innervated by C7 nerve. The FCR muscle branch can be used to transfer the posterior interosseous nerve (PIN) to increase the independent control of the finger extensor muscle group. This study was designed to test the effectiveness of FCR branch transfer to PIN.

Methods: Two patients were enrolled in the study. The first is a 48-year-old man who had severe spasticity and hemiplegia in both upper and lower limbs on the right, 29 months after a left cerebral hemorrhage and 17 months after contralateral C7 transfer. The second patient is a 19-year-old man who suffered from permanent muscle weakness in his right wrist and finger extension 8 years after left cerebral arteriovenous malformation rupture, with little spasticity. Both patients underwent right FCR branch to PIN transfer to improve finger extension 1 year after contralateral C7 nerve transfer. Motor function of lower limb was assessed preoperatively and postoperatively.

Results and Conclusions: Results: one year after surgery, the first patient experienced transient significant decrease of wrist and finger spasticity lasting for 2 months, and gradually back to the baseline. Both patients regained finger extension in an extremely relaxed state but failed in tension state. Motor function of wrist flexion was not impaired by transferring FCR branch. Conclusions: Although more nerve fibers from contralateral C7 nerve entered PIN, the functions of the finger extension were not significantly improved. It suggested that improving the independent control of finger extension for hemiplegic patients may require more attention to the inhibition from the tensor of flexion.

Keywords:
Hemiplegia, Functional Reconstruction, Nerve Transfer, Spasticity, Stroke
Denervation of the thumb carpometacarpal joint in the case of osteoarthritis: results of a controversial treatment option

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Objectives / Interrogation: If conservative treatment is not sufficient in thumb carpometacarpal (CMC1) joint osteoarthritis trapeziectomy is a valid procedure to reduce pain and gain back functionality. These operations destroy the carpal anatomy and some lead to reduced power and loading forces. This is a relevant problem especial for younger manual workers. Wrist denervation has shown to reduce pain relevantly in radiocarpal osteoarthritis. Therefore, we investigated on the effect of denervation in CMC1 osteoarthritis.

Methods: Between 2005 and 2018, 51 patients suffering from CMC1 (44) and STT(11) joint osteoarthritis underwent a denervation procedure which consisted in a total denervation (Wilhelm 1966) extended to the CMC1 joint (Lorea 2003). Pain (VAS), strength (grip and pinch), mobility (Kapandji index, range of motion), DASH score, complications and overall patient satisfaction were determined.

Results and Conclusions: The preliminary follow-up assessment showed a significant decrease in pain. 6 weeks post operation the pain reduction was 56.5 % and long-term pain reduction was 66.8 %. The postoperative strength of the pinch was 0.6 kg lower than on the other hand. Additionally, the postoperative mobility as measured by the Kapandji score was 9.3 of 10. Overall, 61% of patients are satisfied with the results of the denervation.

The results of our study implicate that a denervation can be an alternative treatment option for patients suffering from symptomatic osteoarthritis. A major advantage is pain reduction through a soft tissue procedure. Furthermore, other more invasive operative treatments are still an option after this operation. However, the long term pain reduction and the overall satisfaction rate is far inferior to the results of simple trapeziectomy. This is why we preserve this operation to patients with special physical requirements.

Keywords:
denervation, osteoarthritis
First Clinical Experience with a Novel Injectable rhCollagen scaffold combined with Autologous Platelet-Rich Plasma for the Treatment of Lateral Epicondylar Tendinopathy (Tennis Elbow)

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Objectives / Interrogation: Lateral epicondylitis is a tendinopathy of the common extensor origin at the elbow. When traditional conservative treatment fails, more effective therapies are needed. Vergenix™ Soft Tissue Repair Matrix is an injectable gel composed of cross-linked bio-engineered recombinant human type I collagen combined with autologous platelet-rich plasma (STR/PRP). The complex forms a collagen-fibrin matrix, which promotes cell migration and tissue repair. Based on positive outcomes from preclinical trials, this study is the first clinical trial of STR/PRP on tendinopathy. We hypothesize that STR/PRP is a safe and effective treatment for lateral epicondylar tendinopathy.

Methods: Patients with chronic lateral epicondylitis underwent treatment with STR/PRP. Outcome assessment included grip strength, functional disability and changes in sonographic tendon appearance for up to 6 months following treatment.

Results and Conclusions: Forty patients were enrolled in the study. No systemic or local severe adverse events were reported. Clinical evaluation revealed an improvement in mean PRTEE score from 64.8 prior to treatment, and showed a 59% reduction at 6 months. The SF-12 questionnaire showed improvement from a mean score of 30.7 to 37.7 at the final follow up. Grip strength rose from 28.8 Kg at baseline to 36.8 Kg at 6 months. Improvements in sonographic tendon appearance were evident among 68% of patients.

We conclude that STR/PRP is a safe treatment that effectively induces clinically significant improvements in elbow symptoms and general well-being as well as objective measures of strength and imaging of the common extensor tendon within 6 months of treatment of elbow tendinopathy recalcitrant to standard treatments.

Keywords: elbow; tendinopathy; lateral epicondylitis; tennis elbow; recombinant human type I collagen; rhCOL1.
What are the ultrasound features of the trigger finger that may guide management?

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Objectives / Interrogation: To determine dynamic ultrasound features of the trigger finger that may guide the management of the trigger finger. Dynamic imaging was conducted to determine the presence of adherence around and between the flexor tendons.

Methods: 30 trigger fingers and 30 controls from the contralateral hand were examined using high-resolution ultrasound. At a pre-determined anatomical point, the static study investigated the A1 pulley thickness. The dynamic study explored the presence of adhesions around and between the tendons.

Results and Conclusions: The dynamic study yielded findings not previously recorded in medical literature. Firstly, the static study showed that trigger fingers had a thicker A1 pulley as compared to normal fingers. The dynamic study demonstrated that trigger fingers had more adhesions around and between tendons, as compared to normal fingers. Patients with adhesions around the flexor tendons were also more likely to lose differential tendon movement due to adhesions between the tendons. Conversely, those without adhesions around the tendons, were also unlikely to suffer from adhesions between tendons. The dynamic study suggested that the severity of finger stiffness may be reflected by the number of sites with adhesions present, and this may guide future management of the trigger finger.

Keywords: -
Fixation of Dorsal Ulnar Corner Fractures of the Distal Radius Through an Anterior Approach A Prospective Study with CT Documentation

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Objectives / Interrogation: Articular fractures of the distal radius involving a displaced dorsal ulnar corner are problematic and may impact both radiocarpal and/or distal radioulnar joints. Operative treatment may require both volar and dorsal approaches. In this prospective single surgeon study approaching all fractures through only an anterior incision, we have documented the accuracy of reduction comparing preoperative and postoperative axial CT scans and clinical documentation at 12 months post surgery.

Methods: 61 patients with an intraarticular distal radius fracture featuring a splint lunate facet or isolated dorsal lunate facet were treated operatively within 10 days of injury. The surgical approach was the standard FCR exposure without additional release of the tendon. The fracture was reduced using ligamentotaxis, manual manipulation, and a specific radiolucent bone reduction clamp over the dorsal lunate facet. The fixation in each case was done with a 2.4mm Variable Angle Distal Radius Plate System®. Pre and early postoperative axial and sagittal CT scans were used to measure the fracture gap at the sigmoid notch, intraarticular step off, degree of ulnar subluxation, and any screw penetration into the joint.

Results and Conclusions: The CT scans revealed a significant correction of the fracture gap from a mean 2.0mm pre-op to a mean of 0.48mm postoperatively. The mean fracture step was corrected from 1.4mm to 0mm. The mean ulnar subluxation was corrected in each instance with minimal residual subluxation in a limited number of patients. Grade I arthritis changes were found in 14 patients and grade II in 7.

Clinically at an average follow up or 12.6 months, the mean range of motion compared to the opposite wrist was 95% of flexion; 92% of extension; 99% of both supination and pronation.

Conclusion

Using a standard volar approach with the important inclusion of a radiolucent reduction clamp which puts direct pressure over the dorsal lunate facet, we have demonstrated successful reduction of the articular fracture including the sigmoid notch

Keywords:
distal radius, lunate facet
Long term outcome of open reduction and internal fixation of distal humeral nonunions in the older age patient.

List of authors:
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1Massachusetts General Hospital, Harvard medical school (Boston)

Objectives / Interrogation: While arthroplasty offers an alternative in the treatment of complex nonunions of the distal humerus in the older age patient, its longevity remains a concern. In contrast, restoration of the articular anatomy with a successful ORIF may offer a more predictable outcome.
In order to explore this hypothesis, we elected to obtain long term follow-up in a cohort of patients 48 years and older at the time of their operative treatment to gain union.

Methods: Out of a total of 95 patient seen and treated for a distal humeral nonunion by a single surgeon, 23 patients 48 years and over at the time of their index procedure to gain union (range 48 to 67 years). Seventeen were female and 6 male with the dominant limb involved in 15. Five patients were found to have deceased and at the time of writing, 6 were still unable to be located leaving twelve patient available for follow up at an average of l8 years (range 13-24 years) Four nonunions were at the supracondylar level; 7 were combined intra and extraarticular nonunions; and one primarily involved the articular surface of the lateral column. All but two had major capsular contracture with 7 substantial ulnar nerve dysfunction requiring neurolysis and transposition.
Internal fixation required 3 contoured plates in 10 patients with 4 plates and 2 plates in one each. Autogenous iliac crest bone graft was used in 9 patients with a vascularized fibular graft in one to bridge a bony defect.

Results and Conclusions: At an average follow up of 18 years (range 13-24 years), all but one remained united after the index procedure with the one converted to a total elbow arthroplasty after one year. One other patient required a repeat capsular release. The average age at follow up was 76 years (range 61-99 years). Examination revealed an average elbow flexion of 115 degrees with average flexion contracture of 36 degrees. The average Quickdash was 26 and average PROMIS 39.5. The average Mayo elbow score was 84 (range 55-95). The follow up radiographs demonstrated in the majority of patients evidence of mild to moderate arthrosis.
While some residual functional deficits exist with some radiographic changes over time, the results of this group of patients would suggest that a successful ORIF of a distal humeral nonunion including those involving the articular surface will remain durable and offer the patient a functional outcome.

Keywords:
DISTAL RADIOULNAR JOINT REPLACEMENT WITH WRIST ARTHRODESIS A LONG TERM FOLLOW UP

List of authors:
jesse jupiter*¹
¹Massachusetts General Hospital, Harvard medical school (Boston)

Objectives / Interrogation: Radiocarpal or midcarpal arthritis can occur in association with arthritis of the distal radioulnar joint (DRUJ). Surgical correction may include partial or total wrist arthrodesis as well as simultaneous or staged reconstruction of the DRUJ. While the semi-constrained total DRUJ prosthesis has been proven successful for a number of problems of the DRUJ, prior or even simultaneous wrist arthrodesis may present additional technical problems. These include the need for further interosseous membrane release in order to gain better access to the medullary canal of the ulna. If simultaneous procedures are to be considered, which should go first and will the added exposure create risks for soft tissue healing.

Methods: From 1998-2012 15 patients had an arthrodesis of the wrist either followed by or together with a total DRUJ prosthesis. Eight male and 7 female patients were retrospectively reviewed with the dominant limb involved in 11. The average age of the patients at the time of the DRUJ procedure was 45 years with 11 involving posttraumatic conditions and 4 rheumatoid arthritis. The average number of surgical procedures prior to the DRUJ implant was 9. Twelve had the wrist fusion before and 3 after total wrist arthrodesis.

Results and Conclusions: The average follow up was 7 years (range 1-15 yrs) All patients had statistically significant improvement in forearm rotation with 11 having complete forearm function. All patients had a significant decrease in pain at rest and during exercise. The mean DASH score improved from preoperative 77 to postoperative 24 (p<0.01). Complications included later surgery for ulnar sided wrist pain including pisiform excision (3) and triquetrum excision (2). Superficial infection occurred in 2 patients treated with oral antibiotics and one deep infection requiring implant removal and staged reinsertion without recurrence.

Conclusion:
While technically challenging, total semi-constrained DRUJ prosthesis can be effective either after or before total wrist arthrodesis.

Keywords:
The Dorsal Barton Fracture Revisited

List of authors:
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¹Massachusetts General Hospital, Harvard medical school (Boston)

Objectives / Interrogation: Background: The anterior shearing fracture-dislocation long termed the "Bartons"" or "Reversed Barton's" fracture of the distal radius by definition involves the carpual subluxation inferiorly along with a wedge segment of the volar aspect of the radius. The dorsal aspect of the radius will be intact and the radiocarpal ligaments will have ruptured but their volar components remain attached to the carpus. Given that the volar ligaments are considerably stronger than their dorsal counterparts, can the same really be the case with the dorsal equivalent or rather are those lesions truly radiocarpal fracture dislocations?

Methods: We evaluated over 500 consecutive distal radius fractures treated operatively as part of the ICUC APP. All fractures were documented with pre and postoperative radiographs and CT scans and followed for a minimum of one year.

Results and Conclusions: We were unable to locate any instance of a case fulfilling the descriptive criteria of a dorsal Barton lesion (AS/ASIF classification 23-B-2). These criteria being a dorsal marginal distal radius fracture including a posterior subluxation of the carpus and an intact volar cortex. Those cases which at first may have appeared consistent with such a injury will be found to have a component of the volar articular surface displaced with maintenance of some continuity of the volar capsular ligaments from the fracture fragment onto the subluxated carpus. These cases without a volar fracture component should be considered radiocarpal fracture-dislocations which are more complex injuries.

Conclusion: The term "Bartons" fracture should be confined to the volar injury with the apparent dorsal equivalent rather a complex intrarticular fracture or a radiocarpal fracture-dislocation.

Keywords:
Radiocapitellar prosthetic arthroplasty: short-term to midterm results of 19 elbows

List of authors:
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² Department of Orthopaedic Surgery, Sint Maartenskliniek Nijmegen (Nijmegen)
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Objectives / Interrogation: Few studies have discussed the short-term results of radiocapitellar (RC) prosthetic arthroplasty (PA). In this study, we assessed the short-term to midterm functional and radiographic results of elbows after RC PA. Our secondary aim was to assess the survival of the RC PA.

Methods: We included 19 elbows in 18 patients with a mean follow-up of 35 months (range, 12-88 months). Patients were examined for instability and range of motion and were assessed using Mayo Elbow Performance Index and Oxford Elbow Score at any subsequent visits. RC PA was the primary treatment in 16 elbows, and 3 were revision radial head arthroplasty with concomitant capitellar resurfacing.

Results and Conclusions: Results: Range of motion, pain, and functional scores improved significantly from the preoperative to the final follow-up visit. Categoric grouping of the final Mayo Elbow Performance Index outcome scores showed 9 excellent, 5 good, 3 fair, 0 poor, and 2 missing data. However, stability of the elbow remained unchanged. There was no pain in 11 patients, mild pain in 5, and moderate pain in 3. Radiographic assessment showed no significant progress in ulnohumeral arthritis, although 3 elbows showed osteoarthritis progression to a higher grade. There were no major complications, including infection, revision, disassembly of the components, or conversion to total elbow arthroplasty. Survival of the RC PA was 100%.
Conclusion: Elbow arthritis seems to become stationary after RC PA. Symptomatic RC osteoarthritis would probably benefit from RC PA regardless of the etiology

Keywords:
Arthroplasty; arthrosis; elbow; osteoarthritis; prosthesis; radiocapitellar; ulnohumeral
Factors associated with removal of a radial head prosthesis placed for acute trauma

List of authors:
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6 Dell Medical School , The University of Texas at Austin (Texas)

Objectives / Interrogation: PURPOSE:
This study tests the hypothesis that there are no factors associated with removal or revision of a radial head prosthesis. A secondary analysis addressed the time to removal or revision

Methods: METHODS:
We reviewed the database of two large hospitals from 2000 to 2014 and identified 278 patients that had radial head replacement after an acute fracture or fracture dislocation of the elbow: 19 had removal and 3 had revision of the radial head implant within the study period. Explanatory variables including demographics, the type of injury, prosthesis type, surgeon, medical centre, and associated injuries were evaluated. Survival analysis using Kaplan-Meier curves evaluated time to removal/revision

Results and Conclusions: RESULTS:
After adjustment for potential confounders using Cox regression multivariable analysis, hospital was the only factor independently associated with removal or revision (Hazard ratio=2.4, Confidence interval: 1.03-5.8, P value=0.043). The highest proportion of removal/revision was during the first year after implantation and decreased by half each year over the second to fourth years. The most common reason for removal of the prosthesis was to facilitate removal of heterotopic ossification (the majority with proximal radioulnar synostosis) rather than technical error or problems with the prostheses.

CONCLUSION:
These findings suggest that the decision to remove a radial head prosthesis may depend more on surgeon or hospital preferences than on objective problems with the prosthesis. Until clarified by additional study, removal of a prosthesis should not be considered an objective outcome in research. In addition, patients offered removal of a radial head prosthesis, might get the opinion of more than one surgeon at more than one hospital before deciding whether or not to proceed.

Keywords:
Elbow fracture dislocation; Prosthesis; Radial head; Removal; Revision; Survival
clinical trial of comparing the effects of active and passive rehabilitation on flexor tendons repair outcomes in Zone 2

List of authors:
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1 burn research center, Iran university of medical sciences (Tehran)

Objectives / Interrogation: The present study aimed to compare early passive and active mobilization on restoration of zone II flexor tendon injuries.

Methods: This was a prospective randomized, controlled trial including 21 patients, 28 fingers with zone II tendon injuries scheduled for tendon repair and rehabilitation who were randomly assigned to receive treatment either with passive motion (PM group) or with early active motion (AM group) rehabilitation. Patients between 15 to 60 years of age, with sharp rapture of zone II flexor tendon, time of injury before 72 hours, residence in Tehran and suburbs, and informed consent forms were included in the study. Total active range of motion (TAM), power of hand griping and pinching were all measured at six, eight, and twelve weeks of follow-up by a blinded independent hand therapist. Early and delayed complications were also recorded by a blinded evaluator. Patients in the both study groups underwent 24 sessions of rehabilitation therapy.

Results and Conclusions: No significant differences were observed between the two groups regarding the demographic characteristics (P > 0.05). None of the patients in the both groups have had tendon rapture, hematoma and infection. Two patients in AM group had flap necrosis which was not significantly different compared to the PM group (P= 0.476). At the first and second follow-up, 95% of patients in both groups (91% and 100% in AM and PM groups, respectively) had edema which was limited to the fingers area and one patient had edema in the hand. The results of wound healing rates were as follow; in the AM group, nine patients excellent and three patients good; in the PM group, eight patients excellent, one patient good and another one fair. The adhesion formation was reported in 8 cases of PM group which was significantly higher than the AM group (one case) (P = 0.003). Extension lag and flexion contracture were not significantly different between the studied groups. Six weeks after surgery, the mean TAM in the Am group was 189.15 ± 51.84 degrees and in the PM group was 144.87 ± 47.32 degrees which was significantly different (P = 0.026). The means of TAM eight and twelve weeks after surgery were not significantly different between the two studied groups (P = 0.207 vs. P = 0.949, respectively).

Keywords: Early mobilization, Passive Mobilization, Repair of flexor tendons, Zone 2
Adaptive 2 plate used as a monoaxial locking plate has sufficient fixation stability for osteoporotic distal radius fracture equal to Acu-Loc 2

List of authors:
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Objectives / Interrogation: APTUS Adaptive 2 Distal Radius Plate (Adaptive 2, Medartis AG, Basel, Switzerland) is a poly-axial locking plate (PLP) with a variable angle of 15° and is suitable for use in the double-tiered subchondral support procedure. However, it can also be used with an attached drill guide block as a monoaxial locking plate (MLP).
In this study, we compared the initial fixation stabilization of Adaptive 2 used as an MLP with the Acu-Loc 2 Wrist Plating System (Acu-Loc 2, Acumed, Hillsboro, OR, USA).

Methods: This study included 42 patients aged >60 years who were followed-up after surgery for 3 months. In total, 25 cases (mean age, 72 years) were treated using Adaptive 2 (Group AD) and 17 (mean age, 73 years) were treated using Acu-Loc 2 (Group AC).
In the third month after surgery, we took X-rays to compare the reduction loss of radial inclination (RI), volar tilt (VT), and ulnar variance (UV) between the groups.
We defined the distance from the most radial screw tip to the radial styloid process tip as the R-value on the front view of the X-ray immediately after the surgery and the distance from the most ulnar side screw?s superior border to the lunate fossa as the L-value level on the lateral view of the X-ray immediately after the surgery.

Results and Conclusions:

<table>
<thead>
<tr>
<th></th>
<th>AC (n=25)</th>
<th>AD (n=17)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>age in yrs</td>
<td>72.1±6.3</td>
<td>74.6±1.5</td>
<td>0.21</td>
</tr>
<tr>
<td>Female/Male (N)</td>
<td>3/22</td>
<td>0/17</td>
<td>0.51</td>
</tr>
<tr>
<td>Fracture type based on AO/OTA (A/B/C) (N)</td>
<td>5/3/17</td>
<td>3/4/10</td>
<td>0.72</td>
</tr>
<tr>
<td>RI reduction loss (°)</td>
<td>0.6±1.0</td>
<td>0.7±0.6</td>
<td>0.68</td>
</tr>
<tr>
<td>VT reduction loss (°)</td>
<td>0.9±1.2</td>
<td>0.8±1.5</td>
<td>0.83</td>
</tr>
<tr>
<td>UV reduction loss (mm)</td>
<td>1.0±1.1</td>
<td>0.8±1.1</td>
<td>0.56</td>
</tr>
<tr>
<td>R-value (mm)</td>
<td>5.9±1.9</td>
<td>8.0±2.7</td>
<td>0.005</td>
</tr>
<tr>
<td>L-value (mm)</td>
<td>3.7±1.1</td>
<td>3.2±0.9</td>
<td>0.13</td>
</tr>
</tbody>
</table>

Age, sex, and fracture type based on AO classification, all items regarding reduction loss, and L-value were not significantly different between the groups.
Only R-value was significantly smaller in group AD than in group AC (p=0.005); however, there was no correlation between RI reduction loss and R-value.

Adaptive 2 is capable of repairing the radial styloid with just one locking screw and was comparable to Acu-Loc 2 in radial side fixation repair. Adaptive 2 used as an MLP had good initial fixation stabilization that was not inferior to Acu-Loc 2.

Keywords:
Adaptive 2, monoaxial locking plate, reduction loss
The effects of Adipose derived stem cell on optimizing Achilles tendon repair in rat

List of authors:
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¹ burn research center, Iran university of medical sciences (Tehran)

Objectives / Interrogation: Most important factor in having more favorable outcome is strength of repaired tendon and lack of adherence to the adjacent tissues. Various methods have been proposed to improve the process of repair and prevent adhesion. The aim of this study is to survey the effects of adipose derived stem cells on optimizing Achilles tendon repair in rat.

Methods: In this research 36 Sprague-Dawley male rats weighing approximately 250 to 300 grams, were randomly divided into three groups. Autologous fat derived stem cells were prepared from inguinal fat pad of 12 rats. Achilles tendon was cut in all 3 groups. Autologous stem cell was injected into the both cut ends of tendon before repair in the first group. In the second group normal saline and in the third group culture medium without cell was injected in the cut ends of the tendons. Strength and quality of repair were surveyed by tensometry and histopathology evaluation after 30 days of repair.

Results and Conclusions: Results showed that the group of stem cell had the most tendon strength with statistically significant difference to other groups (p-value=0.017). The histopathology indices such as the amount of collagen, fibroblasts and else were not significantly different. Although, metaplasia was more common in culture and normal saline groups than stem cell, but the difference was not significant. (p-value= 0.02). This study showed that stem cells could improve biomechanics of tendon repair without any pathologic changes. Although, it was unexpected to have metaplasia in control and culture groups which necessitates more studies in this field.

Keywords:
Adipose derived stem cells, Achilles tendon, tendon injury, tendon repair
OUTCOME OF A CONSTRAINED ARTHROPLASTY OF THE DISTAL RADIOULNAR JOINT

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Objectives / Interrogation: This study reports the results of 20 patients who have had a replacement of the distal radioulnar joint (DRUJ).

Methods: Between 2010 and 2018 28 patients received an Aptis prosthesis. 20 out of these 28 patients were willing to undergo a final evaluation. We examined the functional outcome and evaluated the DASH, PRWE and VAS score.

Results and Conclusions: The average results of these questionnaires were 33.5 for the DASH score, 38.7 for the PRWE and 4 for the VAS score. The mean flexion and extension were 68° and 57° respectively. The grip strength recovered to 59% and pinch strength even to 71% after surgery compared to the non-operated side. One prosthesis was removed because of persistent pain and synovitis which brought our survival rate to 96.4%.

Since the introduction of this prosthesis good results. In our study we were able to find comparable results with high satisfaction rates.

Keywords:
distal radioulnar joint, wrist, forearm, arthroplasty, DRUG
A nationwide registry study on the epidemiology of scaphoid fractures in Sweden.

List of authors:
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¹ Karolinska Institute (Stockhom)

Objectives / Interrogation: The epidemiology of scaphoid fractures is described only in limited populations and incidence reports are inconsistent. We investigated the nationwide incidence of scaphoid fractures in Sweden 2006-2015.

Methods: Registry data on 34377 patients with a reported scaphoid fracture were evaluated regarding diagnosis, age, sex and treatment. The data was validated by assessing radiographs and medical journals of 300 random patients and incidence rates were adjusted accordingly. The risk for a diagnosed nonunion up to 5-9 years after a scaphoid fracture was analyzed in patients with a scaphoid fracture 2006-2010.

Results and Conclusions: Results: A large proportion (41%) of the recorded scaphoid fractures could not be confirmed (i.e. had a false positive diagnosis). The overall adjusted incidence rate was 22 per 100 person-years. The incidence peaked at 15 years of age in both gender. There was a small but statistically significant decrease in the overall incidence rate in men during the study period. Particularly, the incidence rate decreased in men 20-24 years. 5,3% of the scaphoid fractures had acute surgery, so the vast majority was treated with a plaster cast. Men received surgical treatment to a greater degree than women (6,4 vs. 2,9%). The rate of surgery did not change during the studied period. The risk for a diagnosed nonunion within 5-9 years after a scaphoid fracture was 4,7% for men and 1,4% for women.

Conclusions: The proportion of false positive diagnoses of scaphoid fractures in the Swedish national patient register is high. Scaphoid fractures have decreased in young men. The rate of surgical treatment of scaphoid fractures is higher in men compared to women. Men are more likely to develop a scaphoid nonunion than women.

Keywords:
Epidemiology, scaphoid fracture, scaphoid nonunion
Can the radiologic progression during 1st follow-up visit after closed reduction of distal radius fracture predict the radiologic outcome?

List of authors:
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Objectives / Interrogation: Distal radius fracture (DRF) is usually treated with cast immobilization followed in short-interval to observe any reduction loss. However, there is little information whether radiological collapse at 1st follow-up will be associated with further deterioration of radiological results. Purpose of current study is to follow up the radiological results of DRF in two different groups according to radiologic progression at 1st follow-up visit.

Methods: A retrospective study involving non-operative treatment of DRF in 60 patients was conducted. Displaced fractures underwent closed reduction with immobilization. Radiographs were obtained after reduction, at 5–12 days (1st follow-up) and after union. If the radial inclination was decreased more than 5mm, volar tilt was decreased more than 10°, or ulnar variance was increased more than 2mm at the 1st follow-up visit, compared to post-reduction radiograph, we assumed these patients as radiologic collapse (RC) group. We analyzed the amount of change in radiologic parameters and final ratio of unacceptable radiologic results. Displacement involving volar inclination of > 20°, dorsal inclination of > 10°, or positive ulnar variance of > 2mm were considered as radiologically un-acceptable.

Results and Conclusions: At initial presentation, 39-patients (65%) has unacceptable radiologic parameter and this was improved to 30% after reduction. At 1st follow-up, the number of patients with unacceptable reduction was similar compared to immediate post-reduction (28%). However, we could observe the progression of radiologic collapse in 21-patients (35%) and assigned to RC group At 1st follow-up, 33% of of patients had unacceptable radiological outcome in RC group and it was 26% in non-RC group (P=0.6).

At last follow-up, 62% of patients in RC group had resulted in unacceptable radiologic outcome (29%-increase) and in non-RC group, it was 41% (15%-increase). This difference was not statistically significant (P=0.2). Odds ratio for finally unacceptable radiographic results according to the presence of radiologic collapse was 1.7.

Patients, who had radiologic collapse at 1st follow-up, had resulted in higher prevalence of radiologically-unacceptable union, although there was no statistical significance. Data also showed that even if there was no reduction loss at 1st follow-up, substantial number of patients (28%) had continuing collapse of fracture. These knowledge can be used to explain prognosis.

Keywords:
Wrist, distal radius fracture, cast, follow-up, radiograph
Factors Associated with Conversion to Wrist Fusion after Proximal Row Carpectomy or Four Corner Arthrodesis

List of authors:
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\textsuperscript{1}Massachusetts General Hospital (Boston)

Objectives / Interrogation: This study aimed to investigate the rate of conversion to total wrist fusion (arthrodesis or arthroplasty) in patients that underwent either proximal row carpectomy (PRC) or four-corner arthrodesis (FCA). Additionally, we evaluated the factors associated with conversion to wrist fusion and progression of radiographic arthrosis for patients treated with PRC or FCA.

Methods: We retrospectively identified patients that underwent a PRC or FCA using ICD-9 procedure and CPT codes and verified these by chart review. We included all adult patients (n=266) that were treated at a single institutional system from 2002-2016. The median age was 54 (IQR:45-62) years, and the median follow up was 8.1 (IQR:5.1-11.7) years. Eighty patients underwent FCA, and 186 underwent a PRC. We performed a multivariable logistic regression to evaluate factors associated with wrist fusion, including all explanatory variables with a p<0.10 in bivariate analysis.

Results and Conclusions: There was an increased progression of lunate fossa osteoarthritis in the PRC cohort (20% vs. 2%, p=0.005). The median time to wrist fusion was 16 months (IQR:12.1-37.7) for PRC and 32 months (IQR:19-45) for FCA. Intraoperative posterior and anterior interosseous neurectomy was associated with a lower rate of conversion to wrist fusion (p=0.004) after PRC. Smoking was independently associated with a higher rate of conversion to wrist fusion (OR: 30.9, p=0.017) after FCA.

Although PRC and FCA appear to have similar rates of arthrodesis at mid-term follow-up; PRC appears to demonstrate more radiographic arthritis. A partial denervation of the wrist may delay conversion or lower the rates of conversion to arthrodesis after PRC.

<table>
<thead>
<tr>
<th>Table 1: Main outcomes</th>
<th>Type of operation</th>
<th>( \text{P-value} )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PRC (n=186)</td>
<td>FCA (n=80)</td>
</tr>
<tr>
<td>Reoperations, n(%)</td>
<td>21 (11)</td>
<td>27 (34)</td>
</tr>
<tr>
<td>Conversion to wrist fusion, n(%)</td>
<td>17 (9)</td>
<td>3 (4)</td>
</tr>
<tr>
<td>Complications, n(%)</td>
<td>9 (5)</td>
<td>14 (18)</td>
</tr>
<tr>
<td>Progression of lunate fossa osteoarthritis, n(%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>23 (20)</td>
<td>1 (2)</td>
</tr>
<tr>
<td>No</td>
<td>90 (80)</td>
<td>41 (58)</td>
</tr>
</tbody>
</table>

* Using Fisher exact test
\(^*\)n=155 total; PRC n=113; FCA n=42
### Table 2: Factors associated with conversion to wrist fusion PRC and FCA

<table>
<thead>
<tr>
<th></th>
<th>PRC (n=186)</th>
<th>Conversion to wrist fusion</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes (n=17)</td>
<td>No (n=169)</td>
<td></td>
</tr>
<tr>
<td>Radial styloid resection, n(%)</td>
<td>45 (24)</td>
<td>0 (0)</td>
<td>45 (100)</td>
</tr>
<tr>
<td>Yes</td>
<td>141 (76)</td>
<td>17 (12)</td>
<td>124 (88)</td>
</tr>
<tr>
<td>No</td>
<td>96 (52)</td>
<td>3 (3)</td>
<td>93 (97)</td>
</tr>
<tr>
<td>PIN/AIN Neurectomy, n(%)</td>
<td>90 (48)</td>
<td>14 (15)</td>
<td>76 (84)</td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td>3 (3)</td>
<td>93 (97)</td>
</tr>
<tr>
<td>No</td>
<td>90 (48)</td>
<td>14 (15)</td>
<td>76 (84)</td>
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<tr>
<td>Gender, n(%)</td>
<td>64 (80)</td>
<td>1 (2)</td>
<td>63 (98)</td>
</tr>
<tr>
<td>Male</td>
<td>16 (20)</td>
<td>2 (13)</td>
<td>14 (88)</td>
</tr>
<tr>
<td>Female</td>
<td>5 (6)</td>
<td>2 (40)</td>
<td>3 (60)</td>
</tr>
<tr>
<td>Smoking, n(%)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Yes</td>
<td></td>
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<tr>
<td>No</td>
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</table>

* Using Fisher's exact test
** Independently associated with conversion to wrist fusion in multivariable analysis

Keywords:
wrist; proximal row carpectomy; fusion; arthrodesis; neurectomy
Recurrent Compressive Neuropathies Treated with Neurolysis and Porcine Extracellular Matrix Nerve Wrap

List of authors:
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Objectives / Interrogation: This study evaluated the short- and mid-term results of revision neurolysis and wrapping with porcine extracellular matrix (PECM) (AxoGuard® Nerve Protector, AxoGen Inc.) as an alternative technique for the treatment of recurrent compressive neuropathy after one previous surgical decompression.

Methods: Between 2009-2017, 86 patients, 49 with recurrent carpal tunnel and 37 with recurrent cubital tunnel syndrome, were treated with decompression and PECM nerve wrap. All patients had recurrent symptoms after having previously undergone one surgical decompression. The mean patient age was 56.7 years. The surgery consisted of revision median or ulnar nerve neurolysis and PECM nerve wrapping. All patients were noted to have extensive cicatrix formation around the median or ulnar nerve at the time of revision surgery. A hypothenar fat pad flap was performed as a supplementary procedure in cases of recurrent carpal tunnel, and a minimal medial epicondylectomy was performed in 15 of 37 cases of recurrent cubital tunnel.

Results and Conclusions: The mean follow-up period was 49 months (range, 6-108). Mean patient VAS pain scores significantly improved from 8.4 preoperatively to 1.4 postoperatively. The mean grip strength was significantly increased to 85.4% of the unaffected arm, compared with 41.3% preoperatively. The mean pinch strength improved from 63.2% of the unaffected arm before surgery to 81.6% after surgery. Static two-point discrimination improved from a mean 10.2 mm preoperatively to 7.3 mm postoperatively. 79 of 86 patients demonstrated 2 mm or more improvement in two-point discrimination postoperatively. Electro-diagnostic findings in those evaluated also improved, although not to normal values. There were no postoperative infections or wound complications. One patient with persistent elbow pain but normal electro-diagnostic findings needed further surgery 32 months after the revision cubital decompression and PECM nerve wrap. This patient was treated with revision ulnar nerve neurolysis and autologous saphenous vein nerve wrap after removal of the PECM. Based on our short and mid-term results of 86 patients, secondary decompression combined with PECM nerve wrapping is an effective and safe alternative technique for the surgical treatment of the symptomatic patient with recurrent carpal or cubital tunnel syndrome. This technique may eliminate the possible morbidity associated with autologous tissue coverage for failed nerve decompression.

Keywords: recurrent neuropathies, carpal tunnel syndrome, cubital tunnel syndrome
Comminuted Jersey's finger (flexor digitorum profundus avulsion fracture) treated by plate fixation

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Objectives / Interrogation: Avulsion fracture of flexor digitorum profundus (FDP) tendon is relatively rare fracture at the distal phalangeal base than avulsion fracture of terminal extensor tendon. Terminal extensor avulsion fracture, known as bony mallet finger, could be successfully treated by closed reduction and pinning, such as extension block technique. However, most of FDP avulsion fracture, known as Jersey's finger, needed open reduction, because of the proximal migration of fracture fragment and difficulty of pin fixation. We designed a new surgical technique for comminuted FDP avulsion fracture to treat with plating fixation.

Methods: A 16-year-old male patient visited our out-patient clinic with pain on his right ring finger with limitation of motion. He got a direct injury at finger tip during playing a baseball. On the plain radiograph, large avulsed fragment of distal phalanx was shown at the volar side of middle phalangeal level. And there was another small fragment was shown at the volar side of distal interphalangeal joint level. Magnetic resonance imaging (MRI) had revealed a comminuted FDP avulsion fracture in the ring finger. We performed open reduction. Under digital nerve block, volar zigzag incision was made from distal phalangeal level to proximal interphalangeal joint level. After dissection, A4 pulley was partially injured during proximal migration of FDP avulsion fracture fragment. The comminuted small fragment was too small to be fixated directly. However, the large fragment was large enough to be fixed by plate and screws. We performed internal fixation of large fragment with a two hole plate and two 1.2mm screws (Jeil medical, Korea). And we fixed small fragment by sutures.

Results and Conclusions: After two weeks from surgery, gentle flexion exercise was started. After six weeks from surgery, the range of motion was recovered fully. At the one-year follow-up, the patient had no pain and he had full range of motion. And there was no irritation sign or discomfort at the plate insertion site.
Up to date, most of FDP avulsion fractures were successfully treated by open reduction and internal fixation by suture button or suture anchor technique. However, in some cases with large or comminuted avulsion fragments, fixation with suture button or anchor might be impossible. And if fixation might be possible, their fixation power might be too low to allow early range of motion exercise. Therefore, we designed a new surgical technique to fix with a plate system, and we achieved good result.

Keywords: avulsion fracture, flexor digitorum profundus avulsion, Jersey's finger
HAND INJURIES OF COAL MINERS IN SOUTHERN WEST VIRGINIA WITH A FOCUS ON INJURY LOCATIONS AND DISTANCE ANALYSIS TO TREATMENT FACILITIES

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Objectives / Interrogation: The implementations of coal mining safety policies have helped to decrease the injury rate and fatalities in miners significantly. However, hand injuries remain commonly observed in coal miners. Therefore, this study aims to review ten years of data and describe the incidence rate, prevalence and patterns of hand injuries in coal miners, as well as investigate the specific areas in WV where coal miners have been injured.

Methods: We evaluated patient demographics, coal mining locations, and patient outcomes. This study is a retrospective review of coal mine workers with coal mining hand injuries included in our level-1 trauma database from a study period of January 1, 2005, through March 31, 2015. Data was collected in an Excel-Spreadsheet.Stata-11.2 which was used to conduct a multinomial logistic regression. A hub analysis was performed to understand the overall distance associated with injury site and care using quantum geographic information systems.

Results and Conclusions: Variables collected are as follows:

- The sample size was 104 coal miners.
- Age of the miners ranged from 19-62. Coal mines are registered on our map with relevance to injury based on location; severity scale is presented in our graphic diagram.
- Most common injuries were fractures at 42.3%-47/104 followed by amputations 26.9%-28/104.
- The index finger had an overall higher rate of injury at 28.8%-30/104.

To understand the overall impact of specific injuries of coal miners based on the location, we looked at the number of injuries sustained at particular sites over the 10-year period.

- Within this, the average distance per injury to a medical center that was able to assist with hand injuries was 46.1 Miles.
- The shortest distance was within one mile of the center; The most prolonged distance was 83.3 miles
- To our level-1 center the average time for a patient to be transported to or from injury was one hour

We found that particular coal mines seem prone to more coal mining hand injuries. This analysis will better clarify which coal mines in Southern WV have been able to promote safety awareness and which continue to harbor a dangerous environment.

Keywords: Coal Mining Injuries, Distance Analysis, Quality Improvement, Hand Trauma, Hand Injuries
Persistent Medial Subluxation of the Ulna with Radiotrochlear Articulation

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Objectives / Interrogation: Two patients—one with a terrible triad fracture dislocation and one with an anterior olecranon fracture dislocation—were treated for maltracking of the elbow (medial subluxation). The radial head articulated with the lateral trochlea while the ulnar trochlear notch was perched over the medial trochlea. The late revision surgery could not correct the subluxation because the joints were accustomed to the new alignment, however the overall function was reasonable.

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Keywords: Elbow, Fracture dislocation, Jumped runners, Subluxation
Magnetic Resonance Imaging Correlate Clinical Features of Medial Epicondylitis

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Objectives / Interrogation: Little is known about the relationship between magnetic resonance imaging (MRI) findings and the clinical features or prognosis of medial epicondylitis (ME). We aimed to evaluate the key MRI findings in patients with ME and whether there are any correlations of MRI findings with the clinical features of ME.

Methods: We retrospectively reviewed 83 patients who had undergone elbow MRI examinations for ME and who were available for follow-up after more than 6 months. We selected five MRI findings for qualitative grading: signal changes of the common flexor tendon (CFT) origin, ulnar collateral ligament insufficiency, ulnar neuritis, bony changes of medial epicondyle, and calcification. We correlated these MRI findings with clinical features, such as symptom, history of steroid injection, ulnar nerve symptoms, and pain level at baseline and follow-up.

Results and Conclusions: The most common positive MRI finding was the signal changes on the CFT (66%), and the least common finding was bony changes (18%). Signal intensity of the CFT was found to be correlated with follow-up pain level ($P = 0.008$) and the number of steroid injections ($P = 0.042$). Signal intensity of the CFT was independently associated with follow-up pain level.

This study demonstrates that the changes in signal intensity in common flexor tendon origin is the most common MRI finding in ME. It also shows that the severity of the signal changes can predict follow-up pain level. This suggests that MRI examinations can be helpful in consulting on the prognosis of conservative treatment in patients with ME.

Keywords:
Medial epicondylitis; elbow tendinopathy; elbow MRI; common flexor tendon; ulnar collateral ligament; ulnar neuritis
The Choice of Operation for Young Patients of Kienböck's Disease: A Case Series.

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Objectives / Interrogation: Kienböck's disease is a rare condition in children or adolescent patients, and incidence of these is reported to be less than 1% of the whole of cases. Because of age-related potential for spontaneous remodeling and revascularization, surgical method for young patients should be different from for adult cases. For children, temporary fixation of the scaphotrapezio-trapezoidal (STT) joint would be not only effective but also simple and less invasive, but for late teenagers with epiphyseal closure, radial shortening osteotomy (RSO) would be more reliable.

Methods: We treated 6 cases of children or adolescent patients (younger than 20 years old) of Kienböck's disease. All patients presented in Lichtman stage IIIa. As a treatment, temporary fixation of the STT joint were performed in 3 patients (bilateral in 1). The ages of the patients in this group were 11, 14 and 16 years old. A period of fixation ranged from 8 to 12 weeks. RSO was performed in the remaining 3 patients. The ages of the patients in this group were 14, 15 and 18 years old. Shortening length was 3mm and volar locking plate was used as internal fixation. For an evaluation of blood circulation improvement in the lunate, MRI images (T1WI) were compared pre- and postoperatively. Carpal height ratio and Stähl index in AP view of X ray image, the range of motion (ROM) of the wrist and grip strength were also measured and compared pre- and postoperatively.

Results and Conclusions: In 11 and 14 year-old-patients underwent temporary fixation of the STT joint, improving blood circulation of the lunate was confirmed with MRI. But in a 16-year- old patient, intensity change was not confirmed with MRI at the time of 20 months postoperatively. As a second surgery, RSO were performed and improving blood circulation was confirmed at the time of 25 months after second operation. In all patients underwent RSO primarily, improving blood circulation of the lunate was confirmed with MRI postoperatively. Carpal height ratio, Stähl index, the ROM of the wrist and grip strength were improved in all patients except 1 patient who underwent secondarily RSO. The choice of operation for young patients of Kienböck's disease should be decided by having epiphyseal plate closure or not. Temporary fixation of the STT joint can be useful in the patients before the epiphyseal closure. In contrast, RSO is recommended after the epiphyseal closure.

Keywords: Kienböck's disease, radial shortening osteotomy, adolescent

References:
Aesthetic reconstruction of thumb or finger partial pulp defect with free lateral great toe flap

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Objectives / Interrogation: We retrospectively reviewed the outcomes of reconstruction of thumb or finger partial pulp defect with free lateral great toe flap, and evaluated the outcomes of esthetic and sensory free toe flap reconstructed the digital pulp defects.

Methods: We performed 31 free toe pulp transfers for thumb or finger partial pulp reconstruction in 30 patients from May 2012 to October 2016: 10 men with 11 digits and 20 women with 20 digits. Their mean age was 36 years (21 - 54 years). The defects involved 15 thumbs, 8 index fingers, 4 long fingers and 4 ring fingers. The sizes of the free pulp flaps ranged from 21mm×12mm to 40mm×25mm. The artery and vein were anastomosed in an end-to-end pattern to the recipient vessels. The donor site of great toe was closed primarily or with a full-thickness skin graft from the groin. We used the Semmes-Weinstein monofilament test and the static two-point discrimination test to measure sensory recovery in the transferred pulps and donor sites of toes. We evaluated the esthetic appearance of the reconstructed digits using the Michigan Hand Outcomes Questionnaire. We also measured digital range of motion in the fingers without concurrent bone or tendon injuries.

Results and Conclusions: A total of 30 patients were all reconstructed in a second stage and followed for more than 12 months (average, 18.5 months). All of flaps were survived completely. One patient suffered local infection. Semmes-Weinstein sensitivity score was 2.43 to 3.78 (mean, 3.17) at the flap and 3.78 to 5.86 (mean, 4.93) at the donor sites of toes. The mean static two-point discrimination score was 6.71 mm. The mean esthetic appearance score was 16 according to Michigan Hand Outcomes Questionnaire. We found that 23 digits had extension deficits ranging from 5° to 25° (average, 13°) which compared with the contralateral uninjured digits. The free lateral neurovascular bundles great toe pulp flap is an efficient and reliable flap for the reconstruction of digital partial pulp defects.

Keywords:
free pulp flap, great toe, esthetic, free finger pulp flap
In vivo kinematics of the thumb carpometacarpal joint during flexion and abduction

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Objectives / Interrogation: Screw-home torque rotation is known to occur on carpometacarpal joint of the thumb during the final phase of opposition, but there is no criterion for quantitative measurement of the opposition of the thumb. Therefore, we evaluated the opposition by dividing it into flexion and abduction movements and examined when the movement occurs using CT images.

Methods: The subjects were 10 healthy males aged 23-65 years (mean, 37.3 years). CT images were obtained in 4 equally divided positions during the motion from maximum extension to maximum flexion of the thumb using a supportive device made of Styrofoam. Similarly, images were obtained in 4 positions during maximum adduction to maximum abduction. A three-dimensional model was constructed from the obtained images, and the models of each position were superimposed with reference to the trapezium. A straight line connecting the extension line of the bone axis of the first metacarpal bone at each position with the shortest distance was defined as the rotation axis, and we hypothesized that the first metacarpal bone is translated while rotating around the rotation axis and the bone axis. A movement section from the first limb position to the second limb position is defined as I, from the second limb position to the third limb position as II, and from the third limb position to the fourth limb as III. The amount of angular change around the rotation and bone axes and the translational movement between each position were evaluated.

Results and Conclusions: The amount of angular change around the rotation axis increased as the flexion angle increased during flexion and decreased as the abduction angle increased during abduction. The angular change around the bone axis involved internal rotation in both flexion and abduction, which increased as the flexion angle increased during flexion and was constant during abduction. In terms of translational movement, the first metacarpal bone shifted toward the palm side with respect to the trapezium during flexion, but then moved toward the dorsal side as maximum flexion was approached. During abduction, the first metacarpal bones moved toward the ulnar side with respect to the trapezium regardless of the abduction angle.
In this study, as the flexion angle increased, flexion of the first metacarpal bone and angular change in internal rotation also increased. Hence, the screw-home torque rotation appears to be more prominent in flexion than in abduction.

Keywords: carpometacarpal joint, biomechanics, thumb
Donor site morbidity after sural nerve graft harvesting

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Objectives / Interrogation: At present, autologous nerve graft is considered the best option for peripheral nerve defects. However, sensory disturbance and the pain associated with the harvesting of uninjured nerves are unresolved issues, and reports of donor site morbidity are limited. The purpose of this study was to evaluate donor site morbidity after sural nerve graft harvesting.

Methods: Ninety-one patients underwent autologous nerve graft by harvesting the sural nerve for peripheral nerves defects at our hospital and related facilities. The current address of these patients was determined from the medical records, and 15 patients (10 males, 5 females; mean age at surgery was 47.6 (range, 22-70) years) agreed to participate in a questionnaire-based survey. The time from surgery to the present was 18.5 (range, 1-37) years. The injured nerves included nine mixed nerves, such as the median nerve, and six sensory nerves, such as the digital nerves. The length of the harvested sural nerve was 111 (range, 20-250) mm. Evaluation was carried out using a questionnaire with a 10-point scale. The evaluation items were: 1) sensory disturbance of the feet immediately after surgery and in the present state (0 = no disturbance, 10 = extreme disturbance), 2) pain immediately after surgery and in the present state (0 = no pain, 10 = extreme pain), 3) current functional impairment (0 = no functional impairment, 10 = extreme functional impairment), 4) recovery of nerve defects (0 = unsatisfied, 10 = completely satisfied), and 5) satisfaction with autologous nerve graft (0 = unsatisfied, 10 = completely satisfied).

Results and Conclusions: Sensory disturbance improved from 3.0 ± 3.0 (mean ± SD) immediately after surgery to 2.4 ± 2.5 at present, and pain improved from 2.7 ± 3.6 immediately after surgery to 2.4 ± 3.1 at present, but these differences were not significant. The functional impairment score was 1.8 ± 2.9, while the recovery of nerve defects score was 6.9 ± 2.4, and satisfaction with the autologous nerve graft was 6.9 ± 3.2. Satisfaction with the autologous nerve graft and the recovery of nerve defects were strongly correlated (r = 0.88).
Though donor site morbidity after sural nerve graft harvesting persisted for a long time period after the operation, functional impairment was mild. Moreover, satisfaction was strongly correlated with the recovery of nerve defects. Autologous nerve graft was considered to still be a useful method for cases where a good recovery can be expected.

Keywords:
autologous nerve graft, sural nerve, donor site morbidity
Comparative study on two models of arterialized venous flap in minipigs

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Objectives / Interrogation: Comparison of two models of arterialized venous flap in minipigs with dissecting the cutaneous vessels in minipigs, in order to provide anatomical foundations for arterialized venous flap research.

Methods: Deep superior epigastric artery (DSEA) of minipig was probed by PeriCam PSI System with Laser Speckle Doppler Perfusion Imaging techniques, and two types of arterIALIZED venous flap models were established on the torso integument of minipigs with anatomical techniques. Twenty healthy minipigs were randomized into two groups with self-control bilateral contrast test method, experimental groups(A group): end to side anastomosis was done between DSEA and cutaneous vein of flap; end to end anastomosis was control groups(B group). The area of the flaps were designed approximately 8cm*6cm. Blood flow perfusion (PU) of all the flaps in two groups were probed by PeriCam PSI System at different times.

Results and Conclusions: According to the measurement data of blood flow perfusion, A groups were 83.62±3.14; and B groups were 98.14±6.54. A groups significantly lower than B groups in early postoperative period, especially within 72 hours, that meant the preload of flap of control groups were higher than experimental groups. This study describes the good results obtained with two types of arterialized venous flap models in minipigs, and shows the significant difference between these two types of models in blood flow perfusion. In conclusion, these operative procedures are suitable for set up arterialized venous flap models in minipigs which can provide anatomical basis for the research of arterialized venous flap.

Keywords:
Arterialized venous flap; Models; Minipigs
Randomized controlled trial of limited fasciectomy with injection of lipoaspirate adipose graft in the treatment of Dupuytren's disease

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Objectives / Interrogation: Dupuytren's disease (DD) is caused by the proliferation and differentiation of myofibroblasts. It is believed that the pluripotent property of stem cells present in adipose tissue would inhibit myofibroblast proliferation. The primary objective of this study was to evaluate the effect of stem cell rich fat graft in patients with DD who underwent limited fasciectomy.

Methods: A total of 45 patients, divided into two groups, were studied in a single blind, prospective and randomized clinical trial. All patients underwent limited fasciectomy. In the control group, only limited fasciectomy was performed. In the fat group, limited fasciectomy was performed and a fat graft was injected at the resected cord site. Outcomes were assessed by Total Passive Extension Deficit (TPED) and Brief Michigan Hand Questionnaire (BMHQ) functional score.

Results and Conclusions: Compared at 6 weeks postoperatively, there was a significant increase in pain in the group with fat graft (p = 0.045). The results of the TPED did not show a significant difference between the groups. The BMHQ had worse outcome measures at 6 months and 1 year postoperatively in the group with fat (p = 0.040 and p = 0.047, respectively). Fat group had 43% complications compared to 8% in the control group (p = 0.019).

The use of fat grafting associated with limited fasciectomy promotes worse functional results compared to conventional limited fasciectomy in the short term. However, there remains doubt as to what the long-term results and recurrence rate will be in the future.

Keywords:
Dupuytren contracture; surgical procedures, operative; adipose tissue; adipose tissue/transplantation; fasciectomy; stem cells; randomized controlled trial; clinical trial; hand/surgery; Dupuytren contracture/complications
Restoration of elbow active flexion via monopolar latissimus dorsi transfer in patients with arthrogryposis

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Objectives / Interrogation: One of the main causes of restriction in daily-living activities in patients with arthrogryposis is severe hypoplasia (or aplasia) of biceps brachii. The aim of this research was to estimate the possibility of restoration of elbow active flexion via monopolar latissimus dorsi transfer in patients with arthrogryposis.

Methods: From 2011 to 2018 we performed restoration of elbow active flexion via latissimus dorsi transfer to biceps brachii in 30 patients with arthrogryposis (44 upper limbs). We used clinical examination, EMG donor and recipient sites, CT chest wall and shoulder in different regimes.

Results and Conclusions: The patients were a mean age of 4,0±2,4 years. The follow-up period was 3,2±1,9 months. The follow-up results were estimated in 26 patients (30 upper limbs). The active postoperative elbow motion was 90,5±14,9°. Limitation of elbow extension was in 51% cases (12,8±4,3°) without problem in daily living. Good results were in 55,6%, satisfactory in 33,3%, poor in 11,1% cases.

Our results of latissimus dorsi transfer were comparable with other authors. Transposition of latissimus dorsi to the biceps brachii allows to restore sufficient flexion of the elbow without severe elbow flexion contractures.

Conclusions: We suggest pedicle monopolar latissimus dorsi transfer as a reliable therapeutic option to restore active elbow flexion in patients with arthrogryposis in cases with passive elbow flexion 90° and more before operation and donor muscle strange grade 4 and more.

Keywords: arthrogryposis, elbow, flexion, muscles transfers.
A new way to screw the scaphoid?

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Objectives / Interrogation: Create customized 3-D printed apparatus for percutaneous retrograde screw fixation of scaphoid fractures (the Fixation Approaches to Scaphoid Trauma, FAST, Procedure) is more accurate, faster, and has less radiation exposure to the surgical team than fluoroscopy-guided percutaneous fixation. We describe in this presentation our process development of this guide.

Methods: We devised a complete system that allows the surgeon to define an optimal insertion point and trajectory on 3D renditions of CT data, and then to construct a guide to position a k-wire in the desired trajectory in cadaver arms. After defining the intended insertion point and trajectory, a 3D printer is programmed to produce the components that perfectly guides a K-wire into the intended position. We developed 4 different models during the process. With this system, we conducted experiments in which orthopedic residents placed casts outfitted with special openings (windows) designed to accommodate the k-wire guides on 7 cadaver arms. Following casting, pre-op CTs were acquired and treatment planning to define the k-wire trajectory was done. Custom guiding inserts were designed based on 3D models of the skeleton and stereolithography (STL) files suitable for 3D printing were produced and made into guide blocks. Finally, the residents placed the blocks into the windows and inserted the k-wires in place. Post-op CTs were used to verify the correct placement of the k-wires and we were able to confirm correct position in all 14 cases.

Results and Conclusions: We first developed an optimal model. We then tested this with resident surgeons. We found that:
FAST is Faster (30 seconds versus 21 minutes)
FAST is More Accurate (all within central axis of the scaphoid)
FAST has no radiation exposure to the surgeon
FAST Procedure planned trajectory courses along the exact planned path (Figure 1)

The FAST Procedure is a faster, more accurate, and more reliable way to perform percutaneous pinning for orthopaedic residents. We present the steps that we took to produce this technique.

Keywords:
Scaphoid fracture, 3D printing, targeting guide
Pharmacologic Prevention of Contractures in Neonatal Brachial Plexus Injury

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Objectives / Interrogation: Contractures in neonatal brachial plexus injury (NBPI) are caused at least in part by impaired growth of denervated muscle, but the mechanism of this impaired growth is unknown. This study uses a mouse model of NBPI to assess muscle protein imbalance (synthesis vs. degradation) as a novel potential target to prevent contractures in NBPI.

Methods: Unilateral C5-T1 NBPIs were surgically created in 5-day-old mice, which reliably causes shoulder and elbow contractures 4 weeks post-NBPI. Protein synthesis was measured in denervated and contralateral control elbow flexor muscles 1-4 weeks post-NBPI by puromycin incorporation and by RNA and protein levels of major muscle proteins. Protein degradation was measured by K48-linkage specific polyubiquitin and RNA levels of protein degradation markers. Bortezomib, a 20S proteasome inhibitor, was then administrated systemically for 4 weeks post-NBPI to inhibit protein degradation. Contractures were measured 4 weeks post-NBPI, and muscles were assayed for proteasome activity and growth.

Results and Conclusions: NBPI did not reduce muscle protein synthesis, either in overall puromycin incorporation or in RNA and protein levels of specific major structural and contractile proteins. However, NBPI increased protein degradation, with a doubling of polyubiquitination and increased expression of MurF1, a driver of proteasome-mediated protein degradation. Bortezomib effectively prevented shoulder and elbow contractures following NBPI (p<0.001, Figure 1). Bortezomib also blunted the denervation-induced increase in proteasome activity (p<0.001), and rescued muscle growth in volume (p<0.0001), cross-sectional area (p<0.001), and length (p=0.03).

Keywords:
Brachial Plexus, contracture, denervation, muscle growth

Figure 1: Prevention of contractures with bortezomib+[Gly14]-humanin. A) Representative images of elbow and shoulder contractures (left side denervated) in mice treated with saline and bortezomib. B) Contractures measured as difference in degrees of range of motion between denervated and contralateral control limbs, blinded to treatment group. [Gly14]-HN, given to limit bortezomib toxicity, had no effect alone. *p<0.001

Thus, contractures in NBPI are caused by increased muscle protein degradation counteracting normal protein synthesis. Proteasome inhibition improves growth of denervated muscle and prevents contractures. This study therefore identifies the pathophysiology of contractures in NBPI and demonstrates the first successful pharmacologic strategy to prevent these contractures by targeting a causative molecular mechanism.

Keywords:
Brachial Plexus, contracture, denervation, muscle growth
A Unique Retractable Guide Block Used in Volar Locking Plate Fixation for Distal Radius Fracture

List of authors:
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Objectives / Interrogation: Volar locking plate fixation is one of the most common surgical treatments in distal radius fracture. Careful attention during placing the plate and fixating the fracture needs to be payed not to injure soft tissues, especially median nerve, radial artery and flexor pollicis longus (FPL) tendon. To make sure the soft tissues are protected, we use a unique retractable guide block (RGB). The aim of this study is to introduce this guide block and the clinical results.

Methods: The retractable guide block has each screw and Kirschner - wire holes, covers the whole plate except distal ulnar screw hole, and has enough height to retract from the bone level to the skin level. The subjects were 84 wrists of 84 cases that underwent volar locking plate fixation for distal radius fracture with a retractable guide block. 24 were male and 60 were female, the mean age was 69 years old (range 19 - 91), 42 were right hands and 42 were left hands. According AO classification, type A2 were 17, type A3 were 21, type B3 were six, type C1 were eight, type C2 were 26, and type C3 were six. The median observation periods were 364.5 day (187.5 - 407 day), the mean operation time was 65.4 minutes (SD 20.8), and the median loss of correction on X-ray was 0 degree (range 0 - 13). The number of surgeons of clinical fellow year were 10 in first year, 14 in second year, 16 in third year, 12 in fourth year, and 32 in fifth year and older. Each year of surgeon treated any AO type fracture with no difference statistically. We retrospectively examined the difference of operation time, the loss of correction on X-ray, and complication according to AO classification.

Results and Conclusions: Results: Neither operation time or loss of correction was statistically different among AO classification. One complication was observed, which was one screw protrusion into articular surface during the time course. Conclusion: Owing to the shape of RGB, the risk of injuring soft tissues such as median nerve and FPL tendon is very low. In addition, the data of the operation time and the loss of correction indicated the probability of stable performance regardless of AO classification. Conclusion: We introduced a unique retractable guide block that has potential for safety and stability in surgical performance.

Keywords:
retractable guide block, distal radius fracture, volar locking plate fixation
Single incision for tendon transfer in Radial Nerve Palsy

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Objectives / Interrogation: One of the drawbacks of the tendon transfer surgery for radial nerve palsy is the resultant multiple scars of the forearm. To overcome this problem we have adopted a single incision technique by harvesting all the tendons and performing the tendon transfers.

Methods: This improves the aesthetic outcome of the tendon transfer surgery. The functional results of the tendon transfer surgery are not compromised by the single incision. The patients were satisfied with the end results of our modification.

Results and Conclusions: We are describing the planning and execution of the tendon transfer surgery using our modified technique and presenting our results of the procedure.

Keywords:
Single incision - tendon transfer - radial nerve palsy
Making five fingered hand in Type III B thumb hypoplasia

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Objectives / Interrogation: Pollicisation remains the gold standard of thumb reconstruction in Type III, IV & V thumb hypoplasia worldwide. Due to cultural differences, Asian parents prefer to have a five fingered hand in Type III B thumb hypoplasia.

Methods: To satisfy these parents, we have developed a novel method to reconstruct the existing hypoplastic digit. A free toe phalangeal bone from third or fourth toe is used to reconstruct the thumb metacarpal in the first stage and a opponensplasty using abductor digiti minimi is performed in the second stage to provide opposition.

Results and Conclusions: We are presenting the technique of thumb reconstruction in Type IIIB thumb hypoplasia and discuss the functional results of our reconstructive procedure and future options.

Keywords: -
A novel method of finger tip reconstruction with composite graft

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Objectives / Interrogation: Finger tip amputations remain a challenge to the reconstructive hand surgeon to restore the lost nail bed. Reimplantation is ideal but may not be possible in all occasions of amputation at terminal phalangeal level.

Methods: A novel method of finger tip reconstruction was performed using a composite graft of nail bed and sliver of terminal phalanx with a cross finger flap. The procedure was carried out in a series of patients and the results were analysed.

Results and Conclusions: We would like to present our indications for the procedure, technical considerations of the reconstructive surgery and discuss the results and functional outcome of this reconstructive option.

Keywords: 

Percutaneous needle fasciotomy in Dupuytren disease: A follow up of the direct outcomes considering recurrence and complications

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Objectives / Interrogation: Background: The treatment of Dupuytren's contracture with needle fasciotomy is subject of controversial debates due to the high recurrence rate. The present study evaluates the results of a technique of percutaneous needle fasciotomy as a less invasive, less time-consuming and less risky alternative to conventional fasciectomy and found ways to reduce the recurrence rate significantly.

Methods:
Patients and methods: In 2008 to 2018, 81 rays in 64 patients with Dupuytren's contracture were treated using the technique of the 'Percutaneous Needle Fasciotomy' (PNF). With the Classification of Tubiana 38 rays Stage I, 29 Stage II, 12 rays Stage III and 1 Stage IV were categorized. PNF was performed using without local anesthesia at several levels in the palm.

Results and Conclusions:
Results: Within the retrospective study 53 patients (68 rays) were reviewed. The mean age of the patients was 63.65 years. The recurrence rate was 18.86. 49 patients with 62 rays had a totally free extension in the follow up (92.4%). All patients, except one who was jobless were able to return to their job in an average of 5.5 days.
Conclusion: The technique of 'Percutaneous Needle Fasciotomy' (PNF) is reliable and relatively simple to perform, when compared to the open aponeurectomy. The rate of complications is low. The time of operation and period of recovery is shorter than for the conventional technique. The recurrence rate of this study is significantly less compared to the literature.

Keywords: -
The economic impact of anaesthesia methods used in hand surgery: global costs and operating room's throughput

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Objectives / Interrogation: There are now growing interests worldwide for the wide awake approach to hand surgery. We hypothesized that using the "wide awake, local anaesthesia and no tourniquet" (WALANT) approach would result in lower global costs and in an increase of the operating room's efficiency when compared to other types of anaesthesia: axillary brachial plexus block and intravenous regional Anaesthesia

Methods: All cases of single carpal tunnel release and trigger finger release performed between January 2016 and December 2017 in an ambulatory surgery center in Switzerland were divided into three groups, depending on which anaesthesia method was used. Total operating room occupation time, surgical time and the "all but surgery" time were analysed. A common minimal bill per anaesthesia was generated using multiple bills sent to insurance companies.

Results and Conclusions: WALANT allows for an increase in the operating room's throughput by having shorter occupation times than other methods (17.5-33% depending on the procedure and anaesthesia). Costs of the two procedures are reduced by 21-31% when using WALANT. Preferring WALANT for some procedures in hand surgery has a notable beneficial impact on the costs and on the operating room's efficiency. This effect is more evident on short surgical procedures where the surgical time is only a small portion of the total operating room's occupation time.

Keywords:
**A new computational approach for fully automatic 3D preoperative planning of forearm osteotomies**

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**Objectives / Interrogation:** Despite available technologies for planning of surgical treatments, definition of an optimal preoperative plan for complex forearm osteotomies can take up to 6 hours, requiring several adjustment iterations. Existing automatic approaches often fail to provide surgeons with ready-to-use solutions that can be implemented without further adjustments. Thus, clinical times and costs of computer-assisted planning remain too high, limiting its clinical use. A new computer algorithm has been developed to provide surgeons with complete preoperative planning solutions encompassing the position and orientation of the osteotomy cut, the required reduction of the bone fragments, and optimal positions of the fixation plate and screws. Goal of this study was to evaluate the capability of our approach to generating planning solutions that can be directly used in the clinical setting, without requiring further manual tuning.

**Methods:** 38 patients who underwent corrective osteotomy (14 distal radius, 24 shaft) were included in the study with baseline data: affected side: 19 left, 20 right; gender: 20 males, 19 females. The developed algorithm was based on artificial intelligence and statistical shape models. Additionally, bone density of each patient was considered for the automatic implant optimization. A clinical validation compared solutions generated by the algorithm (OA) against manually generated 3D preoperative planning by expert surgeons, considered as the gold standard (GS). Both solutions were blinded and presented to 6 expert hand surgeons, who had then to choose the better operative plan for each case. A technical evaluation was also done, comparing reduction accuracy, position of implant relative to the bone fragments and screw purchase.

**Results and Conclusions:** Clinical validation showed that surgeons favored OA solutions to be better than the corresponding GS solutions in 60% of the tested cases. Subsequent technical evaluation indicated an improvement of 40% on the reduction accuracy, 60% on the implant position and 80% on the screw purchase, in comparison to GS solutions. OA solutions particularly outperformed the GS in cases with a difficult fixation, further improved when considering variable-angle screws.

The presented computer approach allows generating complete solutions for patient specific pre-operative planning of distal and shaft radius osteotomies, which can improve planning times and help assist surgeons on better surgical decisions.

**Keywords:**
Forearm Osteotomy, Preoperative Planning, Computer-Assisted, Optimization
Radial head Resection and Hemi-interposition vs "functional radial head resection" with a computerized ring fixator in patients with chronic missed Monteggia pathology: a prospective analysis.

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Objectives / Interrogation: Chronic "missed" Monteggia pathology is characterized by mild flexion deficit due to abutment of the radial head, progressive cubitus valgus with/without ulnar neuropathy, radiocapitellar arthrosis and pain. In a prospective patient series in 2 tertiary reference centers for this pathology in adolescents and young adults, i.e. in chronic Monteggia lesion with deformity and hypertrophy of the radial head either a radial head resection and hemi-interposition with local capsule tissue or a "functional radial head resection" after Slongo with a computerized ringfixator programmed for angular correction and concomittant lengthening of the ulnar with transfixation of radius and ulna were performed and prospectively evaluated.

Methods: 20 patients (14 M, 6 F, ∅ age 16 years, range 14-25 years), all with the diagnosis of chronic Monteggia with clear deformity and arthrosis of the radial head were included in the study. After thorough clinical assessment and counselling of the Patient and the family one of the afore mentioned procedures (14 resection hemi-interpositions vs 6 "functional radial head resections") were performed by 2 senior upper extremity reconstructive consultant surgeons. At FU and final FU (minimum 2 years, ∅ 5 years, range 2-8 years), function, RUJ- and DUJ stability, q-DASH, PRWE, 2 quality of life scores and and cost analyis were performed.

Results and Conclusions: There were no procedure related complications in the resection hemi-interposition group i.e. no damage to the deep branch of the radial nerve or postoperative instability. There were 2 fixator related complications, one pinsite infection resolving by antibiotics and one aseptic loosening of a radial halfpin treated by resiting of the pin, both occurring during the consolidation period. In all computerized corrections the preplanned goal was reached. 2 patients in the resection group reported mild problems at the distal radioulnar joint (moderate ulnar head abutment) and 1 patient did experience pain at the proximal end of the radius. At final FU elbow function and forearm rotation improved equally, most significant in flexion and pronation. ∅ q-Dash and PRWE improved in both groups, all patients did have better quality of life score at final FU. All patients but one (resection group) would undergo the procedure again.

Both resection interposition and computerized "functional radial head resection" can be performed to alleviate the symptoms and treat the motion deficit in patients with chronic Monteggia pathology.

Keywords:
chronic "missed" Monteggia, Resection hemi-Interposition, "functional radial head resection", computerized ring fixator
Changes in joint distance during flexion and abduction of the thumb carpometacarpal joint

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Objectives / Interrogation: Although osteoarthritis of the thumb carpometacarpal (CMC) joint is common, the effect of thumb movement at the joint surface remains unclear. The purpose of this study was to examine the changes in joint distance during flexion and abduction of the thumb by computed tomography (CT) at multiple positions.

Methods: The subjects were 5 healthy men (mean age 44.4±14.9 years). CT images of one hand of each subject were obtained during motion of the thumb from maximum extension to maximum flexion, taken at 4 equally divided positions using a supportive device made of Styrofoam. Similarly, images were obtained in 4 positions during movement from maximum adduction to maximum abduction. A three-dimensional model was constructed from the images, and the joint distance at each position was measured. Solidworks was used as the analytical software, and a measurement perpendicular to the metacarpal joint surface was used as the joint distance.

Results and Conclusions: The minimum joint distance became smaller as the joint flexed from the extended position. The mean minimum joint distance was decreased from 0.66 mm in the extended position to 0.51 mm in the flexed position, but this change was not statistically significant. In the flexed position, the joint distance became smaller on the volar and ulnar sides of the metacarpal joint surface. The minimum joint distance also became smaller as the joint abducted from the adducted position. The mean minimum joint distances was significantly decreased from 0.71 mm in the adducted position to 0.34 mm in the abducted position (p<0.05). In the abducted position, the joint distance became smaller on the volar side of the metacarpal joint surface. Movement of the thumb CMC joint consists of a complex balance of a saddle joint, ligaments, muscles, and tendons. However, its specific movement has been under-investigated. Some studies report that wear of the thumb CMC joint occurred on the volar side of the metacarpal joint surface. However, in our study, as the thumb joint flexed or abducted, the joint distance decreased. Moreover, in the flexed and abducted positions, the joint distance on the volar side was smaller. Importantly, this movement is involved in the occurrence and progression of osteoarthritis of the thumb CMC joint.

Keywords:
thumb carpometacarpal joint, joint distance, biomechanics
Motor innervation pattern of C7 nerve root and clinical study of its reinnervation in BPAI

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Objectives / Interrogation: Contralateral C7 (CC7) nerve root has been utilized as a more prevailing procedure for treating not only disastrous peripheral nerve injuries such as brachial plexus avulsion injury (BPAI), but also spastic arm paralysis in central hemiplegic patients, with promising results reported from many centers. The premise of this procedure is that harvest of C7 nerve root would not cause permanent functional loss in the healthy extremity. However, the relative motor contribution of C7 innervation to the overall function of the upper limb remains unknown, as well as the recovery assessment of specific muscles. In the present study, cadaveric and clinical investigations were combined to delineate the motor innervation pattern of C7 nerve root and to ascertain the extent of functions that can be regained by reanimation of the C7 myotome through CC7 nerve transfer in a completely paralyzed limb suffering from BPAI.

Methods: In the anatomical study, we dissected C7 nerve root in eight embalmed adult cadavers bilaterally, and traced its branches to the muscles. In clinical study, CC7 to C7 nerve transfer was performed on eight patients with BPAI. Outcomes were evaluated by electromyography study and the muscle strength.

Results and Conclusions: Anatomically, consistent and predominantly C7-derived nerve fibers were found in the lateral pectoral, thoracodorsal and radial nerve. The average distance from the C7 nerve root to the lateral pectoral nerve entry point of the pectoralis major was 10.7 ± 1.5 cm which was the shortest. In the clinical study, for the electromyography study, compound muscle action potentials were recorded in all the muscles mentioned above. After an average follow-up of 37 months, it was found that seven out of eight patients regained M3 or higher power for shoulder adduction and elbow extension. Three patients regained M3 wrist extension. All patients were recorded the recovery of finger extension but the muscle strength was not stronger than M2. C7 nerve root provides consistent and dominant contributions to the lateral pectoral nerve, thoracodorsal nerve and long head of triceps branch of radial nerve. For BPAI patients, after successful reinnervation of C7 nerve root, satisfying shoulder adduction and elbow extension could be anticipated, while the recoveries of wrist and finger extensions are poorer.

Keywords:
C7 nerve root, brachial plexus avulsion injury, nerve transfer, motor innervation pattern
Bilateral Elbow Extension Contracture in a Child with Arthrogryposis A VERY RARE OCCURRENCE

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Objectives / Interrogation: Arthrogryposis is characterized congenital contractures of two or more joints1,2. The term arthrogryposis multiplex congenita is used to describe a large heterogeneous group of disorders, and it has been subdivided into syndromic arthrogryposis, distal arthrogryposis, and classic arthrogryposis (amyoplasia). The degree of stiffness and weakness ranges from mild to severe and is not progressive. Elbow dysfunction poses a substantial functional limitation for these children2,9-11. With the elbow stiff in extension, they cannot bring the hand to the mouth to feed them or attend to facial hygiene. The goal of treatment for children with arthrogryposis is to improve their quality of life by facilitating functional independence.

Methods: 1.5yr old female child born out of non consanguineous marriage came to our OPD with parental concerns of bilateral upper limb deformity. Though she had almost 90° of range of motion in her right shoulder but no movement was possible at elbow. The X-Ray findings revealed normal elbow joint and MRI showed Normal alignment of bilateral elbow joint with complete atrophy of muscle in anterior compartment both arm. Posterior capsulotomy with triceps lengthening (v-y) was performed for both elbow joints.

Results and Conclusions: Result: Posterior capsulotomy with triceps lengthening (v-y) was performed first on right side and followed by similar surgery on left side after 3 months. The duration of follow-up was 3 years in this case. The arc of motion of elbows improved from 0° preoperatively to 110° at the time of final follow-up. The child was able to reach the mouth without passive assistance and is able to feed herself independently. The child do not underwent any subsequent tendon transfer surgery.

Conclusions: Elbow capsulotomy with triceps lengthening successfully increases elbow flexion and the arc of elbow motion of children with arthrogryposis, enabling hand-to-mouth activities. From this our main emphasis is that one can be benefited to very extent with elbow capsulotomy and triceps lengthening and one should be little careful while doing or selecting tendon transfer for example in this case Latissimus Dorsi was not working, and we could not use pectoralis major, while performing triceps to biceps could result in flexion contracture deformity which is more cumbersome for patient as it restrict free out reach of hand and table top activity such as use of computer which has become a necessity in today’s world.

Keywords:
Elbow joint; Contracture; Extension; Congenital; Surgical release; Children.
Shorter Rehabilitation after Extensor Pollicis Longus Reconstruction Combining Modern Suture Technique and New Rehabilitation Protocol

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Objectives / Interrogation: Reconstruction of Extensor pollicis longus (EPL) function is realized by transferring the tendon of the Extensor indicis (EI) to the distal part of the EPL. Common suture techniques combined with established rehabilitation protocols have proven to achieve good results. However, patients regularly experience an impairment of the operated hand for three months. In addition established rehabilitation protocols tend to be complex and depending on substantial support from hand therapists.
Compared to common suture methods newer Side-to-Side (STS) suture techniques provide improved strength and have been successfully implemented for tendon transfers.
Hypothesis of this prospective study is that the combination of a Side-to-Side suture technique with a straightforward active rehabilitation protocol based on the increased suture stability simplifies and shortens time of rehabilitation after EPL reconstruction.

Methods: Between 11/2015 and 04/2017 we treated a series of 10 patients, median age 56 (range 18-70) after spontaneous EPL-rupture using STS suture technique for EI to EPL transfer. For postoperative rehabilitation we implemented a simplified Controlled-Active-Motion protocol. Clinical follow up was at 2, 4 and 8 weeks postoperatively and additionally one year later by phone. Primary endpoints were the unrestricted use of the operated hand and major complications, defined as tendon rupture or relevant tendon elongation. We reported on patient satisfaction and pain. As objective parameter active range of motion of the thumb and index finger as well as pinch and grip strength were measured.

Results and Conclusions: Results: All 10 patients underwent surgery and postoperative rehabilitation without complication. All patients were satisfied with the treatment 8 weeks and one year postoperatively. All were back to work after 8 weeks or could use the operated hand without any restriction. At 8 weeks all patients achieved a powerful active extension of the IP-joint of the thumb. Pinch- and grip- strength reached on average 83% and 81% of the contralateral side. There was no lost to follow up.
Conclusion: Despite the small patient group and the relative short follow up the results suggest that the Side-to-side suture technique in combination with an adapted active rehabilitation protocol provides a safe and successful method for EPL-reconstruction. Compared with the current literature this concept shortens time of rehabilitation by a third.

Keywords:
Tendon transfer; Extensor pollicis longus (EPL) reconstruction; Side-to-side suture technique
Management and outcome of acral soft tissue sarcoma

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Objectives / Interrogation: Aim
The aim of this study was to evaluate the surgical management and outcomes of patients with acral (peripheral extremity hand or foot) soft tissue sarcomas.

Methods: Methods and Patients
We identified 63 patients with acral soft tissue sarcomas who presented to a tertiary referral sarcoma service (27 hands and 36 feet). Mean age was 49 (35 males and 28 females). The commonest sarcoma subtypes were epithelioid in the hand (8 patients) and synovial in the foot (11 patients).

Results and Conclusions: Results
In 41 patients (65%) the tumour size was less than 5cm in its largest dimension (median size 3cm). 27 patients (43%) were diagnosed after inadvertent excision prior to their referral to the specialist sarcoma unit. After biopsy and staging, primary surgical intervention at the sarcoma unit was excision and limb salvage in 43 (68%), partial (digit or ray) amputation in fourteen (22%) and more proximal amputation in six (10%). At final follow up, local recurrence had been treated by one partial amputation and six amputations, resulting in a partial amputation rate of 24%, and the proximal amputation rate to 19%.

The rate of local recurrence was 19% and the 5 year survival was 82%. Patients who underwent inadvertent excision demonstrated no statistically significant difference in survival or local recurrence, but underwent a higher rate of amputation (p=0.008). Large tumour size (>5cm) was associated with lower survival (p=0.04) and a higher risk of local recurrence (p=0.009).

Conclusions
The majority of acral soft tissue sarcomas are smaller than 5cm at presentation, indicating that whilst size can be a useful prognostic factor, it should not be used as a diagnostic threshold for referral. Increased tumour size is associated with a higher rate of local recurrence and reduced survival. Sarcoma excision with limb preservation does not result in an increased risk of local recurrence.

Keywords:
sarcoma, acral, soft tissue, hand, foot
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Objectives / Interrogation: Previous biomechanical studies of LCL injuries and their surgical repair, reconstruction and rehabilitation have primarily relied on gravity effects with the arm in the varus position. The application of torsional moments to the forearm manually is not reproducible; hence studies to date likely do not represent forces encountered clinically. The aim of this investigation was to develop a new biomechanical model to quantify posterolateral stability of the elbow.

Methods: Six cadaveric arms were mounted in an elbow motion simulator in the varus position. A threaded screw was inserted on the dorsal aspect of the proximal ulna and a weight hanger was used to suspend 400g, 600g, and 800g of weight from the screw head to allow torsional moments to be applied to the ulna. An LCL injured (LCLI) model was created by sectioning of the common extensor origin, and the LCL. Ulnohumeral rotation was recorded using an electromagnetic tracking system during simulated active and passive elbow flexion with the forearm pronated and supinated.

Results and Conclusions: During active motion with the forearm pronated, the addition of weights did not significantly increase the external rotation (ER) of ulnohumeral articulation (10.0±7.0°, P=.268 400g; 10.5±7.1°, P=.156 600g; 11.0±7.2°, P=.111 800g) compared to the LCLI (8.4±6.4°). However, with the forearm supinated, the addition of 800g but not 400g and 600g significantly increased the ER (8.2±5.7°, P=.083 400g; 8.7±5.9°, P=.054 600g; 9.2±5.9°, P=.038 800g) compared to the LCLI (5.9±5.5°). During passive motion with the forearm pronated, the addition of 600g and 800g but not 400g resulted in a significant increase in ER (9.3±7.8°, P=.103 400g; 11.2±6.2°, P=.004 600g; 12.7±6.8°, P=.006 800g) compared to the LCLI (3.7±5.4°). With the forearm supinated, the addition of 400g, 600g, and 800g significantly increased the ER (11.7±6.7°, P=.031 400g; 13.5±6.8°, P=.019 600g; 14.9±6.9°, P=.024 800g) compared to the LCLI (4.3±6.6°).

Conclusion
This novel biomechanical model demonstrates that the application of even small amounts of torsional moment on the forearm with the arm in the varus position exacerbates the rotational instability seen with the LCL deficient elbow. This new model allows for a more provocative testing of elbow stability after LCL repair or reconstruction, allowing smaller sample sizes to be used while still demonstrating clinically significant differences. Future biomechanical studies evaluating LCL injuries, repair and rehabilitation should consider using this testing protocol.

Keywords:
Torsional moment, weight, elbow, instability, lateral collateral ligament, PLRI, kinematics
Polyaxial Locking Plating for Volarly Displaced Intra-articular Fractures of the Distal Radius

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Objectives / Interrogation: Volarly displaced intra-articular fracture of the distal radius with volar lunate facet fragments are very difficult for internal fixation. The object of this study is to evaluate the results following polyaxial locking plate fixation of the fractures.

Methods: A retrospective study was conducted to identify patients who had been treated with polyaxial locking plates (Aptus2.5 plate, Medartis, Basel) for unstable volarly displaced intra-articular fracture of the distal radius. 49 patients 51 wrists were identified with an average age of 63.3 years old and with an average follow-up period 12.3 months. Fracture types were classified type B3 30 cases, C2 7 cases, C3 14 cases in AO classification. We evaluated various parameters with X-rays included calcral translation, size of volar lunate facet fragments and coverage rate of locking plate with CT, range of motion, and Mayo modified wrist score.

Results and Conclusions: All fractures were united. Final ulnar variance averaged 0.6mm, radial inclination was 21.7º, and volar tilt was 13.4º and carpal translation was corrected except initial 2 cases. The average range of motion were: flexion-extension 124° (94.8% of the opposite extremity); pronation-supination 172° (95.1%); grip strength was 12.4 kg (72.1%). There were no complications. Mayo modified wrist score were averaged 88 points.

This study for unstable volarly displaced intra-articular fracture of the distal radius, resulted in union, good to excellent alignment and wrist motion. Especially, polyaxial locking plate fixation enabled to place plate distally by changing of the screw direction. This feature leaded to stabilize volar lunate facet fragments by buttress effect. Polyaxial locking plate fixation were very useful for the fractures.

Keywords:
distal radius fracture, volar lunate facet fragment, polyaxial locking plate
Aging Affects Tenogenic and Chondrogenic Gene Expression in Mouse Intrasynovial Tendons

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Objectives / Interrogation: It is well known that aging alters the musculoskeletal system, resulting in tissue degeneration and age-associated injury and disease. Tenosynovitis is also considered to be an age-associated intrasynovial tendon disease. However, little is known about the pathogenic mechanism of tenosynovitis and its relation to tendon degeneration during the aging process. Senescence accelerated mouse (SAM) P6, a strain with low peak bone density, is an osteoporosis and senescence model mouse. The purpose of this study is to investigate age-related changes in SAMP6 mouse intrasynovial tendon.

Methods: Eighty hind paws were obtained from forty mice: ten 8-week SAMR1 mice, ten 8-week SAMP6 mice, ten 24-week SAMR1 mice, and ten 24-week SAMP6 mice. SAMR1 mice were used as controls for SAMP6 mice. The right side hind paws of each mouse were used for real-time PCR. Relative expression levels of scleraxis, tenomodulin, collagen type I, Sox9, Sox5, Sox6, and aggrecan were compared. The left side hind paws were used for histological analyses and immunohistochemical analyses with anti-tenomodulin and anti-aggrecan antibody.

Results and Conclusions: Gene expression analysis for tenogenic marker showed decreased expression of tenomodulin and collagen type I and slightly increased expression of scleraxis in DDF tendons of 24-week SAMR1 and SAMP6 mice compared with 8-week SAMR1 and SAMP6 mice. There was no statistical difference between SAMR1 and SAMP6 in each week. Analysis for chondrogenic marker showed that Sox9 and Sox6 expression in DDF tendons of SAMP6 was higher than in SAMR1 in both 8- and 24-week mice. The expressions of Sox5 and aggrecan were higher in 8-week SAMP6 mice than in SAMR1 mice and increased in 24-week SAMR1 mice. Histological analysis showed no changes in DDF tendon and surrounding tissues of both 8- and 24-week SAMP6 and SAMR1 mice. Immunohistochemical analysis showed the expression of tenomodulin was reduced in DDF tendons of 24-week SAMR1 and SAMP6 mice compared with 8-week SAMR1 and SAMP6 mice. The trend was much stronger in SAMP6 than in SAMR1 mice. Immunostaining of aggrecan showed no difference between 8- and 24-week SAMP6 and SAMR1 mice. This study demonstrates decreased expression of tenogenic marker and increased expression of chondrogenic marker in intrasynovial tendon with aging. Chondroid metaplasia has also been found in the A1 pulley in adult trigger fingers (Sbernardori et al., 2007). This may be associated with the pathogenesis of tendon degeneration and tenosynovitis.

Keywords: tenosynovitis, intrasynovial tendon, aging
Artery-only fingertip replantation distal to lunula: A retrospective analysis of clinical results

List of authors:
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Objectives / Interrogation: Both arterial and venous repair are crucial for optimal results in digital replantation. However, anastomosis of veins becomes challenging in very distal fingertip amputation because of small vessel diameter or unavailability by damage. The purpose of this study is to investigate the clinical results of artery-only replantation without vein repair for very distal fingertip amputation.

Methods: We performed a retrospective review of 47 digits of 39 patients who had undergone fingertip replantation between 2015 and 2017. All patients in this study had complete fingertip amputation distal to the lunula. By Ishilawa's classification, 12 digits in subzone I, and 35 digits in subzone II. Only one central artery repair distal to arch was performed. All patients received the postoperative protocol including external bleeding with or without the use of medical leech, and anticoagulation therapy for a week until physiological outflow was restored. Clinical outcomes including range of motion, grip strength, and sensory recovery assessed by modified Highet scale at the final follow-up for the patients with the minimum follow-up period of 6 months were reviewed and analyzed.

Results and Conclusions: The mechanism of injury was crush in 16, clean in 10, blunt in 10, and avulsion in 11 patients. The mean ischemia time was 6.0 hours. Complete survival was observed in 30 out of the 47 fingertip replantation (64%). There was statistically significant difference between amputation level and survival rate (91% for subzone I, 54% for subzone II, respectively, p=0.02). There was statistically significant difference between mechanism of injury and survival rate (85% for clean/blunt injury, 48% for crush/avulsion injury, respectively, p<0.01). At the final follow-up, the mean total active motion of surviving digits was 84% of normal side. The mean grip strength was 80% of normal side. Sensory recovery was classified as S1, S2, S3 and S4 for 5, 22, 5 and 0 digits, respectively.

This study suggested that artery-only fingertip for fingertip replantation distal to lunula including many crush/avulsion injuries achieved satisfactory survival rate and good clinical outcomes. Both amputation level of subzone II and crush/avulsion injury were associated with lower survival rate.

Keywords: replantaion, fingertip, microsurgery
Motion-preserving microvascular reconstruction of the distal radius after osteomyelitis

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Objectives / Interrogation: An open fracture of the upper extremity in the context of a high energy trauma is in a great risk of developing osteomyelitis of the damaged bones. Chronicity may occur, resulting in a pathological fracture, sequestrum formation and pseudarthrosis. When the distal radius is affected it leads to substantial bone loss that occasionally destroy de radiocarpal joint.
We present 2 cases of wide segmental bone loss at the distal radius affecting the radiocarpal joint due to chronic osteomyelitis, and different techniques to preserve motion at the midcarpal joint.

Methods: Case #1
57-year-old male, who works as policeman, presented in our clinic sustaining a chronic osteomyelitis of the distal radius after 3 months of treatment of an open intraarticular fracture of the distal radius while practicing paragliding as the initial injury. After resecting a segment of the distal radius including a portion of the articular surface, an antibiotic-impregnated cement spacer was placed to fill the gap. One month later, a free vascularized fibula transfer supplemented with a partial arthrodesis (Fibula-scaphoid-lunate) was performed to reconstruct the distal radius while maintaining some motion at the midcarpal level.

Case #2
43-year-old male, who suffered 4 months ago an open intraarticular fracture of the distal radius after a motorbike accident, developed chronic osteomyelitis. In this case, the first row of the carpus was also affected by the osteomyelitis. After 6 weeks of treatment, a free fibula and a free vascularized osteochondral graft from the base of the 3rd MTT was performed to reconstruct the segmental bone loss of the distal radius while keeping some motion at the midcarpal joint.

Results and Conclusions: The follow up of both patients is 2 years and 3 years respectively. The patients have returned to work and leisure activities with little impairment, although motion at wrist level has decreased.
CT scans confirm bone consolidation at both ends of the vascularized bone grafts without radiological defects or shortened bones.
A diverse variety of treatments have been proposed for reconstruction of extensive bone loss at the distal forearm for different conditions such trauma, bone tumours and osteomyelitis, but the vascularized free fibula graft still remains as the gold standard. When distal radius and proximal carpal row are affected motion can still be preserved by the means of either partial arthrodesis or reconstruction of the articular surface with a free vascularized osteochondral graft.

Keywords:
Osteomyelitis, Free fibula, Osteochondral graft
Wide Awake Local Anesthesia No Tourniquet (WALANT) versus General Anesthesia for Plating Distal Radius Fractures

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Objectives / Interrogation: Objective: This study aims to compare the outcomes of plating distal radius fractures using WALANT and general anesthesia as we evaluate WALANT as an alternative anesthesia for this type of surgery. Introduction: WALANT is being considered as an alternative anesthesia for fixation of fractures beyond the wrist such as distal radius fractures, which are classically performed under general anesthesia, because patients with acute cardiorespiratory problems or multiple chronic medical illnesses often experienced delay in fracture fixation until they are deemed medically fit for surgery under general anesthesia. As distal radius fracture is very common in the community, fixation of this fracture in a timely manner, is essential to enable patients to regain early full wrist function for continuation of their activities of daily living.

Methods: Methods: Five patients of various ages, comorbidities and with distal fracture requiring plating were recruited for fracture fixation using WALANT whilst another five patients underwent fracture fixation under general anesthesia. Outcomes observed and compared were waiting time for operation, patient’s pain control and hemodynamics, estimated blood loss, occurrence of adverse effects of lignocaine with epinephrine and drugs used for general anesthesia and duration of post-operative stay.

Results and Conclusions: Results: All patients in the WALANT group experienced mild to no pain during surgery and did not require conversion to general or regional anesthesia. None reported any adverse effects from lidocaine or epinephrine during and after surgery. Waiting time to operation was significantly shorter in the WALANT group. Blood losses were comparable to patients who used tourniquet during general anesthesia. Duration of post-operative stay at hospital was relatively shorter for WALANT group.

Conclusion: WALANT approach can be an alternative to general anesthesia for plating of distal radius fracture as it is able to provide patients with adequate pain relief, no adverse effects from lidocaine or epinephrine and good control of bleeding at the operation field thus resulting in a clear operative view for the surgeon. It is also potentially cost saving to both patient and healthcare provider as it obviates the need for pre-operative assessment and post-operative monitoring by the anesthetist and an overall shorter stay at the hospital.

Keywords:
WALANT, distal radius fracture, general anesthesia
Elbow and Forearm  

Type C distal humerus fractures. A 15-year experience in a demanding surgical issue

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Objectives / Interrogation: In this retrospective study we evaluated long term outcomes of type C (AO classification) distal humerus fracture treated with open reduction and internal fixation with plates.

Methods: From 2002 to 2016, 32 patients with type C distal humerus fracture were treated operatively by plating. Fifteen were males (47%) and 17 females (53%) with a mean age of 53.5 years (18 to 83). Three fractures were open (9.4%), two patients had an ipsilateral olecranon fracture and one patient olecranon and radial head fracture. Fractures resulted from simple fall in 22 patients, fall from a significant height in 6 and motor vehicle accident in 4. All patients were treated operatively by posterior approach and olecranon osteotomy using two plates (preferably precontoured LCP plates, parallel placed) often combined with free screws and K-wires. Olecranon was fixed by tension band technique in 26 patients and by other technique (screw, plate) in 6. Elbow mobilization under protection started after 2 weeks postoperatively. Mean follow-up was 8.7 years (2-15.5).

Results and Conclusions: In 29 patients (90.6%) fracture healed after 8 weeks in average (6 to 10). There were 3 non-unions (9.4%), 9 cases of malunion of varied importance (28.1%), 1 deep infection (3.1%), 1 postoperative ulnar neuropathy, and 1 CRPS treated appropriately. Reoperation rate was 18.7% (6 patients). Postoperative ulnar palsy was present in 3 patients (9.4%). Tension band was removed in 7 patients (21.9%). Carrying angle (average 8o, 5-17o) and posterior angulation (average 45o, 40-56o) of distal humerus were measured. Intercondylar distance was normal in 23 patients (72%). In 9 patients it was 16.7% in average (5-25%) narrower compared with the contralateral. Average ROM was 117o (range 75-150o), extension lag 21o (0-45o) and elbow flexion 141o (120-150o). Mean DASH score was 20 (0-49) and mean MEPS 83.3 (25-100). At final follow up half of the patients (16/32) had some kind of osteoarthritic changes and three had heterotopic ossification. Two-column fixation of type C distal humerus fractures by posterior approach and olecranon osteotomy using plates (preferably pre-contoured LCP) provides satisfactory results. Anatomic reduction and stable fixation are prerequisites for early mobilization, preventing elbow stiffness.

Keywords:  
distal humerus fracture, precontoured locking plate, olecranon osteotomy, tension band, ulnar nerve anterior transposition, elbow stiffness
Thumb IP joint arthroplasty with a surface gliding implant: One-year follow-up

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Objectives / Interrogation: Osteoarthritis of the thumb interphalangeal (IP) joint is a rare condition. Standard treatment of destructed IP joints is arthrodesis, which yields adequate pain relief. However, fine motor skills, especially picking up fine objects and achieving a powerful pinch with the index finger, can be restricted. We hypothesize that joint arthroplasty might lead to better functional results in patients with destructed but preoperatively stable IP joints. Therefore, the objective of our pilot study was to analyze the clinical and patient-reported outcomes in patients up to one year after thumb IP arthroplasty.

Methods: Patients received a surface-gliding arthroplasty (CapFlex-PIP, KLS Martin Group, Tuttlingen, Germany), which was originally designed for the PIP joint, at the thumb IP joint and were assessed preoperatively as well as three months and one year after the intervention. Range of motion (ROM) of the IP joint and key pinch were measured. Patients rated their pain on a numeric rating scale (0-10) and completed the brief Michigan Hand Outcomes Questionnaire (brief MHQ, score 0-100).

Results and Conclusions: Nine patients with a mean age of 67 years were included in this analysis. Pain at rest was reduced from 5 points before the surgery to 4 points after 3 months and to 3 points a year after surgery. The preoperative brief MHQ score of 41 points improved to 67 after 3 months and to 54 points by one year. At final follow-up, ROM could be preserved with 41° and baseline key pinch strength changed from 6 kg to 5 kg and 6.5 kg at 3 months and 1 year, respectively. None of the patients developed lateral instability. In one patient, dorsal luxation of the distal component was observed 7 weeks after surgery, which was finally converted to an arthrodesis. No further complications were documented.

Conclusions: The use of a surface-gliding implant at the thumb IP joint presents as an adequate alternative to the function-restricting arthrodesis, particularly since pinching with the index finger requires high lateral stability at high shear forces. Arthroplasty results in a considerable reduction in pain combined with satisfactory hand function. However, the results of this pilot study have to be confirmed with a larger sample size and longer follow-ups.

Keywords: osteoarthritis, thumb interphalangeal joint, arthroplasty, surface replacement
Can finger fractures be fixed with a chemical adhesive?

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Objectives / Interrogation: A new chemical adhesive for bone repair based on the thiol-ene coupling (TEC) chemistry was developed. The adhesive is inspired by dental resin composites and self-etch primers. Fracture fixation is achieved by building a patch over the fracture constituted by a primer solution followed by layers of the adhesive with imbedded hydroxyapatite and polyethylene terephthalate (PET) fiber meshes. The layers of the patch are cured by using tissue-friendly high-intensity light. The result is a FRAP (Fiber Reinforced Adhesive Patch) and provides a fixation that can be custom made for every fracture. The objective of the study was to examine biomechanical properties, safety and influence on fracture healing and inflammation of the FRAP.

Methods: Adhesion strength to bone was tested biomechanically in vitro on processed wet bovine bone regarding shear bond strength and compared to commercially available dental adhesives. The rigidity of the FRAP was compared to crossed 1.2 mm K-wires and AO Compact hand 1,5 plates in two fracture patterns, transverse and oblique, on pig metatarsals using 1000 cyclic loads of 10-70 N in a three point bending set up. In vivo studies were performed on a rat femur fracture model investigating adhesion to bone, effect on bone healing and inflammation. A safety evaluation (ISO 10993-1:2009) on FRAP leachables was also carried out.

Results and Conclusions: Shear bond strength in vivo was 55% higher than commercially available acrylate dental adhesive, 9.0 MPa vs 5.8MPa. In comparison between K-wire and plate fixation on pig metatarsal fractures in cyclic loading there was no detectable difference of the fixation between metal plate and FRAP, whereas K-wires showed considerable movement and displacement. Histology studies from in vivo samples on rat revealed no inflammation, and no negative effect on bone healing. Initial adhesion strength and adhesion after 5 weeks in vivo revealed that FRAP had maintained 60% bond strength. No cytotoxicity nor genotoxicity was detected in safety evaluation and neither skin irritation nor inflammation were seen.

Conclusion
The FRAP has promising properties and has potential to become a new versatile technique for osteosynthesis for phalangeal fractures. The fixation material is strong, adheres well to bone, does not cause inflammation and is benign to tissues. Further development to human use is under way.

Keywords:
Delayed surgery for bony mallet finger - a retrospective comparative study -

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Objectives / Interrogation: It is common for the patient with mallet fracture not coming to the clinic immediately after the injury. Purpose of this study was to investigate the surgical outcome for bony mallet fingers with delayed presentation, and to compare the outcomes between two methods.

Methods: Thirty-one bony mallet fingers treated 35 days or later from the injury with open reduction and internal fixation were included in this retrospective study. Cases with open fractures, multiple finger and/or joint injuries, fracture of the thumb, follow up shorter than 60 days, and reoperation of cases initially treated elsewhere were excluded. There were 18 males/13 females, 5 index/8 middle/11 ring/7 little fingers. Age ranged from 10 to 74 (average 35.3) years old. Intervals from injury to operation were 36 to 122 (average 56.5) days. Fractures were internally stabilized with open Ishiguro's method in 12, and with a hook plate and Kirshner wires in 19.

Results and Conclusions: Active flexion/extension of the DIP joint in open Ishiguro's method and the hook plate group was 44.8±15.2/-12.2±9.7 degrees and 51.8±14.6/-11.9±8.4 degrees respectively. Off set at the DIP joint was 0.63±0.30mm in open Ishiguro's method and 0.39±0.48mm in the hook plate group. The hook plate group tend to be better at active flexion and reduction, however there were no significant differences between two groups. Two cases in the open Ishiguro's group and three in the hook plate group had residual volar subluxation of the DIP joint. All fractures healed at final follow up. Both groups achieved bony union with usable range of motion. Postoperative volar subluxation remains a problem to be addressed. Further study is needed to clarify better solution for the treatment of bony mallet fingers with delayed presentation.

Keywords:
bony mallet finger, delayed surgery
Acute Compartment Syndrome of Upper Limb Requiring Emergency Wide Range Fasciotomy Caused by Suction Injury. A Case Report

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Objectives / Interrogation: Object: Acute compartment syndrome due to absorbing by vacuum hose is a rare injury that requires immediate diagnosis and surgical resolution. We report a case of acute compartment syndrome in the upper limb from shoulder to hand requiring emergency wide range fasciotomy caused by suction injury.

Methods: Materials and Methods: A right-handed 24-year-old man was injured by suctioning his whole upper limb about 30 seconds by the hose of vacuum car which treat factory waste. Initially, he only felt mild pain and observed by himself at home. About 12 hours after the injury, he came to our hospital literally "Walk-in". At the first medical examination revealed diffuse swelling and hardening muscles from shoulder to hand, but there was no rest severe pain, paleness, pulselessness, paresthesia, nor paralysis. He felt disproportionate pain on passive extension of the deltoid, biceps, triceps, flexor and extensor muscles of forearm except intrinsic muscles of hand. From the above, he was diagnosed with acute compartment syndrome of upper limb from shoulder to forearm, and we decided to perform an emergency wide range fasciotomy under general anesthesia. We measured intra-compartmental pressure after anesthesia using an arterial line transducer. The intra-compartmental pressure of each muscles rose from 30 to 70 mmHg, so we performed fasciotomy by the Henry approach extended from the wrist to volar upper arm and independent dorsal upper arm approach. After the procedure, the intra-compartmental pressure of each muscles fell to normal level, and we used shoelace technique with elastic vessel loop. After one week, the swelling of whole upper limb went down, we re-sutured the wound completely.

Results and Conclusions: Results: After eight months, he healed without any disfunction of shoulder, elbow, forearm, hand, and finger.
Conclusion: Acute compartment syndrome of upper limb caused by suction injury is rare, and in some case, the pain is so mild as to pass unnoticed at the initial visit. If the compartment syndrome is missed, it will result in very serious sequela. Therefore, in such case, even if the injury looks light, we need to perform fasciotomy without hesitation.

Keywords: Acute Compartment syndrome, suction injury, vacuum hose, emergency fasciotomy
Primary melanoma of the hand - experiences and review of the literature.

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Objectives / Interrogation: The diagnosis of melanoma of the hand is associated with a poor prognosis. While the surgical management of melanoma is following distinct guidelines, there are no specific considerations regarding functional areas of the hand or subungual melanoma. It was shown by literature, that a wide local resection does not provide any advantage over R0 resection.

Methods: Between 2010 and 2017, 13 patients presented with melanoma of the hand in our clinic. Patient records were reviewed retrospectively and literature was carefully reviewed.

Results and Conclusions: 12 cases were primary melanomas, 7 were subungual tumors. Mean age at presentation was 56 years. The most frequent localization was the thumb. Mean Breslow index was 3,2mm (range 0,2-10). Melanoma in situ was treated with simple excision and full thickness skin grafting. In 5 cases amputation was mandatory.

In this series, amputation was considered in most cases of subungual melanoma. With simple excision, function sparing treatment could be ensured in cases of melanoma in situ with good cosmetic results and sensibility. However, a distinct guideline for treatment of acral melanoma is necessary and desirable.

Keywords:
Multiple flexor tendon rupture in a 34-year old patient with rheumatoid arthritis.

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Objectives / Interrogation: Flexor tendon ruptures in patients with rheumatoid arthritis are an uncommon condition caused by attrition on osseous spurs or by direct invasion of the tendon by hypertrophic tenosynovium. The most common localization of this condition is the carpal tunnel. The flexor pollicis longus and profundus to the index finger are most commonly affected.

Methods: We present the case of a 34-year old patient with seropositive rheumatoid arthritis that suddenly presents hand pain with no prior traumatic event.

The physical examination showed a limited flexion of flexor digitorum superficialis and profundis of all the fingers of the dominant hand as for the fifth. Extension of all fingers was preserved.

An MRI and an ecography were performed showing important synovial proliferation and distension concerning the common synovial sheath of the flexor pollicis longus and flexor tendons at the level of the carpal tunnel and metacarpal region of the hand, as well as partial rupture of flexor digitorum profundis and probable rupture of the flexor digitorum superficialis of 2nd, 3rd and 4th fingers.

A surgical treatment is then performed: A volar approach over the carpal tunnel showed a partial rupture and proliferative tenosynovitis of the flexor digitorum profundis and superficialis of the second, third and fourth finger and of the flexor pollicis longus in flexor zones III, IV and V, as well as an important adhesion of the median nerve.

Consequently, the surgery consisted in an exoneurolysis of the median nerve, identifying both motor and sensitive branches and a reconstruction of the flexor tendons using an autograft of the palmaris longus for the flexor pollicis longus and the radial hemi flexor carpi radialis tendon for the flexor digitorum profundis and superficialis of the second, third and fourth finger. The tenosynovial tissue was excised and sent for histological examination.

The patient was immobilized with a forearm splint in flexion including all fingers.

After two weeks the surgery wounds were in good state with no signs of infection, and the splint was changed to allow phase I of early protected mobilization.

At four-weeks post-operative the splint was changed to advance in the protected mobilization. The analysis of the tissue showed various rheumatoid nodules (nodulosis) and presence of synovitis.

Results and Conclusions: Patients with flexor tendon ruptures present an high disease activity. Prevention of tendon ruptures by early tenosynovectomy is advised, due to poor prognosis.

Keywords:
Rheumatoid Arthritis Nodulosis Flexor Tendon Repair Surgery Hand
How Important is the Understanding of Embryology for Parents of Children Born with Congenital Hand Differences?

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Objectives / Interrogation: The Oberg, Manske and Tonkin (OMT) system for congenital upper limb anomalies was designed to allow clinicians to reliably classify an anomaly, based on its embryological origin\textsuperscript{[1]}. Despite this, uptake is slow amongst clinicians, largely due to a reluctance to learn embryology. Without discussing embryology, clinicians focused on the treatment plan but often stop short of explaining to parents 'why' congenital hand differences (CHDs) happen. The primary aim of this work was to evaluate the importance of understanding embryology for parents of children born with CHDs. Secondarily we aimed to investigate whether this importance of embryology correlates with disease severity, maternal age or level of education.

Methods: A retrospective, self-administered questionnaire was designed to evaluate the importance of embryology of CHDs for parents within a congenital hand clinic. Parents were given a simple explanation of normal upper limb embryology by a consultant hand surgeon and possible theories of why development 'went wrong', based on current developmental biology knowledge. A questionnaire was then completed, with responses rated on a scale of 1-5 (5 being most important).

Results and Conclusions: Responses were collated from 25 questionnaires. Importance of knowing why CHDs happen was given an average rating of 4.46 ± 0.13 by parents. 84% of respondents believed understanding the embryology of the hand would improve their understanding of why CHDs happen. Parents desired a mean level of knowledge of 3.92 ± 0.22, where 1 represents no knowledge and 5 is of the medical textbook level. Only 52% of parents reported that possible causes of CHDs were discussed with them at time of diagnosis. Overall, 64% believed their questions were adequately answered, and just 40% were aware of specialist support charities.

Analysis of variance (ANOVA) was performed to investigate the secondary aim of the study. Results showed that there was no statistically significant relationship between the importance of understanding embryology and disease severity (p=0.687), maternal age (p=0.161) or maternal level of education (p=0.145).

We have provided preliminary evidence that suggests parents are interested in understanding, to a reasonably high level, the embryology and hence 'why' CHDs happen, irrespective of disease severity, maternal age or maternal level of education. This study further supports the importance of understanding embryology among clinicians, and the use of the OMT in regular clinical practice.

Keywords:
Embryology, Congenital hand differences

References:
Ulnotriquetral Split Tear Repair: Is It Myth or Fact?

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Objectives / Interrogation: To report the outcomes of ulnotriquetral (UT) ligament split tear repairs.

Methods: 228 wrists (142 right and 86 left) in 221 patients (100 males and 128 females, mean age 35 ± 15.5, range 14-77 years) underwent UT ligament split tear repair between 2007 and 2016. Mayo wrist score, Visual Analogue Scale (VAS) pain scores, and objective measures including grip strength and range of motion were obtained. Patients were followed with a mean follow up of 10.3 months.

Results and Conclusions: Ulnotriquetral split tear repair resulted in substantial improvements in pain and function. Mayo Wrist Score for the cohort improved from 56 preoperatively to 82 postoperatively (p<0.0001), and 83% of patients achieved a good or excellent outcome. VAS pain scores decreased from 6.0 preoperatively to 1.4 postoperatively (p<0.0001). Grip improved from 26.1 kg preoperatively to 29.8 kg postoperatively (p=0.003). There was no significant change in range of motion of the wrist. Complications were noted in 13 patients with 8 experiencing continued pain, 4 with dysesthesia of the dorsal sensory ulnar nerve and 1 superficial infection.

Conclusion: Arthroscopic UT split tear repair significantly reduced pain and improved Mayo Wrist Scores.

Keywords: Ulnar wrist pain, arthroscopy, ulnotriquetral split tear
Hook Plate for volar rim fractures of the distal radius: review of the first 45 cases and focus on dorsal radiocarpal dislocation

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Objectives / Interrogation: The volar rim fragment is an attachment site for the short radiolunate and the volar distal radioulnar ligament. Its unstable fixation can lead to articular incongruity, volar or dorsal subluxation of the carpus and distal radioulnar instability. The involvement of this fragment on distal radius fractures is relative common and many studies of Literature have been focused on its treatment.

This study evaluate the clinical and radiological outcome of a new device born to treat marginal articular fractures of the distal radius, focusing on dorsal fracture-dislocations. The device (Aptus Wrist Distal Radius System 2.5, Medartis AG, Basel, Switzerland) represent a fragment-specific fixation system.

Methods: A retrospective review was conducted on the first 45 patients with a mean follow-up of 23 months including postoperative clinical evaluation, grip strength, CT scan and X-ray control.

Results and Conclusions: All fragments, except one, healed and maintained reduced until the final follow-up. The carpus was aligned with the distal radius in all patients presenting with a radiocarpal dislocation.
The Hook Plate stabilizes distal fragments at their bone- ligament interface. In addition to bony reduction, the device permits to stabilize the capsule and ligaments, as volar bony ligament avulsions, in a picture of dorsal radiocarpal dislocation.

Keywords:
The Safety of the Volar Midcarpal Portals in Wrist Arthroscopy

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Objectives / Interrogation: To describe the safe placement of volar midcarpal portals using the inside out technique and the surrounding anatomical structures at risk.

Methods: Five fresh frozen cadavers were used after institutional approval. Volar midcarpal ulnar (VUMC) and radial (VRMC) portals were placed using an inside out technique. The distance between these portals to surrounding anatomical structures was measured using a caliper, in millimeters.

Results and Conclusions: The VUMC portal pierced the flexor digitorum profundus (FDP) tendon to the long finger in one specimen. The portal was an average 3.7 and 8.4 mm away from the ulnar artery and nerve, respectively. The VRMC portal pierced the palmaris longus in two specimens. It usually was between the flexor pollicus longus, palmaris longus and median nerve. It was an average 1.0 and 1.95 mm away from the median nerve and palmar cutaneous branch of the median nerve, respectively and in one specimen, was in contact with the median nerve.

Conclusion: With increasing use of volar midcarpal arthroscopy, the surgeon needs to have an understanding of the structures at risk when placing the VUMC and VRMC portals.

Keywords:
Volar Midcarpal Arthroscopy, Portals, Structures at risk
Outpatient neuromodulation may avert the need for surgery in patients with painful cutaneous neuromas

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Objectives / Interrogation: To report the outcome of neuromodulation as an outpatient, non-invasive therapy for painful cutaneous neuromas

Methods: This was a retrospective review of a consecutive series of patients who presented with a painful cutaneous neuroma secondary to a direct trauma or surgery. The diagnosis was made by the presence of neuropathic symptoms in the dermatome of a cutaneous nerve and a positive Tinel sign. Local anaesthetic injection was performed for confirmation of diagnosis. NCS was requested only if there were diagnostic doubts or to exclude superimposed entrapment neuropathy. Each patient was offered optimisation of medical therapy and physiotherapy for scar desensitisation. Neuromodulation was offered as an alternative to neuroma surgery. A course of neuromodulation typically involved six weekly outpatient visits, supervised by a trained nurse. The primary aim of treatment was symptom reduction such that neuroma surgery was no longer required.

Results and Conclusions: Between October 2015 and June 2018, 50 patients (25 females, 25 males) with a mean age of 47 years (range 18-79) presented with a painful cutaneous neuroma. The nerves injured in the order of frequency were superficial radial nerve (16), digital nerve (8), dorsal ulnar cutaneous nerve (7), palmar cutaneous branch of median (4), saphenous nerve (4), sural nerve (2), lateral femoral cutaneous nerve (2), medial antebrachial cutaneous nerve (2), lateral antebrachial cutaneous nerve (2), superficial peroneal nerve (1), posterior cutaneous branch of radial nerve (1) and supraclavicular nerve (1). 3 cases were due to a dog bite, 9 were due to direct trauma and 38 were due to an operation. The index operations included De Quervain release, trapeziectomy, UCL reconstruction, wrist arthroscopy, elbow arthroscopy, carpal tunnel release, cubital tunnel release, ray amputation, distal radius plating, metacarpal plating, CMCJ fusion, trigger finger release and wrist fusion; pelvic surgery, ankle arthroscopy, knee arthroscopy, TKR, high tibial osteotomy, femoropopliteal bypass and Achilles tendon repair. 18 (36%) patients had sufficient symptom relief after neuromodulation such that they did not need to pursue neuroma surgery. Conclusions: Surgery is the commonest cause of a painful cutaneous neuroma. Neuromodulation may offer symptom relief such that neuroma surgery may be avoided in a third of cases. It is a safe and effective therapy for painful cutaneous neuromas.

Keywords:
neuromodulation; neuropathic pain; cutaneous neuroma
Autoregulation of Lmx1b during limb development: A role in Nail-Patella Syndrome?

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Objectives / Interrogation: The LIM homeodomain transcription factor Lmx1b is restricted to the dorsal limb mesenchyme during development and is essential for distal limb dorsalization. In humans, LMX1B mutations cause Nail-Patella Syndrome characterized by nail dysplasia, absent or hypoplastic patellae, and progressive renal disease. In the functional Lmx1b knockout, Lmx1b transcription is reduced 5.7 fold, indicating a role for Lmx1b in its own expression. In this report our goal was to determine whether there are associated enhancers for Lmx1b and whether these play a role in maintaining Lmx1b expression in the limb.

Methods: We used an Lmx1b-targeted ChIP-seq during mouse limb development (E12.5), to identify potential Lmx1b bound regulatory regions. We isolated the Lmx1b bound regions from genomic DNA using PCR and inserted them into a thymidine kinase (tk) basal promoter linked to a GFP reporter. We electroporated the reporter constructs into presumptive chick wings to determine activity of the potential regulatory regions. The role of Lmx1b in the activity of potential regulatory regions was determined by site directed mutagenesis of the Lmx1b binding sites. We also used Chromatin Configuration Capture (3C) to confirm interaction between the Lmx1b promoter and potential regulatory regions. In addition, we performed a targeted CRISPR-cas excision of the potential Lmx1b-associated regulatory regions and examined the phenotypes of the resulting knockout mice.

Results and Conclusions: We identified two Lmx1b-bound noncoding regions 60 and 66 kbs upstream of the Lmx1b locus that were conserved across divergent vertebrate species and active in the dorsal limb coincident with Lmx1b. The two noncoding regions also overlapped with multiple chromatin regulatory marks (p300, H3K27Acetylation, H3K3methylation2, RNAPol II and Med12) suggesting a role as cis-regulatory modules (CRMs). Site directed mutagenesis of the Lmx1b binding sites within these two Lmx1b-associated CRMs abolished reporter activity within the chick wing bioassay. In addition, Chromatin Configuration Capture (3C) confirmed interaction between the Lmx1b promoter and the most distant CRM. Homozygous CRISPR-cas excision of these two CRMs generated mice with nearly symmetrical ventral-ventral limbs.

Our findings indicate that Lmx1b upregulates its own expression through two upstream CRMs. Our data further implies that a threshold level of Lmx1b expression is required to accomplish normal limb dorsalization.

Keywords: LMX1B, Nail-Patella Syndrome, NPS, Limb dorsalization, Congenital upper limb anomalies, CULA, Limb development, Genomic, Genetics, Mouse
Arthroscopic Suspension Arthroscopy using PL tendon for Osteoarthritis of the Thumb Carpometacarpal Joints

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Objectives / Interrogation: Arthroscopic surgery has become a more popular for the treatment of osteoarthritis of the thumb carpometacarpal joints (CMC-OA), since introduction of interposition arthroplasty. However, it is difficult to indicate the arthroscopic interposition arthroplasty for the patients with radial instability in CMC-OA. We reported a new technique of arthroscopic suspension arthroplasty for CMC-OA along with a minimum of 2 years of results.

Methods: Twenty-nine thumbs with were treated by arthroscopic suspension arthroplasty. The procedure included partial trapeziectomy followed by ligamentoplasty using PL tendon similar to Thompson technique. Under arthroscopic visualization, the bone tunnel was made on base of 1st and 2nd metacarpal bone, and PL was passed through the bone tunnels in the order of dorsal diaphysis, articular surface of 1st metacarpal, base of 2nd metacarpal, dorsal capsule and APL tendon. Finally, the tendon was fixed to both metacarpals using interference screws and was tightly sutured to APL. We evaluated pain VAS; DASH; grip and pinch strength; thumb abduction range of motion, and radiographic examination including trapezial space and subluxation ratio preoperatively and every 3 months until 1 year after surgery, and every 6 months thereafter. Besides, these assessments were analyzed in the patients with greater than 1/3 subluxation of the 1st metacarpal base, referred to Menon's classification.

Results and Conclusions: The mean duration of the follow-up was 3.2 years. The mean preoperative pain VAS and DASH were 71 and 45.7, respectively, which were significantly reduced to 7 and 20.0 at the final. Also, strength of grip, tip, and key pinch significantly increased at 9, 9, and 12 months later after surgery, respectively. Abduction motion tended to decrease, although the differences were not significant. Although trapezial space ratio was significantly reduced, there were no significant differences in the results between each follow-up time and the final follow-up. Subluxation ratio was significantly improved and maintained until the final follow-up. Furthermore, the values of clinical and radiographic outcomes, except motion, were significantly improved in patients with greater than 1/3 subluxation of the 1st metacarpal base. In conclusion, the clinical outcomes of this technique were: satisfaction with pain relief, recovery of hand and thumb strength, insignificant decrease of abduction motion, and radiological reduction, even in the patients with radial instability in CMC-OA.

Keywords:
arthroscopy; thumb; osteoarthritis; carpometacarpal joint
**Abstract no.: IFSSH19-394**

Oral presentation or poster presentation

**Tendon**

**14th IFSSH Congress**

**Objectives / Interrogation:** The purpose of this study is to present secondary trigger finger caused by a neglected partial flexor tendon rupture including discussion of the mechanism and treatment.

**Methods:** We retrospectively reviewed the records of six patients with trigger finger caused by a neglected partial flexor tendon rupture who had been treated with exploration, debridement and repairing of the ruptured tendon from August 2010 to May 2015. The average patient age was 41 years (range, 23-59). The time from injury to treatment averaged 4.7 months. The average follow-up period was 9 months (range, 4-18). Functional outcome was evaluated from a comparison between the Quick-disabilities of the arm, shoulder and hand (DASH) score and the visual analogue scale (VAS) for pain, which were measured at the time of preoperation and final follow up.

**Results and Conclusions:** Four patients showed partial rupture of the flexor digitorum profundus (FDP) tendon and three showed partial rupture of the flexor digitorum superficialis (FDS) tendon. Both the FDP and FDS tendons were partially ruptured in 2 patients, and the remaining patient had a partial rupture of the flexor pollicis longus (FPL) tendon. All patients regained full range of motion (ROM), and there has been no recurrence of triggering. The average VAS score decreased from 3.6 (range, 3-5) preoperatively to 0.3 (range, 0-1) at the final follow up (P=.026). The average Quick-DASH score decreased from 33.6 preoperatively to 5.3 at the final follow up (P=.028).

When we encounter patients with puncture or laceration wounds in flexor zone 2, even when the injury appears to be simple, partial flexor tendon laceration must be taken into consideration and early exploration and repairing of the partially ruptured tendon is recommended.

**Keywords:** Trigger finger, Neglected, Flexor tendon, Laceration
Dorsal fracture-dislocations of the distal radius: a new classification and proposal of a standardized surgical treatment

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Objectives / Interrogation: Dorsal radiocarpal dislocations can be isolated or accompanied with a spectrum of fractures, as bony depressions and marginal articular avulsions of the distal radius. Although isolated dorsal dislocation of the radiocarpal joint is a rare injury, a dorsal fracture-dislocation is more common and often consists in a translocation of the carpus, which treatment and outcomes are not well defined.

In Literature, various methods of operative stabilization and repair have been recommended but the surgical treatment of these injuries is still not well standardized.

Today, a lot of devices of fragment-specific fixation are available to treat these injures properly. We retrospectively reviewed the dorsal radiocarpal dislocations treated in our Institute in the last 5 years in order to propose a new classification and define the proper surgical treatment for each type of lesion.

Methods: We retrospectively reviewed the operative records at our institution for all patients undergoing surgical treatment for a dorsal radiocarpal dislocation or translocation in the last 5 years. We included only patients presenting a preoperative X-ray and CT-scan evaluation of the injury. Information regarding the method of reduction and fixation, type of surgical approach, associated injuries, and complications was recorded. Patients with incomplete clinical and/or radiological records were excluded. Grip strength and range of motion were recorded with the Mayo wrist scores. Two questionnaire as DASH and PRWE were calculated at the last follow-up. Postoperative lateral and A/P radiographs of the wrist were used to look for signs of malunion (or osteoarthritis) and determine whether the radiocarpal joint was unstable.

Patients were classified in IV groups of lesions, each group was subdivided in 2 types of fractures. For each type was proposed a standardized and reproducible surgical treatment.

Results and Conclusions: Clinical and radiological outcome were satisfactory. This classification adequately addresses the spectrum of osseous and soft tissue injuries that occur in dorsal radiocarpal fracture-dislocations. Furthermore, it give a practical guide to surgically treat this various spectrum of lesions.

Keywords:
Bony mallet thumb: Our experience with 9 patients treated surgically

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Objectives / Interrogation: Although a mallet fracture is a common injury, few reports have described bony mallet thumb injuries. We retrospectively investigated bony mallet thumb injuries treated surgically.

Methods: We evaluated 9 patients (6 men, 3 women) who underwent surgery for bony mallet thumb injury between January 2009 and February 2018. The mean age (range) of the patients was 44.9 years (18-80 years), and the surgery was performed 7.2 days (0-18 days) after the injury. The mean follow-up period was 4.8 months (2-14 months).

Results and Conclusions: Based on the Wehbe and Schneider classification of mallet fractures, all patients demonstrated Type I fractures (no joint subluxation). Subtypes A and B were observed in 4 and 5 patients, respectively. Six patients were treated with extension block K-wire pinning using a closed method, and 3 patients were treated with screws. Bone union occurred in 8 patients; however, 1 patient treated with pinning did not show bone union. One patient continued to demonstrate pain with interphalangeal (IP) joint extension. Range of motion and extension lag at the IP joint at the final follow-up were 64.1° (40°-85°) and 3.6° (0°-20°), respectively.

A biomechanical study of mallet fractures has reported that distal phalangeal subluxation is more common with defects involving >40-50% of the joint surface. In this study, although 5 patients demonstrated subtype B fractures (one-third to two-third of articular surface involvement), no patient demonstrated joint subluxation. The retinacular ligament of the IP joint of the thumb (which does not exist in other distal IP joints of fingers) may contribute to joint instability. Bone union did not occur in 1 patient treated with pinning. The fracture fragment observed in bony mallet thumb injuries is relatively larger than that observed with fractures of other fingers. Rigid fixation with screws may be superior to pinning to achieve effective bone union. In conclusion, joint subluxation is rare in bony mallet thumb injuries despite the large area of joint surface defects. Rigid fixation with screws may be effective to achieve bone union.

Keywords:
mallet thumb
Severe PIP joint flexion contracture release by External Fixator - importance of post-operative management -

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Objectives / Interrogation: Mobilization of proximal interphalangeal joint (PIP) with severe contracture is extremely difficult. We had used the external-fixator, but experienced several complications such as pin site fracture or recurrence of contracture. We modified original technique in order to avoid these complications. Here, we introduce our technique, post-operative management and outcomes.

Methods: Since 2007, we treated 35 fingers with severe flexion contracture of the PIP joint. The patients were divided into 2 groups; the most severe group (12 fingers) showed more than 80° of flexion contracture with long duration (> 3 yrs.), and severe group (23 fingers) showed less contracture with shorter period. Setting of fixator differed depending on each finger condition. At surgery, we only apply the fixator without open soft tissue release. Post-operative management: 1st stage is a distraction phase; PIP was distracted in its flexed position by using strong elastic bands instead of rigid rod to avoid pin site fracture. 2nd stage is a correction phase to spread the range of movement (ROM); PIP was distracted either in extended or flexed position for more than 4 hours a day including sleeping time, respectively. 3rd stage is a stabilization phase to prevent the recurrence; PIP was stretched in extended or flexed position at maximum. Each stage takes a few weeks duration. At the end of the 2nd stage, we evaluated that the central slip was effective or not. Then we reconstructed the attenuated central slip, if necessary. After removal of fixator, night splint was applied at least 6 M.

Results and Conclusions: An average period of applying fixator was 8 weeks. The follow-up ranged 6 M to 97 M. The median active ROM improved from 4° to 32° in the most severe group and from 16° to 54° in the severe group. Nine fingers needed central slip reconstruction. Pin site infection and fracture were observed 4 and 6 fingers, respectively. Recurrence of the most severe cases after long duration (> 3 yrs.) was frequently observed, thereafter we changed the goal setting and strategy of each patient. We will show the changes of our strategy and methods.

The 1st stage is the most important. The joint distraction is achieved in contracted position up to obtaining 2-5 mm of sufficient joint space. In addition, usages of elastic tools (i.e. rubber bands, coil springs) provide safe and reliable traction and correction force.

Despite very severe contractures with various pathologies, we could improve joint motion with minimum complication.

Keywords: severe flexion contracture, PIP joint, external-fixator
Treatment of acute forearm compartment syndrome after transradial coronary intervention

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Objectives / Interrogation: This study documented our experience with acute forearm compartment syndrome after percutaneous coronary intervention via radial artery and suggested caution in order to achieve good results.

Methods: We retrospectively reviewed the records of 4 patients with acute forearm compartment syndrome (ACS) after transradial intervention (TRI) following emergent fasciotomy from 2015 to 2017. The patients included 3 females and 1 male with an average age of 70 years. ACS was diagnosed with clinical symptoms and compartment pressure monitoring and computed tomography angiography to confirm preoperative vascular status was performed in all cases. The time from symptom to operation averaged 5.7 h. The functional outcome was evaluated using a Quick-disabilities of the arm, shoulder and hand (DASH) score, grip and pinch strength at the time of final follow-up.

Results and Conclusions: In three cases, ACS was caused by bleeding from the rupture at the radial artery puncture site, and one case was caused by brachial artery rupture at the level of distal humerus and radial artery rupture at the level of proximal forearm. We obtained satisfactory results without any complications with an average follow-up of 11.5 months (range, 9 to 12). The average Quick DASH score was 15.35. The last follow-up average grip strength was 16 kg and the average pinch power was 1.6 kg. All 4 patients were satisfied with the function of the hand.

We stress that if physicians encounter ACS after TRI, they should be aware of the bleeding from the arterial rupture to confirm the preoperative status of artery and early surgical decompression with minimal injury of soft tissue with satisfactory results even in elderly patients.

Keywords:
Percutaneous coronary intervention; radial artery; forearm; compartment syndrome
Arthroscopic treatment of chronic wrist pain after distal radius fractures

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Objectives / Interrogation: The purpose of this study is to report the arthroscopic findings and clinical results of patients with chronic wrist pain after distal radius fracture who underwent diagnostic arthroscopy and arthroscopic-assisted tailored treatment.

Methods: We retrospectively analyzed the records of 11 chronic wrist pain patients after distal radius fracture, who underwent diagnostic arthroscopy and arthroscopic-assisted tailored treatment from 2010 to 2015. Average patient age was 49 years (range 31-68 years), the average time from injury to treatment was 13.8 months (range 3-36 months) and the average follow up period was 17.5 months (range 12-39 months). The functional outcome was evaluated by comparing the range of motion, grip strength, pinch strength, visual analogue scale (VAS) for pain and quick Disabilities of the Arm, Shoulder and Hand questionnaire (Quick DASH score), which were measured preoperatively and at final follow up.

Results and Conclusions: Based on the arthroscopic findings, we could find synovitis in all cases and we could classify the pathologic intra-articular lesions into 4 patterns. TFCC rupture was seen in 11 cases, intercarpal ligament rupture and radiocarpal ligament rupture was in 7 cases, ulnar impaction syndrome was observed in 4 cases, and cartilage defect was noted in 8 cases. In terms of surgical treatment, 11 patients underwent arthroscopic synovectomy, 5 underwent foveal or capsular repair of TFCC, 5 underwent intercarpal K-wires fixation or intercarpal thermal shrinkage, 1 underwent intercarpal ligament reconstruction, 2 underwent Sauve-Kapandji procedure and 1 underwent unlar shortening osteotomy. Postoperatively, the average range of motion, grip strength and pinch strength increased significantly. The average VAS score increased from 6.4 (range 4-8) preoperatively to 1.3 (range 0-3) at the final follow up (P=0.003), while the average quick DASH score decreased from 54.9 preoperatively to 14.7 at the final follow up (P=0.003).

Diagnostic arthroscopy and arthroscopic-assisted tailored treatment of chronic wrist pain after distal radius fracture can provide an accurate diagnosis, significant pain relief and functional improvement.

Keywords:
Distal Radius Fractures (DRF), Chronic Pain, Wrist arthroscopy
Operative Treatment of Intra-Articular Distal Radius Fractures With versus Without Arthroscopy: RADAR Trial

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Objectives / Interrogation: Open reduction and internal fixation (ORIF) for intra-articular distal radius fractures leads to a quicker recovery of function compared to non-operative treatment. However, some patients continue to have a painful and stiff wrist postoperatively. Arthroscopically assisted removal of intra-articular fracture hematoma and debris may improve the functional outcomes following operative treatment of intra-articular distal radius fractures. The purpose of this randomized controlled trial is to determine the difference in functional outcome, assessed with the Patient-Rated Wrist Evaluation (PRWE) score, after ORIF with and without an additional wrist arthroscopy in adult patients with displaced complete articular distal radius fractures.

Methods: In this multicenter trial adult patients with a displaced complete articular distal radius fracture are randomized between ORIF with an additional wrist arthroscopy to remove fracture haematoma and debris (intervention group) and conventional fluoroscopic assisted ORIF (control group). The primary outcome is functional outcome assessed with the PRWE score after 3 months. Secondary outcomes are wrist function assessed with the Disability of the Arm, Shoulder and Hand (DASH) score, post-operative pain, range of motion, grip strength, and complications. Additionally, in the intervention group the quality of reduction, associated ligamentous injuries and cartilage damage will be assessed. A total of 50 patients will be included in this study.

Results and Conclusions: A total of 50 patients were randomized, 25 to the intervention group and 25 to the control group. All patients who had arthroscopic treatment had a hematoma which was removed. All patients had an associated injury consisting of TFCC, SL, LT or damage to the scaphoid or lunate fossa. Median PRWE was not significantly better for the intervention group at 3 weeks (48 [25-67] vs 58 [44-73], p = 0.1), and at 6 weeks (37 [18-63] vs 39 [19-53], p = 0.7). Median PRWE was significantly worse for the intervention group at 3 months (23 [9-44] vs 13 [5-21], p = 0.02). At six months follow-up both groups had a PRWE of 10 (p= 0.3). Complications were equal in both groups; 7 complications in the intervention group and 7 in the control group. Additional arthroscopy after ORIF, compared to only ORIF, does not lead to better functional outcomes in patients with displaced intra-articular distal radius fractures.

Keywords:
Distal radius fracture, wrist arthroscopy, wrist function, PRWE, ligament injuries
Functional outcomes after corrective osteotomy of symptomatic distal radius malunions in children

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Objectives / Interrogation: Closed reduction and cast immobilization of displaced distal radius fractures carries the risk of secondary displacement, which could result in a symptomatic malunion. In patients with a symptomatic malunion, a corrective osteotomy can be performed to improve pain and functional impairment of the wrist joint. The aim of this study was to assess the functional outcomes of children who underwent a corrective osteotomy due to symptomatic malunion of the distal radius.

Methods: All consecutive corrective osteotomies of the distal radius for children younger than 18 years, between 2009 and 2016 were reviewed. The primary outcome was functional outcome assessed with the ABILHAND-Kids score. Secondary outcomes were QuickDASH score, range of motion, complications and radiological outcomes.

Results and Conclusions: A total of 13 patients with a median age of 13 years [IQR 12.5-16] were included. The median time to follow-up was 31 months [IQR 26-51]. The median ABILHAND-Kids score was 42 (range 37-42) and median QuickDASH was zero (range 0-39). Range of motion did not differ significantly between the injured and the uninjured side for all parameters. One patient had a nonunion requiring additional operative treatment. The postoperative radiological parameters showed an improvement of radial inclination, radial height, ulnar variance, dorsal tilt, and dorsal tilt.

Corrective osteotomy for children is an effective method for treating symptomatic malunions of the distal radius.

Keywords:
distal radius, malunion, pediatric surgery, corrective osteotomy, functional outcome
Utility of Image Fusion System for 3D Preoperative Planning in the Osteosynthesis of Distal Radius Fractures

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Objectives / Interrogation: To reproduce anatomical reduction and appropriate implant placement during the osteosynthesis, image fusion system for the 3D preoperative planning and the fluoroscopy was developed. The objective of this study was to assess the utility of image fusion system by evaluating the reproducibility of preoperative plan in the osteosynthesis of distal radius fractures.

Methods: Twenty-eight wrists of 28 distal radius fracture patients who underwent osteosynthesis using volar locking plates (22 females, 6 males, mean age 62.2 years) were evaluated. The patients were divided into two groups. The image fusion group (n=14) utilized 3D preoperative planning and image fusion system. The control group (n=14) utilized only 3D preoperative planning. The age, sex, and fracture types were matched between groups. All patients had pre- and post-operative CT scans to evaluate the reproducibility of preoperative plan. In both groups, 3D preoperative planning were performed in order to determine the reduction, placement and choices of implants. In the image fusion group, the outline of the planned image was displayed on the monitor overlapping with fluoroscopy image during surgery. Surgeons performed osteosynthesis with the fusion image. Reductions were evaluated by the volar tilt and radial inclination of the 3D images. Plate positions were evaluated with the distance between distal edge of the plate and the distal radius articular surface, and the positions of plate axis relative to the radius axis. Screw choices were recorded for the plan and actual choices for each screw hole. The reproducibility were evaluated by the difference of the parameters between pre- and post-operative image. The differences for reduction shape, plate positions, and screw choices were compared between groups.

Results and Conclusions: The difference of the distance between plate and articular surface were significantly smaller in the image fusion group compared to the control group (0.30+/-0.29 mm and 0.81+/-0.59 mm for image fusion and control groups, respectively, P<0.01). The difference of the distal screw choices were significantly smaller in the image fusion group compared to the control group (0.32+/-0.64mm and 0.64+/-0.92 mm for image fusion and control groups, respectively, P<0.01). There were no significant differences in the reduction shape and the plate axis position. The image fusion system was useful to reproduce the planned plate position and distal screw choices in the osteosynthesis of distal radius fractures.

Keywords:
distal radius fracture; fluoroscopy; fusion; three dimension; preoperative plan
IFSSH19-403

Treatment of Pyogenic Arthritis with Drainage Sinus in Digits

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Objectives / Interrogation: In pyogenic arthritis of the digits, when diagnosed lately, drainage sinus may occur. Because of combined osteomyelitis, soft tissue destruction, and cartilage damage, it is difficult to treat this situation. In this study, we reviewed 36 cases of chronic pyogenic arthritis with drainage sinus in digits and (1) reported the result of repeated irrigation and debridement followed by flap surgery, and (2) compared the clinical manifestation between distal interphalangeal (DIP) joint and proximal interphalangeal (PIP) joint.

Methods: 36 patients (16 men and 20 women, 41-80 years of age with a mean age of 60.1 years) were diagnosed with chronic pyogenic arthritis with drainage sinus. The involved joints (21 DIP joints, 12 PIP joints, 2 thumb interphalangeal (IP) joints, 1 thumb metacarpophalangeal (MCP) joint) underwent surgical debridement and followed up for at least 12 months. Combined osteomyelitis in simple radiograph or magnetic resonance image, microorganism, antibiotic therapy, duration of treatment delay, duration of hospital stay, number of irrigation and debridement (I&D), and soft tissue coverage method were analyzed retrospectively. The range of motion (ROM) of the joint and radiologic outcome at final follow up were also analyzed.

Results and Conclusions: Combined osteomyelitis was diagnosed in 30 cases. Microorganisms were identified in 29 cases and 7 were polymicrobial infections. The identified microorganisms were resistant to the antibiotics used before, except one case. In the group analysis between DIP and PIP joint, mean duration of antibiotic therapy (5.9 ± 0.31 weeks, DIP; 7.6 ± 0.66 weeks, PIP; p<0.001) was significantly longer in PIP joints and patients involved their PIP joints had more I&D than those involved DIP joints (2.9 ± 0.84, DIP; 6.5 ± 1.7, PIP; p<0.001). Eight patients (n=0, DIP; n=8, PIP; p<0.001) underwent additional flap surgery. Three patients with involved DIP joint and 10 with involved PIP joint, the joints were fused (p<0.001). The mean ROM was 5.57 degree (8.57±5.51 degree DIP; 0.83±2.88 degree PIP, p<0.001).

Conclusions
Chronic pyogenic arthritis with drainage sinus in digit could be treated with repeated irrigation and debridement. When PIP joint is involved, longer duration of treatment, more I&D, higher need of a flap surgery, and less ROM is expected compared with DIP joint. If empirical antibiotics was used before, the surgeon should perform antibiotic susceptibility test.

Keywords:
pyogenic arthritis, infection, finger, digit,
Delayed zone 2 flexor tendons repair with less fatigue of the operators had better outcomes than primary repairs: An analysis of 83 fingers

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Objectives / Interrogation: We compared the outcomes of delayed zone 2 flexor tendon repairs by surgeons with less fatigue and better assistants with those patients repaired in emergency settings in late afternoon or night when surgeons have remarkable fatigue and less qualified assistants.

Methods: We repaired 83 flexor digitorum profundus (FDP) tendons in zone 2 of 68 patients from November 2013 to July 2017. There are 54 men and 14 women. The average age of patients was 36 (range 17 to 65) years old. 36 fingers were repaired after a delay a mean of 4 (2 to 10) days with primary skin closure and later tendon repair. 47 fingers were repaired primarily with 12 hours after injury. The FDP tendon was repaired with the 6-strand M-Tang repair using 4-0 looped suture and sparsely placed simple running peripheral suture with 6-0 or 5-0 nylon. The delayed repair was performed in the daytime with better assistants (1 or 2 junior attending surgeons or residents) and the primary repair was performed during the late afternoon or nighttime with only one general surgery resident to assist. After surgery, the fingers in both groups of patient followed the same rehabilitation protocols of early active motion, with partial range digital active flexion in the first 3-4 weeks and full range of active flexion thereafter. We compared the functional results and demographics and injury factors (gender, age, accompanied injuries, and follow-up lengths) between patients treated with delayed repair or repair in emergency settings.

Results and Conclusions: There are 25 excellent, 7 good, 3 fair, 1 poor in the fingers with delayed primary, and 23 excellent, 13 good, 8 fair, 3 poor outcomes using primary repair with follow-up of 8 to 27 months. There were no tendon ruptures. The mean range of motion of the proximal and distal interphalangeal joints in the 36 fingers with delayed primary repair was 161+/-25 degrees, which significantly better than that of 47 fingers with primary repair of 147 +/- 29 degrees (p = 0.018). We found no significant differences in demographics and injury factors (gender, age, accompanied injuries and follow-up lengths) between the two groups.

A primary repair in the late afternoon or nighttime with inexperienced assistants has worse outcomes than delayed primary repair as a selective procedure with experienced assistants. We conclude that surgeons' fatigue and quality of assistants affect outcomes of zone 2 flexor tendon repair.

Keywords:
Primary tendon repair, six-strand repair technique
Growth of transplanted bone after reconstruction for severely hypoplastic thumb

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Objectives / Interrogation: We have developed a novel two-stage reconstruction for a severe hypoplastic thumb: transplantation of a non-vascularized metatarsal head with epiphysis or metatarsophalangeal (MTP) joint for the first stage and tendon transfers for the second stage. The purpose of this study was to assess the biological attachment, the bone union and the growth of reconstructed first metacarpal bone.

Methods: We retrospectively reviewed the biological attachment and the bone union of 57 hypoplastic thumbs (27 Blauth IIIB and 30 Blauth IV) that underwent the two-staged reconstruction after 1992. The mean age at the first stage of surgery was 3.3 years. Bone union and growth of reconstructed first metacarpal was reviewed up to 5 years after surgery. The length of the reconstructed first metacarpal bone was measured on the AP view of plain radiographs every year. It was compared with the length of the ipsilateral second metacarpal bone.

Results and Conclusions: 42 hands obtained biological attachment. 32 hands obtained bone union without complication and a mean period of bone union was 8.8 weeks. Nine hands needed additional surgeries, and one hand with a bone graft from paralyzed side of the spina bifida had fallen into severe bone absorption. 27 hands (13 Blauth IIIB and 14 Blauth IV) reconstructed after 2000, which excluded these complications, were evaluated up to 5 years after surgery for bone growth of the reconstructed first metacarpal. The mean length of the first metacarpal bone was 23.8mm at surgery and 29mm at 5 years after surgery. On the contrary, the second metacarpal bone was 33.8mm at surgery and 44.6mm respectively. Growth of the reconstructed first metacarpal bone was recognized; however, the growth rate was lower than that of the second metacarpal bone. Subgroup analyses were performed according to the Blauth classification and the type of bone graft (metacarpal head or MTP joint). The growth rate of the first metacarpal bone was 129 % for Blauth IIIB and 118% for Blauth IV cases. There was a statistically significant difference between the two groups. The growth rate of the first metacarpal bone with the MTP joint was inferior to that with the metatarsal head, but there were no significant differences between the two groups.

In our study, the biological attachment and the long-diameter growth of the bone graft were confirmed for 5 years after surgery, although it was transplanted in a non-vascularized fashion. Further long-term follow-up study until epiphyseal closure is necessary.

Keywords:
hypoplastic thumb, growth
ANIMAL EXPERIMENTAL ASSESSMENT OF NERVE REGENERATION WITH A PROCESSED HUMAN UMBILICAL VESSEL USED AS A REGENERATION CHAMBER

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Objectives / Interrogation: Nerve regeneration chambers are used to decrease sites transplant donor morbidity. We propose a safe biomaterial, derived from an inverted umbilical artery from human umbilical cord, included in Wharton jelly which is rich in collagen and hyaluronic acid.

Methods: The biomaterial, with an inner diameter of 1.75 mm, is dehydrated and also secured by a viral inactivating treatment, enabling a hold of its tubular structure. A sciatic nerve section has been performed on 15 rats, with a sleeving and nerve endings suture by nylon points 9/0, in order to create a 1 cm gap. A daily monitoring allowed to assess the motor index of tonus recovery and sensitive recovery, compared to the healthy side. Rats are split in 3 groups and sacrificed at 1,3 or 8 weeks for macroscopic and histological analysis.

Histological staining specific to the myelin (MCOLL) and immunostaining of Schwann cells (S-100) and axonal cells (NF), have enabled to assess axonal regrowth, Büngner bands, the biomaterial integrity and the inflammatory reaction.

Kinetic regrowth compared to contro-lateral nerve has been assessed by histomorphometry.

Results and Conclusions: First sensitive recovery signs appear from D5. The tonus recovery in the emptiness appears from D24, movement against gravity since D28 and continue to evolve until D54. The biomaterial is resorbing progressively since D21 while preserving a regrowth chamber, and disappears completely on D56. The inflammatory reaction is weak since D7.

Staining and immunohistochemistry show a 90% axonal cells recovery since D56, a high density of Schwann cells with an increasing since D21 and an of organisation axonal fibers in the time and biomaterial space, moving from the proximal to distal stump, with an efficient myalination in 8 weeks. Nerve recovery fills quickly the 1 cm gap of the sciatic nerve: 50% at D21 and 100% filling at D56.

Conclusion
The biomaterial shows an efficient axonal regrowth in 8 weeks, after a section of a 1 cm gap. The biological allogenic devitalized structure shows a good tolerance with a complete integration and several physiological proteins that can have enhanced the good kinetic of the nerve regrowth. This new conduit has shown its biocompatibility in rats, with an axonal regrowth. It seems a promising product to consider for human transplants and nerve sutures.

Keywords: 
The Patient Specific Functional Scale in Dupuytren's disease; a more responsive outcome measure than standardized PROMS?

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Objectives / Interrogation: Due to the wide variety of functional problems of patients with Dupuytren's disease, standardized patient-reported outcome measures (PROMs) may fail to capture all problems these patients experience. Individualized PROMs might overcome this problem by enabling patients to specify and rate those activities with which they have difficulty in daily life. The Patient Specific Functional Scale (PSFS) is such an individualized PROM and is easy and relatively quick to use. The aim of this study is to determine the responsiveness of the PSFS compared to the Michigan Hand Questionnaire (MHQ) in patients with Dupuytren's disease.

Methods: Patients treated for Dupuytren's disease were asked to fill in the PSFS and the MHQ prior to surgery and three months after treatment. For the PSFS, patients were asked to identify and score three to five important activities they experienced difficulties with due to Dupuytren's disease. Activities were scored on an 11-point scale with '0' representing 'unable to perform' and '10' representing 'able to perform at prior-disease level'. At follow-up, the patients are presented with the same activities again and ask to rate the ability for each activity. Cohen’s D effect sizes were calculated to assess the responsiveness to change.

Results and Conclusions: A total of 308 patients was included. Patients mentioned a wide variety of functional problems of which the majority (e.g. computer use) was not covered by standardized PROMs like the MHQ. The mean PSFS score improved significantly from 5.0 at baseline to 7.7 at follow-up. The effect size of the PSFS was 1.0 (95% confidence interval 0.86-1.2), which was significantly higher and almost double the responsiveness of the MHQ (0.58; 95% confidence interval 0.42-0.74) of the MHQ.

This study demonstrates that the PSFS is more responsive to change compared to the MHQ in patients with Dupuytren's disease. Self-generated items and the measurement of such items truly reflect the needs and problems of the individual patient. These characteristics make the PSFS a valuable outcome measure for Dupuytren's disease and this fits well within the current emphasis of patient-centred healthcare.

Keywords:
Patient Specific Functional Scale; Michigan Hand Questionnaire; PROMs; Patient Centered Care; Responsiveness; Dupuytren's disease
Online patient information on Hand Transplantation: How reliable is it for facilitating shared decision making?

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Objectives / Interrogation: This study evaluates the quality of online information available for patients considering hand transplantation with vascularised composite allotransplantation.

Methods: Selected key phrases were entered into two popular search engines (GoogleTM, BingTM). These phrases were: “hand transplant”, “hand transplant amputation” and “hand transplant vascularised composite allotransplantation”. The first 50 hits per search were reviewed. Of the 300 identified sites, duplicate (158), irrelevant (26), news (128), academic papers (62) and inaccessible (3) results were excluded. 23 discrete resources were identified for evaluation by two independent assessors using the DISCERN instrument, a set of online criteria by which the quality of patient information websites can be judged.

Results and Conclusions: The median DISCERN score of analysed websites was 40/80 (20.5-55.0). This equates to Fair, bordering on Poor global quality (Excellent = 80-63; Good = 62-51; Fair =50-39; Poor = 38-27; Very poor = 26-15). None of the analysed sites were rated Excellent, 9% (2) rated Good, 48% (11) rated Fair, 30% (7) rated Poor, and 13% (3) rated Very poor. The included websites scored poorly on both reliability of information, including extent to which it can be trusted (18/40; 8.5-25.5), and also quality of information on treatment choices (20.5/35; 8.5-25.5). High quality information is required to facilitate patient-centred shared decision making in patients considering hand transplantation, but is not easily available online, with many available resources being of poor quality. There is a need for focused and reliable online resources to be developed for this patient cohort.

Keywords:
Hand transplantation
**Computed tomography-based three-dimensional preoperative planning for total wrist arthroplasty**

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**Objectives / Interrogation:** There have been many reports on the usefulness of three-dimensional preoperative planning (3D planning) using computed tomography (CT) for total knee and hip arthroplasties. However, few reports have described CT-based 3D planning for prosthetic arthroplasty of the upper limbs. We report a case of total wrist arthroplasty (TWA) using CT-based 3D planning.

**Methods:** A 65-year-old female presented to our hospital with weakness of the extensors of the left middle and ring fingers, which had gradually progressed over 2 months. She also had suffered from left wrist pain for 2 years. Having been diagnosed previously with rheumatoid arthritis and systemic sclerosis, she had been treated with methotrexate and tocilizumab since she was 40 years old. On physical examination, her left wrist was swollen, and the range of motion of her wrist joint was restricted: -10 degrees in extension to 40 degrees in flexion. Plain radiography revealed advanced bone destruction of the wrist joint and volar dislocation of the carpal bones, indicating arthritis mutilans. We planned a total wrist arthroplasty and extensor tendon reconstruction. After a 3D digital model of the wrist was reconstructed using CT and software, the computer-aided design models of the implant were superimposed on the wrist; the appropriate size and position of the implant were determined. During surgery, the planned parameters were measured with a slide gauge to reproduce the 3D-planned position of the implant. The size of the implant used at surgery was the same as in 3D planning, and the location of the implant was virtually the same as in 3D planning. Nine months after surgery, the extension and flexion of her wrist improved to 15 degrees and 35 degrees, respectively. Postoperative complications were not observed.

**Results and Conclusions:** It is difficult to place an implant in the proper position during TWA since the procedure is indicated for the treatment of severe wrist deformity due to RA with advanced bone destruction and bone weakness. The size and position of the implant can be appropriately predicted by 3D planning. Our method may contribute to a reduced incidence of complications and improved long-term outcomes after TWA.

**Keywords:**
3D planning, total wrist arthroplasty, TWA
Genotype-phenotype insights into familial polydactyly in Chinese people

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Objectives / Interrogation: Polydactyly is a genetically and phenotypically heterogeneous disorder which is the third most frequent congenital anomaly in China. The purpose of this study was to systemically investigate the genotype-phenotype correlations of familial polydactyly in Chinese people.

Methods: A total of 18 Chinese families with polydactyly were included. The family histories were recorded and physical examination of available family members was performed. Genomic DNA was prepared from peripheral blood of affected and unaffected individuals. Whole exome sequencing, Sanger sequencing, CytoScan and qPCR were used to identify the pathogenic mutations. The genotype-phenotype correlations were analyzed. Variants were functionally assessed by luciferase assay or computational simulation.

Results and Conclusions: Pathogenic mutations within HOXD13 and GLI3 were predominantly identified in 17 out of 18 families (94%). Among 11 families with HOXD13 mutations, 10 families had a 7- to 9-alanine expansion of the N-terminal 15-mer poly-alanine region spanning amino acids 57 to 72, and the other one family had a single amino acid substitution, I309F, in the conserved homeobox domain. GLI3 mutated in 6 families, all of which were truncating mutations. Phenotypically, preaxial polydactyly of either hands or feet, frequently Wassel type II and IV, and postaxial polydactyly of the hands were exclusively found in GLI3 mutated families, while postaxial polysyndactyly of the feet was unique for HOXD13 mutated families. In addition, synpolydactyly of 3/4 fingers and 4/5 toes was exclusively associated with HOXD13 mutations, but in GLI3 mutated families, syndactyly could happen between any of two digits and frequently involved multiple digits. Finally, clinodactyly of 4th or 5th fingers and broad thumbs were additional unique feature for HOXD13 and GLI3 mutated families, respectively. Functionally, I309F impairs HOXD13 transcription activity. In conclusion, through the molecular genetics study of the largest cohort of familial polydactyly of Chinese people, we revealed that GLI3 and HOXD13 were predominant mutated genes. Preaxial polydactyly of hands or feet, postaxial polydactyly of the hands, and broad thumbs were exclusively associated with GLI3 mutations, while synpolydactyly of 3/4 fingers or 4/5 toes, and clinodactyly of 4th or 5th finger were unique for HOXD13 mutations. Sanger sequencing of GLI3 or HOXD13 according to specific manifestation could be a cost-effective genetic diagnosis method for patients with polydactyly.

Keywords:
polydactyly, familial, Chinese, mutation, genotype-phenotype correlation
Recurrent Masson’s Tumor of the Finger: A Case Report

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Objectives / Interrogation: To describe a case report of a recurrent Masson’s Tumor of the finger. Intravascular Papillary Endothelial Hyperplasia (IPEH) often referred to as Masson’s Tumor, is an uncommon yet benign vascular disease of the skin and subcutaneous tissues. It usually arises within a blood vessel, but considered to be a non-neoplastic reactive endothelial proliferation commonly associated with vascular injury. Although it is rare, knowledge of this disease is important as it may mimic other benign and malignant tumors, especially angiosarcoma. Typically, IPEHs are asymptomatic and are slow growing soft-tissue masses with extremely low recurrence rates.

Methods: We describe a 19-year-old male with a recurrence of a Masson’s Tumor over the right little finger within 2 months of a routine excision of the lesion. We also present accompanying multimodality clinical, radiological and pathological imaging.
Results and Conclusions: This case illustrates the innocuous nature of the initial lesion easily mistaken for hematoma, thrombus or benign haemangioma. Awareness of the possibility of a recurrence of a Masson's Tumor is important for clinicians to rule out the presence of malignant vascular lesions.

Keywords:
Masson's tumor, Recurrence
Motor Imagery and Mental Practice as an augment for surgical training

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Objectives / Interrogation: The challenges of producing competent surgeons in the shortened training time available requires innovative and easily executable strategies that are evidence based. The working environment of the surgeons for skill acquisition is the operating room (OR) which cannot be the ideal environment for surgical learning both from a quality-of-care, work place efficiency and safety perspective (Arora et al., 2010). There is a need therefore for the design and development of a model for deliberate practice in surgery that is universally accessible and effective in producing learners of expert level performance at the end of the stipulated period of training for a psychomotor skilled task.

Methods: This research shows the methodology to provide a solution for training surgeons with predictable levels of expertise in a standard common surgical procedure using the interventions prescribed in the research model, given the constraints of limited time and unpredictable learning opportunities in the surgical environment.

Results and Conclusions: This new model for deliberate practice in microsurgery designed using Motor Imagery & Mental Practice (MIMP) scripts to produce expert performance among novices will be described together with the theoretical basis for this model and the methodologies of production of the script for other surgical procedures will be presented. The script has shown content and face validity and shown to be effective among surgical interns in a tertiary hospital in Singapore for performing microsuturing with a microscope in a glove model.

This research provides evidence for the use of this new model of motor imagery and mental practice in the microsurgical training domain. It shows that rapid skill acquisition in microsurgery is possible using MIMP training which can be incorporated into residency training programs in Singapore and be utilised for further research work in other settings.

Keywords:
Education
Opinion of surgeons worldwide on management of fingertip injuries

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Objectives / Interrogation: Fingertip injuries are common and there are numerous options available for management. The aim is to explore the preferences between how surgeons would want their own fingertip injuries treated compared to how surgeons would treat patients with similar fingertip injuries.

Methods: This qualitative study used a purposeful sampling with an online survey form, distributed to surgeons worldwide via a social media platform. These surgeons were from a community of surgeons on LinkedIn and Facebook. 3 different cases were presented to respondents - case 1 was an Allen 1 injury, case 2 was an Allen 3 injury with 2mm exposed bone, and case 3 was a crush injury of the distal phalanx. Respondents were invited to opine on their management preferences in these scenarios if these were their patients and their own fingertip injuries.

Results and Conclusions: There were 30 respondents. 60% males, 50% practicing in Europe, 36.7% in the Asia-Pacific region. 53.3% had >10 years of experience in surgery, 26.7% had 5-10 years. 36.7% were senior consultants, 43.4% were (associate) consultants.

For case 1, 73.3% would treat both patients and themselves identically, conservatively with toileting and dressing. The remaining would treat both patients and themselves identically, surgically - 6 chose local flaps, 1 a distal flap. 1 respondent chose local flap for his patient, but elected for microsurgical reconstruction with pulp transplant for his own care.

For case 2, 30% would treat both patients and themselves identically, conservatively with toileting and dressing. 4 also chose to shorten the bone. The remaining chose surgical treatment for their patients, of which 66.7% chose surgical treatment on themselves. This respondent elected to treat his own fingertip injury conservatively with simple dressing while treating his patient's with a local flap. Otherwise, the remaining would perform identical surgical treatment on both patients and themselves. 13 respondents chose local flaps, 2 replantation, 2 microsurgical reconstruction with pulp transplant, 1 each for distal flap, terminalization, and grafting.

For case 3, all chose identical treatments for both patients and themselves - 83.3% chose conservative treatment with toileting and suturing the wound followed by dressing. The remaining elected to remove nail with nail bed repair followed by a fingertip splint.

In conclusion, most surgeons would want their own fingertip injuries treated identically to how they would treat patients with similar fingertip injuries.

Keywords:
Fingertip injuries
An early experience on the use of intramedullary headless screws for hand fractures

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Objectives / Interrogation: The surgical management of metacarpal and phalangeal fractures is commonly with Kirschner wire and plate and screws, which may cause scarring and adhesions leading to poor functional outcomes. Intramedullary headless screw fixation can be a viable alternative with better outcomes. The aim is to present our institution's early experience on the outcomes of metacarpal and phalangeal fractures surgically fixed with intramedullary headless screws.

Methods: We retrospectively reviewed clinical data of patients who had metacarpal and phalangeal fractures fixed with intramedullary headless screws at our institution from January 2018 - August 2018. A total of 6 patients were identified. They were all male, all right handed, all work permit holders with an average age of 31. Five were labourers who were involved in an industrial accident while 1 was a technician who was involved in a road traffic accident.

Results and Conclusions: There were 2 proximal phalanx fractures, 1 middle phalanx fracture and 3 metacarpal fracture, and a single screw was used in all. Two patients had previous fixation of their fracture with plates and screws - 1 patient had removal of implants as his fixation was complicated by painful non-union and poor range of movement, while the other patient had peri-implant fracture. Subsequently, their fractures were surgically fixed with intramedullary headless screws.

At latest follow up, total average range of motion was 128. In 3 patients, fractures were healed and within acceptable radiological parameters. None of the patients have post-operative complications thus far at follow-up.

All patients are still on active follow-up, with ongoing hand occupational therapy. Patient satisfaction, quickDASH score, time to return to normal activities and work have yet to be determined.

Intramedullary headless screw fixation is a reliable alternative to metacarpal and phalangeal fractures.

Keywords:
Hand fractures, intramedullary headless screw
Experience with the use of semi-occlusive dressing and splint caps for the management of fingertip amputation injuries

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Objectives / Interrogation: Fingertip amputation injuries are one of the most common traumatic hand injuries. These injuries can be treated with surgical intervention such as locoregional flaps, replantation, or with terminalization. However, conservatively treated fingertip amputation injuries have an excellent regenerative ability and can lead to a functional, sensate and cosmetically pleasing fingertip. Our aim is to demonstrate our institution's experience with the conservative management of fingertip injuries with the use of semi-occlusive dressing and splint caps.

Methods: This retrospective study of consecutive patients who have sustained fingertip amputation injuries to the distal phalanx of the finger at our institution from January 2017 - July 2018. All patients attended our day surgery facility. All patients had local anaesthesia, wound debridement to the fingertip injury, followed by dressing with a semi-occlusive dressing, and thereafter the splint cap. We developed a three dimensional thermoplastic splint of the patient's original fingertip contour, termed the splint cap.

Results and Conclusions: There were 20 fingertip injuries in 20 patients who were all male. There were 25% Allen 1, 50% Allen 2 and 25% of patients with Allen 3 injuries. The mean age was 26. The mean follow-up duration was 4 months. The primary semi-occlusive dressing with splint cap was left for an average duration of 2 weeks.

In all our patients, the pulp regains satisfactory tissue cover after 4 weeks. Sensation returns within 6 weeks. 75% of patients had nail involvement. All patients had some degree of deformity of the nail. There were no serious complications such as tissue infections, neuroma, or osteomyelitis. None of the patients required a secondary flap coverage.

In conclusion, conservative treatment with semi-occlusive dressing and splint caps is a viable and cost effective alternative to the management of fingertip amputation injuries with excellent outcomes.

Keywords:
Fingertip injuries, semi-occlusive dressing
Outcomes and impact of fingertip amputation injuries in a local tertiary hospital in Singapore

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Objectives / Interrogation: Fingertip amputation injuries are common with treatment of these injuries by conservative or surgical means, where there has been increasing interest in treatment via conservative techniques. Also, these relatively small injuries also result in a high economic burden due to loss of productivity and disability.

The aim of this study is to demonstrate the outcomes of three different treatment options for fingertip amputation injuries and quantify the economic burden of such injuries in relation to the different treatment modalities.

Methods: This is a combined retrospective and prospective study of patients who received treatment for fingertip amputation injuries at a tertiary hospital in Singapore. These injuries are defined as distal to the distal interphalangeal joint.

In the retrospective arm, 30 case-matched patients received treatment for their injuries from January 2015 to July 2018 were analysed according to the following treatment modalities - semiocclusive dressing and splint cap, tutoplasty or locoregional flap coverage. There were 10 patients in each group.

In the prospective arm, purposeful sampling was used to randomly assign patients to receive treatment to either semiocclusive dressing and splint cap, tutoplasty or locoregional flap coverage.

The clinical and functional outcomes of these treatment modalities were examined and compared. Demographic data, occupation and cost of treatment were also collected and an estimation of economic costs was performed.

Results and Conclusions: Initial results revealed that patients who received tutoplasty took a longer time to heal, while patients who received locoregional flap coverage healed faster. Functional outcomes showed no statistical difference between all three groups.

Despite these clinical outcomes, there were no statistical difference in return to work amongst all three groups. Even though healing was faster in the surgical intervention group, however the costs of treatment was higher. The economic burden remained high for all three groups.

Deeper analysis will be presented.

In conclusion, fingertip injuries are common and although the outcomes are generally acceptable, these injuries result in significant economic burden. Semi occlusive dressing and splint cap is a treatment modality that can potentially reduce healthcare costs and time to return to work.

Keywords:
Fingertip injuries
Flap reconstruction and salvage of the diabetic foot - early results of a single surgeon.

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Objectives / Interrogation: To evaluate the outcome of diabetic foot reconstruction with free and locoregional flaps.

Methods: Between November 2017 and September 2018, diabetic patients requiring lower limb reconstruction were recruited into our study. All surgeries were performed by a single surgeon. Preoperative risk factors (smoking, peripheral arterial disease, history of angioplasty, chronic renal impairment and cardiac disease), minor and major complications (including need for repeat surgery as well as flap failure) and limb salvage rate were analysed.

Results and Conclusions: Results:
12 patients with diabetes and lower limb wounds received flap reconstruction. There were 7 microsurgical free flaps (1 gracilis, 6 anterolateral thigh) and 5 locoregional flaps. Patient age ranged from 35 to 74 years. There was 1 case of total free flap loss that was subsequently amenable to skin grafting. There were no incidences of life-threatening complications. Limb salvage rate was 100% at follow up.

Conclusion:
Our early results show that flap reconstruction for the diabetic foot has a good success rate and limb salvage rate with careful patient selection. Co-morbidities such as diabetes, peripheral arterial disease and smoking do not preclude lower limb flap reconstruction.

Keywords:
diabetic foot; lower limb; free flap; reconstruction
Triquetral fractures - a retrospective, multi-centre study of incidence, management and outcomes

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Objectives / Interrogation: This study examines triquetral fracture data from 6 hospital centres between 2009 and 2018. This study focused on elements of triquetral fracture management within these 6 centres, including the incidence, the fracture pattern, the short-term and long-term outcomes and the common mechanisms of injury. It is anticipated this will be the largest cohort of triquetral fractures studied to date and will ultimately lead to treatment recommendations for optimal management of triquetral fractures.

Methods: Data was obtained from hospitals within the Nepean and Blue Mountains Local Health district in NSW, Australia. (Nepean hospital ethics approval no: NBM18/805)

Results and Conclusions: Initial analysis has shown the incidence of triquetral fractures is higher than previously reported and may continue to rise as a result of increasing rates of motor vehicle accidents and falls in an aging population. In addition, triquetral fractures can be challenging to identify with plain radiography, and can be commonly identified as lunate fractures. If there are ongoing symptoms and a high clinical suspicion CT may be indicated and, in future practice, may be justified as a first line imaging modality. Particularly, given the increasingly higher resolution imaging available with shorter radiation exposures. For the management of triquetral fractures where there is a small chip fracture and wrist stability is intact a short arm cast with carpal stability is the standard, however a shorter period maybe useful and more easily tolerated by patients who are compliant and can aid in a rapid functional recovery.

Keywords:
Triquetral Fracture, Triquetrum Fracture, Carpal Fracture, Wrist Fractures, Wrist Injury
Outcomes of flexor tendon repairs of 99 fingers in zones 1 and 2 using a multi-strand core suture repair followed by early active mobilization

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Objectives / Interrogation: We retrospectively reported the outcomes of flexor tendon repairs in zones 1 and 2 using a multi-strand core suture repair followed by early active mobilization, and evaluated the influencing factors on the recovery of flexor tendon repairs, including finger, age, gender, zone, time of surgery and associated nerve injury.

Methods: From January 2014 to August 2017, we performed primary or delayed primary repair for completely divisions of flexor digitorum profundus (FDP) tendon in zones 1 and 2 in 99 fingers (67 patients) using multi-strand core suture repair followed by early active mobilization. The FDP tendons were repaired in 11 fingers in zone 1, 16 in zone 2A, 24 in zone 2B, 35 in zone 2C and 13 in zone 2D. These included 27 index, 26 long, 29 ring, and 17 little fingers in 51 men and 16 women. Their mean age was 36 years (16 - 67 years). Fifty-eight fingers had associated digital nerve or artery injuries. All repairs were performed within 7 days after injury except six patients. We repaired the FDP tendons using either a 6-strand M-Tang or a 4-strand U-shaped Tang core suture with 4-0 looped sutures, followed by a running peripheral suture using a 6-0 nylon suture. We did not repair the superficialis tendon in any patients and vented the entire A4 pulley or a part of the A2 pulley when necessary. A digital extension-flexion test was always performed after tendon repair. Active partial range flexion exercise were initiated from day 3 to 5 after surgery. The outcomes were evaluated with Tang criteria. Kruskal-Wallis test and the Mann-Whitney U-test were used to compare outcomes between zone 1 and each zone 2 subzones.

Results and Conclusions: A total of 99 fingers were followed up from 6 months to 20 months (mean 8.7 months). According to Tang criteria, excellent or good function was achieved in 46 (47%) and 41 (42%) fingers, fair 9 (9%) and poor 2 (2%) at the final follow-up, respectively. The outcomes in zone 2D were significantly superior to those in zones 2C (p=0.002) and 1 (p=0.004). The functional outcomes of women were significantly better than those men (p=0.02). However, the effects of some other demographics and injury factors (different fingers, time of surgery and accompanied injuries) on the recovery of flexor tendon repairs were little. There was no significant difference in outcomes between zone 1 and zone 2 in general.

We conclude that flexor tendon repair in zone 2D has significantly better outcomes than in zone 1 or zone 2C.

Keywords:
Flexor tendon repair, pulley venting, repair method, early active motion
Accessory Palmaris Longus causing carpal tunnel syndrome

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Objectives / Interrogation: The palmaris longus is the most variable muscle of the human upper extremity, and many variations have been describe. One of these variations is the accessory palmaris longus, or more commonly known as the palmaris profundus. In humans, the palmaris longus does not serve any important intrinsic function, however, the clinical applications of this muscle in hand surgery makes it important to recognize and be aware of its normal and variant anatomy.

Methods: We will briefly describe the anatomy and developmental origins of the palmaris longus, and describe the clinical relevance of an accessory palmaris longus by presenting a case report of an 86-year-old female who had right sided carpal tunnel syndrome secondary to an accessory palmaris longus.
Results and Conclusions: Awareness of the normal and variants of the palmaris longus is useful for hand surgeons. Furthermore, the accessory palmaris longus is a rare but important entity for the surgeon to recognize during routine carpal tunnel release surgery.

Keywords:
Palmaris longus, carpal tunnel syndrome, carpal tunnel release surgery
Treatment for flexor tendon tenosynovitis with rare non-tuberculous Mycobacteriosis (M. haemophilum): A case report

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Objectives / Interrogation: Background
We need to keep non-tuberculous mycobacteria for recurrent flexor tendon tenosynovitis with poor inflammatory findings in mind. Mycobacterium haemophilum (M. haemophilum) belongs to the group of non-tuberculous mycobacteria and is rarely reported as a cause of upper extremity and hand infections. Now we report surgical treatment for flexor tendon tenosynovitis due to M. haemophilum.

Methods: Case
A 73-year-old female patient was admitted with chronic flexor tendon synovitis of the left middle finger. She had a history of living renal transplantation and oral administration of immunosuppressant. Three debridements were carried out and wound swabs were taken. In the initial surgery of middle finger, acid-fast bacteria was found. As the swelling gradually appeared on the left thumb, second synovectomy for thumb were carried out and histologically a granulomatous infection with Langerhans cells was revealed. Mycobacterium haemophilum was identified by genetic examination. Medication was started with clarithromycin, rifampicin, moxifloxacin and rifabutin. Six months after second operation, synovitis of middle finger recurred. Third synovectomy was performed, and M. haemophilum was detected again.

Results and Conclusions: Discussion
M. haemophilum infection is very rare. Although there are few reports of pulmonary lesions and skin lesions in immunocompromised patients, M. haemophilum is rarely reported as a cause of flexor tendon tenosynovitis. It is difficult to identify this bacteria by conventional method and standard therapeutic regimen is unknown. The multiple drug combination of acid-fast bacteria is used and the administration period tends to be long term.

Conclusion
We experienced recurrent cases of M. haemophilum of the flexor tendon. It is necessary to keep this bacteria in mind for recurrent flexor tendon tenosynovitis of immunocompromised patient.

Keywords:
Mycobacterium haemophilum, flexor tenosynovitis
Outcomes of Syndactyly Reconstruction using Hyaluronic Acid Matrix

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Objectives / Interrogation: Syndactyly reconstruction typically includes full thickness skin grafts for areas of skin deficit after finger separation. Skin grafting requires additional anesthesia time and has donor site morbidity. In 2014, Landi, et al reported favorable outcomes with the use of a hyaluronic acid (HA) scaffold for syndactyly reconstruction instead of skin grafts. The purpose of this investigation was to assess our objective outcomes with HA scaffold use in syndactyly reconstruction.

Methods: All patients who were treated for syndactyly reconstruction with HA scaffold at our institution from 2015-2017 who had at least 1 year follow-up were included. 23 webs in 16 patients were identified including 11 patients with congenital syndactyly, 3 with symbrachydactyly, and 2 with amniotic constriction band. Average age at surgery was 39 months. There were 7 female patients and 5 webs were revisions. All webs were assessed with blinded clinical photos by two congenital hand surgeons. Outcome measures included web creep assessment (range 0-4), Vancouver Scar Scale (0 normal) to characterize scar appearance and a Visual Analogue Scale (VAS) for appearance and satisfaction (range 0-10).

Results and Conclusions: Web creep averaged 0.4, with 15 webs having no creep. Vancouver Scar Scale averaged 1.25 including 19 webs had normal vascularity, 16 with normal pigmentation, 12 with normal pliability and 14 with a flat scar. VAS assessment of appearance was 9 on both surgeon and parent assessment (range 5-10) and VAS for satisfaction averaged 9 (range 7 - 10). There were no post-operative complications.

Conclusions
HA scaffold instead of skin grafts is a reasonable option in syndactyly reconstruction. Our heterogeneous population revealed satisfactory outcomes for both surgeons and families. While no post-operative complications were noted, the maximum deficit able to be covered has not yet been determined.

Footnote

Keywords:
syndactyly; skin graft; scaffold; hyalomatrix; outcomes
Age, pathogenesis and the period from onset to surgery significantly affects the severity of cubital tunnel syndrome

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Objectives / Interrogation: Cubital tunnel syndrome (CuTS) is symptomatic ulnar nerve dysfunction at the level of the elbow resulting from a combination of compression, traction, and friction. McGowan's classification is most frequently used to define the severity of CuTS. There are several causes of CuTS including osteoarthritis (OA) of the elbow, valgus of varus deformity after elbow fractures, subluxation of the ulnar nerve and constriction at arcuate ligament of Osborne. The severity of the CuTS is diverse due to the different causes of CuTS. The purpose of this study is to identify the characteristics of patients operated for CuTS, based on their severity of CuTS.

Methods: 107 patients who were operated under the diagnosis of CuTS at a single institute were included in this study. Apart from clinical examination, all the patients were examined with electrophysiological testing and a plain radiograph of the elbow. The analysis of the characteristics of CuTS included the cause of CuTS based on the operative findings, age, gender, time from onset to surgery. These factors were cross compared between different McGowan stages.

Results and Conclusions: According to McGowan's classification, 11 patients were classified as grade I, 59 patients were classified as grade II and 37 were as grade III. The average age of the patients was significantly younger in grade I (47.7±4.3) in comparison with grade II (60.8±1.7) and III(63.3±2.0). As for the causes of CuTS, 45% was due to subluxation of the ulnar nerve and 18% was due to OA in grade I, whereas in grade II, OA was significantly higher in grade II followed by deformity after elbow fracture (11.9%). In grade III, the prevalence of OA also was also significantly higher (83.8%), followed by deformity after fracture (10.8%). The period from onset was significantly longer in patients with grade III (10.1 months) in comparison with grade I (6.7months) and II (6.1).

Our result revealed that patients going under surgery at McGowan stage I are significantly younger and have less incidence of osteoarthritis. Although here is no significant difference in age and cause of CuTS between grade II and II patients, the period from onset to surgery is significantly longer in grade III patients. We conclude that age, pathogenesis and the period from onset to surgery significantly affects the severity of cubital tunnel syndrome.

Keywords:
Anatomic Study of the Endoscopic Carpal Tunnel release

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Objectives / Interrogation: Our hypothesis is to define the relationship between vulnerable anatomic structures and knife edge of the instrument (Arthrex) in a cadaveric study. Vulnerable structures (ulnar artery, ulnar nerve, digital nerve 3rd and 4th web space, flexor tendons) will be within 10 mm of the knife edge when performing a ECTR using the Arthrex instrument in more than 50% of cadaveric specimens.

Methods: 18 specimens, 44% male, and 50% RHD and 50% LHD, ). The distance between the knife and the nerve for the 3rd web space showed the average distance when in neutral position 2.88 ± 2.18 mm increased to 4.22 ± 3.19 mm when the hand was in extension. When comparing the tip of the instrument to the nerve to the 4th web space, the distance averaged 5.1 ±1.88 mm when the hand was in neutral position, and increased to an average of 6.5 ±1.89 mm when the hand was in extension. The percentage of specimens with structures within 10 mm of the knife edge was statistically higher than expected 50% of specimens for the ulnar artery (P=0.027), the nerve for the 3rd web space (p=0.031) and the nerve to the 4th web space (p=0.039), as well as both in extension (p=0.039), as determined by Fisher’s exact test. An average of 2.6 passes of the knife to completely release the transverse ligament was documented.

Results and Conclusions: In conclusion, the data supported our hypothesis that in the majority of specimens the ulnar artery, commons digital nerves and are all less, and in many cases much less, than 10 mm from the knife edge of the instrument during a carpal tunnel release procedure. A relationship between the flexor tendons and the knife edge was not observed. In wrist extension, the distance from the tip of the knife to the common digital nerve for the 3rd and 4th web space increases, but is still less than 10 mm.

Keywords:
Endoscopic Carpal tunnel Release, Median nerve, Common digital nerve, Ulnar Artery, Flexor tendon
The distally based and free microvascular interosseous anterior flap in the treatment of hand injuries. Our experience.

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Objectives / Interrogation: In contrast to the distally based and free interosseous posterior flap, the interosseous anterior flap is not very often used. We strongly believe, that this flap should be more often be considered as an ideal flap in the treatment of hand- and especially of finger injuries. The anatomical basis is very constant and the harvesting of the flap, pedicled or free, is easy and straightforward.

Methods: We used the interosseous anterior flap in its pedicled and microvascular variant in 12 cases of hand- and finger injuries. The free microvascular flap was used in 3 cases as a through-flow flap for revascularization and soft tissue reconstruction. In the literature we find hardly no description of the interosseous anterior flap in clinical use for this purpose. We want to show the exact anatomical basis and our clinical experience with this flap.

Results and Conclusions: 11 of our 12 interosseous anterior flaps survived completely. In 1 case we lost one distally pedicled flap. In one case the revascularisation of a thumb was not successful but the flap survived and could be used for covering the amputation stump. We believe that this flap has many advantages and is ideal for revascularisation of severely damaged fingers. This flap is our first choice for harvesting a through-flow flap for finger revascularisation and should be used more often than in the literature mentioned so far.

Keywords:
pedicled and free microvascular interosseous anterior free flap, Through-flow flap
Mallet finger Treatment with temporal finger arthrodesis

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Objectives / Interrogation: The mallet finger is a common traumatic disease, can be open or closed injury. The closed injuries can be treated without surgery, but the patient has to use a splint, this kind of treatment is so many times uncomfortable for the patients, and let the patients don't follow and fail this. In our clinic for the closed mallet finger use a temporary transarticular k wire, lock the distal interphalangeal joint and the wire is left under the skin, and the patient doesn't have to use a splint, go back to work in 2 days, and take out the k wire in 8 weeks. This study is for review the functional and clinical outcomes of this technique, and review complications.

Methods: All the patients were examined by a medical doctor, different of the hand surgeon, who performed the surgery, all patient was check the range of motion of the finger, and the pain, and also the days to return to work and describe complications.

Results and Conclusions: The study find 60 patients, only 2 patients lost, 58 was examined, the average lag of extension was 6º (5-12), the pain was 1 (0-3), return to work was 3 days (1-8), we find our results can be compared with other treatments, and our technique can be useful for patients who wants to come back to work, and can be more comfortable for the patients this technique.

Keywords: mallet finger, k wires, interphalangeal arthrodesis, tendon injury
Dupuytren’s contracture: Long term results after treatment with excision of the contracted palmar fascia

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Objectives / Interrogation: Operative treatment for Dupuytren’s contracture includes percutaneous division, partial excision or total excision of the palmar fascia. The aim of this study is to present complications and the long term outcome in a large group of patients in whom the disease was treated with resection of the contracted palmar fascia, only in the affected rays.

Methods: From 2000 to 2016, 234 patients with Dupuytren’s contracture were treated with excision of the contracted palmar fascia in the affected rays. Mean age was 68 years (from 37 to 86). The dominant hand was affected in 146 patients. The ring finger was most commonly affected (149 patients). Ninety eight patients presented with two or more finger rays affected. The procedure was performed with axillary block and with a tourniquet application. All diseased tissues (contracted fascia, skin, digital ligaments) were dissected and excised. Excision of the contracted tissues at the proximal phalanx was carried out to restore or improve range of motion. Check rein ligaments in the PIP joint were divided if there was stiffness of the joint. When skin was infiltrated by the disease, it was removed and the wound was left open to close by secondary intention. Non diseased palmar fascia of the adjacent finger rays was not excised.

Results and Conclusions: Mean postoperative follow up was 10 years (from 2 to 16). Preoperatively, average extension deficit in the MCP and PIP joint was 38 and 32 degrees respectively. Postoperative values at the final follow up were 10 degrees in both joints presenting improvement of 28 and 22 degrees. Complications occurred in 61 patients (26%) and included 16 recurrences, 15 patients with complex regional pain syndrome, 1 amputation of the distal phalanx of the finger, 3 arthrodeses, 7 infections, 5 injuries of digital nerves that needed immediate repair, 7 sensory neuroapraxias that resolved after 6 months and 7 patients with cold intolerance which resolved at two years postoperatively. Excision of the affected-contracted palmar fascia is effective in the treatment of Dupuytren's contracture. Although it is technically demanding in the advanced stages, it remains the most effective type of treatment in these late stages. Complications (early and late) are frequent with the most serious being a digital nerve injury, infection, complex regional pain syndrome and recurrence of the disease. Early complications need immediate and appropriate treatment for a satisfactory outcome.

Keywords:
Dupuytren's contracture, palmar fascia, finger ray, extension deficit, check rein ligaments, digital nerve
Reconstruction of fingertip injuries using the homodigital island flap

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Objectives / Interrogation: Amputation of the fingertip with loss of the pulp, exposed bone and nail bed injury is a common problem, not infrequently neglected. Fingertip reconstruction requires new pulp glabrous skin coverage with sensitivity buttressed by the nail. Traditional management techniques may leave a much shorter hypersensitive stump, with joint stiffness, cold intolerance and prolonged disability. The aim of this study is the analysis of our experience from the use of homodigital island flap for the reconstruction of amputated fingertips.

Methods: The homodigital island flap was applied in 52 patients (65 fingers), at every level of finger amputation with special indication on fingertip coverage. The procedure was carried out under axillary or wrist block using magnifying loupes. For the index and the middle fingers, use of the ulnar bundle is preferred. For the thumb, ring and little finger use of the radial neurovascular bundle is used. The neurovascular bundle is well dissected from the flap to the base of the finger. After suturing of the flap the donor area is covered with split thickness graft from the hypothenar. The finger is mobilized one week after the procedure.

Results and Conclusions: Follow up ranged from 14 to 94 months (mean 46 months). Postoperatively, range of motion was normal in 50 fingers, 8 fingers had 10 degrees loss of extension at the DIP joint and 7 fingers had loss of motion between 10 and 20 degrees. Two-point discrimination was 4mm (from 3 to 10mm). Three patients had cold intolerance for 8 months. There was no neuroma or sensitive scar formation and no need for a second operation. According to patients cosmesis was acceptable to all fingers.

The use of homodigital island flap provides excellent functional reconstruction of the fingertips after a complex tissue loss in Allen II, III, and IV amputations. It is a straightforward operation that provides very satisfactory results.

Keywords:
homodigital island flap, fingertip amputation, Allen's classification, fingertip reconstruction, split thickness graft
A new non-invasive device in the treatment of severe finger contractures

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Objectives / Interrogation: Advanced Dupuytrens disease and other pathological conditions can lead to extreme contractures of fingers, which are technically hard to access by surgery. Thus, the effort and the chance of complications in operative treatment are increasing in relation to the level of contracture.

Hence preoperative treatment for those severe conditions, aiming to minimize extension deficit, is desirable.

In this concern, treatment is divided in invasive and non-invasive methods. Invasive treatment can be associated with severe complications and needs good compliance. Non-invasive, ready-to-use splints are useless for severe contractures. Only few technical devices and solutions are described in the literature, most of them are only available at one hospital and not on the European or global market.

We felt the necessity to obtain a non-invasive device, capable of mastering all desired requirements and linked with lowest drop out rate possible.

Methods: We developed a pneumatic splint, which addresses severe contractures of the fingers and is obtainable for everybody.
It is composed of a combination of a hard material splint, a steel frame clip and flexible materials. The splint has a hinge, which can be adjusted and fixed with a lever at any angle. The clip divides an air chamber, allowing to direct the expansion of the flexible materials in two different locations (thenar/hypothenar and fingers) from palmar to dorsal; the device is fixed at the dorsal side of the hand. The combination of the materials interact, thus realizing a stretching force to the fingers, according to the three-point support principle. The splint can be easily adapted and used with one hand and at both sides.

Results and Conclusions: The recently on the market available, innovative device is efficient particularly for the preoperative treatment of severe finger contractures, avoiding the disadvantages of invasive options. It is simple to use, variable and adaptive to even high grade contractures and thus effective, when other splints fail. The acting forces can be fine-tuned at any time and the splint therefore fulfills the need to act smoothly on the tissues. It provides patients with a magnitude of comfort, is very application friendly and highly accepted.

Keywords:
finger contracture, Dupuytrens, splint, extension treatment, pneumatic
The use of titanium miniature plates and screws for the treatment of intra and extra-articular fractures of the hand

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Objectives / Interrogation: Operative treatment of hand fractures is reserved for unstable, irreducible, comminuted, intraarticular, and open fractures. The aim of this study was to evaluate the outcome of hand fractures treated with titanium, low profile plate and screws.

Methods: 90 patients with 114 hand fractures were treated with titanium mini plates and screws. 46 phalangeal and 68 metacarpal fractures were included. Mean age of the patients was 36 years (from 11 to 75). The dominant hand was injured in 50 patients (55%).
114 fractures involved 113 rays. 32 were open, 27 were intra-articular and 12 were both open and intra-articular. 23 fractures involved combined injuries with damage to tendons or neurovascular bundles.
Fractures were fixed after a mean of 2.9 days (range, 0-28) from injury. Regional anaesthesia was utilized in 85 patients and general anaesthesia in 5 patients. Combined plates and screws were used in 85 fractures, while only screws were used in the remaining 29 fractures. Fixation with screws was selected for condylar or intra-articular fractures, and for long oblique or spiral diaphyseal fractures.

Results and Conclusions: Mean follow-up was 39 months (from 30 to 57). Apart from one case, all fractures were successfully fixed. Grip strength was measured as high as 89% compared to the uninjured hand even in patients of intra-articular fractures. Open intra-articular fractures had the least favorable outcome (67% of the contralateral hand).Regarding tip pinch, open intra-articular fractures had the least favorable outcome (68% of the contralateral pinch strength). DASH score was 8.7 in the intra-articular group and reached 15.6 in the open intra-articular group. Finally, pain measured with the Visual Analog Scale reached a maximum of 2.3 in all groups, except for open intra-articular fracture, which demonstrated a mean of 3.2. There was no statistically significant difference in grip strength (p= 0.25) or Total Active Motion (p= 0.849) between extra and intra-articular fractures. TAM and grip strength were statistically different between open and closed fractures (p= 0.001 and p= 0.013 respectively).

Low profile plates and screws can be used successfully to establish union and restore alignment of the hand skeleton while achieving satisfactory clinical outcome. Factors that influenced the final outcome included the severity of the initial injury and not the anatomic location (intra or extra-articular, metacarpal or phalangeal) of the fracture.

Keywords:
hand fracture, intra-articular comminuted fracture, mini plates fixation
An analysis of patient’s and disease related factors predictive of the outcomes of surgery for carpal tunnel syndrome

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Objectives / Interrogation: Outcomes of surgery for carpal tunnel syndrome may differ in relation to certain factors like age, duration of symptoms, clinical and electrophysiological severity. The objective of this study was an investigation into the hypothesis that several factors are predictive of results of surgical treatment of the condition.

Methods: The pre- and postoperative records of 1,117 patients: 909 women (81%) and 208 men (19%) with a mean age of 63 years were analysed. The whole group was divided into subgroups, depending on the variables analysed: sex, age, duration of symptoms, clinical and electrophysiological severity of and presence of comorbidities. The effect of these variables on outcomes of surgery at 6 months was investigated by univariate and multivariate analysis.

Results and Conclusions: None of the considered variables had a substantial impact on the results of carpal tunnel release which were sufficiently satisfactory at any circumstances. Slightly poorer outcomes in grip strength were observed in elderly patients, with clinically severest condition and with concomitant comorbidities.

Keywords:
carpal tunnel syndrome; outcome measures; multivariate analysis
An analysis of the course of carpal tunnel syndrome before operation

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Objectives / Interrogation: The natural history of carpal tunnel syndrome (course of untreated disease) is not well recognised. Older studies suggested that CTS progressed in time leading to median nerve compromise and subsequent loss of sensation, muscle weakness and functional impairment. However, more recent literature shows that a proportion of patients who were scheduled for surgery, cancelled it due to significant clinical improvement or permanent spontaneous recovery.

Methods: This work reports the results of an analysis into the course of carpal tunnel syndrome before operation in 479 patients, predominantly women, aged a mean of 58 years, who were scheduled for carpal tunnel operation. The patients were asked to characterise in detail the course of the disease and what determined the decision to undergo surgery.

Results and Conclusions: We identified two specific patterns of CTS course: progressive and preservative/mild. Patients with short-lasting disease suffer first of all from symptoms, but the longer the duration, the more pronounced the functional impairment. In a proportion of patients with longer-lasting disease, spontaneous resolution may occur, for up to a year or more. Bilateral involvement is more common than unilateral and the interval between involvement of the other hand is a mean of 10 months. For most patients the primary motivation to undergo surgery is troublesome symptoms (pain and paraesthesia). Functional impairment is of secondary importance, however, its prominence increases in older patients and in those with longer-lasting disease.

Keywords: Carpal tunnel syndrome, Natural history, Clinical course
Familial occurrence of carpal tunnel syndrome

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Objectives / Interrogation: The controversy has been considerable regarding the incidence of familial occurrence of carpal tunnel syndrome. Single families have been reported where the most of members have been affected and the results of some population-based studies showed a higher incidence of the condition among relatives of some patients. The objective of this study was to investigate the incidence of familial carpal tunnel syndrome in patients admitted to the authors' institution for carpal tunnel release.

Methods: Questionnaires completed at baseline clinical examination by 120 patients with CTS admitted to the authors' institution between December 2017 and March 2018 (4 months) were reviewed. Informed consent was obtained from all subjects before enrolment. There were 92 women (77%) and 28 men (23%) at a mean age of 56 years (range 33-84). Basic demographic and clinical information was recorded in the questionnaire. All participants were then asked whether they knew of one or more family members with carpal tunnel syndrome. In the event of a positive answer, patients were asked to indicate who of the relatives were affected, when the disease was diagnosed, which hand was involved and how they were treated.

Results and Conclusions: Familial occurrence of the disease was noted in 21 patients (17%): 16 women and 5 men. Three family members were affected in 3 patients, two relatives in 8 patients and one relative in 10 patients, giving a total of 35 affected relatives. The patients' sisters (n=16) were the most commonly involved, followed by mothers (n=12), daughters (n=2), brothers (n=2), grandmothers (n=2) and an aunt (n=1). Bilateral manifestation of the disease was noted in 19 patients (90%) and in 31 (88%) of their affected relatives. The results suggest that carpal tunnel syndrome shows moderate tendency to familial occurrence and if so, it usually manifests bilaterally.

Keywords:
carpal tunnel syndrome; familial occurrence; genetical predispositions
Late outcomes after hand replantation

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Objectives / Interrogation: The objective of this study was evaluation of functional outcomes in patients whose underwent successful replantation of amputated hands in author's institution at least 4 years before.

Methods: 54 patients who underwent successful replantation of amputated hands or fingers were identified. These patients were mailed a set of questionnaires asking for hand function (DASH questionnaire), quality of life (SF-36), cold intolerance and return to work. 22 completed questionnaires returned (response rate 41%) and these data was a subject of the analysis. This group comprises also 5 patients who were examined directly in the hospital. The group consisted of 22 patients, 20 men and 2 women, in a mean age of 43 years (range 20-82), who had performed hand or fingers replantation a mean of 6.5 years before the assessment (range 5-7). The most patients had amputation of the metacarpus (n=9), followed by fingers II-V (n=8), wrist (n=2), thumb (n=2) and forearm (n=1). The cause of amputation was circular saw in 15 cases (68%) followed by industrial or agriculture machinery.

Results and Conclusions: A mean DASH score for a whole group was 23 (range 2-74) what shown for an average mild dysfunction of the replanted hands. Ten patients (45%) regained very good function (DASH< 20), seven (32%) showed mild dysfunction (DASH 21-40) and five had greater disability (DASH >40). The patients following wrist and thumb replantation showed the best functional outcomes (DASH 4), less favorable had patients after finger II-V replantation (DASH 16) and the poorest showed patients after metacarpus and forearm replantation (DASH 33). The mean score in physical subscale of the SF-36 questionnaire was 61, indicating good quality of life. For mental SF-36 subscale the mean score was 58 indicating moderate quality of life. Twenty patients complained of troublesome symptoms of cold intolerance. Twelve patients (54%) returned to previously performed work.

Conclusion. Results of this study show that most patients regained good function of replanted hands allowing them good functioning in a daily life and return to work in proportion of them.

Keywords:
hand replantation; outcomes measure; quality of life
Successful treatment of paediatric lower limb CRPS by continuous epidural anaesthesia: a report of 2 cases

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Objectives / Interrogation: CRPS occurs in children less frequently than in adults, but in the last two decades it has become a well-established entity in children and adolescents. The symptomatology, course, responsiveness to treatment and prognosis of the paediatric disease is also different from the "adult" form.

Methods: The paper presents the successful treatment of two cases of paediatric CRPS involving the lower limb, by continuous epidural anaesthesia with bupivacaine. Both patients developed the condition after minor trauma or overuse. CRPS diagnosis was based on clinical grounds. Both patients presented a history of psychological distress, due to familial problems.

Results and Conclusions: In one patient, the initial treatment was lumbar sympathetic block, resulting in immediate and complete recovery. After relapse of the disease at four months, the next intervention included continuous epidural infusion of bupivacaine, with an excellent and rapid response. In the 2nd case, continuous epidural infusion was used primarily with the same, excellent and fast result.
Clinical peculiarities, treatment modalities and other aspects of paediatric CRPS are discussed. Poor awareness of the condition in the paediatric community is emphasized.

Keywords: complex regional pain syndrome; epidural anaesthesia; psychological distress
Three-year (2014-2016) activity report of the Replantation Service for hand amputations in a Mid-European country

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Objectives / Interrogation: The paper summarises 32 months (January 2014 - August 2016) of activity of the Replantation Service for hand amputation in a Mid-European country.

Methods: Questionnaires were analysed received form 6 institutions, members of the National Replantation Service. Over the period of 32 months (January 2014 - August 2016) a total of 354 cases of amputations and other complex injuries to the hand were treated. There were 167 total (47%) and 142 subtotal (40%) amputations; 45 patients (13%) had other severe hand injuries. Vast majority of the patients constituted males aged a mean of 39 years. The most common injury was amputation of several digits in one patient, and thumb amputation - a total of 229 cases (65%), followed by transmetacarpal and wrist amputations - 92 (30%) and forearm/arm amputations - 33 cases (9%).

Results and Conclusions: Replantation of amputated extremity was performed in 141 patients (40%), revascularization in 145 (41%) and in 29 (8%) primary repair of the complex injuries. In 27 cases (8%), a coverage of the tissue defects, and in 12 (3%) primary terminalization was performed. Survival rate was of 78% for replantations and revascularizations. Comparing to the period 2010-2012, an increase in number of treated patients (of n=64 cases), in number of amputations (of 96 cases) and in number of amputated digits (of 88 cases) were noted. The activity report shows importance of Replantation Service, an informal structure, in saving limbs of severely mutilated patients.

Keywords: -
DORSAL CAPSULOPLASTY FOR POST-TRAUMATIC INSTABILITY OF THE DISTAL RADIOULNAR JOINT

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Objectives / Interrogation: Analyze the functional and subjective outcome of patients with posttraumatic Distal Radioulnar Joint (DRUJ) instability treated with dorsal Capsuloplasty.

Methods: We have re-examined 8 patients with chronic posttraumatic instability of the DRUJ who have been operated with a Dorsal Capsuloplasty and reinsertion of the Triangular Fibrocartilage. Their ages varied between 23 and 57, with an average of 42. The duration of the symptoms before surgery varied from 2 to 18 months. Only patients with at least 1 year after surgery were included. We have assessed subjective issues like pain, instability and satisfaction. In the objective assessment we carried out the physical examination of the wrist and potential complications from the surgery.

Results and Conclusions:
All of the patients reported relieve from the pain. Three patients reported local pain for a few months after immobilization and 4 patients reported paresthesia in the dorso-ulnar region of the hand. However, in every case, the symptoms improved before the re-examination for this study, in which all of the patients examined were operated more than 1 year before. In all of the patients the range of the pronosupination motion was normal, although 3 of them have noted that the region of the head of the Ulna was still a bit more protuberant when compared with the contralateral side. Nevertheless, these patients had no complaints. They have all reported not having the previous instability symptoms anymore and have resumed the activities they performed before the trauma, and also, they have all mentioned being satisfied with the treatment. Four patients are high level amateur tennis players that are satisfied with being back to their sport activity.

Conclusion:
The Capsuloplasty of the DRUJ for chronic instability of such articulation is an efficient surgical procedure with few complications.

Keywords:
DRUJ, distal radioulnar instability, triangular fibrocartilage, wrist
Outcomes after scaphoid excision and midcarpal arthrodesis for SNAC and SLAC wrist arthritis

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Objectives / Interrogation: Persistent, long-lasting pseudoarthrosis of the scaphoid or scapholunate dissociation results in arthrosis of the radio-scaphoid joint called "scaphoid nonunion advanced collapse, SNAC" or scapholunate advanced collapse, SLAC", which cause pain, reduction of movement of the wrist and weakness of the hand grip. Scaphoid resection followed by midcarpal "four-corner" arthrodesis is a recognized method of management of this condition. The objective of this study was assessment of long-term outcomes of this technique employed in patients with SNAC and SLAC wrist arthrosis.

Methods: The results of the treatment of 27 patients, 26 men and one woman with SNAC (n=15) and SLAC (n=12) wrist arthritis at a mean of 4 (range 2-8) years after the operation were assessed. The outcome measurements included pain intensity in numeric rating scale, NRS, wrist range of motion, total grip strength, and function of the hand with DASH and Mayo questionnaires.

Results and Conclusions: A mean pain score at wrist movements in numeric scale was 3.6 (range 1-5). A mean wrist active range of movement was (affected vs healthy hand) was: flexion 27O vs 58O (46%), extension 27O vs 52O (53%), ulnar deviation 16O vs 26O (62%), radial deviation 9O vs 17O (53%), total grip strength 22 kG vs 29 kG (76%), DASH scores a mean of 22 (range 4-36) and Mayo scores a mean of 72 (range 65-80). None of the patients required revision surgery. Of the 16 patients employed prior to operation 10 returned to work after a mean of 4 months sick-leave.

Conclusion. The resection of degenerated scaphoid bone followed by midcarpal arthrodesis is an effective treatment of SNAC and SLAC wrist arthrosis, resulting in pain cessation and improvement of hand dexterity, at the cost of mild reduction of wrist movements.

Keywords:
Wrist arthrosis, SNAC, SLAC, midcarpal arthrodesis, four corner fusion
Percutaneous K-wires vs palmar-locking-plate fixation for distal radial fractures: a comparison of the outcomes of two methods used according to the accepted guidelines.

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Objectives / Interrogation: There are several options for the operative treatment of distal radial fractures, but the two most-common forms of surgical fixation are percutaneous K-wire and locking-plate fixation. Although the latter technique has attracted increasing popularity in recent years, the former is still useful for selected fractures. The objective of the study was a comparison of the outcomes of K-wire vs plate fixation for distal radial fractures used according to the proposed institutional algorithm. Fracture configurations A2, A3, B1, B2, C1 and some C2 were operated on with K-wire pinning, whereas B3 and some B2, C3 and some C2 were with locking palmar-plate fixation.

Methods: Four hundred and sixty-seven patients were non-randomly allocated for either K-wire (n=363) or palmar-plate (n=104) fixation. The results were assessed at 3 and 12 months by the same outcome measures.

Results and Conclusions: No statistically significant differences were observed in any of the analysed variables: range of wrist motion, total grip strength, and DASH scores at the final assessment. Statistically significant differences were noted in radiological measures of the palmar tilt (0° vs -5°) and the ulnar variance (0.3 vs 1.4 mm), both favouring the plate-fixation method. Although K-wire fixation provides suboptimal stability and does not guarantee the maintaining of the reduction, it can be effective for selected fracture configurations, which constitute at least 2/3 of their total number. We concluded that being guided by the postulated algorithm in the choice of treatment for distal radial fractures struck a reasonable balance between clinical- and cost-effectiveness.

Keywords:
distal radial fractures; K-wire fixation; outcome measures
Outcome of partial excision arthroplasty of fifth carpometacarpal joint

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Objectives / Interrogation: Comminuted intra-articular fractures of the base of the fifth metacarpal without carpometacarpal joint dislocation are relatively common injuries. A small proportion of these injuries develop displacement of a bony fragment due to the pull of extensor carpi ulnaris tendon resulting in an intra-articular step, subsequently remaining symptomatic, with pain, weak grip and subsequent inability to return to their previous level of activity at work.

To assess outcome and function in patients who underwent partial excision arthroplasty of the fifth carpometacarpal joint (CMC) with excision of this bone fragment and interposition of a distally based capsular flap.

Methods: Ten patients were identified prospectively. Wrist range of motion and grip strength were assessed pre-operatively, and at six weeks, six months and one year post-operatively. Pre and post-operative pain visual analogue score (VAS), post-operative patient evaluation measure (PEM) score, and return to work were also assessed.

Results and Conclusions: All patients had delayed presentations, between four and six weeks following injury, and involved the dominant hand. Seven were manual workers, three were military personnel. None had fifth CMC joint dislocation or other injuries on computed tomography scan. Wrist dorsiflexion and ulnar deviation were decreased pre-operatively due to pain and returned to normal when compared to the contralateral side within six weeks of surgery. Mean grip strength was 40% of the contralateral side pre-operatively and improved to 68% by six weeks post-operatively and 87% at six months. Mean pain VAS decreased from 8.4 to 3.4 at six weeks post-operative. Mean PEM score was 19.4 six months after surgery. All patients returned to their previous employment, and none required further surgery. There was no significant further improvement at one year and manual workers described discomfort after a full day at work, which they described as minimal when compared to pre-operative level of pain.

Partial excision arthroplasty of the displaced bone fragment to restore articular congruency of the fifth CMC joint and capsular interposition in cases of delayed presentation or fracture fragment displacement provides good pain relief and improved function allowing return to function and gainful employment.

Keywords:
comminuted fracture base fifth metacarpal; delayed presentation
Intramedullary fixation using artificial bone block for comminuted distal radius fractures suppresses the reduction loss after the surgery

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Objectives / Interrogation: On the past decade, volar locking plate has become the most popular technique in the treatment of distal radius fractures (DRFs). Rigid fixation using these plates allowed for early mobilization, restoring the wrist function. However, DRFs with cortical comminution at the palmar side makes it difficult to stabilize to anatomical alignment only volar locking plate and that treatment often require additional methods. The object of this study is to assess that surgical fixation using artificial bone block suppressed reduction loss after the surgery by investigating the change of postoperative anatomical alignment of the distal radius.

Methods: A total of 153 patients with the open reduction and internal fixation were seen in this series between March 2013 and June 2018. All patients underwent proximal-type volar locking plate (stellar 2, HOYA technosurgical). Patients were excluded if they underwent fixation using external fixator or distal-type volar locking plate. Of these, 15 patients were added to artificial bone blocks. 10 patients, who belong to the same AO/ASIF classification as artificial bone block used group, were treated without bone block and compared as control group.

Imaging data using preoperative and postoperative radiographs were examined for radial alignment including radial tilt (RT), volar tilt (VT) and ulnar variance (UV) from 0 to 3 months after surgery.

Statistical analysis was done using a student-T test or ANOVA.

Results and Conclusions: At the population of patients by AO/ASIF classification, A3 was one (3), C2 was four (2) and C3 was ten (5). In Postoperative alignment of the cases using artificial bone block, the mean of RT was 21.5° (21.5°), VT was 12.2° (11.1°) and UV was -0.7mm (0.1mm). In Postoperative reduction loss, the group with artificial bone block, RT was 0.6° (2.4°), VT was 1.3° (2.8°) and UV was 0.6mm (2.1mm). () showed control group.

In comminuted DRFs, especially palmar side comminution, those treatment still be challenging. This analysis indicates surgical fixation using artificial bone block is effective for preventing reduction loss after the surgery.

Keywords:
distal radius fracture
Sonographic diagnosis of closed pediatric finger injuries

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**Objectives / Interrogation:** Closed injuries of the fingers are very common in childhood. In the majority of cases, targeted two-planes X-rays can exclude or confirm the diagnosis of possible fractures. High frequency ultrasound can have a diagnostic value similar to X-ray. In our presentation we report the results of 200 point of care sonographic examinations.

**Methods:** We included children under the age of 14 with closed, 1-3 days old finger injuries. We excluded children with open physeal plates, open injuries or non-traumatic hand complaints. Sonographic examinations were carried out immediately after physical survey by two orthopaedic surgeons skilled in pediatric trauma and musculoskeletal ultrasound. Fingers were evaluated from four different standard longitudinal planes. A comparative picture from the unaffected side was also made. Ultrasound pictures were saved and analyzed. The examinations were carried out with a 20MHz frequency linear transducer. Standard two-planes x-rays were made immediately after physical and sonographic evaluations. Results of X-rays and sonography were compared.

**Results and Conclusions:** Between 2017 and 2018 we evaluated 200 children. We found 61 (30.5%) finger fractures out of 200 injuries by x-rays. Distribution of fractures diagnosed by X-rays was the following: 20 (10%) basal phalangeal avulsions, 6 (3%) distal phalangeal avulsions, 7 (3.5%) epiphyseolysis, 5 (2.5%) diaphyseal fractures, 21 (9%) torus fractures, 2 (1%) intraarticular displaced fractures. We did not detect any false negative sonographic result. We found five false positive sonographic cases. Regarding bony cortex disruptions we found the following results of ultrasound tests compared to X-ray examinations: sensitivity 1, specificity 0.96, positive predictive value 0.92, negative predictive value 1. Evaluation by examiners showed a minimal difference. Interobserver agreement was 95.08%, Cohen's kappa value: 0.88. In the case of negative sonographic findings X-rays may be omitted. In cases when the exact configuration of the fractures can be established by ultrasound the need for any X-rays should be considered. X-rays are indispensable with positive but uncertain sonographic findings. The use of the ultrasound can provide additional information of a particular injury. Point of care high frequency sonography can be a valuable addition in the diagnostics of pediatric finger injuries. The routine use and the accurately defined professional and legal background of the method are still the tasks of the future.

**Keywords:** sonography, pediatric finger injury, point of care, ultrasound
Scapholunate Ligament Reconstruction with Internal Brace Technique Provides Biomechanically Equivalent Fixation Compared to the Percutaneous Pin Fixation in a Cadaveric Model

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Objectives / Interrogation: To compare the in-vitro efficacy of a knotless suture anchor internal brace technique with the percutaneous pin fixation for wrist stabilization in the setting of scapholunate interosseous ligament injury (SLIL) injury.

Methods: 10 cadaveric forearm pairs were randomly assigned to two groups based upon repair techniques, either internal brace reconstruction or percutaneous pinning.
Internal Brace Technique

A) scapholunate interval widening following SLIL transection  
B) anatomic reduction  
C) internal brace fixation  
Radiographs demonstrating three-pin fixation:  
D) posteroanterior (PA) view  
E) lateral view

Figure 1 Images demonstrating internal brace: A) scapholunate interval widening following SLIL transection B) anatomic reduction C) internal brace fixation Radiographs demonstrating three-pin fixation: D) posteroanterior (PA) view E) lateral view

Three-pin Fixation Technique

The SLIL was transected utilizing a dorsal approach. A modified Henry approach was utilized to isolate the flexor tendons, which were secured with #5 Ethibond suture. Kirschner wires were placed in the lunate and scaphoid for use as joysticks to aid in
reduction, which was held with two transscaphoid, transtunate k-wires and one transscaphoid, transcapitate k-wire. In the internal brace group, an Arthrex Swivelock anchor with labral tape was first placed dorsally in the proximal pole of the scaphoid and then secured under tension to the dorsal aspect of the lunate using a second Swivelock anchor. The "V"-shaped construct was completed by bringing the labral tape back to the distal pole of the scaphoid and securing it under tension with a third Swivelock anchor dorsally. For the k-wire repair group, two k-wires were placed percutaneously spanning the scaphoid and lunate and a third was placed spanning the scaphoid and capitate. Retroreflective markers were attached to the distal radius, scaphoid, and lunate to track the 3D motions of each bone. The flexor tendons were loaded to 20lb at 1Hz for 300cycles to simulate physiologic gripping. The change in scapholunate gap (mm) and scapholunate angle (degrees) were calculated after completion of cyclic loading. Paired t-tests were used for statistical comparisons with a p-value < 0.05 considered to be statistically significant. All values reported as mean ± standard error.

**Results and Conclusions:** There was no difference in the increase of the scapholunate gap (0.51 ± 0.14 vs. 0.26 ± 0.18, p>0.05) or angle (0.97 ± 0.23 vs. 1.12 ± 0.33, p>0.05) between repair techniques. The use of an internal brace technique is biomechanically comparable to k-wire fixation in a cadaveric model.

**Keywords:**
SLIL, Wrist
Social Deprivation and Congenital Hand Anomalies - An assessment using PROMIS

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Objectives / Interrogation: Social deprivation, a measure of socio-economic status, has been shown to negatively affect perceptions of orthopedic conditions and outcomes of treatment. The objective of this study was twofold to assess whether social deprivation would correlate with subjective assessment of function in pediatric patients with congenital hand anomalies.

Methods: All upper extremity (UE) anomalies in patients enrolled in the prospective Congenital Upper Limb Differences (CoULD) registry were classified and subjective function assessed using the Patient Reported Outcome Measurement Information System (PROMIS). PROMIS scores for pain interference, peer relations, anxiety, depression, and UE function were obtained for all patients 5 years and older at initial presentation. Social deprivation was determined by the Area Deprivation Index (ADI) through use of 9-digit zip codes; the index ranges from 0-100 with higher scores being the most deprived. PROMIS scores were correlated with the ADI for all patients.

Results and Conclusions: 375 pediatric patients with congenital UE differences were evaluated. Average age at inclusion was 11 years. 56% were female. 55% of patients had bilateral involvement. There were 247 extremities with a diagnosis of malformation of the entire limb and 261 had a hand plate malformation. 137 limbs had a diagnosis of dysplasia, 4 had a deformation, and 54 had an associated syndrome. Overall, PROMIS scores were within one standard deviation of normal for peer relations, pain, depression, and anxiety. However, PROMIS scores for UE function were more than one SD below the national average (50), both for parent (40) and child (38) scores.

The mean ADI for the cohort was lower than the national average, indicative of less deprivation, with only 14% of patients in the most deprived quartile. Parent PROMIS scores did not vary with ADI scores. In contrast, child reported PROMIS scores for pain, peer relations, and anxiety were statistically different between the highest and lowest quartile. Children with higher social deprivation reported higher pain interference, lower peer relations, and higher anxiety.

Conclusions:
1) PROMIS scores for UE function were one standard deviation below normal for all patients with congenital hand anomalies, but were normal for the psycho-social measures.
2) Child reported PROMIS for pain interference, peer relations, and anxiety scores were statistically worse in more socially deprived areas, suggesting more psychosocial challenges in these children.

Keywords:
congenital; social deprivation; PROMIS; outcomes
Convergent Validity of PODCI and PROMIS domains in Congenital Upper Limb Anomalies

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Objectives / Interrogation: This study evaluates the patient reported functional and psychosocial impact of upper limb congenital anomalies in patients prior to surgical intervention utilizing the PODCI and PROMIS. We hypothesized that patients will have scores that are in the normal range. Secondarily we sought to assess the similarities between the PODCI subscales and PROMIS domains and hypothesize that the two outcomes measures will have strong convergent validity.

Methods: A multi-center prospectively collected database of congenital upper limb patients, the CoULD (Congenital Upper Limb Differences) registry, was utilized for this study. All patients with complete PODCI and PROMIS data prior to surgical intervention were included in this study. Demographic information was collected and all anomalies were classified by the Oberg-Manske-Tonkin (OMT) classification. Scores for PODCI subscales of UE function, pain/comfort, and happiness and PROMIS domain of UE function, pain, depression, anxiety, and peer relations were collected. Ceiling and floor effects were examined and convergent validity for PODCI and PROMIS domains were assess using Spearman’s correlation coefficients.

Results and Conclusions: 359 patients were included in the study. 241 patients had a diagnosis of malformation of the entire limb and 231 had a malformation of the hand plate. Four, patients had a diagnosis of deformation, 118 had a dysplasia, and 45 patients had a syndrome. Median PODCI and PROMIS scores are seen in Table 1.

There was no difference between the PODCI and PROMIS ceiling or floor effects for the upper extremity domains. The ceiling effect for the PROMIS pain domain (46%) was not different than the floor effect of the PODCI pain subscale and there was no difference seen between the floor effect of PODCI happiness and PROMIS depression domains. Convergent validity was achieved between the PROMIS and PODCI upper extremity domains (r = 0.82; 95% CI = 0.78 to 0.85; p<0.001), between the PROMIS pain domain and PODCI pain/comfort subscale (r = -0.60; 95% CI = -0.66 to -0.53; p<0.001), and between the PROMIS depression domain and PODCI happiness subscale (r = -0.53; 95% CI = -0.60 to -0.45; p<0.001).

Conclusion
For assessment of pediatric patient perceptions of congenital upper extremity anomalies, PROMIS domains for the upper extremity function, pain, and depression are comparable to PODCI domain scores. Consideration can be made for replacing the PODCI with the shorter and more widely utilized PROMIS questionnaire.

Keywords:
Congenital; PROMIS; PODCI; Outcomes;
Radiographic remodeling of the proximal phalangeal head using a stretching exercise in patients with camptodactyly

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Objectives / Interrogation: The aims of this study were to verify the recovery of proximal phalangeal head after stretching exercise in patients with infantile type camptodactyly and to propose radiographic indices to quantify bony deformities.

Methods: Forty-eight fingers of 20 patients (9 males/11 females, mean age 14.2 ± 12.16 months, age range 1-35 months) with camptodactyly were selected and normal 163 fingers in 66 participants also included to estimate reference values of proposed indices. Patients with camptodactyly were younger than 36-month-old and had no other combined anomalies of the hand. The stretching exercise were instructed to all patients and their parents. The new radiographic parameters, head triangle ratio (HTR) and head angle (HA) were estimated on finger lateral radiographs taken at the initial visit and at the point of 12-month follow up. The extent of proximal interphalangeal joint (PIP) flexion contracture was evaluated to determine clinical outcomes from conservative treatment. The normal group comprised patients who visited our clinic with unilateral hand trauma to verify the reference values of HTA and HA accordance with finger types and age ranges.

Results and Conclusions: Two suggested radiographic parameters showed significant differences before and after intervention. The extent of PIP flexion contracture showed significant improvement. The HTA and HA had excellent validity and reliability. In the normal group, both parameters did not show significant differences accordance with finger types and age ranges. The stretching exercise could not only improve the motion of the proximal phalangeal joint but also have influence on recovery of congruency of proximal phalangeal head in patients with infantile type camptodactyly. The HTR and HA would be useful indices for objectifying the degree of bony deformities in patients with camptodactyly.

Keywords:
Camptodactyly, finger contracture, radiographic remodeling, proximal phalangeal head, stretching exercise
The Prevalence of the Linburg-Comstock anomaly in a Multiracial Population Sample.

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Objectives / Interrogation: The Linburg-Comstock (LC) anomaly is an anatomical variation characterized by the interconnection between the tendons of the thumb flexor and the deep flexor digitorum muscles. This interconnection is usually asymptomatic and as a consequence of its presence, the flexion of the thumb is accompanied by the simultaneous bending movement of the indicator alone or accompanied by the other long fingers. The prevalence of the Linburg-Comstock anomaly in a multiracial population sample is different from that reported in the literature.

Methods: We evaluated 1008 volunteers, 531 men and 477 women, totaling 2016 hands. The two clinical tests (Linburg and Comstock, 1979) were used for the clinical diagnosis of the anomalous tendon slips from the flexor pollicis longus to the flexor digitorum profundus. In the flexion test, the volunteer was asked to flex her thumb with a flat hand and supine forearm. When simultaneous flexion of one or more long fingers was observed, this was considered to indicate the presence of the anomaly (Image 1A). When the flexion test indicated presence of the anomaly a second test was performed. The volunteer was asked to flex her thumb while the examiner maintained passive extension of the index finger. If the participant reported pain or discomfort in the distal volar region of the forearm and wrist, this was considered symptomatic of an anomalous tendon slip (Image 1B).

Results and Conclusions: The mean age of the volunteers was 38.3 years (18–70 years). The Linburg-Comstock anomaly was observed in 564 individuals (52.63%), p=0.4377, being bilateral in 300 individuals (52.67%) and unilateral in 162 (28.72%), p=0.0016. In the male population, the prevalence was 291 individuals (54.80%) and in the female population, 273 individuals (57.23%), no statistical significance for gender. The pain test was positive in 105 (36.08%) of males and females in 150 (54.94%), p=0.0001.

Keywords:
Linburg-comstock; prevalence; anatomical variation; wrist pain
**Prognostic factors for conservatively treated sagittal band injuries of the metacarpophalangeal joint**

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**Objectives / Interrogation:** Most sagittal band injuries can be nonsurgically managed with relative motion extension splintage, especially in the acute setting, although optimal management of subacute and chronic sagittal band injuries remains controversial[1]. The aim of this study was to evaluate the factors that influence the prognoses for patients with sagittal band injuries who were treated conservatively.

**Methods:** A total of 94 patients who had been diagnosed with traumatic sagittal band injury and initially treated with 7 weeks of relative motion extension splintage (5 weeks of full time followed by 2 weeks of part time use, figure 1) were enrolled. The response to treatment, including finger range of motion (ROM), extensor tendon instability, grip strength, and functional outcome measured as Quick Disability of the Arm, Shoulder, and Hand score were assessed at 24-week follow-up. The factors that were assessed for their influence on the outcomes were age, sex, occupation, hand dominance, type of injury, injury severity, time to treatment, and the duration of splintage.

**Results and Conclusions:** After 24 weeks follow-up, 67 (71%) patients achieved resolution of symptomatic tendon translocation with 78% of grip strength and 90% of ROM compared to the un-affected hand, and final mean QuickDASH scores was 15. However, 27 (29%) patients had persistently symptomatic tendon subluxation and of those, 18 (19%) underwent surgical repair. There were significantly more manual laborers in the failure group than in the success group. Subjects in the treatment failure group were older, had longer symptom durations, and were more likely to have grade III injuries than were those in the success group. Multivariable analysis revealed that manual labor (Odds ratio [OR], 3.4), longer symptom duration (OR, 3.9), and grade III injury (OR, 2.4) were associated with a higher likelihood of conservative treatment failure for sagittal band injuries.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Success Group (n = 67)</th>
<th>Failure Group (n = 27)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age (years)</td>
<td>34 ± 14</td>
<td>40 ± 14</td>
<td>.06</td>
</tr>
<tr>
<td>Sex (male/female)</td>
<td>46/21</td>
<td>19/8</td>
<td>.87</td>
</tr>
<tr>
<td>Manual labor</td>
<td>12 (18%)</td>
<td>11 (41%)</td>
<td>&lt;.05</td>
</tr>
<tr>
<td>Dominant side</td>
<td>41 (61%)</td>
<td>17 (63%)</td>
<td>.57</td>
</tr>
<tr>
<td>*Injury severity (III)</td>
<td>37 (55%)</td>
<td>19(70%)</td>
<td>&lt;.05</td>
</tr>
<tr>
<td>Injury type (sports-related)</td>
<td>18 (27%)</td>
<td>11 (41%)</td>
<td>.19</td>
</tr>
<tr>
<td>Duration of symptom (weeks)</td>
<td>1.7 ± 1.1</td>
<td>2.8 ± 1.4</td>
<td>&lt;.05</td>
</tr>
<tr>
<td>Duration of splintage (weeks)</td>
<td>4.2 ± 1.8</td>
<td>3.6 ± 1.6</td>
<td>.11</td>
</tr>
</tbody>
</table>

**Clinical and radiologic differences between treatment success and failure groups**

**Keywords:**
Sagittal band injuries, metacarpophalangeal joint, conservative treatment, prognostic factors

**References:**
Comparison of conservative versus operative treatment of peripheral TFCC tear after acute distal radius fractures.

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Objectives / Interrogation: This study was designed to compare the clinical outcomes and residual instability conservative and operative treatment of peripheral TFCC tear after acute distal radius fractures.

Methods: We reviewed retrospectively patients who treated with volar locking plate for distal radius fractures. We enrolled 39 patients suffering from the distal radius fracture with peripheral tear of TFCC that confirmed with arthroscopy. All distal radius fractures were fixed with a volar locking plate. 26 patients of them were conservatively treated with long arm splint (group A). 13 patients were operatively treated with TFCC repair (group B). We compared the clinical outcomes between the conservative and operative treatments, using their range of motion; Disabilities of the Arm, Shoulder, and Hand score; PRWE score; and grip strength. At final follow-up, we checked DRUJ stability with stress test and recorded the grade of DRUJ instability from 0 to 3.

Results and Conclusions: Results: There was no statistically significant difference in the DASH score, PRWE score, grip strength, and wrist range of motion between two group. At final follow-up, DRUJ stress test showed similar stability in both groups.

Conclusion: We think that the conservative treatment with long arm splinting will provide good clinical results without DRUJ instability.

Keywords:
conservative, operative, peripheral TFCC tear, After acute distal radius fractures
Comparison of Clinical Outcomes after Ulnar Shortening Osteotomy for Ulnar Impaction Syndrome With or Without Arthroscopic Debridement

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Objectives / Interrogation: Only a few reports have compared the results of ulnar shortening osteotomy (USO) alone with those of combined arthroscopic debridement (AD) and USO. The purpose of this study was to compare the clinical outcomes after USO for UIS, either with or without concomitant arthroscopic TFCC debridement.

Methods: Forty-four patients who had been diagnosed with ulnar impaction syndrome and who were scheduled to undergo ulnar shortening osteotomy were randomized into two groups, one treated by ulnar shortening osteotomy alone and the other treated by ulnar shortening osteotomy combined with arthroscopic debridement. The response to treatment, including the pain numeric rating scale in an ulnar provocation test and the Disability of the Arm, Shoulder, and Hand score was assessed at 3 and 12 months after surgery.

Results and Conclusions: The mean pain and disability scores showed significant clinical improvement at the 12-month
follow-up in both groups. The pain scores at 3 months of follow-up were significantly better in the ulnar shortening osteotomy with arthroscopic debridement group. However, no significant differences were observed between the two groups in the disability scores at 3 and 12 months, or in the pain scores at 12 month follow-up. We conclude that similar improvements in symptom severity and hand function occurred in the long term in patients both with and without concomitant arthroscopic debridement. This information regarding concomitant arthroscopy could be used in the informed consent discussion with patients scheduled for ulnar shortening osteotomy.

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>USO alone (n = 21)</th>
<th>USO with AD (n = 20)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain NRS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Month 3</td>
<td>4 (2-6)</td>
<td>3 (2-5)</td>
<td>0.042</td>
</tr>
<tr>
<td>Month 12</td>
<td>2 (1-4)</td>
<td>2 (1-4)</td>
<td>0.681</td>
</tr>
<tr>
<td>DASH</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Month 3</td>
<td>34 (25-46)</td>
<td>31 (22-41)</td>
<td>0.310</td>
</tr>
<tr>
<td>Month 12</td>
<td>28 (19-38)</td>
<td>26 (16-35)</td>
<td>0.571</td>
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</tbody>
</table>

Comparison of functional outcomes after operation

**Keywords:**
Ulnar impaction syndrome; ulnar shortening osteotomy; arthroscopic debridement;
Thumb and finger reconstruction using vascularized half-big toenail flap with minimum donor site morbidity

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Objectives / Interrogation: The vascularized half-big toenail flap was originally developed by Kuroshima in 1990. This flap is a short-pedicled free vascularized flap of approximately 30 mm in size that contains a fibular half nail with a 5 mm skin edge and partial distal phalanx bone. The fingertip skin of the amputated finger is reflected to cover the skin deficiency. The sensation and function of the donor site are maintained, and primary wound closure of the donor site is possible. We herein report cases of thumb and finger reconstruction using this flap.

Methods: We assessed 16 patients (11 cases of single-digit amputation, 5 cases [8 digits] of multiple-digit amputation) who underwent this procedure among 108 (85 cases of single-digit amputation; 23 cases [47 digits] of multiple-digit amputation) who were indicated for reconstructive surgery between 2007 and 2017. We evaluated the following parameters: digits, amputated level, survival rate, elongated length, feeding artery, vein distribution, width and length of nails, longitudinal and axial convexity of nails before surgery/final follow-up and complications. We used the Mann-Whitney U test to evaluate the significance of differences.

Results and Conclusions: The reconstructed digits were three thumbs, five index fingers, five middle fingers and six ring fingers. The amputated levels were Tamai Zone II to IV. The flap survival was obtained in all cases, including one atrophic case. The elongated length was 14.1 mm (range, 0 to 30), including 4 cases of iliac bone graft. The feeding artery to the flap was the digital artery in 15 toes, anonymous artery in 3, and a branch of the digital artery in 1. We harvested the vein in the first web in 16 toes. The mean width and length and the longitudinal/axial convexity of the transferred nail before surgery and final follow-up were as follows: 8.0 to 9.2 mm (p<0.01), 14.2 to 11.7 mm (p<0.01), 10.8° to 23.1° (p<0.05) and 32.9° to 61.1° (p<0.01), respectively. Complications were partial necrosis of the skin graft and delayed wound healing of the donor site. Multiple-digit defects were more unacceptable to our patients than a single-digit defect, and they preferred cosmetic improvement to functional improvement. This flap restored the thumb's availability to grasp and made the middle finger longer than other fingers with no functional deficits at the donor site. Morphological adjustment of the transferred nail at surgery was unnecessary, as the donor site nail ultimately resembles the finger nail.

Keywords:
Half-big toenail flap, reconstruction, finger, thumb, minimum donor site morbidity
Comparison of ultrasound-guided versus blind corticosteroid injection for carpal tunnel syndrome: a prospective randomized trial

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Objectives / Interrogation: Although a local corticosteroid injection for carpal tunnel syndrome (CTS) is frequently performed by palpation using anatomic landmarks, ultrasound allows physicians to place the injectate closer to the median nerve without damaging the surrounding tissue, improving the efficacy of the injection. The aim of this study was to compare the effectiveness and complications of ultrasound (US)-guided steroid injections with blind injections for CTS.

Methods: A total of 102 patients with CTS were randomized into 2 groups: blind injection and US-guided injection. The response to treatment, including grip strength, perception of touch with a Semmes-Weinstein monofilament, and the Boston Carpal Tunnel Questionnaires (BCTQ) was assessed at baseline and at four, 12, and 24 weeks after the injection.

Results and Conclusions: The Boston symptom and function scores were similar in the two groups throughout the 24 week follow-up period, with the exception of significantly lower (better) Boston symptom scores at 4 week follow-up in the US-guided injection group than in the blind group. The grip strength and sensory index of Semmes-Weinstein monofilament were similar in...
the two groups throughout the 24 week follow-up period. After 24 weeks, 12 patients (24%) in the blind injection group and 9 patients (18%) in the US-guided injection group had undergone carpal tunnel surgery. With regard to adverse events, symptoms of median nerve irritation were more likely to occur in patients with blind injections than in those with US-guided injection (14% vs. 2%). US-guided steroid injection for CTS reduces steroid-associated complications, but produces similar pain and functional results to those of blind injection.

**Keywords:**
Carpal tunnel syndrome; complications; corticosteroid injection; effectiveness;
Acute Loge de Guyon Syndrome in distal forearm fracture - a case report

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Objectives / Interrogation: Nerve palsies after closed fractures of the upper arm and forearm are usually treated by expectation. A broadly recognized exception from this rule is acute carpal tunnel syndrome resulting from distal forearm fractures. In this setting, carpal tunnel syndrome is a special form of compartment syndrome and requires therefore the immediate surgical intervention to restore tissue perfusion, thus preventing muscle contracture and permanent nerve palsy. Hand surgeons even know the spontaneous acute entrapment of the median nerve without vascular disturbance of the hand. This atraumatic acute carpal tunnel syndrome requires urgent carpal tunnel release to prevent permanent median palsy. An acute compression of the ulnar nerve in Guyon's canal is not an established entity. But how should you manage a situation when a closed distal forearm fracture is complicated by an acute and complete distal ulnar nerve palsy?

Methods: A 9-year old boy sustained a closed, apex palmar angulated distal forearm fracture, 3 cm proximal the wrist joint. The immediate clinical evaluation registered a classical clawing of the ring and small fingers, a complete sensual loss of the small finger pulp and of the ulnar side of the ring finger pulp, and a partially impaired sensibility of the ulnar-sided dorsum of the hand. After closed reduction and percutaneous pinning of the distal radius and ulna, we revised the ulnar nerve, its dorsal branch, and the ulnar artery in the same operative session. We did not find any signs of injury except a compression mark of the ulnar nerve at the entrance of Guyon's canal. After incising 7 mm of the volar ligament, the entrapment was eliminated, putting aside a formal opening of the whole Loge de Guyon. Three hours after surgery, the ulnar nerve had completely recovered, the sensibility was completely reestablished, the clawing had gone. The whole case is pre-, intra- and postoperatively documented by photographs and x-ray pictures.

Results and Conclusions: Analogue to acute carpal syndrome, we recommend immediate ulnar nerve revision if a distal forearm fracture is complicated by an acute ulnar nerve entrapment. The entrapment at the entrance of Guyon's canal could otherwise cause a prolonged ulnar palsy. This risk justifies the relatively small operative effort even in the case of closed fracture treatment.

Keywords:
Ulnar nerve entrapment, distal forearm fracture, wrist fracture, Loge de Guyon
Annual trends in surgery for osteoarthritis of carpometacarpal joint of the thumb: Analysis of a national database in Japan

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Objectives / Interrogation: There have been no reports to clarify annual trends in surgery for osteoarthritis (OA) of carpometacarpal (CMC) joint of the thumb. The aim of this study was to examine the annual numbers of surgeries related to the CMC joint of the thumb in Japan, using the Diagnosis Procedure Combination database, which is a nationally representative inpatient database of hospital information, discharge abstract, and administrative claims data, including about 55% of all acute-care inpatients in Japan.

Methods: For this study, we extracted data on a total of 2,210 patients who underwent arthroplasty (AP) (n=1,215) or arthrodesis (AD) (n=995) of the thumb CMC joint from July 2010 to March 2016. We examined patients' age, gender, accompanying bone graft, length of stay, total costs (in US dollars), year, and type of anesthesia.

Results and Conclusions: The average and standard deviation of age (years) in the AP and AD groups was 63.7 (10.4) and 63.7 (10.2) years, respectively. Males made up 17% and 31% of the AP and AD groups, respectively (P<0.001). Bone graft was accompanied in 12 (17%) patients in the AD group, and 398 (40%) patients in the AD group (P<0.001). The average length of stay was 11.5 days in the AP group and 10.9 days in the AD group (P<0.001). The average total cost was $5,760 in the AP group, and $6,090 in the AD group. The numbers of surgical patients each year in the AP/AD groups were 157/169, 242/200, 187/155, 221/186, and 264/202 in 2011, 2012, 2013, 2014 and 2015, respectively (P=0.023). General anesthesia was selected in 875 (72%) patients in the AP group, and 775 (79%) patients in the AD group (P=0.002). The AP/AD group ratio gradually increased year by year together with the spread of surgical techniques of arthroplasty. The ROAD study, a large population-based cohort study, revealed that about 50% of all adults, both male and female, had OA of the CMC joint of the thumb on the X ray imaging. This figure was comparable to those in OA of the hip or the knee. However, our study showed that the annual numbers of surgery for OA of CMC joint of the thumb was much smaller than those for total knee replacement or total hip replacement in Japan. This may be because (i) there are fewer recommendable surgical procedures for OA of CMC joint of the thumb than for the knee or the hip, and (ii) pain derived from pinch motion can be less severe than that from gait or getting up.

Keywords:
osteoarthritis, carpometacarpal joint of the thumb, CMC, database
Revision of trapeziometacarpal prosthesis by replacement with another prosthesis: a report of 8 cases.

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Objectives / Interrogation: Indications for total trapeziometacarpal (TTM) arthroplasty in the management of thumb basal joint arthritis are becoming more and more common. The trapezium in particular is exposed to complications such as aseptic loosening or fracture. Loosening of TTM prosthesis generally leads to simple trapeziectomy. The aim of this study was to present our experience of revision of a failed TM prosthesis by replacing it with a new prosthetic implant.

Methods: Our study involved 8 cases of revision of Elektra metal-metal prosthesis with a 6.5mm impacted cup. Between 2012 and 2018, 8 patients (1 male, 7 female) with a mean age of 63 years (58-72) were operated on by the same surgeon for aseptic loosening of the prosthetic cup including 2 cases of trauma. The mean delay between the initial surgery and revision was 31.8 months (11-87). In all cases the bone scan showed a loosening of the trapezium implant. We found no fractures of the trapezium on the preoperative CT-scan. All cups were surgically revised with implantation of 1 cemented cup, 2 double mobility impacted cups with bone graft and 5 double mobility screwed cups (9 or 10mm) without bone graft. Complications consisted of 1 case of intra-operative fissuring of the trapezium which, however, did not prevent the implantation of a cup, and 1 early mobilization of an impacted cup, although this did not require surgical revision.

Results and Conclusions: At a mean follow-up of 37.3 months (9-73) no patients required reoperation. Residual pain on the VAS was 0.71 with a Quick-Dash score of 21.2. Mean pinch strength was 3.5kg and the key-grip was 4.25kg. Five patients "forgot" their prosthesis and these represented our best results. Radiographic evaluation showed signs of loosening of the cemented cup, but the clinical result remained excellent. No radiologic modifications were noted for the other implants. The particularity of this series was the revision of a small trapezium cup and the absence of preoperative fracture of the trapezium which conditioned preserving this bone. The surgical technique without a bone graft currently represents the preferred procedure during revision surgery of a total TM prosthesis with a conservable trapezium. Preoperative CT-scanning is important to measure the dimension of the loosening cavity of the trapezium which must not go beyond 10mm of diameter. In selected clinical cases, loosening of a total TM prosthesis can be revised by replacing it with another prosthesis leading to stable results at medium-term follow-up.

Keywords:
Trapeziometacarpal arthritis, arthroplasty, revision surgery
Direct coaptation in the microsurgical reconstruction of obstetric brachial plexus lesions

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Objectives / Interrogation: Severe upper and total obstetric brachial plexus lesions must be explored and reconstructed within the first months of life. The frequently encountered non conducting neuroma in continuity are routinely excised and grafted by sural interposition fascicles. In specific cases, when the gap is around 1 cm and the mobilisation of the distal plexus is achievable, a direct coaptation of both the proximal and distal nerve stumps after histographic control is feasible- we present those cases among our patient series.

Methods: We performed direct intraplexic coaptations in 22 children between 2013 and 2016, involving 10 combined upper and middle trunk, 12 upper trunk (1 partial rupture). All patients were followed clinically and video documented.

Results and Conclusions: We observed good functional improvement in all cases, comparable to autologous grafts. Six months after surgery, active elbow flexion ranged between 60 and 90 degrees and active abduction was 75°, improving to 90° after 12 months and 124° after 18 months. In upper lesions treated by direct coaptation of the upper trunk, an additional spinal to suprascapular nerve transfer improves passive and active shoulder lateral rotation.

In selected cases with short gap after neuroma resection, the direct stump coaptation is feasible and appealing. Suture tension is reduced by special 6/0 sutures and a more adducted- elbow flexed limb position and immobilisation. Clear advantages are the missing need for sural nerve harvest and the coaptation of thick, fiber rich nerve stumps of good regenerative capacity. Potential drawbacks are the risk of suture rupture and intraneural fibrosis ; also do we observe some more coactivation. So far our clinical results are promising and feared complications are rare.

Keywords: obstetric palsy, direct nerve suture, brachial plexus
Nerve transfers for non traumatic diseases in children

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Objectives / Interrogation: Nerve transfers have become a reliable surgical technique to restore function after severe traumatic nerve lesions, where direct coaptation or grafting is impossible, especially when the proximal nerve stump is unavailable for reconstruction. This technique might be successfully applied to other non traumatic conditions in children, where there have been so far no surgical solutions, like (atypical) arthrogryposis and transverse myelitis.

Methods: We reviewed our patient charts for this indication and found 3 children affected by arthrogryposis and one with severe sequelae from transverse myelitis. All children underwent nerve transfers to improve shoulder and/or biceps function. Postoperative function was analysed looking at the active range of motion scored by the BRMC score from M1 to M4. Videorecordings were added.

Results and Conclusions: We regularly obtained M3 motor function in the targeted muscles in the shoulder and arm, offering useful function in body segments where no other surgical repair technique so far could help. Results are constant in the follow-up period for 3-5 years.

Nerve transfers allow an extension of repair techniques to some non traumatic diseases affecting children's upper limbs. We present clinical cases and update the treatment strategy in these diseases.

Keywords: nerve transfer, arthrogryposis, transverse myelitis
First web-space commissure reconstruction with a precisely designed morphometric free flap

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Objectives / Interrogation: First web-space contractures have a significant impact on hand function by restricting thumb opposition and abduction. Surgical management utilizing non-standardized free flaps has been reported in the literature with often unpredictable outcomes. We sought to delineate the anthropometric morphological characteristics of first web-spaces derived from cadaveric dissections in an attempt to conceive a configuration algorithm for an individually-proportioned first web-space free flap design and harvest.

Methods: The morphological parameters of cadaveric first web-spaces were measured after pre-defining their cutaneous boundaries. Seven parameters measured from the patient's unaffected hand were selected to precisely calculate the dimensions, size and shape of the requisite free flap.

Results and Conclusions: Clinically, six cases of first web-space contracture were released and reconstructed with precisely designed morphometric free flaps. The appearance of the reconstructed first web-space aesthetically and functionally satisfied the patients. This study demonstrates the technique of precisely designing a patient-tailored first web-space commissure, utilising measurements from the patient's unaffected hand.

Keywords:
First web-space, free flap, design, harvest technique
It is never late to perform flexor tendon reconstruction for zone 2 injuries

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Objectives / Interrogation: The problems of flexor tendons reconstruction in patients who present for surgery at many years after laceration are not often discussed in the literature. We would like to share our surgical treatment experience for the very long lasting flexor tendon injuries within the fingers.

Methods: Forty one patients with deep or both flexor tendons laceration in 49 fingers presented for tendon reconstruction at 2 to 30 years after injury and were treated by the same hand surgeon. In 20 cases surgery was performed at the time from 2 to 5 years after laceration, in 11 cases - at the time from 5 to 10 years and in 18 cases surgery was performed at the time from 10 to 30 years after injury.

In each of these patients two-staged reconstruction using passive silicone implants was carried out. Pulley system was carefully preserved, A2 pulley was cut transversely into several parts for to dilate each part separately. Stage 2 procedure - silicone rod removal and grafting from toe extensors - was usually performed at 12 months after rod implantation. Early active motion rehabilitation program in all patients was the same.

Results and Conclusions: The functional outcomes were clinically evaluated at follow-up examination 6 months after grafting in 31 patients to whom deep flexor tendons had been reconstructed in 36 fingers. Eight patients are still having ongoing treatment. Four patients were lost to final follow up, but their midterm results had been favorable. One patient declined stage 2 surgery. The overall outcome was excellent in 17 (47,2%) of fingers, good in 14 (38,9%) and fair in 3 (8,3%) of fingers. Excellent/good results ratio was 1,21. In 1 digit (2,8%) finger flexion contracture was evaluated and in 1 finger (2,8%) graft ruptured. These results are comparable to our general results of two-stage deep flexor tendon reconstruction in 316 cases: 52,9% of excellent results, 25,3% of good, contracture rate at 4% and rupture rate at 10,7%, with excellent/good results ratio at 2,1. Therefore the rate of excellent outcomes seems to be somewhat lower in long-standing lacerations group, but this difference is not statistically significant (t=0,6; P > 0,05).

In this very flexor tendons series the average time from injury was about 10 years. In spite of so long delay of reconstruction two-stage deep flexor tendon grafting provided good enough outcomes with rather low contracture rate. Hence FDP reconstruction should be attempted no matter how late after injury patient presents for surgery.

Keywords:
late flexor tendon reconstruction
Healing of a critical-sized bone defect in the rat with the use of platelet concentrates

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**Objectives / Interrogation:** The purpose of this study was to evaluate the osseous healing of a critical-sized tibia shaft defect in rat model with the use of three platelet concentrates: PRP, defrosted PRP and PRF. The shaft of rat tibia as a model was used because of its subcutaneous position similar to hand phalanges and metacarpals.

**Methods:** Intramuscular anesthesia was used. Critical-sized 5-6 mm-long midshaft defect of the right tibia of 73 male cross-breed rats (weight 420-500 g, age 5-6 months) was created and secured with a pre-bend gauge plate and screws, and a fragment of 22G needle placed intramedullary. In group 1 (24 animals) the bone defect was filled with hydroxyapatite-collagen biomaterial and orthotopic bone chips 1:1 mix, infused with 0,2 ml fresh allogeneic PRP. In group 2 (23 animals) the defect was filled with the same biomaterial - bone chips mix, infused with 0,2 ml cold-stored and defrosted allogeneic PRP. In group 3 (12 animals) allogeneic Choukroun's PRF was added to the biomaterial - bone chips mix. In group 4 (14 animals) the defect received biomaterial - bone chips mix alone and no platelet concentrate was added. Animals were sacrificed at 6 and 12 weeks, at 4,5; 6; 7,5; 9 and 12 months and 2 rats from group 4 - at 24 months. Both tibia and fibular bones were dissected and the presence of new bone formation in the tibia defect was examined. Bones were fixed in formalin and embedded in paraffin after decalcifying and hardware removal. Longitudinal histological sections were stained with hematoxylin and eosin.

**Results and Conclusions:** According to the data from dissection, in PRP group 19 animals of 24, in defrosted PRP group 15 animals of 23 and in PRF group 8 animals of 12 demonstrated new bone formation in the defect. There was no detectable bone formation over the 24 months period in no platelet concentrate group 4. On histologic analysis at 6 weeks to 12 months after surgery 42 of 59 rats (71,2%) from groups 1, 2 and 3 demonstrated more or less mature bone formation in the defect and an increase in calcified bone formation over time. Group 4 showed no histologic evidence of bone formation. Results demonstrate that either of the three platelets concentrates added to hydroxyapatite-collagen biomaterial promotes bone formation and healing of critical-sized segmental bone defect in rat model. Thus PRP, defrosted PRP and PRF autologous techniques may provide other options for reconstruction of hand bones segmental defects in cases where biomaterial alone is not sufficient to heal the defect.

**Keywords:** platelets concentrate, critical-sized bone shaft defect, rat model
Multidisciplinary neuropathic pain management improves differential diagnosis considering thoracic outlet syndrome

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Objectives / Interrogation: Thoracic outlet syndrome is a rare neuro-vascular compression syndrome affecting the upper limb with various vascular and/or neurologic symptoms, frequently including neuropathic pain. When the vascular or neurologic etiology is unclear and pain the pertinent symptom, patients may be admitted to the hospital for 2 to 3 weeks of interdisciplinary treatment involving anaesthetists, physio- and ergo therapist, psychologist under coordination of the hand surgeon, all together in a specific therapeutic frame recognised by the national health system. We present our 3 years experience with this modality allowing us not only to efficiently treat these patients, but to sort out operative indications in disputed thoracic outlet syndrome cases.

Methods: Between 2016 and 2018, 20 patients were admitted in our hand surgery department for evaluation and multidisciplinary pain treatment. The standardised protocol for pain (VAS) and functional impairment assessment was applied and treatment assumed by all participating disciplines. Our retrospective review concentrated on patient characteristics, comorbidities, pain relief and eventual surgical indication.

Results and Conclusions: Patients were representative of all age groups within the working community. Subjective improvement of pain was reached in all patients, 3 underwent secondary hand surgery, none a surgical decompression for a hypothized TOS syndrome. Patient compliance was high and complication rate low (2 superficial infections at the pain catheter skin insertion).

This treatment modality is a useful tool when sorting out "disputed" TOS patients for a surgical indication, while the interdisciplinary pain treatment allows a lot of new insights and therapeutic actions in a chronic course of severe neuropathic pain and certainly avoids undue or complex surgery in selected patients.

Keywords:
neuropathic pain, thoracic outlet, multidisciplinary
Objectives / Interrogation: Distal radius fractures are the third most common type of fragility fractures, following vertebral and proximal femur fractures. There has been an increasing trend towards surgical fixation, although most fractures are treated non-operatively. Minimally-invasive surgical approaches have been described before. However, a single transverse incisional approach to distal radius fractures has never been published.

Methods: A retrospective case series of patients undergoing distal radius fracture fixation via a single transverse wrist incision. The surgeries were performed by a fellowship trained hand surgeon, between July 2015 and August 2016. All patients underwent the institution-specific standard post-operative rehabilitation regimen for distal radius fractures.

Results and Conclusions: There were 16 patients with a total of 17 fractures. The mean age of patients was 58 years old. 11 out of 16 patients were females. The most common fracture type was the AO 23-A3. At 3 months post-surgery, the mean range of wrist motion showed a flexion of 52 degrees, extension of 60 degrees, pronation of 80 degrees, supination of 83 degrees, radial deviation of 17 degrees and ulnar deviation of 33 degrees. Mean grip strength was 67% of the contralateral side. Radiographic parameters showed a mean post-operative improvement of 6.9 degrees in radial inclination, 2.0 mm in radial height, and 26.9 degrees in volar tilt. All patients returned to pre-injury work within 3 months after surgery. There was one incidence of superficial wound cellulitis, which resolved with oral antibiotics. The patients were satisfied with the appearance of the surgical scar. Clinical and radiological parameters were maintained in the 11 patients that were followed up 1 year post-operatively. Average grip strength at 1 year was 78% of the unaffected side.

The single transverse wrist incision approach to distal radius fractures is a viable alternative which provides an aesthetically pleasing scar which blends with the wrist crease. There was better exposure of the ulnar corner of the distal radius during fracture fixation. Post operative range of motion and radiographic parameters were comparable to published literature of conventional volar approach at 3 months and 1 year post surgery. There maybe a learning curve for this new approach and care should be taken during retraction of the skin.

Keywords:
Distal radius fractures, transverse incision, minimally invasive, novel, approach
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**Objectives / Interrogation:** Replantation cannot be performed in all cases of fingertip amputation, and in such cases, a pedicle flap is sometimes used to cover the skin and soft tissue defect. Kutler described a technique of bilateral V-Y advancement flap for reconstructing fingertip amputation in 1947. In this study, we show a newly developed bilateral V-Y advancement flap (modified Kutler method) and evaluated the outcomes of this local flap.

**Methods:** Materials: We reviewed 21 cases (men, 21; women, 1; average age, 47 years) of amputation of the fingertip from July 2009 to February 2016. The injury sites were as follows: thumb (1), index finger (6), middle finger (7), ring finger (4), and little finger (3). Nineteen cases were injured in crush, and 2 were in clean cut. The average follow-up period was 188 weeks. Sensory disturbance and pain were examined at the final follow-up. Methods: Inverted triangular flaps, the apex of those were placed on distal interphalangeal joint, were designed in radial and ulnar side of amputated finger. The volar incision was slightly undermined but left attached to subcutaneous tissue, and the dorsal incision was made to periosteum in both flaps. Both dorsal incisions were connected anterior to distal phalanx and volar subcutaneous tissue which include two flaps was separated from distal phalanx. Because of this maneuver, mobility of both flaps was greater than original Kutler method.

**Results and Conclusions:** Results
All flaps survived. numbness, hypersensitivity, or hypesthesia remained in 8, 5 and 10 cases respectively. And pain due to an attack remained in 1 case. Coldness remained in 5 cases. Affected finger were useful in 18 patients and not useful in 3 patients. Of three cases, one was not useful because of pain, one was of hypersensitivity, and remained one was of hypesthesia.

Summary
Our modification allowed much greater mobility of the bilateral V-Y advancement flap than original Kutler method. But in this study, the incidence of numbness, hypersensitivity, or hypesthesia after operation were higher than expected. Otherwise, this flap is very useful method for fingertip injury because affected fingers were useful in most of patients.

**Keywords:**
Kutler flap, amputation of the fingertip
Flexor pollicis longus excursion and irritation following plating of distal radius articular volar lip fractures

List of authors:
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1 Nuffield Orthopaedic Centre (Oxford)

Objectives / Interrogation: Comminuted intra-articular fractures of the distal radius involving the marginal volar lip often require fixation distal to the watershed line in order to obtain bone purchase and control of these far distal fragments. Despite recent developments and various low profile smooth contoured plate designs, implants sited in this region have been described to cause tendon irritation and rupture.

The aim of this study is to evaluate excursion and irritation of the flexor pollicis longus (FPL) tendon in fractures treated with these implants, as the course of this tendon runs in close proximity to the radial aspect of the plate.

Methods: Patients who underwent fracture fixation using plates designed to be sited at this far distal site were identified from theatre and implant registers. Thumb interphalangeal (IP) joint flexion, and maximal thumb composite opposition were compared with the contralateral side at six and twelve weeks. Ultrasound assessment was performed at the same time intervals, and at six months following surgery.

Results and Conclusions: Thirty patients were identified. Full thumb mobilization was encouraged in all cases. Patients described initial pain and restricted thumb movement which improved over the first six weeks, ranging from a mean visual analogue score for pain of 8.8 for all thumb movement to no pain on IP joint movement and 2.8 pain on full thumb flexion. 37% of cases had sonographic signs of tenosynovitis at six weeks post-operatively. Full IP joint movement was present and maintained at and beyond six weeks of surgery. Full thumb opposition was decreased by a mean of 3 points on the Kapandji score when compared to the contralateral side at 6 weeks, becoming symmetrical in 89% of the cases by twelve weeks. Evidence of tenosynovitis resolved in most cases, with mild persisting tenosynovitis on ultrasound in 23% and discomfort on pinch grip testing in 17% at six months following surgery.

This study shows that the initial postoperative thumb stiffness improves over the first three months after surgery. As movement progresses, mild signs of FPL tendon irritation are present on ultrasound despite patients being asymptomatic during their daily activities. Given the potential for flexor tendon rupture due to irritation from implants inserted distal to the watershed line, the persistence of evidence of tenosynovitis in nearly a quarter of patients at 6 months is concerning, although the clinical relevance and so the implication when advising upon implant removal is unclear.

Keywords: flexor pollicis longus, tendon irritation, complications distal radius fractures
Chronic Scapholunate Instability in Carpal Anomaly: Proposed Surgery Treatment

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Objectives / Interrogation: A 47-year-old man presented to Hand Unit, Hesperia Hospital with right wrist pain after recent fall injury at work. Standard X-ray, MRI and physical examination were consistent with scapholunate instability and surgery confirmed carpal dissociation in presence of a lunotriquetral coalition (complete osseous fusion os luno-triquetrum).

Methods: This patient was treated surgically with horizontal proximal carpal row retightening. This unusual case emphasizes the need to reconstruct the carpal alignment and scapho-lunate linkage.

Pre-surgery

Right hand (traumatized hand) presented a type 3 coalition (classification by Devilliers Minnaar 1952) and the left hand had type 1 coalition (incomplete fusion resembling pseudo-arthritis (fibro-cartilage coalition)). Widening of the scapholunate joint space is a common finding in patients with lunotriquetral coalition. This condition poses difficulty in diagnosis scapholunate instability.
Post-surgery
Results and Conclusions: At 2 years follow up, the function of the right wrist was normal. X-ray confirmed a normal scapholunate joint space.

Keywords:
scapholunate instability; luno-triquetral coalition; scapholunate fibrodesis; carpal anomaly

References:
Short to mid-term results of a 360 degree technique for reconstruction of the scapho-lunate ligament

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Objectives / Interrogation: The aim of this prospective study is to present short to mid-term results of a 360 degree technique for reconstruction of the scapholunate (SL) ligament.

Methods: Patients with a symptomatic SL ligament lesion Geisler type 3 or 4 were included. In the technique for reconstruction a part of Flexor Carpi Radialis or Plantaris tendon was used to stabilize on both the dorsal and volar side of the scapholunate joint. Temporary K-wire fixation was not used in the later part of the study. All the patients had a cast for 6 weeks. All patients were evaluated preoperatively, 12 and 26 weeks postoperatively and then yearly with ROM, grip strength, VAS scores for pain and satisfaction, Quick-DASH and PRWE-questionnaires. X-Ray was performed preoperatively, 3 months postoperatively and thereafter yearly. Forty-seven patients were operated and 2 patients twice, 39 men and 8 woman. Median age 42 years (19-61). Mean values are used.

Results and Conclusions: Median follow-up was 31 months (range 3-89). 6 patients had Geisler 3 and 41 Geisler 4 status preoperatively. Early changes of the cartilage of the proximal pole of the scaphoid was found preoperatively in 20 (43%) patients. Preop. SL distance on x-ray was 5.4mm (1.4-8.3) and at last follow-up (LFU) 3.5 mm (0-9.4) (P<.01). Dorsal/volar flexion was preop. 89% (range 17-185%) of the contralateral wrist and at LFU 72% (31-114) (P<0.01). Radial/ulnar deviation was 85% (23-193%) versus 89% (22-191%) postoperatively (P=NS). Grip strength preop. was 36 KgF (2-60) and at (LFU) 35 (4-67) (P=NS). VAS for pain (mm) was preop. at rest/activity; 28/56 and at LFU; 23/36 (P=NS/<.01). Watsons test was positive in of 39 of 42 cases preop and positive in 13 of 49 at LFU (P<0.01). Radiographic dorsal intercalated segment instability (DISI) was seen in 22 of 47 cases preop. compared with 26 of 47 at last Follow-up. Quick DASH and PRWE preop: 41 and 52 and at LFU; 30 and 35 (P<0.01). Patients VAS of Satisfaction improved from 26 (0-100) Preop. to 62 (0-100) at LFU(P<0.01). Six developed SLAC wrist. Five revisions (10.2 percent) were performed, two with a new ligament with the same technique, one to an arthrodesis of the wrist and one to a proximal row carpectomy and one scheduled to four corner arthrodesis. This 360 degree technique for reconstruction of the SL ligament improved Quick-DASH, PRWE, VAS for pain in activity and patients satisfaction. Revision rate is so fare acceptable low, but longer follow-up is needed to evaluate this technique.

Keywords:
Scapholunate ligament reconstruction, SL-ligament reconstruction
Outcome of Tendon Transfer Around Shoulder with Erb’s Palsy Internal Rotation Deformity

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Objectives / Interrogation: Background: Obstetric Brachial Plexus Palsy (OBPP) is one of the most severe complications at birth with internal rotation deformity that have significant functional disability. There is a many different methods of tendon transfer that have been descrided to improve the shoulder Range of Motion (ROM).
Objectives of Study: Evaluate the outcome of teres major tendon transfer around the shoulder in children with Erb’s palsy internal rotation deformity.

Methods: Methods: This study was Retrospective and Prospective randomized clinical study carried out on totally (25) patients admitted to Orthopaedic Department of Tanta University Hospital. Ten children represented the Retrospective portion of the study, and fifteen represented the prospective portion. All cases were operated by Modified Sever-L’Episcopo technique. The external rotation, according to Mallet score, was recorded pre-and post-operatively.

Results and Conclusions: Results: The mean follow-up period was twelve months (range 6-18). The Mallet score for the shoulder external rotation, at the end of follow-up periods, was graded as Grade II in two patients (8%), Grade III in nine patients (36%), and Grade IV in fourteen patients (56%). There was a highly significant improvement (p=0.00001) of the external rotation range as the mean pre-operative score was 2.04±0.02, and the mean post-operative score was 3.48±0.65.
Conclusion: The Modified Sever L'Episcopo procedure that compromises of anterior release, then teres major tendon transfer to the tendon of infraspinatus shows a high incidence of good outcome with a promising subjective and objective improvement in almost cases.

Keywords:
Tendon transfer - OBPP - Erb’s palsy - Modified sever L'Episcopo procedure.
Midterm follow up of volar plate fixation for chronic unstable scaphoid nonunion

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Objectives / Interrogation: Fixation of chronic unstable scaphoid nonunion with a volar angular stable mini-plate and cancellous bone grafting has shown to be a successful technique in small series. No mid or long term follow-up has been documented ever since. Our objective was to evaluate the midterm follow-up of plate fixation for scaphoid nonunion and to evaluate the necessity for hardware removal in these patients.

Methods: Patients with a chronic unstable scaphoid nonunion were prospectively enrolled and treated with open reduction of the scaphoid fracture using a volar approach and internal fixation using an angular stable miniplate fixation and cancellous bone grafting from the ipsilateral iliac crest. Follow-up included physical examination, functional assessment using the PRWHE questionnaire and multiplanar reformation computed tomography at a three month interval until union was confirmed. For the midterm follow up, (median 31 months after surgery) physical examination and functional assessment will be re-evaluated.

Results and Conclusions: Forty-eight patients with a mean age of 30 years with a mean duration of nonunion of 45 months were included. Eleven patients had previous surgery of the scaphoid fracture, 26 patients had a dorsal intercalated segment instability and 13 patients had a scaphoid nonunion advanced collapse of the affected wrist. Post-operative, 93% of patients showed radiological confirmed healing of nonunion. Average time to union was 4 months. Due to impingement of the plate on the volar rim, 17 patients had the hardware removed during follow up. No significant changes in range of motion and grip strength were found postoperative after 3 months compared to pre-operative function. Functional outcome improved significant after 3 months (PRWHE from 50 to 25 points). Midterm functional outcome after 1-3 years will be evaluated but is expected to improve further, especially after plate removal.

In conclusion, angular stable plate fixation supplemented with autologous cancellous bone grafting is a successful technique for treatment of chronic unstable scaphoid nonunion, resulting in union in the majority of patients within half a year in this large cohort. Impingement of the plate against the volar rim may necessitate a second operation for hardware removal and should be discussed pre-operatively with the patient. Midterm results will determine if functional outcome will further improve.

Keywords: scaphoid nonunion; internal fixation; plating; follow up
Collagenase dose related correction of flexion deformity in Dupuytren's contracture: A prospective randomized study

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Objectives / Interrogation:
Collagenase injections have been used in treatment of Dupuytren's contracture. The recommended dose is 0.58 mg per cord. We hypothesized that increasing the Collagenase dose may increase the likelihood of correcting the flexion deformities.

Methods: A prospective randomized study was conducted comparing 2 groups of patients with Dupuytren's contracture. Patients were selected randomly for either injection of 0.9 mg of Collagenase (group I) or 0.58 mg (group II). The injection technique was the same. Patients were seen after 24 hours for the extension procedures under local anesthesia. There were 37 digits in 27 patients in group I and 34 digits in 29 patients in group II. Age averaged 58 years in group I and 61 years in group II. There were 23 males in group I and 24 in group II. Isolated Metacarpophalangeal (MP) joints were involved in 21 digits in group I and 18 digits in group II. Isolated Proximal Interphalangeal (PIP) joints were involved in 4 digits in group I compared to 6 in group II. Both MP and PIP joints were involved in 12 digits in group I and 10 digits in group II. Flexion deformities of MP joints averaged 69 degrees in group I compared to 72 in group II while PIP joint flexion deformities averaged 41 in group I compared to 39 in group II.

Results and Conclusions: All patients in both groups exhibited bruising and swelling of the involved hand after injection with no significant difference. Correction of flexion deformities of MP joints to 0-5 degrees was achieved in 26 digits (79%) in group I compared to 17 digits (61%) in group II which was statistically significant (P=0.01). Correction of PIP joints to 0-5 was achieved in 10 digits (63%) in group I compared to 8 digits (50%) in group II (P=0.02). The mean improvement in MP joints was 40 degrees in group I compared to 28 in group II (P=0.02). The mean improvement of PIP joints was 27 in group I compared with 17 in group II (P=0.02). DASH scores were similar in both groups (P=0.3).

Complications
One patient in group I had axillary lymphadenopathy that improved in one week. 4 patients in group I and one patient in group II had skin tears that healed within 2 weeks.

Conclusions:
Increasing the dosage of Collagenase injections to 0.9 mg increases the effectiveness of correcting flexion deformities with Dupuytren's contractures.
There is no increase of risk or complications.

Keywords:
Dupuytren; Collagenase: Dosage; Deformities; correction
A different perspective on the aetiology of hook of hamate fractures and the high association with other carpal fractures

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Objectives / Interrogation: Fractures of the Hamate are rare and difficult to diagnose both clinically and radiographically. It was thought that hook of hamate fractures were sustained by either a fall onto an outstretched hand or by direct impact from a racquet or ball whilst playing sport. We have reviewed our series of hook of hamate fractures from a level 1 trauma centre over a ten year period. This was to assess the aetiology and associated injuries of this uncommon yet significant injury.

Methods: A retrospective analysis of all patients who presented with a hook of hamate fracture to the level 1 trauma centre over a ten year period. The patient demographics and mechanism of injury was collected from the patients notes. All patients underwent radiographs and advanced imaging in the form of either Computed topography (CT) or magnetic resonance imaging (MRI). Imaging was examined for classification and associated injuries.

Results and Conclusions: There were 27 patients who sustained 28 hook of hamate fractures between 2007 to 2017. The fractures occurred through the base of the hamate in 16 patients, the body in 11 patients and the tip in 1. The mechanism of injury in 18 Hamate fractures were sustained whilst falling onto an outstretched hand and of these 6 had an associated carpal fracture. 4 of the 28 fractures were sustained from a direct blow with 2 cases having an associated fracture. 6 of the 28 hamate fractures were sustained from gripping a handle (Tennis racquet, Golf club) with no direct blow or fall reported.

We found no evidence to support the current opinion of hamate fractures being sustained from a direct blow against a handle. The authors feel that the fractures in this patient population occurs as a consequence of the tangential force from the adjacent flexor tendons (flexor digitorium profundus of the ring and little fingers) when maximal grip occurs against the handle. There is also a higher association of scaphoid and carpal fractures (28%) with a hamate fracture than what has been previously been reported in the literature. It is our opinion that with the increasing use of CT or MRI imaging more associated carpal injuries would be identified. This has led to an increased rate of identifying both the hook of hamate fractures and any associated injuries. The authors recommend a thermoplastic splint that has been developed to support the wrist and fingers of the little and ring and prevent excessive FDP movement of these fingers.

Keywords:
hamate fracture hook aetiology
A Decision Aid Decreases Decisional Conflict in Patients Undergoing Plate Fixation for a Distal Radial Fracture

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Objectives / Interrogation: Although a shared decision-making model is emphasized for patient-centered care, patients experiencing acute trauma might have limited time and resource for their involvement in decision-making, which may lead to decisional conflict. The purpose of this study was to evaluate whether a decision aid can reduce decisional conflict in patients undergoing plate fixation for a distal radius fracture (DRF) and to investigate factors that may affect the decisional conflict.

Methods: We prospectively enrolled 50 patients who presented with acute DRF and chose to undergo plate fixation. We randomized these patients into two groups. The test group was given a decision aid in addition to regular information while the control group was only given regular information. The decision aid consisted of purpose, procedure, and effect of the surgery, precautions and complications after the operation, and other treatment options that could be performed if operation was not performed. At 2 weeks after the surgery, we evaluated patients’ decisional conflict during decision-making for surgery by decisional conflict scale (DCS). In addition, we evaluated factors that might affect decisional conflict, such as age, dominant hand, comorbidities, history of previous surgeries, perceived disability, and administration of a decision aid.

Results and Conclusions: The test group showed significantly lower DCS than the control group (19.6 vs. 32.1, P = 0.001). In multivariate analysis for factors affecting the DCS, younger age and administration of a decision aid were independently associated with lower DCS. This study shows encouraging results towards that a decision aid can reduce decisional conflict in patients undergoing plate fixation for DRF. This study also shows encouraging results towards that older patients have more decisional conflict in decision-making for surgery than younger patients, suggesting that they need more careful doctor-patient communication.

Keywords:
Distal radial fracture, Decisional conflict scale, Decisional aid
The treatment of the chronic lateral epicondylitis by denervation of the lateral humeral epicondyle: technique and results

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Objectives / Interrogation: To evaluate the surgical treatment of the lateral epicondyle humerus denervation technique for chronic lateral epicondylitis, which is a frequent pathology and is well treated by conservative ways in most cases, and that for refractory ones, there is no consensus in the literature of which technique would be the most appropriate. We present an unusual surgical technique for this pathology with good clinical results.

Methods: retrospective study in one institution with prospective data collect. All the surgeries were performed by the same surgeon in an outpatient procedure, with local anesthesia and sedation. Magnifying glasses 4.5 x was used.

12 patients, 12 elbows were evaluated.

The inclusion criteria was the response to the nerve block - posterior branch (es) of the cutaneous posterior of the forearm by anesthesia with lidocaine 1.0% without epinefrine, 5 cm above of the epicondyle in a straight line taking with reference of the humerus, in pre operative with complete reduction of the pain; at least 1 year of symptoms and non response to another treatments.

The evaluation of the patients was by Quick Dash score with comparison pre and post operative.

Results and Conclusions: the Quick Dash score was used to measure the results. In all the patients we observed a reduction of the score.

pre operative the average was 78.7 and pos operative average of 28.9.
pre operative the higher score has 91.7 and the lower 60.0
pos operative the reduction were significant with the higher still 86.7, but the lower 5.0 (2 patients)
the worse result was in a patient that as receiving benefits by social security.
half of them were below the 20 points in pos operative
75% showed a good clinical result

we conclude that the denervation of the lateral epicondyle of the humerus in a chronic situation, produces good results, as showed by another authors, being a simple outpatient surgery, low cost (compared to arthroscopy or open surgery), with fast recovery and no need of formal reabilitiation.

Keywords: elbow, lateral epicondylitis, denervation, surgical results
Revision arthroscopic surgery for tennis elbow

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Objectives / Interrogation: Literature regarding the outcomes of revision arthroscopic surgery for tennis elbow is limited. The purposes of the study were to report clinical outcomes for a cohort of patients with chronic tennis elbow who underwent revision arthroscopic release of the extensor carpi radialis brevis (ECRB) tendon.

Methods: From January 2003 to December 2017, 150 arthroscopic surgeries for chronic tennis elbow were performed by a single surgeon. Among them 5 patients had persisted elbow pain following a primary surgery and underwent revision arthroscopic surgery. Indications of primary surgery included failure of a minimum of 6 months of conservative treatment such as rest, activity modification, counterforce bracing, nonsteroidal anti-inflammatory medications, and corticosteroid injection. Operative treatment consisted of an arthroscopic inspection, debridement of the ECRB tendon origin, and resection of the radiocapitellar synovial plica if interposed in the joint. The mean age of 5 patients was 48 years; four were male and one was female. The average duration between primary and revision surgery was 11 months and the average follow-up period after revision surgery was 18 months. Outcome was evaluated on the basis of visual analogue pain score, range of motion of the elbow, grip strength, Japanese Elbow Society (JES) score, DASH score and patient satisfaction. Arthroscopic findings of the revision surgery were also evaluated. Statistical analysis was performed using a paired Student t test, with statistical significance set at p< 0.05.

Results and Conclusions: Significant improvements were seen in terms of postoperative pain (p < 0.05), active extension and flexion (p<0.05), grip strength (p<0.05), the JES score (p < 0.05), and DASH (p<0.05). All of 5 patients satisfied with the operative results. Arthroscopic findings of the revision surgery included insufficient release of the ECRB origin in three patients and persisted impingement of the posterolateral synovial plica in two patients. Rate of revision arthroscopic surgery for tennis elbow was 3%. Incomplete release of the ECRB origin or synovial plica was considered to be a cause of persisted pain. Revision arthroscopic surgery resulted in reliable pain relief and improvement in elbow function in patients with persisted elbow pain following primary arthroscopic tennis elbow surgery.

Keywords: tennis elbow, revision surgery, arthroscopy
The relationship between positional contracture of proximal interphalangeal joint on trigger finger and metabolic syndrome

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Objectives / Interrogation: Trigger finger (TF) is a common hand problem and sometimes leads to positional contracture of proximal interphalangeal (PIP) joint after treatments, especially it is mostly in middle finger (MF), however this has not been proven scientifically. Though several studies reported that the relationship between tendinopathy and metabolic diseases such as diabetes, obesity and dyslipidemia, there were few reports about the relationship with metabolic syndrome (MetS). we herein presented the relationship between positional contracture of PIP joint on TF and MetS

Methods: The study group was composed of 34 fingers in 34 patients (25 women and 9 men; mean age, 67.4 years), treated with corticosteroid injection or open release of the A1 pulley for TF of MF. The survey included age, sex, degrees of PIP joint before treatments(pre-PIP), height, weight, Body mass index (BMI), waist, blood examinations (T-chol, HDL, LDL, TG, FBS, HbA1c) and the prevalence of MetS. We defined -10 degrees of PIP joint after treatments (post-PIP) as positional contracture and assessed between the patients with (group P) and without contracture (group N) at 6 months after treatments.

Results and Conclusions: Thirteen fingers (38.2%) were diagnosed as positional contracture. In group P, the mean of age, waist and degrees of pre-PIP were 72.8 years, 91.0cm and -24.2°, respectively. These were significantly greater than the value (64.0 years, 81.1cm and -7.4° respectively) in group N. Additionally, there was a significant correlation between the degrees of pre-PIP and post-PIP. Besides, in group P, the mean value of HDL (60.8 mg/dL) was significantly lower than group N (74.4 mg/dL) and the those of TG (173.8 mg/dL) was significantly higher than group N (135.3 mg/dL), with significant negative correlation between TG and the degrees of post-PIP. There were no significant differences among the others. Moreover, there was a significant relevant between MetS and the presence of positional contracture.

MetS is responsible for the increase in chronic diseases, diabetes, cardiovascular disease, neurodegenerative disease, and cancer. In addition, a low-grade inflammation may have a role in the pathogenesis of MetS. Favre described that the chronic inflammation would cause an enlargement and/or shortness of tendon and induce the flexion contracture of the PIP joint. From our study, the prevalence of Mets would become the predictor of positional contracture of PIP joint on TF.

Keywords:
trigger finger, positional contracture of proximal interphalangeal joint, metabolic syndrome
Factors related poor outcomes in the extension block pinning of mallet fractures

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Objectives / Interrogation: Percutaneous extension block pinning (pinning) for mallet fracture is simple and less invasive method. However, we occasionally encounter poor outcomes. We reviewed our cases in order to find out the factors causing poor outcomes.

Methods: Patients: From 2012 to 2017, fifty mallet fingers of 50 patients were consecutively operated on by pinning. There were 32 men and 18 women with an average age of 43. The patients followed more than 6 months were involved in this review. The affected fingers were 2 index, 10 middle, 22 ring, and 16 little fingers. The average interval between injuries to surgery was 7.6 days. The surgery was done according to Ishiguro method with some modification. The K-wire was removed at 5 to 6 weeks, then followed by night splint in extension.

The patients were evaluated by DIP joint motion, then divided into good or poor group. Either more than 10 degrees of extension lag or less than 30 degrees of active flexion was rated as poor. Fracture type was divided as avulsion type or axial compression type. The length of the dorsal cortex and the joint surface ratio of the bony fragment were measured on the lateral X-ray.

Results and Conclusions: Results: Thirty-three fingers were resulted into good, and 17 fingers were poor. The average patients' age was 40.1 years in good group and 50.6 years in poor group, which was statistically significant (P<0.05). The involved fingers and the interval to surgery were not significantly difference between two groups. Regarding fracture type, 67% of fingers showed avulsion type in good group, on the other hand 65% showed axial compression type in poor group. Joint surface ratio of the bony fragment was not significantly different between two groups, but the average length of dorsal cortex was 2.4 mm in poor group and 1.8mm in good group, which was significantly different (P<0.05).

Discussion: The average age was significantly high in poor group. Bone quality might be not rigid enough to secure K-wire, or pre-existing osteoarthritic changes caused restriction of DIP joint motion. Regarding fracture type, compression type and long bone fragment caused poor outcomes. The extension block pin aims to decrease traction force by terminal tendon, but it does not effectively prevent rotation deformity of bone fragment. We have to use an additional pin to directly fix bone fragment to the distal phalanx, or small screw would be effective. We should know the limitations of percutaneous pinning.

Keywords: mallet fracture
Minimally invasive screw fixation versus extension block pinning for mallet fracture

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Objectives / Interrogation: There are many operative techniques to treat mallet fracture when it is larger than one-third of the articular surface of the distal interphalangeal (DIP) joint, including extension block pinning or open reduction and internal fixation and the use of a hook plate. The extension block pinning is a useful surgical procedure for the treatment of this fracture. However, its complications are pin tract infection, flexion contracture of DIP joint and delayed union or nonunion. We have reported good outcome of minimally invasive screw fixation (MISF) technique for mallet fracture on 2013 FESSH, which is combined closed reduction of the mallet fragment by an extension block pining with internal fixation with one or two Leibinger screws through dorsal stab skin incision. We retrospectively compared the clinical and radiographic results of extension block pinning with MISF for mallet fractures.

Methods: Forty patients with a mallet fracture involving more than one-third of the articular surface were reviewed. Twenty cases were treated using extension block pinning (EB group) and 20 were treated using MISF technique (MI group). At the final follow-up (average 18 months), extension lag and range of motion of the DIP joint of the affected digit were measured, and the overall clinical outcomes were graded using Crawford's criteria. Complications, including nail deformity and dorsal prominence, were also assessed. The Mann-Whitney's U test was used to determine the significance of intergroup differences for continuous variables.

Results and Conclusions: At the final follow-up, the mean extension lag in MI group was 2.2°, which was significant different from that of the EB group (mean 12.8°; P<0.01). The mean range of motion of DIP joint in MI group was 74.9°, which was significant different from that of the EB group (mean 51.2°; P<0.01). Outcomes, as assessed using Crawford's criteria, were excellent in 12, good in 2, and fair in 6 in the MI group, and excellent in 2, good in 17, and fair in 8 in the EB group. All the fractures had united by 3 months after injury in both groups. We acknowledge that this is a short-term study of a small series, but patients treated with MISF technique had greater ROM and clinical outcome in the finger than extension block pinning. The current study indicates that adaptation of MISF for mallet fracture may be efficient to minimize soft tissue damage, stabilize the fracture fragment and mobilize the joint at the early stage.

Keywords:
surgery, mallet, fracture
Involvement of the lesser sigmoid notch in elbow fracture dislocations

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Objectives / Interrogation: This study addressed the primary null hypothesis that there is no difference in the articular surface area of the lesser sigmoid notch involved among Mayo classes. Secondarily, we analyzed the fracture line location and the pattern of lesser sigmoid notch articular surface involvement among Mayo classes.

Methods: Using quantitative 3-dimensional computed tomography, we reconstructed and analyzed fractures involving the lesser sigmoid notch articular surface in 52 patients. Further, we assessed the surface area involved in the fracture, the number of fracture fragments, and the location and direction of the fracture lines. Coronoid fractures were classified according to Mayo types.

Results and Conclusions: Results: There was no significant difference between Mayo types 1 and 2 in any characteristic of the involvement of the lesser sigmoid notch articular surface, whereas Mayo type 3 was significantly different from both Mayo types 1 and 2 in the area involved in the fracture (42% in Mayo type 3 vs. 9% in Mayo types 1 and 2), the number of articular fragments (>3 fragments in type 3 vs. 2 fragments in types 1 and 2), and the direction of fracture line (both horizontal and vertical lines in type 3 vs. only horizontal line in types 1 and 2).

Conclusion: Mayo type III results in a more complex fracture, which might need to be addressed directly or indirectly during open reduction with internal fixation of olecranon fracture dislocations because changes in the geometry of lesser sigmoid notch may affect the radioulnar joint if it remains incongruent.

Keywords:
Mayo; lesser sigmoid notch; coronoid; Q3DCT; elbow fracture; Monteggia; terrible triad; varus posteromedial instability
The utility of the mangled extremity severity score (MESS) for decision-making in treating mangled upper extremities? A meta-analysis

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Objectives / Interrogation: The mangled extremity severity score (MESS) is utilized to decide whether to try limb salvage or perform an amputation for the severely mangled extremity, but its utility in the treatment of the mangled upper extremity is not documented. To demonstrate its accuracy, we conducted a meta-analysis of studies comparing the diagnostic accuracy of the MESS in patients with mangled upper extremities.

Methods: We retrieved PubMed and EMBASE. We defined sensitivity as the probability that limbs requiring amputation had the MESS of 7 and above. Specificity was defined as the probability that salvaged limbs had the MESS <7. Cases where reconstruction failed and eventual revision amputation was performed were counted as amputation. The heterogeneity and publication bias were evaluated. Pooled sensitivity and specificity and positive and negative likelihood ratios were calculated using a bivariate random effects model for meta-analysis of diagnostic tests.

Results and Conclusions: Most studies dealt with injuries of lower and upper extremities collectively. Therefore, after full-text reading, we verified the availability of the information associated only with upper extremity injuries from the studies. Ultimately, nine studies (N=285) were included in the meta-analysis. The I-square test showed heterogeneity (I=0.60), caused by the difference in the injury characteristics between studies. Allowing for potential heterogeneity among studies, a hierarchical summary receiver operating curves model and bivariate model were used.

The pooled sensitivity and specificity were 97.7% (95%CI; 72.5% to 99.9%) and 89.2% (95%CI; 75.6% to 95.7%), respectively. The positive and negative likelihood ratios were 9.04 (95%CI; 3.81 to 21.5) and 0.25 (95%CI, 0.00 to 0.38), respectively. The area under the hierarchical summary receiver operating curve was 0.98 (95%CI; 0.97 to 0.99). Deeks' funnel plot asymmetry test suggested a little potential publication bias (p=0.09).

The pooled sensitivity and specificity was not worse than those of the lower extremity; the sensitivity means an extremely high probability of achieving limb salvage in cases where the MESS was under the threshold. The gained specificity suggests that limb salvage was achieved in more than 10% of the patients whose MESS was 7 and above. Limb salvageability of the mangled upper extremity does not depend on the MESS; amputation cannot be justified by the MESS. Development of a new scoring system that has excellent specificity is indispensable for surgeons.

Keywords:
Mangled extremity severity score, Upper extremity, meta-analysis
Recurrent and persistent carpal tunnel syndrome: predicting clinical outcome of revision surgery

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Objectives / Interrogation: The aim of this study was to evaluate the outcome of revision surgery in patients with recurrent and persistent carpal tunnel syndrome (CTS) and to identify predictors of clinical outcome of revision surgery.

Methods: A total of 114 hands in 112 patients were surgically treated for recurrent and persistent CTS in 1 of 16 specialized hand clinics. As part of routine care, patients were asked to complete online questionnaires regarding demographic data, comorbidities and clinical severity measures. Symptom severity scale (SSS) and function status scale (FSS) were measured with the Boston Carpal Tunnel Questionnaire (BCTQ) at intake and at 6 months postoperatively to evaluate the clinical outcome. Using multivariable regression models, we indentified factors predictive of the outcome as measured by the BCTQ FSS, SSS and total score at 6 months.

Results and Conclusions: RESULTS
Revision surgery significantly improved symptoms and function. Longer total duration of symptoms, a higher BCTQ total score at intake and co-diagnosis of Complex Regional Pain Syndrome (CRPS) were associated with worse outcome after revision surgery at 6 months postoperatively. Respectively 33%, 23% and 30% of the variance in outcome measured by FSS, SSS and BCTO total score could be explained by our multivariable regression models. Although patients with higher BCTQ score at intake have worse outcome, they generally have most improvement of symptoms and function.

CONCLUSIONS
This study identified total duration of symptoms, BCTQ total score at intake and co-diagnosis of CPRS as predictors of clinical outcome and confirmed that revision surgery significantly improves symptoms and function in patients with recurrent and persistent CTS. Patients with more severe CTS symptoms have greater improvement in symptoms at 6 months postoperatively as compared to patients with less severe CTS, but 80% of our patients still had residual symptoms 6 months postoperatively. These results can be used to inform both patient and surgeon to manage expectations on improvement of symptoms.

Keywords:
Carpal tunnel syndrome, persistent, recurrent, revision surgery, prediction, Boston carpal tunnel questionnaire.
Isolated limb perfusion beyond 24h - a potential avenue for global organ sharing, limb resuscitation and optimization

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Objectives / Interrogation: The maximum allowable ischemia time of 4-6h for amputated limbs is currently the biggest hurdle for broader application of limb allotransplantation and optimized donor-recipient matching. The safe extension of the allowable ischemia time for transport and or restoration and optimization of tissues prior to replantation may be achieved through extracorporeal isolated limb perfusion.

Methods: Based on the results of our experimental studies of ex-vivo perfusion of porcine forelimbs for up to 24h and beyond, and when compared with conventional cold storage on 4°C ice, extracorporeal perfusion with acellular solution at 10°C is a safe means to preserve amputated limbs.

Results and Conclusions: The implications of this progress are many-fold as its success would potentially allow for global organ sharing as well as treatment of injured limbs with compounds unavailable for systemic therapy prior to replantation.

Keywords:
limb perfusion, ex-vivo perfusion
Allogenic upper extremity transplantations - opportunities and limitations

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Objectives / Interrogation: Two decades ago the first successful hand transplantation has kindled the development of previously unthinkable reconstructive and restorative surgical options. Since then more than 100 of these vascularized composite limb allotransplantations (VCA) have been performed. VCA has moved from an experimental approach to a sound surgical option for patients with upper limb amputations.

Methods: Cumulative data from the international cohort suggest adequate functional and aesthetic outcomes. Patient reported quality of life after these interventions is also favourable. The remaining major limitation towards broader application is the need for continuous life-long immunosuppression. Despite advancements in terms of immunosuppressive protocols, the related infectiology, metabolic, and malignant side effects still remain.

Results and Conclusions: Allogenic limb transplantation is a good option for some amputated patients, although not all. Careful selection and individual risk-benefit evaluation is mandatory prior to considering this novel therapeutic option.

Keywords:
VCA, extremity allotransplantation, limb transplantation
Upper extremity amputations in Germany

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Objectives / Interrogation: Macroamputations of the upper extremity - from the level of the mid-hand to more proximal - are relatively rare in developed countries. This is mostly to high standards of work environments, transportation and traffic. When these amputations occur, they represent a major challenge in terms of the possibility of replantation as well as long term functional results. Specific knowledge on the incidence of macroamputations in Germany is currently lacking and mostly based on case reports.

Methods: We used publicly available data from the summary of quality reports of hospital of the joint German federal committee. We conducted a search query with ICD-10 codes for partial and total upper extremity amputation and OPS codes for limb replantation.

Results and Conclusions: The most recent available database contained data from 2016. A total of 23 traumatic amputations at the level of the wrist, 21 at the level between shoulder and elbow, 9 at the level of the elbow, 14 between elbow and wrist and 23 of not further specified amputations of the upper extremity. A total of 40 replantations of these amputations at various levels has been reported as well. More than 80 major amputations of parts of the upper limb are documented for a single year in Germany with replantation in less than 50%. Among further more detailed studies of these patients, future efforts should be geared towards prevention as well as modalities for optimizing replantation efforts, such as ex-vivo perfusion for example.

Keywords:
amputation, macro amputation
Three dimensional kinematic analysis of scapholunate joint during axial-loaded extended wrist position

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Objectives / Interrogation: Wrist injuries are most frequently caused by falls on an outstretched hand, resulting in bone fracture or ligament injury when the wrist joint is loaded in an extended position. We hypothesized that kinematic change would occur in the scapholunate joint when the wrist joint is loaded in an extended and pronated position. The purpose of this study was to investigate changes in the lengths of simulated scapholunate ligaments during wrist extension with axial loading and to clarify whether loading changes scapholunate joint kinematics.

Methods: The dominant arms of 9 volunteers with healthy wrists were studied. We mounted a compression device onto the elbows in an inverted position. A 0-kg and 7-kg load each was applied during low-dose radiation CT imaging and a bone model was produced. We marked the insertion sites for the 3 scapholunate ligaments stabilizing the scapholunate joint: proximal scapholunate ligament (P-SL), volar scapholunate ligament (V-SL), dorsal scapholunate ligament (D-SL). Each ligament was virtualized and the length of each simulated ligament was measured.

Results and Conclusions: The length of P-SL was 4.82mm at 0kg and 4.85mm at 7kg. The length of V-SL was 3.66mm at 0kg, and 3.79mm at 7kg. The length of D-SL and V-SL increased under the loaded condition compared with the unloaded condition but this difference was not statistically significant. The length of D-SL was 4.05mm at 0kg, 3.94mm at 7kg. The length of D-SL decreased significantly under the loaded condition compared with the unloaded condition. The dorsal SL ligament is an important ligament stabilizing the scaphoid bone and lunate bone, but it was thought that the compression force is generated on the dorsal side by the load and the length of the D-SL is shortened. Although not significant, the V-SL extends, there is a possibility that the ligament were stretched during axial loading. This results may support that there may be a progressive tearing of the SL ligaments from palmar to dorsal, eventually leading to a complete scapholunate dissociation.

Keywords: three dimensional kinematic analysis, scapholunate ligament

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Tendon transfer surgery after contralateral C7 nerve transfer to reconstruct the finger extension function in spastic arm paralysis patients after central neurological injury

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Objectives / Interrogation: Spastic arm paralysis after central neurological injury was difficult to treat. Conventional means such as tendon transfer could not be applied since the forearm muscles were in a high level of spasticity. Contralateral C7 nerve transfer provided a good method for the control and reduction of the spasticity of the paralyzed forearm muscles. Here we reported the use of forearm muscles innervated by the contralateral C7 nerve as the donor for tendon transfer to reconstruction finger extension function in central neurological injury patients.

Methods: Before the surgery, the spasticity of the flexors of the forearm was high, and surface EMG detected persisted contraction waveform in the flexor carpi radialis (FCR). Intuitive control of the spastic arm was not possible; therefore, the patients was not able to perform hand opening tasks. Contralateral C7 nerve transfer surgery was performed firstly, and the spasticity was significantly lower, while intuitive control was better in both of the patients at one-year follow-up. After this, tendon transfer surgery was performed with the following strategy: the FCR transposed to the extensor digitorum communis (EDC) via subcutaneous tunnel. The hand function was evaluated again after the surgery including the range of motion, muscle strength and hand function evaluation (Fugl-Meyer scale).

Results and Conclusions: Results: After the contralateral C7 nerve transfer surgery, the surface EMG detected shows the low-level of spasticity of the FCR. No detectable functional loss was reported from the patients. Three months after the tendon transfer surgery, the finger extension motion range increased from 0° to 0-30° while the mean increase in hand function score in the paralyzed arm was 7 points comparing to the one-year follow-up results after the contralateral C7 nerve transfer surgery. Conclusion Contralateral C7 nerve transfer surgery connected the paralyzed upper limb to the contralesional hemisphere, and provided good intuitive control and reduction in spasticity of the FCR. This provided good donor muscle for tendon transfer to further improve the hand open function and acquired good clinical outcome in our preliminary study.

Keywords: Contralateral C7 nerve transfer; Central neurological injury; Spastic arm paralysis; Tendon transfer.
Is hand dominance and a history of hand injury associated with a higher prevalence of hand pain and osteoarthritis in cricketers?

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Objectives / Interrogation: Hand osteoarthritis (HOA) is the most common form of OA. However, factors associated with hand pain and HOA in current and former sport participants is poorly understood. We aimed to determine if hand pain and HOA are more prevalent in (i) cricketers with a history of hand-injury (ii) the dominant hand.

Methods: 28,152 current and former cricketers of all playing standards who were registered on a national database were invited via email to complete a questionnaire. 2,598 participants responded and consented to the questionnaire. To be eligible for this study, participants must have played at least 1 cricket season and be aged at least 18 years.

Self-reported explanatory variables included any former cricket-related hand injury leading to more than 4 weeks of reduced participation in exercise/training/sport; and dominant hand used to throw/bowl. Outcomes were current hand pain on most days of the last month; and doctor diagnosed HOA.

Chi-squared test was used to compare outcome prevalence between groups. The association between injury and pain was only assessed in former cricketers (to minimise confounding by acute injury). Other analyses were performed on all cricketers (current and former).

Results and Conclusions: Results
2294 were eligible for this study, mean age 52 +/- 15 (range 18-94) years, mean BMI 27.8 +/- 5, mean seasons played 29 +/- 15 (range 1-68), 65 (2.8%) female, 835 (36.4%) former cricketers.

Former cricketers reporting former hand-injury (n=128, 15%) had a higher prevalence of hand pain, compared to former cricketers reporting no hand-injury (38% vs. 17%, p<0.01). All cricketers reporting a hand injury (n=385, 17%) had a higher prevalence of HOA, compared to all cricketers reporting no hand injury (7% vs. 3%, p<0.01). There was no difference in the prevalence of hand pain or HOA between dominant and non-dominant hands (pain 6.6% vs 5.2%, OA 3.9% vs 2.8%, respectively).

Conclusions
Cricket-related hand injury was associated with a higher prevalence of hand pain in former cricketers and a higher prevalence of HOA in current and former cricketers. Hand pain and HOA prevalence was similar between the dominant and non-dominant throwing hand. This suggests hand injury may be a risk factor for the development of hand pain and HOA.

Keywords:
Hand, Osteoarthritis, Pain, Injury, Dominance, Cricket
Suture button suspensioplasty vs Sigfusson-Lundborg ligamentoplasty for basilar thumb arthritis treatment

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Objectives / Interrogation: The purpose of this study is to determine if basilar thumb arthritis treatment using suture button suspensioplasty (SBS) is associated with better clinical and functional outcomes than treatment with Sigfusson-Lundborg ligamentoplasty (SLL).

Methods: We performed a retrospective study that included patients diagnosed with basilar thumb arthritis, submitted to surgical treatment with one of two techniques - SBS vs. SLL - and with a minimal follow up of 6 months. Surgical technique was chosen upon surgeon preference. Functional outcomes were compared using QuickDash Score (QDS) and pain was assessed with Visual Analogic Scale (VAS) in three diferent moments: before surgery and at 3 and 6 months after surgery. We also measured trapezial space before surgery and at last appointment.

Results and Conclusions: Twenty-six patients were included in this study. Thirteen were in SBS group and 13 in SLL group. Mean age was 63 (52-75) and no differences were found between groups (61,6 in SBS vs. 64,5 in SLL). Follow up was similar for both groups, 12,4 months for SBS and 12 months for SLL. Pain was 5,31 for SBS group and 5,46 for SLL group before surgery, which did was not significative (p>0,05). At 3 months, pain was statistically significative inferior in SBS group, 0,77 vs 1,77 (p=0,005). At 6 months, the differences between groups did not maintained (0,69 vs 0,92; p>0,05). QDS improved in both groups, from 36,01 to 12,76 in SBS group and from 37,77 to 12,93 no SLL group. In both times of measurement, we did not find differences between groups (p>0,05). Trapezial space decreased 28,1% in SBS group and 39,4% in SLL group which was statistically significant (p=0,012)
We reported no major complications and we registered two patients, one in each group, that sustained anesthesia in sensitive radial nerve area that resolved after nearly 3 months.
Basilar thumb arthritis can be a disabling condition. There are several surgical options for treatment of this condition and recently, SBS has grown in popularity, presenting as main advantage early mobilization. We think this is the main reason why, in our study, patients submitted to SBS refer less pain at 3 months than patients submitted to SLL.
We conclude that patients submitted to basilar thumb arthritis treatment with SBS recover faster than patients submitted to SLL, but this effect tend to disappear over time.

Keywords: -
Salvage of the proximal scaphoid: A retrospective comparison of Medial Femoral Trochlear Osteocartilaginous graft and Costo-osteochondral graft with a minimum 2 year follow-up

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Objectives / Interrogation: Introduction
The free vascularized medial femoral trochlear (MFT) osteochondral graft and the costo-osteochondral graft (COG) are two options for the salvage of the fragmented proximal scaphoid. The aim of this study was to compare outcomes of these techniques at a minimum of 2 years postoperatively.

Methods: Methods
Institutional ethics approval was obtained to review all patients who had undergone either a MFT or COG for fractures of the proximal third of the scaphoid over the last 20 years. Baseline demographic information was collected, including age, sex, hand dominance and pre-operative procedures. Patients returned for clinical review and outcome measures were recorded (DASH, PRWE and VAS). Range of motion of the wrist and grip strength were measured. Follow-up radiographs were reviewed to identify degenerative changes, carpal height, lunocapitate and radiolunate angles.

Results and Conclusions: Results
There were 12 MFT and 21 COG procedures performed, of which 9 MFT and 12 COG patients presented for review. The MFT group were younger (mean 30.6 Vs 38.3 years, p=0.01) and had significantly shorter follow-up (mean 35 Vs 124 months, p< 0.001). The MFT group had significantly better postoperative VAS (1.4 Vs 3.3, p=0.05), but there was no significant difference in postoperative DASH (15.3 Vs 12.7), PRWE (23.3 Vs 16.5) or Grip strength (41 Vs 35.6 kg)(p >0.05). There was no significant difference in postoperative wrist Flexion/Extension arc (65° Vs 77.7°), Ulnar/Radial arc (36.1° Vs 34.2°) and Pronation/Supination arc (159.4° Vs 158.9°)(p>0.05). In the MFT group there was radiographic evidence of beaking of the radial styloid in 6 wrists. In the COG group all patients had mid-carpal and radiocarpal osteoarthritis. The two groups had a markedly different complication profile. In the COG group 1 patient required a total wrist fusion 2 years postoperatively. There were 2 pneumothoraces, 1 joint infection and 1 radial styloectomy. In the MFT group 1 patient underwent scaphoid excision and four corner fusion at 7 months, 1 patient had notable knee pain and 8 patients complained of some knee discomfort not sufficient to affect their daily activities.

Discussion
The survivability of the COG group is notable at 10 years with good outcomes despite the radiological changes. The intermediate results of the MFT group are promising and potentially will have better long-term outcome, because of the similarity in arc of curvature of the MFT to the proximal scaphoid and the presence of articular cartilage.

Keywords:
Scaphoid non-union, medial femoral trochlear osteochondral graft, costo-osteochondral graft, rib graft
Treatment of Fracture-dislocation of hamate-metacarpal articulation with across-joint internal fixation using bridging plate technique

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Objectives / Interrogation: To introduced the clinical application results and surgical technique of treatment of Fracture-dislocation of hamate-metacarpal articulation with across-joint internal fixation using bridging plate technique.

Methods: From August 2008 to December 2015, 55 cases of Fracture-dislocation of hamate-metacarpal articulation were treated with this kind of method and followed up. According to Cain type, including 8 cases of 1A type, 27 cases of 1B type, 13 cases of 2 type, 7 cases of 3 type. Open reduction and across joint internal fixation was performed to Fracture-dislocation of hamate-metacarpal articulation using a 2.3mm Stryker bridging plate, early motion was allowed. The plate was removed at 4 months after operation.

Results and Conclusions: All the cases were followed up average 2.5 years, all the fractures were union successfully, the average union time were 5.5 weeks. Function evaluation was made according to pain degree and flexor and extensor activity of wrist joint. The overall good-excellent rate was 96.3%, the clinical results were satisfactory. Treatment of Fracture-dislocation of hamate-metacarpal articulation with across-joint internal fixation using bridging plate technique was better than conventional methods. This technique avoids redislocation and instability of the hamate-metacarpal joint, It is allowed to early active motion of wrist joint while still being able to achieve a stable fixation construct strong enough. Minimizing the need for prolonged splinting. It is an effective method in treatment of Fracture-dislocation of hamate-metacarpal articulation

Keywords:
Across joint; Bridging plate interfixation; Hamate-metacarpal articulation
The diagnosis and treatment of aneurysmal bone cyst of the metacarpals and phalanges of the hand

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Objectives / Interrogation: To analyse the clinical features, imaging Characteristics, differential diagnosis, clinical treatment methods and the recurrence rate of aneurysmal bone cyst of the metacarpals and phalanges of the hand.

Methods: The clinical data of 12 cases of aneurysmal bone cyst of the metacarpals and phalanges from 2002 to 2012 was evaluated, and follow-up information was available. To review clinical symptoms and signs, X-ray and MRI imaging Characteristics, tumor performance, operative methods and bone graft, recurrence rate.

Results and Conclusions: 8 of 12 cases were in metacarpal, 4 of 12 were in phalange. The mean age was 28 years, 7 male and 5 female. Clinical features Characteristics were local inflation and pain. Radiographs typically show a lytic lesion with expansion of the cortex. The lesion is usually well marginated and may have a faint sclerotic rim. MRI show a soap bubble like expensive bone destruction was detected, Bone trabeculae mixed with osseous septae in the lesion and fluid-fluid level was detected. During operation bone cortex became purple and swelling and thin. Treatment is by curettage and bone grafting and resection with reconstruction. 1 case recurrence. The diagnosis was clear by histopathology. 1 cases concurrent Giant cell tumors. Aneurysmal bone cyst of the metacarpals and phalanges of the hand is a infrequent disease, is not familiar to hand surgery surgeon. Early diagnosis is very difficult, should be differentiated from other hand bone tumors. Aneurysmal bone cyst of the metacarpals and phalanges of the hand have some identical clinical features and imaging Characteristics. Combination of X-ray and MRI can distinctly improve the correct ratio of the diagnosis. High-speed burr curettage and bone grafting and resection with reconstruction may reduce recurrence rate.

Keywords:
Scaphoid Fracture Classification: a Three-Dimensional Computed Tomography Analysis

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Objectives / Interrogation: Traditional scaphoid fracture classifications rely on radiography. Radiography alone can prove challenging for fracture diagnosis and description of fracture characteristics. The aims of this study were to describe acute fracture morphology, to map fracture patterns onto a three-dimensional scaphoid model and to devise a classification system based on computed tomography (CT).

Methods: In this retrospective, multicenter study, 59 adult (>18yrs) patients with an acute scaphoid fracture who had a CT-scan within 6 weeks after injury were included for analysis. Exclusions: pre-existing scaphoid pathology and scans of insufficient quality (such as slice thickness >2mm). CT scans were segmented manually to create 3D surface rendered models. These models were reduced and superimposed onto a 3D standardised template of an intact scaphoid. Fracture lines of all models were then superimposed onto the template.

Results and Conclusions: Preliminary analysis identified four distinct fracture patterns:
1) Proximal pole: 17% of the fractures ran obliquely and proximal to the dorsal ridge. These fractures were more distal than usually described.
2) Transverse waist: 29% of the fractures fractured transversely through the dorsal ridge
3) Oblique waist: 37% of the fractures ran obliquely along the dorsal ridge
4) Scaphoid tubercle fracture: 17% of the fractures constituted 2 types of tubercle fractures - those localised to the Scapho-Trapezial ligaments, and those that went into the STT joint.

The proximal pole and scaphoid tubercle fractures were rarely significantly displaced. Waist fractures were commonly displaced (31%). Most fractures were 2-part fractures (92%). Remaining fractures (8%) were 3-part fractures, which typically involved displaced oblique waist fractures with a third fragment involving the dorsal ridge.
Figure 1. Radial and ulnar view of three-dimensional right scaphoid fracture map

Conclusion:
3D-CT analysis identified four distinct patterns of scaphoid fractures: proximal pole fractures, transverse waist fractures, oblique waist fractures and tubercle fractures. Waist fractures were commonly significantly displaced, whereas proximal pole and tubercle fractures were not.

Keywords:
Scaphoid fracture, classification, 3D computed tomography, computed tomography
Soft tissue reconstruction for preserving metacarpophalangeal joints in the rheumatoid hand

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Objectives / Interrogation: Implant arthroplasty is a popular surgical procedure for correcting metacarpophalangeal (MP) joint deformity in rheumatoid arthritis (RA) patients. However, there are several problems such as infection, implant breakage, limitation of MP joint flexion. This study reports the surgical results of soft tissue reconstruction for preserving MP joints in rheumatoid hand with ulnar drift and extension loss of the fingers.

Methods: We retrospectively reviewed 21 fingers in 6 RA patients with ulnar drift and extension loss of the fingers who had undergone soft tissue MP reconstruction. Our indication for this procedure are: (1) RA well controlled by medication; (2) MP joint not severely destructed; (3) MP joint is passively correctable. The mean age at the time of surgery was 60 years (range, 55-71). The mean follow-up was 36 months (range, 13-72). Soft tissue MP reconstruction was basically performed in accordance with the method previously described by Wood et al.. Crossed intrinsic transfer was done only in 2 fingers that showed severe ulnar drift (more than 65 degrees). The dislocated extensor tendon was sutured on the dorsal base of the proximal phalanx in all fingers. All patients were evaluated for active range of motion of the MP joints and the degree of ulnar drift in maximum active extension preoperatively and at final follow-up. Comparisons between preoperative and final follow-up active range of motion and the degree of ulnar drift were performed. Postoperative complications were also assessed.

Results and Conclusions: The active finger extension of the MP joint was significantly improved from a preoperative average of -42° (range, -80°-0°) to -9° (range, -35°-0°). The active finger flexion of the MP joint did not change from a preoperative average of 93° (range, 73°-110°) to 93° (range, 50°-110°). The degree of ulnar drift was significantly improved from a preoperative average of 35° (range, 10°-80°) to 9° (range, 0°-35°). There were no serious surgical complications. There are several limitations, including small number of patients and short-term results. However, our procedures provides good results without serious complications if the MP joint not severely destructed and is passively correctable.

Keywords: Extension loss, Metacarpophalangeal joint, Soft tissue reconstruction, Ulnar drift
The evaluation of Dupuytren's contracture with ultrasonography for safety of Collagenase Clostridium Histolyticum injection

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Objectives / Interrogation: The technical instruction leaflet for Collagenase Clostridium Histolyticum (CCH) injection recommends a "2-3mm depth" of injection, however, there is little supporting evidence. We consider that CCH injection into the middle of the cord is optimal to avoid the possible complications of skin laceration or flexor tendon rupture. This study investigated using the long axis images of ultrasonography as a tool to determine the appropriate injection depth.

Methods: 32 patients with Dupuytren's contracture with a mean age of 71.4 years (range; 57-87 years) were included in this study. All patients showed fixed flexion contracture (FFC) of the MCP joint caused by a palpable cord. The average FFC of the MCP joint was 51.4 degree (range; 20-80). We marked the CCH injection point on the skin above the cord and added two injection points proximally and distally with a 2mm distance. Then we measured the thickness of the skin and the width of the cord, and the distance from the skin to the middle of the cord as "the appropriate injection depth" by high resolution ultrasonography with long axis images (SNiBLE; Konica Minolta, Tokyo, Japan).

Results and Conclusions: The average distance from skin to the cord was 1.1mm (range; 0.5-2.0). The average width of the cord was 2.7mm (range; 1.5-3.8). The average distance from the skin to the middle of the cord was 2.4mm (range; 1.5-3.0). There was no difference of the distance among the three points.

Injection of CCH to an adequate depth is very important not only to obtain the maximum effect of collagenase but also to avoid possible complications. By using ultrasonography, we demonstrated that the distance from the skin to the middle of the cord was comparable to that described in the technical manual for the CCH injection namely "2-3mm depth injection is recommended". Using long axial images was practical for the measurement of the three injection points at one time. CCH injection could be possible safely not only relying on the feeling of resistance at the injection but also recognizing the actual depth by the ultrasonography.

Keywords:
Dupuytren's contracture, injection, Ultrasonography
Late primary FDP tendon repair under walant

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Objectives / Interrogation: After 21 days, the flexor digitorum profundis (FDP) tendon is so retracted that the surgeon considers there will be too much traction and a bad vascularization of the sliding system (flexion contracture or tendon rupture) to obtain a good result.
The aim of this clinical study is to blow the myth that you can’t repair flexor tendon after 21 days if the tendon is retracted prior to the palm.

Methods: In 2 Hand Surgery Centers, we repair 4 patients (aged 19 to 49 year-old) with injured FDP tendon with no other complications (no digital nerve injury, no infection, to joint stiffness) : one index finger, one 3rd finger and two 5th fingers. The FDP tendon have been checked at the first phalanx by high resolution ultrasonography with Doppler mode. Every patient have been treated under wide awake surgery with local anesthesia and no tourniquet (walant technique). The Lalonde and Tang guidelines has been respected : vent of the pulley 1,5 to 2 cm proximaly, solid six strand suture with no gap after several active motion, authorization to move it but not to use it, and education of the patient who see the finger at the end of the procedure. Immediate rehabilitation started few days after surgery.

Results and Conclusions: The ultrasonography was possible for every patient. The Doppler mode was not a good exam to attest if the vascularization was correct around the injured tendon.
The walant anesthesia has been performed successfully for all the patients (no sedative drugs or general anesthesia needed). The tendon was repaired with the respect of a part of A2 pulley. The opening of the A4 pulley was done for 3 patients. At one and a half month follow-up, there was no rupture observed. The mean total active motion (TAM) in flexion (MP+PIP+DIP) was 190° and the mean TAM in extension was 5° of flessum.

A late FDP tendon repair has been performed successfully for this short cohort. We recommend to use ultrasonography to check the retracted FDP tendon and to use the walant technique respecting the Lalonde and Tang guidelines to check the suture.

Keywords:
ultrasound tendon flexor repair walant anesthesia
Wide awake ultrasound guided percutaneous anterior interosseous nerve release

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Objectives / Interrogation: Anterior interosseous nerve (AIN) palsy is a purely motor neuropathy that comprises less than 1% of all upper extremity nerve palsies. The AIN innervates three muscles in the forearm: flexor pollicis longus (FPL), pronator quadratus (PQ), and the radial half of flexor digitorum profundus (FDP).
AIN compression is classically treated under general anesthesia with open surgical release of the median nerve through a long incision above and below the elbow. More recently, Hagert has published good success sectioning the Lacerates Fibrosus (LF) with a less invasive wide awake approach though a 3 cm incision at the elbow crease in a cohort of patient suffering of AIN compression without palsy.
We present 2 cases report of a AIN palsy, treated with minimally invasive ultrasound guided wide awake release of lacertus compression of the proximal median nerve at the elbow with return of function on the operating table.

Methods: 2 patients (30 year old female and a 26 year old male) presented to the outpatient clinic complaining of a 4 months history of complete palsy in the FPL and index FDP for the male and a unique palsy of the FPL tendon for the female. He was found to have a positive scratch collapse test over the median nerve at the elbow. There was no sensory deficit in the median nerve distribution.
Electrodiagnostic studies supported the diagnosis of a compression neuropathy affecting the AIN at the elbow. An ultrasound examination showed no extrinsic tumor or vascular/nervous abnormalities but the dynamic compression of the median nerve between the pronator teres and the LF. The MRI of the wrist showed a denervation of the FPL and the PQ muscles.
The patients underwent wide awake surgical decompression of the median nerve using a technique similar to the technique described by Hagert. We used a 1 cm transverse skin incision 5 mm distal to the anterior elbow crease to cut the LF with a polycarbonate knife.

Results and Conclusions: We performed an intraoperative total active movement examination, and found the index distal interphalangeal joint and the interphalangeal joint of the thumb were able to immediately actively flex against resistance, compared to no movement preoperatively.
The wide awake ultrasound guided AIN release technique allowed intraoperative active motor examination confirming immediate return of strength of muscle groups involved in AIN palsy.

Keywords:
median nerve ultrasound walant palsy
Targeted Muscle Reinnervation at the Time of Amputation Reduces Pain Severity and Behavior in Upper Extremity Amputations

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Objectives / Interrogation: Targeted muscle reinnervation (TMR) is a technique for the management of peripheral nerves in amputees. Regarding pain management, TMR aims to address symptomatic neuromas, which are disorganized ends of severed nerve fibers encased in scar. Neuromas are often responsible for much of the residual limb pain (RLP) experienced by those with limb loss, limiting function and making the use of prostheses uncomfortable, or even impossible. Moreover, neuromas may be a driver of phantom limb pain (PLP), or the feeling of discomfort in the non-existent limb. We have employed TMR as a means to prevent such pain when performed at the time of amputation.

Methods: A retrospective review of patients who underwent upper extremity amputation with concurrent TMR was performed. Pain was assessed using the NIH-funded Patient-Reported Outcome Measurement Information System (PROMIS) Pain Intensity Short Form 3a, and Pain Behavior Short Form 7a, which assess the intensity and outward manifestations of pain over a 7-day recall period, respectively. Our TMR cohort was compared to benchmarked data from an unselected population of upper extremity amputees.

Results and Conclusions: Sixteen patients who underwent upper extremity TMR at the time of amputation were identified and were compared to 55 patients who underwent upper extremity amputation without TMR. Among TMR patients, 25% underwent transradial amputation, 31.2% transhumeral amputation, and 43.8% underwent shoulder disarticulation. Median follow-up time was 13.7 mos, ranging from 3.1 mos to 5.3 yrs. Nine patients (56%) were using a prosthetic at most recent follow-up, and avg time to prosthetic was 4.7 mos. The mean PROMIS PLP intensity t-score for the general amputee population was 47.02 vs 36.6 in the acute TMR population (p=0.001), representing a statistically significant reduction in the TMR cohort. PROMIS pain intensity for RLP trended towards benefit with TMR (44.68 versus 39.8, p=0.133). Additionally, the PLP behavior t-score among general amputees was 52.2 vs 46.7 in the TMR population (p=0.046), demonstrating a reduction in pain behavior among TMR amputees.

In addition to the benefit of TMR for myoelectric prosthetic control, our study demonstrates that TMR performed at the time of amputation is a promising strategy for improving PLP and RLP severity and behaviors in the upper extremity. TMR performed at time of amputation is cost-effective, technically easier, and permits the patient early prosthetic rehabilitation without need for delayed procedures.

Keywords:
targeted muscle reinnervation, TMR, phantom limb pain, residual limb pain, amputation
**Tendon transfer and wide awake: innovation and high functional result**

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**Objectives / Interrogation:** The wide awake anesthesia technique is the new frontier for hand surgeon. Operating patients under local anesthesia, without the discomfort of the tourniquet, allows you to observe the tension given to tendon transfers by active movements and possibly make changes in tension before skin closure. [1]

**Methods:** We present our case studies of 20 patients, aged between 8 and 86 years, operated with this anesthesiological technique, to which we carried out tendon transfers. The tendon rupture was after degenerative disease. Active rehabilitation was carried out for all to obtain high results.

**Results and Conclusions:** In no case we have obtained a deficit of vascularization of the fingers, never used the tourniquet, in no cases we have assisted tendons rupture or deficit of tension in tendon transfer. No patients felt ill during the surgery and were pleased to have participated like active actor during the surgery.

We believe that the wide awake technique is a good innovation for hand surgery and can perform over 80% of the operations. It is a technique that can be applied to all ages, it does not require the suspension of any therapies and introduces the concept of field sterility

**Keywords:**
wide awake, tendon transfer, epinephrine.

**References:**
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Surgical treatment for metacarpal and proximal phalangeal fractures: Retrograde Screw versus Kirschner Wires versus Plate-Screw

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Objectives / Interrogation: Metacarpal and phalangeal fractures account for 41% of all below-elbow fractures. Despite most of them can be managed successfully conservatively, unstable fractures often need surgical treatment. We sought to compare the three different techniques most used in extra-articular metacarpal and phalangeal fractures: plate-screw, KW and retrograde intramedullary screw (RIS). We aimed to determine whether retrograde intramedullary screw provides better clinical outcomes than plate-screw or KW fixation.

Methods: We conducted a retrospective review of patients who underwent surgical treatment of metacarpal and phalangeal fractures from January 2011 to December 2017. Only patients with displaced short oblique or transverse extraarticular metacarpal and phalangeal fractures were included. Patients were classified into three groups depending on the treatment received: plate-screw, KW and RIS. The duration of each procedure was collected. Clinical assessments included measuring total active motion, grip strength, and evaluation of plain x-ray until healing. Quick-DASH had been performed in all the patients. The data was analyzed by model analysis of variance (ANOVA) or Kurskall-Wallis rank test.

Results and Conclusions: A total of 253 fractures in 230 patients were included, 202 metacarpal and 51 phalangeal fractures. One hundred thirty-five fractures underwent plate-screw fixation (53.3%), 53 KW fixation (20.9%), and 65 RIS fixation (25.6%). Mean surgery time was significantly shorter in KW (20 min [11-36]) and RIS (25 min [17-38]) groups, compared to plate-screw group (32 min [16-48]) (p<0.05). Loss of reduction occurred in 6 patients in KW group, 2 in plate-screw group and 3 in RIS group. A total of 38 patients of KW group, 33 patients of PS group and 2 patients of RIS required hardware removal. No differences between the three groups were observed when evaluating mean grip strength, total active motion, Quick Dash and mean time to radiological union. Mean return to work time was significantly lower in the plate-screw (7.8 weeks, [3-6]) and RIS (8.3 weeks, [4-24]) groups when comparing to KW group (9.2 weeks, [5-20]) (p<0.05).
Surgical treatment should be individualized in patients with unstable metacarpal and phalangeal fractures. RIS has shown lower surgery duration and time to return to work when compared to plate-screw and KW, respectively, and lower hardware removal compared to both. Prospective randomized study should be performed to better define the advantages of retrograde screw technique.

Keywords:
metacarpal, phalangeal, fracture, retrograde screw
Distribution of sensory nerve endings in the interosseous membrane of the forearm

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Objectives / Interrogation: The role of proprioception in understanding the dynamic stability and neuromuscular control of the forearm is important for the treatment of forearm injuries involving bone, ligaments and joint capsules. Therefore the aim of the study was to investigate types and distribution of sensory nerve endings in the different parts of the human interosseous membrane of the forearm.

Methods: The distal oblique bundle (DOB), the distal accessory bundle (DAB), the central band (CB), the proximal accessory bundle (PAB), the dorsal oblique accessory cord (DOAC), and the proximal oblique cord (POC) were dissected from twelve human fresh frozen cadaver forearms. Sensory nerve endings were analysed in two levels per specimen as total cell amount/ mm² after immunofluorescence staining with low-affinity neurotrophin receptor p75, protein gene product 9.5, S-100 protein and 4,6-Diamidin-2-phenylindol (DAPI) on an Apotome microscope (Carl Zeiss Microscopy, Jena, Germany) according to Freeman and Wyke's classification.

Results and Conclusions: Free nerve endings were the predominant receptor in all six ligaments with greatest density in the DOB followed by POC. The second most sensory nerve endings were unclassifiable corpuscles, followed by Pacini corpuscles. The DOB had the highest amount of Pacini corpuscles followed by the PAB and POC. The DOAC only contained free nerve endings and unclassifiable corpuscles.
The DOB, PAB and POC had the highest density of sensory nerve endings, which indicates, that control of the dynamic stability of the forearm is pronounced at the distal and proximal radioulnar joint due to the closed proximity of the DOB and POC, respectively.

Keywords:
interosseous membrane, microscopy, proprioception, sensory nerve endings, stability
Nailbed trauma: a review of 76 cases

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Objectives / Interrogation: Nailbed trauma is a commonly overlooked part of fingertip reconstruction. To evaluate outcomes of nailbed injuries treated with different reconstructive techniques, we performed a retrospective review of 76 patients who presented with nailbed injuries.

Methods: We conducted a retrospective chart review of 76 adult and pediatric patients who underwent nailbed reconstructions due to trauma between January 2000 and August 2017 at our institution's division of Hand Surgery and Reconstructive Microsurgery; only patients with at least 12 months of follow-up were included. Outcomes assessed were growth (0 = no growth; 1 = partial growth; 2 = normal growth), size (0 = less than 25%; 1 = between 25 and 50% and 2 = >50% of the size of the contralateral nail) and shape (0 = significant deformity on the horizontal and vertical planes; 1 = vertical deformity, 2 = no deformity) of the nail compared to the contralateral finger. The results obtained by the sum of scores were classified as good (5-6), acceptable (3-4) and poor as previously described by Foucher et al. This study was approved by our institution's institutional review board for ethics in research and performed in accordance with the Declaration of Helsinki.

Results and Conclusions: In our series, 32 patients (42.10%) underwent suturing of the nailbed (SNB); 25 patients (32.89%) underwent suturing of the nailbed associated with an osteosynthesis of the distal phalanx (SNBOst); 19 (25%) received a nailbed graft in the ER (NBGE) (Table 2). The results were considered "good" in all patients who underwent SNB and in those who underwent SNBOst associated with an osteosynthesis of the distal phalanx. "Good" results were also achieved in 57.9% of patients who underwent NBGE. "Acceptable" results were obtained in 42.1% of patients grafted in the ER.

In summary, in our series, patients treated with simple suturing of the nailbed - both those with and without associated finger fractures - and patients who underwent reconstruction of the entire nailbed showed improved outcomes compared to those treated with nailbed grafts. Larger prospective, randomized trials stratified by degree of injury may help guide the most appropriate approach to patients with these challenging injuries.

Keywords:
Trauma; nail; nailbed;
Surgical Outcomes following Syndactyly Reconstruction - using JSSH Evaluation Form

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Objectives / Interrogation: The purpose of this study is to investigate long term surgical outcomes after syndactyly release by Japanese Society for Surgery of the Hand Evaluation form (JSSH form) and patient-reported outcomes.

Methods: Eleven patients of 15 hands were included in this study. Involved fingers were 3 index/middle finger, 10 middle/ring, 1 ring/little and 1 middle/ring/little. Ten hands were simple syndactyly (6 showed the complete type, 4 the incomplete type) and 5 hands were complex syndactyly. We used dorsal rectangular flap to create the web and volar triangular flap with full-thickness skin graft for 12 hands, and dorsal Y flap for 3 hands of incomplete type. Of 15 hands, eight hands had undergone a revision surgery. All patients were directly assessed and interviewed. JSSH form includes function (joint contracture), cosmesis (web creep, skin pigmentation, nail deformity, finger deformity, scar quality) and subjective assessment (pain, patient satisfaction). Patient-reported outcomes include Quick DASH and HAND 10, then overall cosmetic appearance was rated in five grades.

Results and Conclusions: Result
An average follow-up interval after the first surgery was 13.5 years (range, 7-21 y). JSSH evaluation form averaged 14.1 points; 4 hands were excellent, 3 good, 5 fair, and 3 hands were poor. Q-DASH averaged 0.4 (0-2.27) and HAND10 averaged 1.63 (0-7). The overall cosmetic appearance averaged 2.6 (1-4). Simple syndactyly showed better outcome compared with complex syndactyly. All patients showed functionally good, but cosmetic factors effected on patient satisfaction. JSSH evaluation reflected well both function and cosmesis.

Conclusion
After long-term follow-up, the most of patients maintained good function, but nail and finger deformities caused poor satisfaction. JSSH evaluation form which includes functional and cosmetic factors is appropriate to assess overall patient condition.

Keywords:
syndactyly, JSSH evaluation
Nailbed regeneration in Pediatric Patients

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Objectives / Interrogation: Controversy still exists as to the regenerative potential of the nailbed after trauma, with some recent evidence in rodent models pointing to the interplay between periosteal osteogenic cells and epidermis as potential contributors. In this context, we present a review of 31 patients with Allen type 2 to 4 fingertip injuries who underwent surgery using either an island or Atasoy flap.

Methods: We performed a retrospective chart review of 31 patients who sustained fingertip trauma with nailbed injury. Variables analyzed were age, type of injury (Allen classification), follow-up period, time from trauma to surgery and affected finger(s). Outcomes were evaluated based on presence and degree of tissue necrosis (1 - absent, 2 - less than 50%, 3 - greater than 50%), nail deformity (classified using the Result Reconstructed Fingertip Length Appearance of Nail Unit - and joint mobility. Mobility was evaluated in comparison to the contralateral (CL) phalange and classified as 1 - 100% CL, 2 - 75% CL, 3 - 50% CL, 4 - 25% CL.

Results and Conclusions: Complete data were available for all 31 patients. Most (21) had a crush injury, while four presented with a laceration. Injuries were classified as Allen types 2 (9), 3 (8) and 4 (14). Mean patient follow-up was 26 months. Nine patients, all of which had Allen type 2 crush injuries, underwent reconstruction with an Atasoy flap. None presented with postoperative necrosis. Regarding nail appearance, four was considered “excellent” while six were classified as “good”. Joint mobility was 100% CL in two patients, 99-75% in another two and 74-50% in one patient. The 22 remaining patients with Allen types 2 (4), 3 (7) and 4 (11) injuries underwent reconstruction with an island flap. One patient with an Allen type 4 crush injury developed postoperative tissue necrosis, compromising less than 50% of the affected fingertip. In total, one patient developed partial tissue necrosis, none developed necrosis greater than 50% of the tissue area, five had “good”, rather than “excellent” nail appearance and four had decreased joint mobility compared to the contralateral finger.

Nailbed injury continues to be a relatively underappreciated topic of hand surgery, as many patients who sustain trauma or other injuries to the nails do not seek out medical help, and there is currently no consensus as to the optimal treatment of such injuries.

Keywords:
Nailbed; regeneration;
Determination Minimal Clinically Important Differences (MCIDs) in Patient-Reported Outcome Measurement Information System (PROMIS) Physical Function (PF), Upper Extremity (UE), and Pain Interference (PI) in Carpal Tunnel Release

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Objectives / Interrogation: An uncertainty exists about what change in PROMIS scores represents a true clinically relevant improvement (minimal clinically important difference [MCID]) in hand surgery care. Using a region-specific PRO tool (Michigan Hand Question (MHQ)) and a condition-specific PRO tool (Boston Carpal Tunnel Questionnaire (BCTQ)) as anchors, MCID values were determined for PROMIS PF, UE, and PI among patients undergoing carpal tunnel release (CTR).

Methods: Patients undergoing carpal tunnel release with a single surgeon from November 2014 to April 2017 were asked to complete the BCTQ, MHQ and PROMIS PF, UE, and PI CAT at each visit. Patients who had completed questionnaires both at a preoperative and either a six-week or three-month postoperative visit were included. MCID values were calculated using established methods in the literature with both region- (i.e., MHQ) and condition-specific (i.e., BCTQ) PRO tool anchors. The region-specific anchor was the MHQ Satisfaction domain, while the condition-specific anchor was the average score of the two BCTQ domains.

Results and Conclusions: A total of 70 patients fit our inclusion criteria. The average age was 61 years (range, 27-86 years) and a minority were men (34.3%). Of our sample, 43 patients (61.4%) had a six-week follow-up, while 27 patients (38.6%) had a three-month follow-up. Using MHQ Satisfaction, PROMIS UE and PI MCIDs were 4.60 and -3.90, respectively; PROMIS PF could not be calculated. Using the average of the two BCTQ domains, PROMIS PF, UE, and PI MCIDs were 2.45, 3.50, and -3.90, respectively.

PROMIS UE and PI can be used to determine MCID cut-offs similarly to both region- and condition-specific PRO tools for patients undergoing CTR. PROMIS PF does not perform as well.

Keywords: Patient-Reported Outcomes; PROMIS; Carpal Tunnel; MCID
Comparing the Responsiveness and Validity of the Patient-Reported Outcome Measurement Information System (PROMIS) domains to Region- and Condition-Specific Patient-Reported Outcome (PRO) Tools in Carpal Tunnel Release

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Objectives / Interrogation: There is a growing trend in surgical care to utilize patient-reported outcomes (PROs) to improve shared decision-making, guide expectation setting, and improve clinical care. We aimed to determine if PROMIS Physical Function (PF), Upper Extremity (UE), and Pain Interference (PI) domains were as responsive and valid in evaluating carpal tunnel release as region-specific (Michigan Hand Questionnaire (MHQ)) and condition-specific PRO tools (Boston Carpal Tunnel Questionnaire (BCTQ)).

Methods: Patients undergoing carpal tunnel release with a single surgeon from November 2014 to April 2017 were asked to complete the BCTQ, MHQ and PROMIS PF, UE, and PI CAT at each visit. Patients who had completed questionnaires both at a preoperative and either a six-week or three-month postoperative visit were included. The effect size index (ESI), a common index of change to judge responsiveness, was utilized. Convergent validity was evaluated using Spearman correlation coefficients.

Results and Conclusions: A total of 70 patients fit our inclusion criteria. The average age was 61 years (range, 27-86 years) and a minority were men (34.3%). All PRO domains demonstrated at least a medium effect size at final follow-up except for PROMIS PF (ESI = 0.25) and MHQ Aesthetic (ESI = 0.02). Within PROMIS, the PI domain demonstrated the best responsiveness (ESI = 0.74), followed by the UE domain (ESI = 0.66). Within the MHQ, the Satisfaction domain demonstrated the largest effect size (ESI = 1.48), followed by the total score (ESI = 1.22). Within the BCTQ, the symptom severity domain demonstrated the best responsiveness (ESI = 1.54), followed by the average of the two BCTQ domains (ESI = 1.27). PROMIS UE and PI demonstrated significant correlations with MHQ Satisfaction and the average of the two BCTQ domains, which are two anchors in the literature; however, PROMIS PF did not.

PROMIS UE and PI demonstrated concurrent validity with the MHQ and BCTQ, while PROMIS PF did not. While PROMIS UE and PI were responsive, the domains were not as responsive as MHQ and BCTQ domains. These findings suggest that PROMIS UE and PI domains are valid and may add value in being universal but that there is a minor trade-off in responsiveness.

Keywords: Patient-Reported Outcomes; PROMIS; Carpal Tunnel; Responsiveness; Concurrent Validity
Treatment of Proximal Pole Scaphoid Nonunion with Capsular-Based Vascularized Distal Radius Graft

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Objectives / Interrogation: Treatment of proximal pole scaphoid nonunion with avascular necrosis is a challenging issue. We retrospectively reviewed the results of 89 patients with proximal pole scaphoid nonunion, 58 with avascular necrosis, treated with a capsular-based vascularized distal radius graft.

Methods: Seventy-one male and eighteen female patients with symptomatic nonunion at the proximal pole of the scaphoid were included in this study. No patient had a humpback deformity. The mean patient age was 28 years (range, 19-44). In all patients, the vascularized bone graft was harvested from the distal aspect of the dorsal radius and was attached to a capsular flap of the dorsal wrist capsule. The graft was vascularized by the artery of the fourth extensor compartment. After fixation of the scaphoid with a small cannulated screw, the graft was inserted press-fit into a dorsal trough across the nonunion site. Supplementary fixation of the graft with a micro suture anchor into the scaphoid was used in 66 patients. At follow-up each patient was evaluated with clinical and radiographic examination.

Results and Conclusions: At a mean time of 12.3 weeks (range, 6-24) after surgery, solid union was achieved in 76 of 89 patients (49 of 58 with avascular necrosis). Eleven patients had persistent non-union and two fibrous union as determined by CT scan. Sixty-six of the patients with solid bone union were completely pain free and ten complained of slight pain with strenuous activities. Wrist flexion and extension were improved postoperatively. The average grip strength at the final follow-up was 84% of the contralateral arm, compared with 67% before surgery. The mean modified Mayo wrist score significantly improved from 42 to 87. No arthritic changes were noted at the dorsal ridge of the radius. No donor site morbidity was observed.

Results of the use of a capsular-based vascularized bone graft from the distal radius for scaphoid nonunions compare favorably with the results of pedicled or free vascularized grafts. The capsular-based vascularized bone graft from the distal radius is a reliable alternative technique for scaphoid nonunions. It is a simple technique that eliminates the need for dissection of small-caliber pedicle or microsurgical anastomoses. The supplemental fixation with a micro suture anchors eliminates the risk of graft displacement.

Keywords:
avascular necrosis, scaphoid nonunion, vascularized bone grafts
Intra-operative Subluxation of the Ulnar Nerve: Use of a Triceps Sling Reconstruction to Avoid Transposition

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Objectives / Interrogation: Ulnar nerve subluxation may occur in up to 17% of patients after in situ release of the ulnar nerve for the treatment of cubital tunnel syndrome. Several surgical techniques have been described to address the ulnar nerve subluxation, including anterior transposition of the ulnar nerve, and minimal medial epicondylectomy. None of which have been reported to be objectively superior to the other in the literature. We retrospectively analyzed the outcomes of 12 patients who underwent a triceps sling reconstruction for intraoperative ulnar nerve subluxation after in situ decompression of the nerve.

Methods: There were 8 women and 4 men with a mean age of 41 years (range, 33-56 years). The subluxation of the ulnar nerve over the medial epicondyle of the elbow was noted with flexion and extension of the elbow after cubital tunnel release with release of Osborne’s ligament as posterior as possible. In all patients, a distally based small strip of triceps tendon was harvested. The strip was sutured to the posterior aspect of Osborne’s ligament. Thus a “sling” is created between the medial epicondyle and the olecranon preventing the nerve from subluxating. At completion, the elbow was flexed and extended, noting no further subluxation of the ulnar nerve through the entire range of motion. Patients were clinically evaluated preoperatively and postoperatively.

Results and Conclusions: The mean final follow-up was 31 months (range, 24 to 38 months). There was no postoperative subluxation of the ulnar nerve. Mean patient visual analog pain scores significantly improved from 8.6 before surgery to 0.2 after surgery. Static 2-point discrimination was improved by a mean 9.1 mm preoperatively to 5.7 mm postoperatively. Strength significantly improved by a mean of 37% and 34% with grip and pinch, respectively. No patients required additional surgery. No other complications were encountered. All patients returned to full activities.

Triceps sling reconstruction is a safe and effective alternative procedure to anterior transposition of the ulnar nerve in patients with intraoperative ulnar nerve subluxation following in situ decompression. With the triceps sling reconstruction, the blood supply of the ulnar nerve is preserved.

Keywords:
cubital tunnel, ulnar nerve instability, ulnar nerve subluxation
The key clinical symptoms that differentiates cervical radiculopathy from cubital tunnel syndrome

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Objectives / Interrogation: Ulnar nerve is supplied by fibers originating from C8, T1 roots and it is sometimes difficult to differentiate cubital tunnel syndrome (CuTS) from C8 radiculopathy. The purpose of this study was to retrospectively review cases of C8 radiculopathy that were referred to our hospital that were diagnosed as CuTS at the previous hospital.

Methods: 238 cases who were referred to our department suspected for CuTS were included in this study. All the patients were examined for their neurological symptoms and underwent electrophysiological study. Among the patients with normal conduction velocity (NCV), 22 cases were diagnosed as C8 radiculopathy by MRI. We investigated the clinical symptoms of elbow and cervical spine, radiographic findings, distribution of the paralyzed muscles and the electrophysiological testing results.

Results and Conclusions: The numbness at the ulnar half of the ring and little finger was observed in 18 cases (88%), and in 14 cases (64%) the area of numbness was observed in the forearm, extending proximally to the wrist crease. Positive Tinel's like sign was observed in 5 cases (23%) and positive Froment sign also in 5 cases (23%). However, spurling or Jackson sign of the cervical spine was positive in only 1 case (5%). In radiographic evaluation, 8 cases had osteoarthritis of the elbow (36%), 13 cases had spondylosis change of the cervical spine (59%) and only 1 case had C7/Th1 intervertebral foramen disorder (5%). On manual muscle testing, 17 cases had paralysis of the first dorsal interosseous muscles (IOD (1)) or the abductor digiti minimi muscle of little finger (ADQ) (77%), but a part of these muscles innervated by the ulnar nerve, some cases had paralysis of the extensor digitorum or the abductor pollicis brevis muscle. In all cases, conduction velocity of the ulnar nerve was normal, but the amplitude was decreased to 80% in comparison with the healthy side. After the diagnosis of C8 radiculopathy, 3 cases (14%) received surgical treatment and the rest were treated conservatively.

The most common difference between a typical CuTS and C8 radiculopathy was sensory disturbance extending to the ulnar side of forearm. Also, paralysis was present in the muscles innervated by the radius and the median nerve, so a detailed evaluation of the muscle strength is required. The electrophysiological testing shows normal conduction velocity of the ulnar nerve but reduced amplitude in C8 radiculopathy.

Keywords:
cubital tunnel syndrome , cervical radiculopathy
Arthroscopic resection of volar wrist ganglion: surgical technique description and a prospective series of 39 patients

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Objectives / Interrogation: To describe the technique and results of arthroscopy for the surgical treatment of volar ganglion cyst of the wrist.

Methods: This study comprised 39 patients that were submitted to arthroscopic treatment of volar ganglion cysts of the wrist during January 2015 to May 2017, with minimum follow-up of six months. The technique was indicated for those patients who presented pain and functional impairment for more than four months, with no improvement with conservative treatment, or for those with cosmetic complaints and the presence of the cyst for over three months.

Results and Conclusions: Mean patient age was 42.4 years; 28 were females (71%), and 23 affected the right side (59%). Mean follow-up from surgery to final assessment was 8.8 months. Two patients complained postoperatively of mild pain, whilst another patient presented slight motion restrictions. The 37 remaining patients reported improvement of cosmetic complaints, along with complete functional recovery, and pain improvement. There were no recurrences or infections. No patient required further surgery. The arthroscopic resection of volar ganglion cyst is a useful and safe technique. It is a minimally invasive procedure, with low morbidity and very few complications, representing a good alternative to the open technique.
Arthroscopic resection of volar wrist ganglion

Keywords:
Musculoskeletal diseases/surgery Wrist joint Ganglion cyst Arthroscopy/utilization
Free osteochondral graft from ipsilateral hand for treatment of partial finger joint defects in adult

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Objectives / Interrogation: This retrospective study was designed to evaluate clinical results of partial finger joint cartilage defects using osteochondral graft taken from ipsilateral hand in adults.

Methods: Since 1996, 9 fingers of 9 patients were reconstructed by free osteochondral graft. There were 5 men and 4 women with an average age of 42 years (rang, 20 - 68years). The affected joints were 2 MP joints and 4 PIP joints and 3 DIP joints (3 index fingers, 2 long fingers, 3 ring fingers, 1 little finger).

The average cartilage defects was 46% (range, 20 % to 60%). Four joints combined 20% to 50% concomitant cartilage damage facing main lesions.

In 8 patients, surgery was performed at 3 days to 12 years after injuries. In a patient with bone tumor, reconstruction was done at the same time of tumor resection.

Damaged lesions were debrided and prepared for the graft. Osteo-cartilage defects of metacarpal head and proximal phalanx head were replaced by a part of capitate or trapezoid which was close to the shape of original joint surface. In patients with defects of proximal phalanx or middle phalanx base, 2nd or 3rd metacarpus base were adopted as the donor. In a particular case with partial loss of DIP joint, osteo-cartilage graft including a part of ECR tendon was transplanted. The graft was fixed by K-wires.

ROM exercise was started at 4 or 5 weeks after surgery.

The postoperative follow-up period ranged from 6 months to 41 months with a mean of 15 months.

Results and Conclusions: There was neither motion pain nor instability on the recipient. Mean ROM of PIP joints increased from 38 degrees to 53 degrees, and mean ROM of DIP joints increased from 0 degree to 17 degrees. In a patient with traumatic partial loss of DIP joint, it failed to ankylosis 9 months after the surgery.

The grafts were all survived, although shrinkage of grafts were detected in 2, and erosive change in 3.

Six donor sites after harvesting of the graft were filled with autogenous bone graft without morbidity.

The requisite shape of joint defects can be reconstructed using a shape-matched portion of cartilage surface of capitate, trapezoid or base of metacarpus within the same surgical field.

Although there is limited indication and technical difficulties, but satisfactory functional results can be expected without donor morbidity.

Keywords:
Osteochondral graft, Joint cartilage defect, Adult
Relationship between width of volar locking plate and loss of reduction in distal radius fracture.

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Objectives / Interrogation: Volar locked plating (VLP) is a standard procedure for distal radius fracture (DRF). The width of locking plate is usually decided in accordance with the width of the distal radius, however, the optimal width of the plate is not well known. The purpose of this study was to disclose relationship between the width of the plate and loss of reduction after VLP fixation.

Methods: Forty-three patients with DRF were treated using VLP between 2014 and 2017. There were 28 females and 15 males, with an average age of 62.4 years. The average follow-up period was 8.1 months. According to AO classification, there were 7 type A, 2 type B, and 34 type C. The maximum width of the plate and the distal radius were measured on the radiological frontal view, and the radio-plate ratio were calculated. We also evaluated loss of reduction by changes in three radiological parameters, radial inclination, palmar tilt, and ulnar variance from immediate after surgery to the final follow-up. Correlation coefficient between the radio-plate ratio and loss of reduction were evaluated. We also divided patients into two groups according to the radio-plate ratio: the wider group (more than 0.65), and the narrower group (less than 0.65), and compared loss of reduction and postoperative complications.

Results and Conclusions: The radio-plate ratio were distributed between 0.56 and 0.85, with an average of 0.72. There were no significant correlations between the radio-plate ratio and the three radiological parameters. There were no significant difference in three parameters between two groups. Although, the narrower group had no complication, one patient with tendinitis of the flexor pollicis longus was observed in the wider group.

DRF is usually treated with a wider plate, and all comminuted fragments are fixed by locking screws, however there was no difference in loss of reduction between those treated with wider and narrower plates. Because we experienced one case of flexor tendinitis in patients treated with a wider plate, we believe that most DRFs could be fixed sufficiently with a narrower plate, and with less complications.

Keywords:
distal radius fracture, the width of locking plate
Long-term follow-up of partial intercarpal arthrodesis after excision of the lunate for advanced Kienböck disease

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Objectives / Interrogation: When the Kienbock’s disease becomes advanced, carpal collapse, joint incongruity, and osteoarthritis develop. For these patients, we have performed the collapsed carpal bone excision, capitate osteotomy and partial intercarpal fusion. At this time, we have formed the newly radio-carpal joint using the articular surface of the proximal capitate. In this study, we report therapeutic results of the procedure on the patients with the advanced Kienbock’s disease.

Methods: The materials were 28 patients, consisting of 18 males and 10 female. The mean age at time of surgery was 44.9 years. The stage of these diseases was stage 3b in 9 and 4 in 19 patients. The mean follow-up period was 142.7 months. Of these patients, 10 to 15 years follow-up was 6 patients, and more than 15 years follow-up was 15 patients. Therapeutic results were evaluated based on the scoring system of Evans et al..

Results and Conclusions: For most patients, pain had disappeared after surgery. For only one patient, the intensity of the pain was reduced to a mild level. On the patients, good were achieved in 20 patients, fair in six, poor in two, and very poor in none. In the range of motion at the wrist joint and the grip strength postoperatively, mean palmar flexion was 42.2 °, mean dorsi flexion was 51.7 °, and mean grip strength was 83.1 % of that on the unaffected side. Postoperative radiographs showed that the carpal bone parameters (carpal height index and radio-scaphoid angle) had improved. Although radiographic osteoarthritic changes occurred in all patients, except for moderate limitation of range of motion at the wrist joint, these findings did not affect their level of pain, grip strength, or activity of daily living.

Lunate excision, capitate osteotomy and intercarpal fusion (the modified Graner procedure) is a reliable form of treatment for patients with advanced Kienböck’s disease for at least ten years postoperatively.

Keywords:
Kienbock’s disease, partial intercarpal fusion, Lunate excision
Determinants of subjective and clinical outcomes one year after proximal interphalangeal joint surface replacement

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Objectives / Interrogation: Predicting the outcome of a medical intervention can help both the patient and surgeon in the decision-making process for treatment. There is little knowledge on the predicting factors for subjective and clinical outcome, especially for proximal interphalangeal (PIP) joint replacement. Therefore, our study objective was to identify the preoperative predictors for subjective and clinical outcome in patients with primary osteoarthritis (OA) one year after PIP joint surface replacement surgery.

Methods: All PIP joint OA patients treated with a CapFlex-PIP implant (KLS Martin Group, Tuttlingen, Germany) were prospectively documented in a clinical registry. Sociodemographic, surgical and radiographic data were recorded at baseline. Patients completed the brief Michigan Hand Outcomes Questionnaire (brief MHQ) and rated their pain at rest and during activities of daily living on a 10-point numeric rating scale before and one year after PIP joint replacement. In addition, PIP joint range of motion (ROM) was measured. In order to identify predictors for the brief MHQ, pain at rest and PIP joint ROM one year after surgery, all baseline variables were entered into three multivariate linear regression models and described with R-square ($R^2$) coefficients.

Results and Conclusions: One hundred and nineteen patients with 119 PIP joints and a mean (± standard deviation) age of 70 (±9) years were included in the analysis. Predictors of a higher brief MHQ score one year after surgery were a better baseline brief MHQ score, higher baseline pain level at rest, greater preoperative PIP joint ROM, less finger axis deviation, and if one of the ulnar sided fingers (i.e. ring and small finger) was affected ($R^2 = 0.24$). However, it was impossible to predict postoperative pain at rest ($R^2 = 0.06$) and PIP joint ROM ($R^2 = 0.10$) using baseline factors.

Subjective hand function measurements are more suitable for the prediction of postoperative outcomes after PIP joint surface replacement. Consequently, the decision for treatment should preferably be based on patient-reported hand function rather than clinical variables. The fit of our models was quite low. Further evaluation of additional predictors seems necessary in order to provide a robust predicting model to support the future decision-making process for PIP joint replacement.

Keywords:
prognostic analysis, surface replacement, CapFlex-PIP, proximal interphalangeal joint, osteoarthritis
Surgical approach to management of perilunate dislocations - Volar or Dorsal or Combined?

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Objectives / Interrogation: Perilunate dislocations are rare injuries of the wrist occurring in high energy trauma and hence missed in the emergency room. Management consists of early closed reduction or open reduction, fracture fixation and ligament repair. Previous studies have used different approaches and the management has been towards fracture fixation and scapholunate ligament repair, however with no clear management of lunotriquetral joint. We highlight upon combined volar-dorsal approach for definitive treatment in perilunate dislocations with or without other carpal bone fractures, their diagnosis and management.

Methods: Patient were included from a tertiary referral center between August 2015 to August 2017 with a minimum follow up of one year. All patients underwent closed reduction in emergency under conscious sedation or external fixation when not reducible as soon as possible considering these were patient with high energy trauma. Once the swelling subsided they were taken up for definitive management with open reduction and fixation with ligament repairs. Intraoperative findings were recorded and patients were followed up at regular intervals. Assessment were made in terms of fracture healing, range of movements, pain, radiological angles and wrist scoring.

Results and Conclusions: There were 22 patients among which 19 were males, all involving high energy trauma with road traffic accidents as the most common cause and fall from a height of more than 3m being the second most common cause. 18 patients had closed reducion in emergency and 4 patients needed reduction and external fixation. All patients underwent combined volar and dorsal approach with fracture fixation and ligament repairs. Grade 3-4 Scapholunate injuries were noted in all 10 patients who had pure ligamentous type of perilunate dislocation which were repaired and stabilized with Scapholunate and Scapho capitate wires. Lunotriquetral ligament was torn in all which was addressed using the volar approach by direct repair and K wire fixation. One patient had scaphoid non union, Average range of motion was 90 degrees in flexion-extension, persistent VISI was seen in 2, DISI in 4 with Grade 4 scapholunate tears and 18 patients had good results using the Mayo wrist scoring.

Conclusion- Using combined volar and dorsal approaches for perilunate dislocations is of paramount importance to address both the scapholunate and lunotriquetral ligaments along with fracture fixation.

Keywords:
perilunate dislocations, scapholunate and lunotriquetral
PIP joint lateral stability in healthy joints compared to surface replacement and silicone arthroplasty

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Objectives / Interrogation: To date, there is no objective quantitative data on the natural lateral stability of healthy proximal interphalangeal (PIP) joints or the postoperative stability of different PIP joint arthroplasties. The objective of this study was to quantify the lateral stability of healthy PIP joints using a three-dimensional (3D) motion capture system, and compare it to affected joints after surface replacement and silicone arthroplasty.

Methods: Three study groups comprised healthy participants, patients with PIP joint osteoarthritis treated with a surface replacing implant (CapFlex-PIP, KLS Martin Group, Tuttlingen, Germany) and those with a silicone arthroplasty. All participants were matched for gender and finger, and the two treated patient groups were also matched according to the follow-up time point. For measuring lateral stability, an optical tracking system was used (CamBar B2 C4, Axios 3D GmbH, Oldenburg, Germany). Radial and ulnar stability of the PIP joint was measured as the maximal lateral deflection angle of the intermediate phalanx under a 170 gram load at 20 degrees PIP joint flexion angle. Measurement reliability was evaluated with a test-retest (intraclass correlation coefficient (ICC)) method. Descriptive statistics were presented as median (range) values.

Results and Conclusions: A total of 30 participants (21 female, 9 male; median age 69 years (52-83)) were assessed including 5 index and 5 middle fingers in each of the three groups. Patients had a median follow-up of 3 years (1-5). The median radial deflection angles were 2.8° (0.8-10.0) for healthy joints, 3.1° (0.7-10.5) for the surface replacement group, and 5.1° (1.0-12.6) for the silicone arthroplasty group; the median ulnar deflection angles were 2.9° (0.5-6.2), 2.8° (0.9-11.0), and 3.9° (1.4-6.9), respectively. Test-retest reliability was high with an ICC of 0.93.

Lateral PIP joint stability shows high variability in both healthy participants and patients after PIP joint arthroplasty. Joints after silicone arthroplasty tend to have higher lateral deflection angles than unaffected healthy joints and joints with a surface replacement arthroplasty. Combined with the possibility to quantify lateral PIP joint stability precisely and reliably, we assume that certain healthy joints show natural joint laxity and that PIP surface replacement arthroplasty tends to achieve anatomical baseline stability with higher intrinsic stability compared to flexible silicone implants.

Keywords: Lateral stability, motion capture system, proximal interphalangeal joint, surface replacement, silicone arthroplasty, CapFlex-PIP, osteoarthritis
Risk factors and outcomes of revision trapeziometacarpal arthroplasty

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Objectives / Interrogation: Although the majority of trapeziometacarpal arthroplasties result in favorable outcomes, 3-5% of patients do not benefit from the procedure at all or develop recurrent symptoms making revision surgery necessary. Outcomes of revision surgery have been reported in rather small patient series. Studies comparing outcomes of revision surgery after conventional resection arthroplasty and implant arthroplasty are lacking and data on risk factors for revision surgery is limited.

Methods: A chart review of the years 2003-2013 identified 1174 trapeziometacarpal arthroplasties. Of these 32 were performed with an implant. Alltogether, 69 patients had had a total of 88 revision procedures. At a clinical and radiologic followup visit subjective analysis was carried out with the Quick disabilities of the arm, shoulder and hand score, patient evaluation measure and visual analog score for pain. Objective assessment included strength and range of motion measurements. Standard posteroanterior radiographs of the hand were obtained. The revision rate, risk factors for revision, factors affecting the outcome of revision and the outcomes of revised patients were analyzed.

Results and Conclusions: The revision rate was 4.6 % for conventional arthroplasty and 59.4 % for implant arthroplasty. Patient age under 55 years was a risk factor (OR 3.3, p=0.00) and an operation on both thumbs at some point in time was a negative risk factor for revision surgery (OR 0.444, p=0.021). There was no difference in revision risk between tendon interposition ligament reconstruction with or without a bone tunnel (p=0.267). No factors affecting the outcome of revision surgery could be identified and there was no difference in outcomes after revision between cases operated on primarily with conventional or implant techniques.

The revision rate is in the same range as previously described. Young age is a risk factor for revision and ligament reconstruction tendon interposition with a bone tunnel does not reduce the risk of revision surgery. Multiple revision procedures do not result in worse outcomes than cases revised only once. The final outcome after revision seems to be the same regardless of the primary surgical method used for trapeziometacarpal arthroplasty.

Keywords:
Trapeziometacarpal, arthroplasty, revision, outcome, implant
Cost-utility analysis of surgery for trapeziometacarpal osteoarthritis

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Objectives / Interrogation: Knowledge about the costs and benefits of hand surgical interventions is important for surgeons as well as social insurances and health policy decision makers. Little is known about the impact of surgery for trapeziometacarpal osteoarthritis (TMC OA) on the quality of life and costs. Therefore, we examined the impact of surgery for TMC OA on the quality of life, direct medical costs and loss of productivity from the societal perspective in the Swiss health care setting.

Methods: Patients with TMC OA indicated for surgery were included in a prospective study. Quality of life (EQ-5D-5L; [index: 0-1]) and hand function (brief Michigan Hand Questionnaire [brief MHQ: 0-100]) were assessed one year before (pre-OP) and up to one year after surgery (post-OP). Their relationship was explored by regression analysis. Eleven major Swiss insurance companies provided direct medical cost data including all health-related diagnoses to consider potential side effects of the surgery. Indirect costs were assessed using the work productivity and activity impairment questionnaire. The year pre-OP served as the control period. Mean total costs to gain one extra quality adjusted life-year (QALY) were estimated by calculating the incremental cost-effectiveness ratio (ICER). Costs are given in 2018 US$ (with a conversion rate of 1.042 from Swiss Francs to US$).

Results and Conclusions: A total of 151 patients (mean age 65.3 years; 77% female) were included and received surgical treatment either as resection or implant arthroplasty. The mean EQ-5D-5L index improved from 0.69 (pre-OP) to 0.88 (post-OP; p < 0.001) and was significantly associated with the brief MHQ (p < 0.001), which improved from 49 (pre-OP) to 83 (post-OP; p < 0.001). Mean total costs were 11,382 US$ in the year pre-OP and comprised the conservative treatment of TMC OA, comorbidities and productivity losses. In the year post-OP, mean total costs including surgical costs and rehabilitation of TMC OA, comorbidities and productivity losses increased to 16,388 US$. The ICER was 25,834 US$ per QALY gained (95%CI: 12,033 to 39,636 US$/QALY) one year post-OP compared to the pre-OP control period.

TMC OA surgery using either resection or implant arthroplasty results in a clinically relevant and statistically significant increase in function and quality of life one year after the intervention. The cost-utility ratio of 26,000 US$ is clearly below the discussed Swiss threshold of about 100,000 US$/QALY.

Keywords: cost-utility, cost-effectiveness, costs, osteoarthritis, trapeziometacarpal osteoarthritis, resection arthroplasty, implant arthroplasty, quality of life, incremental cost-effectiveness ratio
Portal placement in elbow arthroscopy by novice surgeons: cadaver study

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Objectives / Interrogation: In this anatomical cadaver study, the distance between major nerves and ligaments at risk for injury and portal sites created by trainees was measured. Trainees, inexperienced in elbow arthroscopy, have received a didactic lecture and cadaver instruction prior to portal placement. The incidence of iatrogenic injury from novice portal placement was also determined.

Methods: Anterolateral, direct lateral, and anteromedial arthroscopic portals were created in ten cadavers by ten inexperienced trainees in elbow arthroscopy. After creating each portal, the trajectory of the portal was marked with a guide pin. Subsequently, the cadavers were dissected and the distances between the guide pin in the anterolateral, direct lateral, and anteromedial portals and important ligaments and nerves were measured.

Results and Conclusions: RESULTS:
The difference between the distance of the direct lateral portal and the posterior antebrachial cutaneous nerve (PABCN) (22 mm, p < 0.001), the lateral antebrachial cutaneous nerve (4.0 mm, p < 0.001), and the radial nerve (25 mm, p < 0.001) was different from the average reported distances in the literature. A difference was found between the distance of the anterolateral portal and the PABCN (32 mm, p < 0.001) compared to previous studies. Three major iatrogenic complications were observed, including: laceration of the posterior bundle of the medial ulnar collateral ligament, lateral ulnar collateral ligament midsubstance laceration, and median nerve partial laceration.

CONCLUSION:
Surgeons increasingly consider arthroscopic treatment as an option for elbow pathology. In the present study a surgical complication rate of 30 % was found with novice portal placement during elbow arthroscopy. Furthermore, as the results from this study have indicated, accurate, precise, and safe portal placement in elbow arthroscopy is not easily achieved by didactic lecture and cadaver instruction session alone. Level of evidence V.

Keywords:
Cadaver study; Elbow arthroscopy; Iatrogenic adverse events; Training
Type of "gloves" - tractional damage of fingers

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Objectives / Interrogation: The choice of tactics of surgical treatment for traction finger damage by the type of "gloves".

Methods: From January 2014 to January 2018 we treated 29 patients with a tractional damage of fingers. Of these, 13 were men, and women 16. For the distribution of damage, we used the classification by J. R. Urbaniak, in the modification R. Adani (1996). Group I patients received only conservative treatment with timely provision of specialized care. Anti-inflammatory treatment was used, including corticosteroid preparations, microcirculatory drugs, anticoagulants, painkillers, physiotherapy and immobilization. Patients of group II were subjected to surgery aimed at normalizing blood circulation, with extensive defects we used "Filatov flap". Damaged vessels were recovered under x8 fold increase. Binocular magnifiers, microsurgical instruments and microsurgical material 9/0-10/0 was used.

7 (35%) patients of this group recovered the patency of one vein, 3 (15%) - two veins, 4 (20%) - one artery, 6 (30%) - one artery and one vein.

In group of II patients dominated venous insufficiency: 66.6% (6 patients), in 3 patients (33.3%) the arterial. When manifestations of venous insufficiency, medical leeches were also used.

Results and Conclusions: In the postoperative period, the dynamics were controlled clinically. Of the 29 examined at 21 (72.4%) was evaluated as a good result, these patients were operated during early after trauma (within 3-4 hours from the time the injury). In 8 (27.5%) cases, the result was assessed as unfavorable and this operation was performed for this group of patients to remove the defect of the fingers' covering tissues with the "Filatov flap".

Traction finger injury of the type "gloves" should be considered as a specific traumatic injury that requires immediate medical care in specialized units.

Keywords:
Trauma-Reconstructive, plastic and aesthetic microsurgery - Hand surgery
Which factors affect the rate of surgery performed in patients with carpal tunnel syndrome?

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Objectives / Interrogation: Carpal tunnel release is recommended when patients with positive electrophysiologic test remain symptomatic in spite of conservative treatment. However, only some of them eventually undergo surgery. The purposes of this study, therefore, were to evaluate the rate of carpal tunnel release performed among the patients with a positive electrophysiologic test and to identify which factors were associated with the rate of the surgery.

Methods: Subjects of this study were 865 wrists of 495 patients (65 males and 430 females) who were diagnosed with a carpal tunnel syndrome between January 2013 and December 2016. The diagnosis of carpal tunnel syndrome was confirmed by electrophysiologic test, and only the patients who were followed up for more than 1 year were enrolled in this study. The average age at the time of the electrophysiologic test performed was 61.4 years, and the severity of carpal tunnel syndrome was evaluated according to the Bland scale (Gr 1—6) based on the electrophysiologic test. Whether or not the patients received carpal tunnel release was evaluated at the last follow-up visit.

Results and Conclusions: Result
Among the 865 wrists, carpal tunnel release was performed on 528 wrists (61%). Rate of the surgery performed significantly increased in patients with more severe grades on electrophysiologic test. More patients in female (63.3%) than in male (50.3%) and more patients with age under 60 (67.5%) than age over 60 (57.1%) received the surgery. However, there was no significant difference in the rate of carpal tunnel release according to the bilaterality or dominant hand.

Conclusions
The rate of carpal tunnel release among the patients diagnosed and confirmed as carpal tunnel syndrome was not higher than we expected.
We should also pay more attention to the patients who did not undergo carpal tunnel release and investigate the reasons why those patients did not undergo surgery.

Keywords:
Carpal tunnel syndrome, carpal tunnel release, decision making, rate of surgery
Shorter versus longer immobilization after surgery for thumb carpometacarpal osteoarthritis: a propensity score matched study

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Objectives / Interrogation: To investigate if shorter immobilization is non-inferior to longer immobilization after Weilby procedure for thumb carpometacarpal osteoarthritis

Methods: Participants that received short immobilization (3-5 days plaster cast followed by a thermoplastic thumb spica splint until 4 weeks) were compared with prolonged immobilization (10-14 days plaster cast followed by a thermoplastic thumb spica splint including until 6 weeks). All the participants were surgically treated with the Weilby procedure and matched using propensity score matching (PSM) to control for confounders. Primary outcomes were pain measured with a Visual Analogue Scale (VAS) and hand function measured with Michigan Hand Questionnaire (MHQ) at six weeks, three months and twelve months. Secondary outcomes were complications, range of motion, grip and pinch strength, satisfaction with treatment and return to work.

Results and Conclusions: Results: We matched 131 participants with shorter immobilization and 131 participants with longer immobilization. No significant differences were found in VAS pain (effect size 0.03, 95% C.I. -0.21-0.27) or the MHQ (effect size 0.01, 95% C.I. -0.23-0.25) between the groups at three months or at twelve months. Furthermore, no differences were found in complication rate or in other secondary outcomes.

Conclusions: In conclusion, shorter immobilization of 3-5 days of a plaster cast after Weilby procedure is equal compared to longer immobilization for outcomes on pain, hand function and our secondary outcomes. These results indicate that shorter immobilization is safe and can be recommended, since discomfort of longer immobilization may be prevented and patients may be able to recover sooner which may lead to reduced loss of productivity. Future studies need to investigate effectiveness of early active and more progressive hand therapy following CMC-1 arthroplasty.

Keywords:
Arthroplasty; Carpometacarpal joints; Thumb base; trapeziometacarpal; osteoarthritis; Equivalence Trials as Topic; Rehabilitation; Thumb; Outcome
The structural changes of carpal tunnel and median nerve in MRI before and 2 years after endoscopic carpal tunnel release

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Objectives / Interrogation: We do not know enlargement of carpal tunnel has maintained for a long time after endoscopic carpal tunnel release (ECTR). We investigated the structural changes of carpal tunnel and median nerve in MRI before and two years after ECTR.

Methods: 28 patients had undergone ECTR for idiopathic carpal tunnel syndrome. The patients included 8 males, 20 females. The mean age was 67 years old. ECTR was performed utilizing Chow's two-portal technique. MRI (Siemens, 1.5T) of carpal tunnel and nerve conduction studies (motor distal latency) was performed before and two years after ECTR. The cross-sectional area of carpal tunnel and median nerve, and palmar bowing (PB) at the hook of hamate level were measured using T2* images. The palmar bowing was the distance to the flexor retinaculum from the line between the hook of hamate and trapezium at the hook of hamate level. The cross-sectional area of median nerve was measured at wrist level. The cross-sectional area of the carpal tunnel and median nerve was outlined digitally. The expansion ratio was calculated by dividing the postoperative cross-sectional area by the preoperative cross-sectional area. Preoperative data was compared with postoperative data using Wilcoxon signed-ranks test.

Results and Conclusions: Motor distal latency was improved from 9.1ms to 4.3ms after ECTR. Detached flexor retinaculum was seen as a linear area of low signal intensity 2 years after ECTR. The cross-sectional area of carpal tunnel and median nerve was 1.16 and 1.2 respectively at hamate level. The cross-sectional area of carpal tunnel and median nerve was significantly increased at hamate level two years after ECTR. PB was significantly increased at hamate level two years after ECTR. The cross-sectional area of median nerve was 0.9 at wrist level. The cross-sectional area of median nerve was significantly decreased at wrist level two years after ECTR. The enlargement of carpal tunnel was maintained two years after ECTR. Flexor retinaculum was released during ECTR. However, a continuous linear area of flexor retinaculum was detected two years after ECTR.

Keywords:
carpal tunnel syndrome, arthroscope, carpal tunnel release
In vivo implantation and characterisation of a novel 3D-printed multiphasic scaffold in the rabbit knee for scapholunate ligament reconstruction

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Objectives / Interrogation: Previous research has shown that it is possible to synthesise a multiphasic bone-ligament-bone (BLB) scaffold similar to the dorsal scapholunate interosseous ligament (SLIL). This scaffold will facilitate regeneration of composite tissue and can be implanted for clinical use. The rabbit medial collateral ligament (MCL) has similar anatomical properties as the dorsal SLIL and thus, can be used as an animal model for testing this novel scaffold in vivo.

Methods: Multiphasic bone-ligament-bone scaffolds modelled from the dorsal component of the SLIL were 3D-printed with medical grade polycaprolactone (PCL). These simulated a BLB construct with two bone compartments bridged by aligned PCL fibres mimicking the architecture of the native ligament studied from cadaveric specimens. For surgical implantation, the native MCL of the rabbit was removed with holes drilled into insertion and origin points of the ligament on the femur and tibia using a 5mm trephine. The bone compartments of the scaffold was press-fitted into the cavities and stapled in place. The rabbit knee joint was fixed in flexion using 1.4mm K-wires for 4 weeks prior to mobilisation for an additional 4 weeks. In total, 18 samples were implanted into 18 rabbits and harvested at four and eight weeks. Mechanical tensile testing (n=5 per group) and in vivo characterisation of the constructs were conducted.

Results and Conclusions: After 4 and 8 weeks in vivo, the scaffold remained intact. Mechanical testing of the BLB scaffolds showed that they were capable of withstanding normal SLIL physiological forces. After 4 weeks of mobilisation of the knee joint, the scaffolds improved in strength. In vivo study in the rabbits demonstrated that the scaffold was biocompatible and displayed good tissue integration and vascularisation. Upon implantation for 4 and eight weeks, bone formation and ligament remodeling was observed in the corresponding compartments.

Various tenodesis procedures for reconstruction of scapholunate instability fail to restore normal carpal kinematics. This research has demonstrated that it is feasible to fabricate a multiphasic BLB scaffold using additive manufacturing for dorsal SLIL reconstruction. Bone and ligament tissues were formed in their corresponding compartments with similar structural and mechanical properties to the native ligament. The artificial scaffold may provide an alternative to current techniques for reconstruction of scapholunate instability.

Keywords: Scapholunate interosseous ligament; Carpal instability
Clinical vs. operative findings in hand trauma using our online eHands system

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Objectives / Interrogation: We use eHands as an assessment tool for all our hand trauma patients who present in our unit. It provides a structured way of assessing and documenting the clinical findings. The aim of this study was to investigate the accuracy of our clinical and operative findings and determine factors which may result in any potential discrepancies.

Methods: We conducted a retrospective study of 100 patients who were assessed and operated on between July and September 2018. Clinical examination findings were compared to the operation notes and categorised as completely correct, partially correct and completely incorrect. Grade of assessing doctor, time of assessment and senior review was also collected. A two-tailed T-test was used to assess statistical significance.

Results and Conclusions: Sixty-two percent of patients had a complete correlation between clinical and operative findings. Partially correct clinical diagnosis was found in 26 patients and 12 patients had a completely incorrect preoperative diagnosis. Digital nerve injury followed by flexor tendon was the most common overdiagnosed condition in both the partially and completely incorrect group. Digital nerve and flexor tendon injury was the most frequently missed of the patients who had a partially correct clinical diagnosis. No difference in clinical accuracy was found correlating with the grade of assessor.

Conclusion
The accuracy of clinical examination and operative findings is high using our eHands assessment tool. There is no significant difference in accuracy between grades of assessing doctors.

Keywords:
clinical assessment, diagnosis, digital tool
Hand injuries in sports - A retrospective analysis of 286 cases

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Objectives / Interrogation: Injuries of the hand account for 3 - 35% of all sport injuries. Hence, the hand is at high risk for injury during sportive activities. The current literature lacks systematic analyses of hand injuries in athletes in German speaking countries.

Methods: We performed a retrospective analysis (2013 -2018) of patients with sport-related injuries of the hand presenting in our department. Our hospital information system was analyzed using both specific search terms as well as ICD-10 codes. Data was further refined by manual screening of full-text clinical reports.

Results and Conclusions: Results: We identified a total of 286 eligible patients. Grouping for type of sport, soccer turned out to be the most common cause for hand injury (n=63; 22.02% of total), followed by equestrian sports (n=48, 16.78%) and handball (n=23; 8.04%). Most injuries occurred within the age group of 25 - 39 years (n=74; 26%), followed by 40 - 59 years (n=62; 22%). Overall male athletes (n=192; 67%) were affected more often than female athletes (n=94; 33%). Overall sport-related hand injuries was more frequently treated in an ambulant setting (n=203; 71%) than inpatient treatment (n=83; 29%). Equestrian sports accounted for the highest absolute hospitalization time (153 days, 34.3% of total, median of 4 days). We further identified differences in treatment strategy (surgical vs. conservative treatment). Types of injuries included fractures (34.3%), soft tissue injuries (25.5%), luxations, sprains and strains of joints and ligaments (17.7%), muscle and tendon injuries (8.1%), and amputation injuries (3.5%).

Conclusion: Hand injuries represent a high burden for the affected individual as well as to the health care system. Young males in prime working age seem to be at the highest risk for these kinds of injuries. Proper diagnosis and individualized treatment by trained hand surgeons are crucial to minimize long term impairments and disabilities. Knowledge of sport-specific injury patterns and their evidence-based treatment are mandatory in that regard.

Keywords:
Hand injuries, sport
Does operative timing of pediatric supracondylar humerus fractures affect postoperative early complications?

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Objectives / Interrogation: The purpose of this study is to evaluate whether the time to surgery of Gartland type II and III pediatric supracondylar humerus fractures affects the incidence of postoperative early complications.

Methods: We retrospectively reviewed 172 pediatric patients aged 1 to 15 years who sustained Gartland type II and III supracondylar humerus fractures and who had been operated in our associated institutions between April 2007 and March 2017. Patients with polytrauma, open fractures and neurovascular injury at an initial examination were excluded from this study. As a result, 142 patients were included in this study. The 91 boys and 51 girls with a mean age of 6.5 years included 66 type II and 76 type III Gartland type fractures. The time from fracture to surgery was calculated from the medical records for each patient. The outcome measures evaluated were the incidence of postoperative early complications and the conversion rate to open reduction in type III cases. We defined patients treated within 12 hours as the Early group (EII for type II and EIII for type III) and those treated more than 12 hours after the injury as the Delayed group (DII for type II and DIII for type III). The analysis of group differences was performed using a Fisher’s exact test.

Results and Conclusions: Results
There were 10 complications in 66 type II patients (15.2%) and 14 in 76 type III patients (18.4%). All complications in type II cases were surgical site infections. There was no significant difference between EII and DII. Complications in type III cases consisted of surgical site infections (n = 8, 10.5%) and postoperative neurological deficits (n = 6, 7.9%). There was no significant difference between EIII and DIII. No iatrogenic ulnar nerve injury or compartment syndrome was observed in either type II or III cases. No patients needed to return to the operating room. Conversion to open reduction was needed in 3 patients in EIII (4.8%) and 0 in DIII (0%).

Conclusions
Delayed surgery was not associated with an increased rate of postoperative early complications or the conversion rate to open reduction. We suggest that it is not necessary to perform emergency surgery for type II cases. On the other hand, type III cases are usually treated on an emergency basis. It is still controversial whether the delay of surgery is permissive for type III fractures. Our findings suggest it is possible to treat closed type III fractures without neurovascular injuries in a less urgent manner.

Keywords:
supracondylar humerus fracture, complication
Application of reverse homodigital flap from the dorsolateral aspect of proximal finger based on a digital artery perforator in the middle phalanx

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Objectives / Interrogation: Local or free digital artery perforator flaps based on a constant distal perforator in the middle phalanx for resurfacing the fingertip defect were frequently reported in previous articles. The donor sites of these flaps all were located on the dorsum or lateral of the middle phalanx, and the flap are not suitable for covering the large area of fingertip defect. Therefore, we reported our experience using a reverse, homodigital flap based on a constant distal perforator in the middle phalanx harvested from the dorsolateral proximal phalangeal area for reconstructing fingertip defects with large area.

Methods: From November of 2017 to April of 2018, 11 fingers with fingertip and pulp defect were treated with this technique. The mean area of flaps was 6 (range 4-8) cm². The flap is designed on the dorsolateral of the proximal phalanx of the injured finger in a teardrop shape. The flap was dissected and elevated superficial to the extensor tenosynovium and the dorsal branch of the digital nerve was identified and divided proximally and included in the flap. 8 mm width of fascial pedicle was dissected and preserved at the distal point of flap. Then the pedicle was elevated in the distal and palmar direction until to the digital artery proximally the middle phalanx neck. The digital artery perforator in this site was not necessary to dissected clearly. Then the homolateral digital neurovascular bundle was dissected proximally from the proximal point of the defect in order to achieve a more free rotation of flap. The flap is then rotated to resurface the fingertip defect. Fingertip sensation is reestablished through coaptation of the proximal end of the dorsal branch of digital nerve to the stump of proper digital nerve.

Results and Conclusions: The color of the most flaps was reddish with capillary reflux slowly in 1 day after operation, and then was gradually reddening. The venous congestion was occurred in 4 flaps, but no treatment was taken. Marginal part necrosis was found and continuous dressing was treated in one of the 4 flaps. There were no other complications. The other flaps survived completely. The average follow-up period was 5 months (range, 4-7 mo). No further flap debulking was required. The mean range of active motion of the proximal and distal interphalangeal joints of the donor fingers were 93 and 76 degrees, respectively. We conclude that this technique is a reliable, simple, and reproducible method for reconstruction of soft tissue defects of the fingertip with large area.

Keywords:
digital artery perforator, flap, fingertip reconstruction
Reconstruction of Severely Hypoplastic Thumb by Non-vascularized Metatarsal Graft with Abductor Digiti Minimi Opponensplasty

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Objectives / Interrogation: Pollicization of index finger has been usually recommended for Blauth IIIb and IV hypoplastic thumb. Although functional result of the pollicization is satisfied, majority of the family desires to keep the number of the digits. We developed two-stage reconstruction procedure, distal two-thirds of the fourth metatarsal bone graft (non-vascularized) with widening of the first web followed by abductor digiti minimi (ADM) opponensplasty.

Methods: From 1980-2018, 76 patients (41 boys and 35 girls) were reconstructed. In the first stage, the distal two-thirds of the fourth metatarsal is transplanted in the reverse manner to form the first carpometacarpal joint without microvascular anastomosis. Widening of the first web is performed using a dorsal sliding flap. More than six months later, ADM opponensplasty is carried out. Extensor index proprius (EIP) and flexor superficialis of ring finger (FDS-R) transfer was respectively added in the second stage. 41 patients were classified to IIIb and 35 were IV. Average ages at the surgery was 3.2 years old. In type IV, metatarsal bone graft was indicated under the condition that the thumb is larger than small finger. Fourth metatarsal head was used in 64 cases and fourth metatarsalphalangeal joint including proximal phalanx was used in 12 cases. Follow-up periods were from 5.2 months to 277 months, average 77.2 months.

Results and Conclusions: Except one case, bony union between grafted metatarsal and distal part of first metacarpal was acquired without significant bony absorption. Fracture of the grafted bone was seen in two cases and additional bone grafts were performed. In the majority of the cases, epiphysis of the grafted bone was remained open more than five years and the functional results are acceptable with high degree of family's satisfaction. Carpometacarpal joint mobility and metacarpophalangeal joint stability were important for good functional results. Metatarsal bone graft with epiphysial plate could be an alternative procedure to pollicization of index finger.

Keywords: hypoplastic thumb; carpometacarpal joint; bone graft
Modified arterialized venous flap for the reconstruction of 12 digits

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Objectives / Interrogation: The key to improving the survival rate of the arterialized venous flap is to ensure a good venous return to reduce venous congestion. To mitigate the problem, we designed modified flaps to restrict shunting and aimed to report our clinical experience and outcomes.

Methods: We performed 12 arterialized free venous flaps in 12 patients for digital reconstruction using our modified method between February 2017 and March 2018. The mean age was 41 (range 24-74) years old. The mean area of flaps was 14 (range 5-30) cm². The number of venous pattern of flaps was 5 (II-pattern) and 7 (H-pattern), respectively. All flaps were harvested from the palmar aspect of the ipsilateral forearm. The distal ports of the two veins were ligation. The length of proximal vein pedicles was depended on the recipient site. Partial fat was eliminated and the all connecting minute branches between the two veins were ligation under microscope in order to achieve the thorough shunt restriction. Then the flaps were positioned over the recipient site without inversion. We usually select the thinner vein as the arterialized vein, which was anastomosed in a retrograde manner, with the inflow running against the valves. The other vein was anastomosed with the superficial vein of digit. Close postoperative monitoring is performed. Routine postoperative anticoagulant therapy is used. The patients were followed.

Results and Conclusions: The average operation time was 101 (range 75-150) minutes. The average follow-up time was 10 (range 6-16) months. All flaps survived entirely. The wounds of donor sites were sutured directly except one case. The color, turgor, temperature of 5 flaps resemble the conventional arterial flaps after operation and during follow-up. Seven flaps demonstrated mild-to-moderate venous congestion without any treatment and the swelling of flaps gradually subsided in 7-10 days after operation. At the final follow-up, the appearance of the flap had no difference with those usually observed in arterial flaps.

Arterialized free venous flaps with thoroughly restriction of arteriovenous shunting can offer decreased congestion of venous flaps and improved survival rate. The flap constitutes an ideal donor to repair a small or medium-sized defect of the hand.

Keywords:
venous flap, reconstruction, defect
Vancomycin is superior to Plectasin against Staphylococcus aureus periprosthetic osteomyelitis in rats.

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Objectives / Interrogation: Commonly used antibiotics cannot always control S. aureus associated infections in orthopaedic and hand implants.
We investigated the ability of vancomycin and plectasin to eradicate S. aureus in a knee prosthesis model of osteomyelitis in rats.
We compared Plectasin in a 20 and 40 mg concentration to vancomycin 20 mg, all antibiotics were given i.p. daily. Plectasin is a peptide antibiotic with therapeutic potential from a saprophytic fungus.

Methods: Thirty Sprague-Dawley rats had prosthesis inserted and divided into three groups (N=10). Vancomycin group including 2 controls and two Plectasin groups (N= 10) 20 mg and (N= 10) 40 mg including 2 controls in each groups. All groups were infected with S. aureus MN8, ica+103 in the tibia and the femur marrow before insertion of the prosthesis. Control rats were given NaCl i.p. After two weeks, the rats were sacrificed and all specimens were analysed.

Results and Conclusions: Results: One rat in the 20 mg Plectasin group and four in the 40 mg Plectasin group died of anaphylactic shock (histamine release). The 20 and 40 mg Plectasin groups both showed a decrease of bacteria but it was not as efficiently eradicated as in the vancomycin group.

Conclusions: Plectasin treatment against S. aureus osteomyelitis reduced the infection. However, Plectasin released histaminestrongly after one day and some of the rats died especially in the 40 mg group. In contrast, Vancomycin reduced the infection significantly in almost of the parameters.

Keywords:
Animal model, osteomyelitis, implant
Prognostic factors of radial head arthroplasty outcomes

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Objectives / Interrogation: Overlengthening of a radial head implant has been associated with less than optimal clinical outcomes and capitellar erosions. The purpose of this study was to identify which factors, both clinical and radiological, have influenced the clinical results in our series.

Methods: We analysed the relation of the initial injury, the repairs associated to implant insertion and the implant length with clinical outcomes. Two postop radiological measurements were made by two independent investigators: the distance between the proximal edge of the lesser sigmoid notch and the proximal implant edge, and the lateral ulnohumeral joint opening angle. Mean values of both measurements were taken as reference. Clinical outcomes were assessed with range of movement measurements, the Mayo Elbow Performance Score (MEPS) and the DASH. In addition to univariable descriptive analysis, comparisons of means and correlations were made using nonparametric tests.

Results and Conclusions: During the 2005-2017 period, we performed 49 radio head arthroplasties (MoPyC, Bioprofile, Tornier). 31 patients (21 women and 10 men, average 53 years) agreed to be evaluated. Mean follow-up was 5 years. The initial lesion was a Masson type III fracture in 5 cases, type IV in 6, a triad in 12, and an association with other proximal ulnar fractures in the remaining 8. The treatment in 9 cases was just radial head arthroplasty, while in 10 it was associated with coronoid fixation and ligamentous repair. The rest of the cases received different combinations of treatment. Implant length was aligned with the proximal margin of the lesser sigmoid notch in 16 cases, was higher in 12 (mean 3 mm, SD 1.5) and inferior in 3 (mean 3.4 mm, SD 1.7). The lateral ulnohumeral joint opening angle was 10.7º (SD 2.6º). Although the best clinical results in mobility, MEPS and DASH have been obtained in Masson fractures type III and IV, the differences have not been significant, nor have there been differences according to the treatment used. Significant correlations (p <0.05) were observed between the increase in the ulnohumeral angle and the decrease in flexion and supination mobility. Variations in implant length in our series have shown no relation to the clinical outcome.

Conclusions: An overlengthening or shortening up to 3 mm has not shown to alter the clinical results in our series, while an excessive lateral ulnohumeral joint opening has a negative effect on mobility

Keywords: radial head arthroplasty, overlengthening, prognostic factors
Surgical outcome of mallet fracture using bone suture anchor

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Objectives / Interrogation: Extension block pinning for acute mallet fractures have been reported with good results. However, for chronic cases, various methods have been proposed. We evaluate the clinical outcome of mallet fractures treated with bone suture anchor for mallet fracture.

Methods: We evaluated 11 cases of mallet fracture patients treated with bone suture anchor (JuggerKnot® Soft Anchor Mini 1.0 mm, ZIMMER BIOMET) that were observable for more than 3 months after surgery (8 men and 3 women; mean age, 42 years). The affected fingers were 6 middle fingers, 1 ring finger and 4 little fingers. Two cases were chronic nonunion of mallet fracture after extension block pinning surgery failed. The surgical approach was follow; the dorsal side of the DIP joint was incised and the bone fragment was released with the extensor tendon and JuggerKnot® was inserted to the distal phalanx after making the fracture site sufficiently fresh. The terminal tendon was sutured with the bone fragment reduced. Arthrodesis of distal interphalangeal joint was added with a Kirschner wire inserted from finger apex. The Kirschner wire buried subcutaneously and was removed on 6 weeks after surgery. We examined the degree of flexion, extension lag, and bone union at the final follow-up. Moreover, we compared the results between the cases that undergone surgery within a month from injury and more than a month.

Results and Conclusions: The mean degree of flexion was 53 ° (30-75 °), and the extension lag was 7.3 ° (0-20 °). Two patients showed excellent, 3 showed good and 6 showed fair results on the Crawford's score scale. Radiographic bone unions were not achieved in two cases but no loss of reduction. In the comparative study between the two groups, 5 cases into group A (the average period from injury to surgery was 6.4(0-17) days), and 6 cases into Group C (the average was 51(31-88) days). The average flexion of the group A was 57 ° (40-75 °), and extension lag was 7.4 ° (2-20 °). The group C was 50 ° (30-70 °) and 7.1(0-15 °), respectively. There is no significant difference between the two groups.

The necessity of joint fixation has been suggested from fixation strength of anchor and it was useful to primary arthrodesis with Kirschner wire because it can be washed hands immediately after the removal of stitches. In this study, this method using bone suture anchor was able to obtained good results in both acute and chronic cases. This procedure was considered to be one of widely applicable methods for mallet fracture.

Keywords:
mallet fracture, bone suture anchor,
Is Carpal Tunnel Syndrome (CTS) two different diseases? A Joint Analysis of 2 Longitudinal Cohort Studies from USA and England Totalling 935,000 Cases

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Objectives / Interrogation: The aim of this study was to use routinely collected real world data to identify the incidence of carpal tunnel release surgery (CTR) in the US and England, and to compare the demographics of patients undergoing surgery in each country.

Methods: For English data, OPCS codes prospectively collected as part of routine care were used to identify CTRs from April 1998-2017. For US data, CPT codes were used to identify CTRs in the Humana claims database (PearlDiver Inc, Colorado Springs) from January 2007-December 2016. Patients were followed up until death or the end of the study period. Disease status was defined by ICD codes. Charlson comorbidity index (CCI) was used as an overall marker of comorbidity.

Results and Conclusions: Results
855,832 procedures were found in English data; 68% of patients were female. A significantly higher incidence was seen in women, especially those aged 45-60. A second peak in incidence was seen in the over 65’s irrespective of gender. Mean CCI was 1.6 (SD 2.41); a past medical history of diabetes mellitus was present in 5.8%; obesity in 2.56%, hypothyroidism in 2.43%; rheumatoid arthritis in 0.13%.

80,037 procedures were included from US data; 60% patients were female. 2 peaks in incidence were found; a peak in women aged 45-60, and a peak in both genders from 60-80 years of age. Mean CCI was 2.0 (SD 2.51); a past medical history of diabetes mellitus was present in 1.6% of patients; obesity in 0.7%; hypothyroidism in 0.9% and rheumatoid arthritis in 4.8%.

Conclusions
This large study of real world data suggests that there are two differing aetiologies for CTS: hormonal changes associated with menopause in women, and idiopathic CTS, mainly manifesting in older age groups. These trends were seen irrespective of a public or private healthcare system.

Keywords:
Carpal Tunnel Syndrome, Surgery, epidemiology, carpal tunnel release, risk factor
The Ulnar Plus Variance Does Not Adversely Affect the Outcomes of Arthroscopic Repair for Triangular Fibrocartilage 1b Tear

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Objectives / Interrogation: There has been a debate regarding the effect of ulnar plus variance (UPV) in the outcomes of arthroscopic repair for TFCC 1b tear. The purpose of this study was to compare the outcomes of arthroscopic repair for TFCC 1b tear between patients with UPV and those without UPV, and to identify risk factors for revision surgery with ulnar shortening osteotomy (UPV).

Methods: We retrospectively analyzed 38 consecutive patients (21 patients with UPV) and 17 patients without UPV) receiving arthroscopic repair for TFCC 1b tear from June 2014 to February 2017. We evaluated the patients with pain visual analogue scale (VAS) at three domains (overall, at hard work, and at rest), Patient-Rated Wrist Evaluation (PRWE), range of motion, and grip strength. Clinical outcomes and arthroscopic findings were compared between the patients with UPV (UPV group) and those without UPV (non-UPV group). A multivariate logistic regression model was used to determine the risk factors for revision surgery with USO.

Results and Conclusions: Demographic data were comparable between the groups (P > 0.05). The subtypes of TFCC 1b tear, signs of ulnocarpal abutment, and the incidence of concomitant intercarpal ligament injuries were not significantly different between the groups (P>0.05). Post-operative outcomes were also similar between the groups regarding the scores for pain VAS and PRWE, and the rates of the patients of the excellent or improved outcomes (P>0.05). The co-existing degenerative central TFCC tear was the only significant risk factor for revision surgery (OR, 30.2; 95% confidence interval, 1.83-500.28; P=0.017) after being adjusted for age and sex.

In conclusion, the ulnar plus variance did not significantly affect the outcomes of arthroscopic repair for TFCC 1b tear, suggesting that simultaneous ulnar shortening osteotomy is not necessary for the patients with UPV. However, the co-existing signs of degenerative central TFCC tear significantly increased the risk of revision surgery with USO.

Keywords:
TFCC, ulnar variance, ulnar shortening osteotomy, repair
Clinical Results of Interposition Arthroplasty with or without Intermetacarpal Ligament Reconstruction for Thumb Carpometacarpal Osteoarthritis: a retrospective comparison study

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Objectives / Interrogation: Objective: Kaarela’s procedure is the simple method for osteoarthritis of thumb carpometacarpal joints (CMC-OA), while is not able to prevent longitudinal instability. Furthermore, there were few studies that compared with the clinical outcomes of the homogenous interposition arthroplasty between without and with suspension. The aim of our study is to describe and to compare the clinical results between the original Karrela’s procedure and a new technique with reconstruction of the dorsal intermetacarpal ligament (IML) in addition to the arthroplasty.

Methods: Methods: 21 patients (3 man and 18 women; mean age, 63y) with CMC-OA were treated by trapeziectomy and Karrela’s procedure without (group K) or with IML reconstruction (group S). Clinical assessments were completed preoperatively and at 12 months postoperatively. These included subjective assessments of pain VAS (0-100), range of palmar and radial abduction, and strength of pulp pinch compared with unaffected side. Moreover, trapezial space ratio was determined by the trapezial space divided by the bone length of the proximal phalanx on the lateral X-ray immediately and at 12 months after surgery.

Results and Conclusions: Results: Pain VAS significantly improved from preoperative 71.0 and 71.0 to postoperative 8.0 and 8.6 in group K and S, respectively. Both volar abduction and radial abduction did not change to a statistically significant degree in both groups. Strength of pulp pinch in group K did not significantly change, while the strength in S group had significantly improved from 73% of unaffected side to 92% after surgery. Trapezial space ratio in group K decreased by 41% from 0.18 immediately to 0.11 at 12 months after surgery. By contrast, there was a decrease of 15% of trapezial space ratio in group S, with 0.27 immediately and 0.22 at 12 months following surgery. Statistical analysis showed a significant difference for the decreased rate of trapezial space ratio between group K and S.

Conclusions: In the Karrela’s procedure, APL, interposed in trapezial space and passed through 1st metacarpal, is considered to play a part in the deep anterior oblique ligament. Moreover, the results in this study indicated that reconstruction of IML in addition to tendon interposition effectively worked against the subsidence of the 1st metacarpal. We believe that addition of IML reconstruction provide better results including pinch strength and long term stability of 1st metacarpal bone.

Keywords:
osteoarthritis of thumb carpometacarpal joints, Kaarela's arthroplasty, dorsal intermetacarpal ligament reconstruction
Reconstruction of the collateral ligament for old dislocation of the DIP joint

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Objectives / Interrogation: We report a case of old dislocation of the little finger. The reconstruction of the collateral ligament was performed with split FDP tendon.

Methods: A 74 year-old-woman was introduced to our institution who was suffering from the DIP joint pain of the right little finger. She fell off her bicycle when she was in junior high school and injured the finger. The injury was thought to be open dislocation of the DIP joint, but only treatment for the wound was conducted. She had felt the restriction of the range of motion and appearance of the deformity of the finger but only slight pain. At 6 years before the presentation, she had begun to feel acute pain at the joint. The pain had deteriorated gradually. Radiographs and computer tomography revealed approximately 70° ulnar deformity of the distal phalanx and dislocation of the DIP joint, which was accompanying osteoarthritic change. Active ROM of the little finger was MPJ 0°/90°, PIPJ 0°/60°, DIP-55°/90°. Q-DASH score was Disability 31.6/ Work 62.5/ Sport 0.

At 3 weeks from the present day, surgical procedure was performed. The collateral ligament of the radial side at the DIP joint was not recognized. 1/3 FDP of the ulnar side was cut at the A3 pulley level and split to the distal phalangeal base, then it was turned over and A5 pulley was incised. A 2.3mm transverse burr hole was made at the condyle of the middle phalanx and passed the split FDP through the hole from ulnar side to the radial side. With applying tension, it was sutured to the soft tissue on the distal phalangeal base at the radial side after reduction of the DIP joint. ROM exercise of the DIP joint was begun from 4 weeks.

Results and Conclusions: At 1 year from surgery, slight ulnar deformity of the distal phalanx was recognized. Active ROM of the finger was MPJ30°/90°, PIPJ0°/90°, DIP-0°/30°. Q-DASH score was Disability 4.5/ Work 0/ Sport 0. Favorable clinical outcome was obtained.

Keywords:
Reconstruction, collateral ligament, DIP joint, old dislocation
Does Degeneration of Triangular Fibrocartilage Complex Improve after Ulnar Shortening Osteotomy?

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Objectives / Interrogation: The degeneration of the triangular fibrocartilage complex (TFCC) is usually combined in patients with ulnar impaction syndrome. Because ulnar shortening osteotomy can decrease the load-sharing through the ulnar carpus, there may be a possibility of indirect healing of TFCC degeneration after ulnar shortening. In this study, we focused on the changes of the TFCC degeneration after ulnar shortening osteotomy using 3D CT wrist arthrography.

Methods: We retrospectively reviewed all patients who were diagnosed as ulnar impaction syndrome and underwent ulnar shortening osteotomy from January 2014 to December 2016. Of them, we enrolled 18 wrists of 15 patients who had checked 3D CT wrist arthrography preoperatively and checked postoperative CT wrist arthrography repeatedly one year after surgery. The average age at the time of surgery was 37 years.

Results and Conclusions: In all patients, the degeneration of TFCC was observed in preoperative CT wrist arthrography. Six wrists were IIA, three were IIB, seven were IIC, and one was IID according to Palmer classification. One year after surgery, the degeneration of TFCC improved in three wrists, and worsened in two wrists. In the other twelve wrists, there were no changes in the degeneration of the TFCC. The average visual analog scale (VAS) for pain was improved from 7 (range, 5–9) preoperatively to 3 (range, 0–6) one year after surgery. Although ulnar side wrist pain was much improved after ulnar shortening osteotomy, indirect healing of the TFCC degeneration was not observed in most of our cases one year after surgery. Therefore, we can conclude that indirect healing of the TFCC degeneration may need more time or may not occur after ulnar shortening osteotomy. The degeneration of the TFCC may not seem to be the main cause of the ulnar side wrist pain in patients with ulnar impaction syndrome.

Keywords: Ulnar impaction syndrome, Triangular fibrocartilage complex, Ulnar shortening osteotomy, Arthroscopy
CHRONIC POST TRAUMATIC TRIANGULAR FIBROCARTILAGE COMPLEX (TFCC) LESIONS IN CHILDREN AND ADOLESCENTS

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Objectives / Interrogation: Post traumatic triangular fibrocartilage complex (TFCC) lesions in children and adolescents are uncommon and pose complex diagnostic and therapeutic challenges for the surgeon.

Methods: Authors report on a series of 14 pediatric and adolescent patients, means 14.4 y (9-17), 4 males and 10 females affected by TFCC tears (n=4 2A, n= 8 2B, n=2 2C with previously styloid fractures). All cases were sport related trauma (9 tennis, 1 boxer, 1 judo, 1 soccer, 1 musician, 1 equitation) Four Patients were managed with arthroscopy techniques, in the other 10 cases were open repaired. Pre and post-operative Range of Motion (ROM), strength, joint stability and functional score (PRWE score) were performed. The average follow-up was 37 months (8-60 m).

Results and Conclusions: The mean post-operative arch of motion in flexion-extension improves from 90% to 95% of the contralateral side, the radio-ulnar deviation improves from 82% to 91% of the lateral side, the prono-supination arch improves from 71% to 94% of health side. No differences in grip strength recovery compared with contralateral side (32,6 vs 35,7 Kg). The PRWE decrease from 84.4 to 9.85.
The study emphasizes the importance of surgical treatment post traumatic TFCC lesion in persistent ulnar wrist pain and/or instability in children and adolescents.

Keywords:
TFCC lesions, children and adolescent, open and arthroscopy management
Outcomes of FPL tendon primary repair in zone 1 and zone 2 by using M-Tang core suture followed with early active mobilization

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Objectives / Interrogation: We reviewed our outcomes of thumb tendon primary repair in zone 1 and zone 2 by using M-Tang core suture followed with early active mobilization in 25 patients, and evaluated the recovery of flexor pollicis longus tendon repairs by robust suture with venting pulley and early active mobilization.

Methods: From January 2014 to December 2017, we performed primary repair for completely divisions of flexor pollicis longus (FPL) tendon in zones 1 and 2 in 25 thumbs using M-Tang core suture repair followed by early active mobilization. These included 17 males and 8 females with a mean age of 39.6 (range 21 to 57) years. Three injuries were in zone 1 and twenty two in zone 2. Eighteen patients sustained injury to the right thumb and seven to the left. Twenty one thumbs had associated digital nerves and arteries injuries. We repaired FPL tendon by using M-Tang core suture with a 4-0 looped suture, followed by running peripheral suture using a 6-0 nylon suture. When the injury site was in zone 1 or the distal part of zone 2, the A2 pulley was vented entirely together with partial venting of the oblique pulley. When the injury site was at the middle or proximal parts of the zone 2, the A1 pulley was vented entirely together with partial venting of the oblique pulley. Extension-flexion test was always performed after tendon repair. Functional outcomes were evaluated with Strickland and Glogovac criteria and Tang criteria.

Results and Conclusions: A total of 25 patients were followed for a mean of 11 months (range 6 to 22) post-surgery. Among three thumbs with zone 1 injuries, two had excellent and one had a good result according to the Strickland and Glogovac criteria, and one had an excellent and two had good results according to the Tang criteria. For the 22 thumbs with zone 2 injuries, 13 had excellent, eight had good and one had fair results according to the Strickland and Glogovac criteria. Nine had excellent, 11 had good and two had fair results according to the Tang criteria. There were no FPL repair ruptures in 25 patients.

We conclude that the A1 pulley can be vented in the FPL tendon repairs in the proximal or middle parts of zone 2 and the A2 pulley and distal oblique pulley can be vented for zone 1 FPL repairs. The oblique pulley can be vented entirely or partially when necessary. Strong repair methods increase repair safety and M-Tang technique allows for safe and efficient early active rehabilitation.

Keywords:
flexor pollicis longus, primary repair, early active motion, M-Tang core suture
Distal interphalangeal joint osteoarthritis: Silicone arthroplasty versus screw arthrodesis

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Objectives / Interrogation: The objective of this study was to compare the outcomes of distal interphalangeal joint (DIP) silicone arthroplasty with DIP screw arthrodesis.

Methods: Patients with a DIP silicone arthroplasty and matched patients with an arthrodesis were examined on average 4.4 years after surgery. Active range of motion (ROM) of the DIP joint and sensibility of the fingertip (Semmes-Weinstein monofilament test) were measured. Patients rated joint pain on a 0-10 numeric rating scale as well as their subjective perception of sensibility, stability and appearance of the affected joint. Patients also completed the Michigan Hand Outcomes Questionnaire (MHQ, score 0-100) to measure hand function. Pre- and final postoperative radiographs were analysed for joint axis deviations and implant situation.

Results and Conclusions: In total, 48 patients were included with 39 arthroplasties and 42 arthrodesis. At follow-up, mean ROM of the DIP silicone arthroplasties was 27° (±15). Arthroplasty patients also had significantly better objective and subjective fingertip sensibility (p<0.01), but were less satisfied with their finger appearance (p<0.05). Overall, patients in both groups were equally satisfied with the treatment result and hand function was similar (MHQ scores were 73 and 77 for arthroplasty and arthrodesis patients, respectively; p=0.22). Pain was only minimal for all patients with an average score below 1. Five arthroplasties (13%) required conversion to an arthrodesis 1-5 years after the primary surgery due to instability and axis deviation in 3 joints and joint irritation in 2 joints. Five arthrodesis screws (12%) were removed between 6 and 12 months after surgery.

Conclusion: DIP silicone arthroplasty is a motion preserving alternative to DIP arthrodesis with high patient satisfaction, although finger aesthetics is superior in fusions. Based on the results, arthroplasty is best indicated in patients with little preoperative joint axis deviation, whereas arthrodesis might be the better choice for unstable and deviated joints with gross osteophytes. Since DIP arthroplasty enables more functionality in pinching and grasping small objects, we recommend this intervention if more function is required in preoperatively stable joints with sufficient collateral ligaments and no axis deviation. DIP arthrodesis should be favored in unstable and/or deviated joints to overcome the aesthetic inadequacies of arthroplasty.

Keywords: Distal interphalangeal joint osteoarthritis, silicone arthroplasty, screw arthrodesis
Total Thumb Trapeziometacarpal Joint Arthroplasty: A Retrospective Study of 12 Prostheses Implanted with WALANT Technique.

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Objectives / Interrogation: De la Caffinière first described total trapeziometacarpal joint prosthesis in 1974 for treatment of the first carpometacarpal joint arthritis. Even though this technique is more expensive than trapeziectomy, it has some advantages such as faster convalescence. Since we perform this procedure under WALANT technique, we report the perioperative and early postoperative functional results of patients treated with a thumb carpometacarpal joint prosthesis implantation in WALANT technique to consider the use of local anesthesia for thumb arthritis surgery.

Methods: A retrospective study assessed perioperative pain score and functional results of 12 patients treated for trapeziometacarpal advanced osteoarthritis (Eaton and Littler stage III). Pre-, peri- and postoperative assessments included pain, range of motion, and pinch and grip strength. The average follow-up time was 12 months.

Results and Conclusions: The mean pain score measured by a visual analog scale was 8 preoperatively, 2 perioperative and 1 postoperatively. The mean preoperative Kapandji opposition score was 7 and postoperative score were 10. The grip strength improved from 17 kg before to 23 kg after surgery.

Trapeziometacarpal arthroplasty with a joint prosthesis in WALANT appears to be a feasible. Patients suffered minimal intraoperative pain and comparable early functional outcomes to other type of anesthesia. The low perioperative pain score and the good early functional outcome encourages us to recommend this treatment of severe trapeziometacarpal osteoarthritis.

Keywords:
WALANT trapeziometacarpal joint prosthesis
Haptic assisted and VR-based training for minimally invasive K-wire drilling

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Objectives / Interrogation: Looking for less costly and time-consuming training methods for complex bone drilling procedures, we are developing a haptic and visual assisted VR-based training system for complex minimally-invasive K-wire insertion to the human hand [2]. Surgeons can learn, train and improve their bone drilling skills and anatomical knowledge in a real-time and bimanual haptic environment composition. To provide a good training effect, especially the drilling process has to be as realistic and immersive as possible.

Methods: For the user interaction we are using a force-feedback device (Haption Virtuose 6D Desktop, www.haption.com) with a drilling tool mounted to the tip in order to render realistic forces during a simulated drilling process. To guarantee a stable simulation without jerking we separated the drilling process into independent logical phases by using a virtual fixture approach. With virtual fixtures we are able to simulate the K-wire behavior by splitting the complex task into elementary sub-tasks. The transitions between these states are well defined, so that every single phase can be handled completely independently. In real-time calculated forces can be perfectly controlled and transmitted to the user over the haptic device.

Results and Conclusions: Within a formative subjective evaluation we presented our bone drilling prototype simulator on the FESSH conference 2018. A total of 30 surgeons, who had predominantly expert status, tested the drilling procedure and assessed the drilling simulation as authentic and very realistic.

Based on virtual fixtures, simple and discrete drilling phases can reliably simulate the complex minimally invasive bone drilling behavior in a real-time and VR-based environment. In a formative subjective surgeon evaluation, our approach was considered as very realistic and promising. Thus, complex bone drilling based on virtual fixtures has a great potential for future medical training.

Keywords:
VR-based training, minimally invasive K-wire drilling, medical training simulator, virtual fixtures, hand surgery
Arthroscopic Resection Arthroplasty for Scapholunate Advanced Collapse Wrists

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Objectives / Interrogation: We previously published early outcomes of arthroscopic resection arthroplasty of the radial column (ARARC) for scapholunate advanced collapse (SLAC) pattern of degenerative wrist arthritis. The purpose of this study was to report mid-term outcomes following ARARC for SLAC wrists.

Methods: Patients (N=31) who underwent ARARC for arthroscopic stage II-IIIB SLAC wrists were prospectively enrolled; 14 of these patients were included in the previous publication. General, regional, or wide-awake anesthesia was used based on patient preference and medical needs. Standard radiocarpal and midcarpal arthroscopy was performed using standard portals. A radiofrequency ablator was used for denervation. Resection of the styloid, arthritic portion of the scaphoid fossa of the radius, and the proximal 2/3rd of the scaphoid were performed using a 4 mm barrel bur. Data were prospectively collected before surgery, and at postoperative intervals of 1, 3, 6, and 12 months, and annually thereafter. Numeric Rating Scale (NRS) for pain (0=no pain, 10=worst pain) and satisfaction with outcomes (0=extremely dissatisfied, 5=extremely satisfied) were obtained. Functional outcomes of grip (position 2 on 5-stage dynamometer), wrist range of motion, and disabilities of the arm, shoulder and hand (DASH; 0=no disability, 100=severe disability) were evaluated. Total arc of motion was calculated by adding flexion, extension, and radial and ulnar deviation.

Results and Conclusions: Mean follow-up was 47 months (range 12-120). Mean age was 62 years (range 40-78) with an equal distribution of nonmanual and manual laborers. Mean pain score was 7 (range 3-10) before surgery and 0.3 (range 0-3) at final follow-up. Mean grip strength was 18 kg (range 5-36) before surgery and 23 kg (range 7-41) at final follow-up. Mean total arc of motion was 113 ° (range 63-170) before surgery and 127 ° (range 61-186) at final follow-up. Mean DASH was 42 (range 16-91) before surgery and 3 (range 0-38) at final follow up. Mean final satisfaction was 4.8 (range 4-5). There were 2 (7%) failures requiring revision surgery for persistent pain.

Mid-term outcomes with 4-year average follow-up demonstrate ARARC for arthroscopic stage II-IIIB SLAC wrists may give good pain relief and increase function. Mean pain, functional outcomes, and satisfaction have not deteriorated with additional follow-up and have improved since our original publication. Longer follow-up and prospective studies comparing ARARC to traditional surgical options should be considered.

Keywords:
Arthroscopy, Arthroplasty, SLAC Wrist
Biomechanical Analysis of the Tendon with Z-lengthening (TWZL) Construct: An Alternative Reconstructive Technique

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Objectives / Interrogation: An alternative to utilization of free tendon grafting is the Tendon With Z-Lengthening (TWZL) technique. This method utilizes the native tendon, z-lengthened and rotated on a distal juncture to provide length in cases of tendon deficiency. This technique obviates the need for tendon autograft and may allow for early active motion (EAM) protocols. This study evaluated the feasibility of the TWZL technique in cadaveric FDP tendons and biomechanically analyzed various suture constructs to determine the ideal one that could potentially allow an EAM rehabilitation protocol.

Methods: The FDP tendons of the index, middle and ring fingers harvested from 20 fresh frozen cadavers were utilized. 60 tendons were randomized into 5 different TWZL construct designs.

Tendon-suture constructs using 3-0 Maxbraid® were tested on a servohydraulic testing machine until failure was observed on the load-elongation recording. Stress-strain graphs were created. Data points on maximum yield and load at 8% strain were recorded for each construct.

Results and Conclusions: The maximum yield data revealed construct #4 to have the highest overall mean load to failure at 150 N compared to all other constructs (p < 0.0003).

Construct #4, at 59 N, had the highest mean load at 8% strain. Constructs #2, #3, and #4 were found to withstand a significantly higher mean load at 8% strain than constructs #0 and #1 (p < 0.0001). Comparison amongst constructs #2 (56 N), #3 (48 N), and #4 (59 N) did not show a significant difference in mean load at 8% strain. Construct #3, however, had standard deviation and confidence limit intervals that fell below the 45 N EAM threshold, whereas both constructs #2 and #4 had 95% confidence limits that fell no lower than 50 N.
Conclusions: The option of having a less morbid and simplified procedure for tendon reconstruction is attractive, especially if an EAM protocol can be initiated at time zero. This study provides evidence that the TWZL technique utilizing either construct #2 or #4 could provide sufficient strength for tendon reconstruction and subsequent early rehabilitation.

Keywords: tendon, tendon reconstruction, tendon grafting
A comparison of hand function in Colles and Scaphoid casts using a technologically updated Jebsen Hand Function test

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Objectives / Interrogation: To investigate the impact of Colles and Scaphoid casts on hand function, assessed using the Jebsen Hand Function test (JHFT) with additional technological subtests.

Methods: The JHFT is an objective measure of hand function, consisting of 7 subtests which reflect activities of daily living. 4 additional subtests were created to assess the impact of the casts on the use of technology. These included (1) texting on a mobile phone, (2) typing on a keyboard, (3) using a computer mouse to point and drag, and (4) using a computer mouse to scroll. 20 healthy volunteers were assessed completing the JHFT and additional subtests without immobilisation, in a Colles cast and in a Scaphoid cast. The data was analysed using a paired t test.

Results and Conclusions: Results
The average age of the participants was 28 years (10 male, 10 female). Immobilisation (Colles or Scaphoid) prolonged task completion times of all subtests of the JHFT. In all the JHFT subtests, volunteers performed worse in a Scaphoid than in a Colles cast. In 5 of the 7 JHFT subtests this reached statistical significance (p< 0.05). Immobilisation (Colles or Scaphoid) also prolonged mean task completion times of the technologically updated subtests. Although mean task completion times were greater for the Scaphoid cast than the Colles cast this was not statistically significant. Volunteers often demonstrated adaptations in technique to accommodate immobilisation of the wrist or thumb.

Conclusions
Scaphoid casts have a greater impact on hand function than Colles casts. This was most evident in tasks involving fine motor movements and forearm rotation. The technologically updated subtests confirmed the negative effect of immobilisation, but immobilisation of the thumb did not produce a statistically significant difference when comparing types of cast.

Keywords:
Hand function, Scaphoid cast, Colles cast
A rare case of thumb polydactyly with metacarpophalangeal joint symphalangism

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Objectives / Interrogation: A rare case presentation of an 14-year old healthy boy of Ethiopian descent presented with a duplicated thumb on his right hand consisting of a non-functioning hypoplastic radial and a fully developed functional ulnar component. The presented case report should demonstrate a case of rare congenital deformities; usually hand surgeons in the western hemisphere are not confronted with. In the current geopolitical situation more often refugees from less developed countries seek advice for their congenital deformities in a very late presentation. This case attempts to describe such a rarely seen deformity, discusses the classification and treatment options.

Methods: After thorough discussions with the patient and explaining the options with the help of an interpreter, we decided to undergo a resection/reconstruction procedure. During surgery the hypoplastic radial component was resected and the metacarpal head reduced to match the proximal ulnar phalanx. Tendons were dissected proximally. Followed by radial collateral ligament anatomic transosseus. In order to avoid a painful neuroma the remaining nerves of the removed radial component were dissected, crushed and buried into an intraosseus drillhole.

Results and Conclusions: At three months follow-up the patient showed no metacarpophalangeal joint instability, a satisfying motion of the thumb as well as intact sensation, was pain free and pleased with the result. Postoperative X-Rays revealed a normal joint alignment. To our knowledge this is only the second case of thumb polydactyly with metacarpophalangeal joint symphalangism and a single interphalangeous joint reported in the world literature and certainly the latest presentation. Al-Qattan, 2010 mentioned this rare anomaly in one case in his study of 228 hands without providing further details. One patient with metacarpophalangeal symphalangism and two distal phalanges radially was described by Afshar, 2007 whereas a few patient reports of interphalangeous symphalangism of the thumb as well as cartilaginous symphalangism in children can be found in the literature. According to Zuidam et al our presented case would be named Type IV S (Symphalangism) u (ulnar). Our reported case is unique in that it is the only case of thumb metacarpophalangeal symphalangism with a near-normal single distal phalanx. Previously reported cases showed either two distal phalanges (Afshar, 2007), a slightly deformed interphalangeal joint (Al-Qattan, 2010) or symphalangism in more distal joints of the thumb.

Keywords: thumb polydactyly, hand, classification, treatment, late presentation
A NEW TECHNIQUE TO VERY CHRONIC UCL INJURY WITHOUT ARTHROSIS - AUGMENTATION WITH FIBER TAPE

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Objectives / Interrogation: The stability of the thumb is necessary for hand function. The ulnar collateral ligament (UCL) of the metacarpophalangeal joint is the major stabilizer for grip and pinch activities. The prevalence of this injury is approximately 50 in 100000 per year, with 86% of complete rupture. The most common mechanism of injury is forceful abduction during sports. It's not uncommon for the injury to be overlooked in the first visit to the ER, due to the lack of suspicion and incorrect physical examination and also because it doesn't appear on plain x-rays. In addition, the injury often does not heal by itself due to the frequently interposition of the adductor aponeuroses.

Sometimes the patients just seek for medical assistance with a very chronic injury (over 6 months) without arthrosis, which is challenging to decide the treatment. The decision depends on the degree of ligamentous injury and physical demands.

Many types of reconstruction using tendons grafts are described for the treatment, but there is always the damage in the donor's site. The use of suture tape as an internal brace is well established for other ligaments reconstructions. Shin et al recently published a biomechanical study comparing the strength of repair alone and repair augmented with tape in thumb UCL lesion in cadaveric specimens, demonstrating the superiority of the last procedure.

The goal of this study is to present the use of UCL augmentation in very chronic injury without arthrosis with a new technique.

Methods: The UCL and UCL accessory were identified during surgery and they were not trustable for repair. Krackow's style suture were made with a 2-0 fiber wire. The fiber wire and a 2-0 fiber tape were fixed distally with a 3X8mm bio-tenodesis screw (Arthrex, Naples, FL). The tension was adjusted with the MCP joint in 30° flexion to avoid restricted flexion in the joint, and the proximal side of the fiber tape were fixed with an equal screw. The patient wore a cast for 1 week and then a splint for 3 weeks when rehabilitation started.

Results and Conclusions: The immediate strength and stability of the repair were excellent, the passive range of motion was complete.

Three months after surgery the grip and the pinch were stronger than contralateral thumb. There was full range of motion.

This method looks promising for the treatment of this difficult chronic UCL injury without arthrosis.

Keywords:
ULNAR COLLATERAL LIGAMENT, RECONSTRUCTION, AUGMENTATION, FIBER TAPE, BIO-TENODESIS SCREW
Ethnic differences in prevalence of Dupuytren disease can be explained by known genetic risk variants

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Objectives / Interrogation: Dupuytren disease (DD), a fibroproliferative disorder of the palmar fascia that causes flexion contractures in the fingers, is prevalent in people of North-Western European descent and less so in other ethnicities. DD is a complex disorder, influenced by genetic risk variants. We aimed to study if the marked differences in prevalences in DD between ethnic (sub)groups could be explained by differences in allele frequencies of the 26 known genetic risk variants of DD.

Methods: Genetic risk scores (GRS) composed of the 26 DD risk variants were calculated for the 26 populations from the 1000 Genomes database and correlated to observed DD prevalences from literature. For comparison, GRSs were generated for 100 sets of 26 random SNPs and also correlated to observed DD prevalences to determine the significance of the observed correlation. To determine whether differences in allele frequencies between ethnicities were caused by natural selection, fixation indices (Fst) were calculated from the 26 SNPs and from the sets of 26 random SNPs for comparison.

Results and Conclusions: Observed prevalences could be determined from literature for ten populations. Their correlation with the GRS composed of DD SNPs proved to be 0.51 (p<0.00). The Fsts between British and other populations were low for Europeans, ad mixed American, and South-Asian populations, and moderate for East-Asians and Africans, but none of them was significantly different from expected values determined from the random sets.
Conclusion: The 26 known genetic risk variants associated with DD explain for a substantial part (R²=0.26) the differing DD prevalences observed between ethnicities.

Keywords:
Dupuytren disease, prevalence, ethnicity, allele frequency, fixation index, population differentiation
Learning curve and risks in carpal tunnel release ultrasounds guided versus endoscopy procedure, a comparative pilot study between a senior surgeon and a junior surgeon, 30 cases

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Objectives / Interrogation: The learning curve and risks of sectioning the transverse carpal ligament (CTL) by ultrasounds have never been evaluated so far.

We have evaluated these parameters, on surgical criteria (quality of section and anatomical injuries), by a comparative cadaveric study between a junior surgeon and an experimented one through two section methods: ultrasound carpal tunnel release (UCTR) and endoscopic carpal tunnel release (ECTR).

Methods: We used 30 normal cadaveric wrists (5 fresh frozen, and 15 conserved).

The Junior surgeon did performed 14 UCTR and 6 ECTR without any external help, against 5 for each method for the senior.

We then extensively dissected each wrist to evaluate the quality of section evaluated by the percentage of section (length of sectioned ligament reported to the total CTL length).

We also researched anatomical injury (tendons, vessels, nerves) caused by the section.

Results and Conclusions: The CTL was fully released in half cases for the junior surgeon in each group. The mean percentage of section was 90% with 2 injuries for ECTR and 80% with 3 injuries for UCTR.

![Graph comparing operators for each technique](image)

The senior surgeon did not cause any damage, the mean section was 100% in ECTR and 88% in UCTR.

There were significant differences between junior and senior surgeons in each method on surgical parameters.

The Junior surgeon showed greater fluency in ECTR around 3 wrists against 10 in UCTR, for the inexperienced surgeon.
There is a longer learning curve and an increase of severe lesions by sectioning the CTL by ultrasounds than the reference method.

This study highlights the importance of cadaveric model for the trainee to acquire the method.

Anatomical knowledge are essentials to manage complications.

Keywords:
ultrasound guided procedure, carpal tunnel, median nerve, endoscopic guided procedure, carpal transverse ligament, cadaveric study

References:
Midcarpal Arthrodesis in Patients with Advanced Carpal Collapse

List of authors:
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Objectives / Interrogation: Midcarpal arthrodesis with excision of scaphoid is a common procedure for the surgical treatment of scaphoid nonunion advanced collapse and scapholunate advanced collapse wrists. However, this method has been associated with the increased risk of complications including nonunion and implant failure. The purpose of this study was to evaluate the results of surgical treatment of patients with SNAC and SLAC wrist in stage II and III.

Methods: Between 2005 and 2017 we performed 11 midcarpal arthrodeses in eleven patients (all men averagely aged 42) with 8 SNAC- and 3 SLAC-wrist. The average interval between the injury and surgery was 5 years. The fusion between lunate and capitate, as well between triquetrum and hamate, was performed together with the excision of the scaphoid bone and radial styloidectomy (5 cases). The Kirschner wire (6) and headless compression screws (5) were used for bone fixation. In eight cases we performed the bone graft transfer from iliac crest or used the excised scaphoid. We examined all patients according to the radiological bone healing, active range of wrist motion (AROM), grip strength, pain score (VAS 1-10), complications, DASH-questionnaire, Cooney-Krimmer score. The mean follow-up was 2.5 years (12 months - 13 years). Statistical Analysis was done using SPSS 21; paired t-test; paired Wilcoxon-test.

Results and Conclusions: Radiographic signs of bone fusion were observed in 3-4 months after the operation in all patients. The preoperative AROM was 71.1±14.3% of the contralateral hand, the postoperative one was 58.8±10.4% (p=0.013). Grip strength improved from 58.6±17.6% to 76.6±10.8% (p=0.008). The average intensity of wrist pain at rest and on exertion was 2.6±2.3 and 6.8±1.5 points (p=0.005) preoperatively, and after the surgery it was 0.6±0.9 and 3.1±1.9 points (p=0.003) respectively. The rates of DASH score prior to the operation were averagely 44.5±13.6 points; after the surgery they made 20.6±8.2 points (p=0.003). The function scores measured by the Cooney-Krimmer wrist score improved significantly from 42.7±12.5 to 71.0±9.4 points (p=0.005). The errors and complications included the damage of lunate and radius cartilage (2), DISI deformity (1), K-wire break (1) and drill break (1). There were no changes in the professional activity of the patients.

Conclusion: The midcarpal arthrodesis is a reliable procedure for SNAC and SLAC to achieve a stable and pain-free wrist with the increase of wrist strength due to the decrease of the overall range of motion.

Keywords:
SNAC, SLAC wrist, midcarpal arthrodesis, four-corner fusion
Complications and Reoperations After Triangular Fibrocartilage Complex (TFCC) Debridement

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Objectives / Interrogation: Few studies analyze factors associated with reoperation after triangular fibrocartilage complex (TFCC) debridement. Of these studies, positive ulnar variance and incidence of associated lunotriquetral ligament tears are factors implicated in worse clinical outcomes and complications. The aim of this retrospective database study is to identify factors associated with unplanned reoperation after TFCC debridement. Furthermore, we aim to determine the rate and type of reoperation after TFCC debridement, and to report on complications and persistence of ulnar-sided wrist pain after TFCC surgery.

Methods: In this retrospective study, we included all patients older than 18 years of age who underwent TFCC debridement between January 2003 and December 2017. Medical records of patients were assessed for our explanatory variables, unplanned reoperations, complications and reporting of symptoms. We used bivariate (Mann-Whitney U test and Fisher’s exact test) and multivariable analyses to identify factors associated with unplanned reoperation after TFCC debridement.

Results and Conclusions: Among 163 TFCC debridement procedures, there were 31 unplanned reoperations (19%). Seventeen patients underwent ulna shortening osteotomy (10%), 7 patients underwent a revision TFCC debridement (4.3%) and 7 patients underwent surgery of a different type (4.3%). In multivariable analysis, a positive ulnar variance appeared to be the only factor independently associated with unplanned reoperation (odds ratio 4.5; 95% CI 1.5-14). Twenty-three patients experienced a complication (14%), the most common being extensor carpi ulnaris (ECU) tendinitis/tenosynovitis (n=9; 5.5%) and symptoms of the dorsal sensory branch of the ulnar nerve (n=5; 3.1%). At final follow-up, 15 out of 163 patients (9.2%) reported persistent ulnar-sided wrist pain.

TFCC debridement yields satisfactory pain-relief with acceptable reoperation and complication rates. This study can help inform decision making as patients with ulna positive variance have about a 4-fold increased odds of revision surgery involving ulna shortening after arthroscopic debridement.

Keywords: arthroscopy; complications; reoperations; tfcc debridement
The Role of Positive Psychology in Understanding Pain Intensity and Disability Among Hand and Upper Extremity Patients

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Objectives / Interrogation: Psychological distress and ineffective coping have shown to significantly contribute to higher pain and decreased physical function among patients with orthopedic illness. However, little is known about the relationship among positive psychology factors - constructs that enable individuals to thrive and adapt to challenges - and pain and physical function in this population. Purpose of this study was to assess which positive psychology factors are associated with upper extremity physical function and pain intensity.

Methods: In a cross-sectional study, we recruited patients presenting to their regularly scheduled appointment with an orthopaedic surgeon at a Hand and Upper Extremity Clinic of a major urban academic medical center. Of 125 approached patients, 119 (44% men; mean age = 50 ± 17) met screening criteria and agreed to participate. Patients completed a clinical and demographic questionnaire, the Numerical Rating Scale to assess pain, the PROMIS Upper Extremity Physical Function CAT to assess physical function, and 7 measures assessing positive psychology constructs.

Results and Conclusions: In bivariate correlations satisfaction with life (r = .272, p = .003), greater gratitude (r = .248, p = .007), humor (r = .197, p = .033), mindfulness (r = .394, p < .001), and optimism (r = .224, p = .017) were associated with higher physical function. Similarly, satisfaction with life (r = -.411, p < .001), greater gratitude (r = -.411, p < .001), resilience (r = -.262, p = .004), mindfulness (r = .330, p < .001) and optimism (r = -.364, p < .001) were associated with lower pain. In multivariable linear regressions that controlled for relevant clinical and demographic variables, we found that mindfulness remained as sole significant positive psychology correlate of physical function (b = .360, t = 2.293, p = .024, sr2 = .188) and satisfaction with life as the sole significant positive psychology correlate of pain intensity (b = -.11, t = -2.16, p = .033, sr2 = -.184).

While causal inferences cannot be drawn, clinical interventions for this population may benefit from focusing on positive psychology principles aimed at human strengths and flourishing, rather than restricting to the standard medical model of physical therapy and pharmacology/opiates. Targeting mindfulness and satisfaction with life may be of particular benefit for this population. Such interventions focused on developing strengths may bypass stigma associated with traditional psychosocial interventions in orthopedic patients.

Keywords:
disability; pain; orthopaedic surgery; positive psychology
Free flap transfers to repair the defects of fingers using the proper digital artery and volar digital veins

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Objectives / Interrogation: We report our method of flap transfer to repair the defect of fingers using the proper digital artery and volar digital veins.

Methods: From December 2014 to April 2018, we used free flaps to 12 fingers (11 patients) with soft tissue defect in fingers using the proper digital artery and volar digital veins as the recipient vessels. 11 fingers were operated immediately after injury, one finger was repaired several days after injury. We transferred a total of 5 thenar perforator flaps, 1 groin flap, 5 great toe fibular flaps, and 1 medial plantar artery perforator flap to repair volar soft tissue defects with bony or tendon exposure of fingers. The artery of these flaps was connected to the proper digital artery. One or two veins of the flap were anastomosed to the volar digital veins in the recipient site. In searching for the volar veins of the finger, we first debrided the recipient site and explored the proper digital artery and volar veins at the proximal edge of wound. Then the flap can be designed with a short pedicle of 1-1.5 cm. The anastomosed volar veins were less than 0.5 mm in diameter. We used 12-0 sutures to vascular anastomosis.

Results and Conclusions: All the transferred flaps survived, no vessel crisis happened. The flap covered the defect site sufficiently and scar of operation is minimal and no circulation problems after surgery. Using volar digital veins as recipient veins is a novel attempt. The merits of this approach is that scar of operation is very limited. We transferred the flap based on a short pedicle, which decrease surgical time. The important findings from our series of 12 fingers indicate that volar vein can be used as recipient veins of the flap transfer in the finger, though traditionally dorsal veins are used because they are large and can be easily dissected. We suggest that volar veins can be considered as the recipient veins for free flap transfers in the fingers, provided that the surgeons are prepared to do finer vascular anastomosis of veins with diameter less than 0.5 mm.

Keywords:
free flap; finger pulp reconstruction; volar vein
Pollicization: new ideas of the biomechanics of the new thumb

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Objectives / Interrogation: Pollicisation is one of the most anatomical options for repairing the bilateral hand grip. The main idea of this operation is to create the skeletal anatomy and biomechanics of a normal thumb. However, the surgeon is always limited in the number of motor units which he can use to reproduce the entire volume of motions of the normal thumb and classical technique of pollicization does not imply the creation of an active rotation of the new thumb.

Methods: The new technics was used in operative treatment in 34 patients with hypoplasia of the thumb (type IIIB-IV Blauth) aged 0.5-2 years. Cross-transposition of the interosseus muscles of the index was made with fixation to the lateral bands of the extensor tendon. EDC tendon was fixed to the radial surface of the proximal phalanx throw the tunnel. The maximal follow-up period was 3.5 years.

Results and Conclusions: Results: all patients demonstrated active rotation of the new thumb in combination with abduction. In 64.7% of patients rotation consisted 140-165 degrees; in 23.5% - 120-140 degrees and in 11.8% of patients - less the 120 degrees. All patients had full active extension of the thumb in all joints.
Conclusion: Transposition of the interosseous muscles in pollicization helps to improve the possibilities of active and passive rotation of the new thumb without reducing the amplitude of active extension.

Keywords:
Pollicization thumb hypoplasia
Validity and responsiveness of strength measurements in the assessment of Distal radioulnar joint arthroplasty

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Objectives / Interrogation: To assess responsiveness of lifting strength, forearm torque and grip strength in the evaluation of distal radioulnar joint (DRUJ) implant arthroplasty

Methods: We performed a retrospective review of 18 patients treated with Herbert (n = 12) and Scheker (n = 6) DRUJ implants. Patients, whose arm and grip strength had been assessed both preoperatively and after a minimum follow-up of one year, were included. Observed changes of strength measurements were correlated to changes of patient reported outcome measures such as Disabilities of the arm, shoulder and hand (DASH), Patient reported wrist evaluation (PRWE) and Visual Analogue Scales (VAS) for pain and satisfaction. Measurements for grip strength, forearm torque and lifting strength were performed with the Jamar dynamometer and our recently presented test methods including the Kern- and Baseline instruments. Preoperative values were compared with one-year values. Statistical analyses included Spearman's correlation to explore relationships between variables. Standardized response mean and effect size were used to analyze responsiveness.

Results and Conclusions: Forearm torque was more sensitive to change of clinical outcomes after DRUJ arthroplasty than grip strength, which did not significantly correlate to other strength recordings or any outcome measures. Change in forearm torque and lifting strength had a moderate to strong correlation to change in PRWE and Pain experienced during activity. There were no significant correlations between change in any strength test and change in DASH.

Our findings suggest that the most relevant measures for the assessment of DRUJ arthroplasty are Forearm torque, PRWE and VAS for pain with activity.

Keywords:
Distal radioulnar joint, Implant arthroplasty, Forearm torque, Lifting strength, Responsiveness
Classification of Electrical burns injuries of the Upper Limb

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Objectives / Interrogation: Electrical burns of the upper limb are devastating injuries. To date there are no specific classifications of electrical burns in the upper limb. Due to the high number of electrical burn injuries treated in our institute we offer a classification and treatment algorithm for the immediate reanimation with tendon transfers after soft tissue cover in electrical burns of the upper limb.

Methods: Patient data was collected over one year and analysed with regards to sex distribution, high and low voltage burns, the areas of the upper limb affected, nerves, tendons and bones involved, amputation levels and soft tissue reconstructions including tendon transfers.

Results and Conclusions: Over 6000 burns are admitted to our institute each year. 27% are due to electrical injuries and 29% include the upper limb. Electrical burns cause 42% of the deaths in our burns patient population. The vast majority of electrical burns are due to High Voltage electricity in males. 60% are admitted in the first 2 days post injury, but admissions continue up to 4 weeks post burn. The most common place of injury was the workplace, followed by the home, roadside educational institutes and the playground.

The average Total Body Surface Area involved was 15% (range 1-50%): mostly 2nd and 4th degrees. Nearly half necessitate amputations with nearly a third below elbow amputations. 20% include nerve injuries and include loss of tendons.

Roadside electrical cables
Surgical debridement was usually performed piecemeal and defects covered successfully with local flap. Tendons were buddied, transferred depending on availability and need. On the basis of our data we offer an upper limb electrical burns classification, which facilitates surgical treatment and reconstruction.

**Keywords:**
burns, electrical burns, tendon transfers, demographics, rehabilitation
Effective Period of Conservative Treatments in Patients with Acute Calcific Periarthritis of the Hand

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Objectives / Interrogation: Acute calcific periarthritis of the hand is a relatively uncommon painful condition with juxta-articular deposits of amorphous calcium hydroxyapatite. Although conservative treatments has been generally regarded effective, there is not much evidence about how long they could be effective.

Methods: We retrospectively reviewed 11 patients who were diagnosed as acute calcific periarthritis of the hand from January 2015 to June 2018. We recommended the use of warm baths, nonsteroidal anti-inflammatory drugs (NSAIDs) and limitation of the activity as an initial treatment. If the pain persisted in spite of the at least 3-months conservative treatments, we explained surgical treatment options. If the pain improved, we recommended gradual range of motion exercises with continuation of daily NSAIDs. Each visual analog scale (VAS) for pain at every 3 months visit (3 months, 6 months, 9 months) were compared with that of previous visit to investigate whether the pain had decreased or not during each time interval. Simple radiographs taken at every 3 months visit were compared with those of previous visit to determine any significant change in calcification amounts during each time interval.

Results and Conclusions: Except one patient with immediate surgical reconstruction of collateral ligaments, 10 patients having 17 affected joints continued the conservative treatments for average 11.1 months. Average pain VAS score at initial visit was 7, while that of 3 months, 6 months and 9 months were 4.3, 3.3 and 2.9 respectively. There was significant reduction in pain VAS scores at 3 months and at 6 months, but not at 9 months (P-value = 0.004, 0.008 and 0.598 respectively). Simple radiographs also showed significant reduction of calcification amounts at 3 months and at 6 months, but not at 9 months (P-value = 0.020, 0.034 and 0.083 respectively).

Patients with acute calcific periarthritis of the hand revealed residual pain and calcifications for relatively prolonged period. Those who continued the conservative treatments including NSAIDs medication showed relieved pain and reduced calcification up to 6 months. This results suggested that the conservative treatments could be tried for at least 6 months before deciding surgical treatments for calcific periarthritis of the hand.

Keywords:
Calcific periarthritis, hand, Conservative treatment, NSAIDs
Distal interphalangeal joint arthrodesis using the ADS memory staple - The London Experience

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Objectives / Interrogation: Aims
The ADS memory staple is the first intramedullary shape device in use for distal interphalangeal joint arthrodesis. We describe our experience of the device used in two hand units.

Methods: Methods
An analysis of 17 consecutive patients undergoing single digit DIPJ arthrodesis using the device between October 2013 and February 2018 by two Consultant Plastic Surgeons at two London Teaching Hospitals was performed. Functional and patient reported outcomes as well as complications were measured.

Results and Conclusions: Results
13 female (76%) and 4 male (24%) patients with a median age of 59 years (29-82yrs) were operated on. Indications included osteoarthritis (n=4), traumatic arthritis (n=8), rheumatoid arthritis (n=4) and psoriatic arthritis (1). 13 DIPJs and 4 thumb IPJs were fused. Average follow up time was 32.6 months (7.2-60 months). 4 patients were retired, 2 unemployed and 11 actively working. 16 patients (94%) achieved bony union within 6 weeks of surgery and had a painless, functional hand. Device displacement occurred in 1 patient requiring removal and arthrodesis with K-wires. 2 patients developed a wound infection requiring antibiotics, 1 developed a hypertrophic scar and 1 healed with a mildly rotated DIPJ. There we no instances of skin necrosis, cold intolerance, paraesthesia or osteomyelitis. All patients were satisfied with their final outcome despite the one displacement.

Conclusions
Our study demonstrates high union rates without many of the complications associated with other arthrodesis techniques. We present a rapid, reliable and cost-effective method of DIPJ arthrodesis using a novel new technique with high rates of patient satisfaction.

Keywords:
ADS; arthrodesis; trauma; arthritis
Treatment of mutilated hands with multiple finger amputation by means of a free flap transfer with digital replantation or revascularization

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Objectives / Interrogation: We report our method of free vascularized tissue transfers to repair mutilated hands with multiple finger destructions.

Methods: From August 2016 to April 2018, we treated 6 patients with multiple finger destructions and severe tissue trauma of the hand using free flap transfers. Three hands had amputation through their MP joints of index to little fingers with soft tissue defects of the dorsal hands. These hands were repaired with free groin flap or a venous flap. The flaps were used as flow-through flaps, which connected distally to the digital arteries or dorsal veins for replanting amputated fingers. Two patients had incomplete amputation of two fingers and multiple fractures and dislocations of other fingers. After reduction and fixation of the fractures and joints, lobed anterolateral thigh flaps were transferred to cover soft tissue defects palmarly and dorsally, with revascularization of the incompletely amputated fingers. The more recent case with skin avulsion of palm and dorsal hand, and destruction of vascular circulation in 5 fingers. The hand was repaired with an anterolateral thigh flap with multiple vein grafting for revascularization of 5 fingers. All the cases were treated by heparin over the first 7 days after surgery.

Results and Conclusions: Results: All the fingers survived except postoperative artery crisis happened in one patient and was rescued by surgical exploration and re-anastomosis. The soft tissue coverage is sufficient and all fingers survived after replantation or revascularization. The hand with a venous flap transfer had obvious scar contracture. That patient required scar excision and finger joint release and a groin flap transfer 6 months after initial surgery. Conclusions: Reconstruction of multiple finger destructions accompanied with soft tissue defects in the hand is challenging. We show here that vascularized flap transfer to repair tissue loss in the dorsal or palm of the hand together with distal anastomosis of the vessels to digital artery and veins of amputated fingers can salvage both amputated fingers and severely traumatized hand with extensive tissue losses. We have used end-to-end or end-to-side anastomosis for the flap transfer or finger revascularization distally. The design of the combined transfer or ideal connection of vessels is a key to success of surgical salvage, which should be decided according to intraoperative findings and availability of vessels in these severely traumatized hands.

Keywords:
mutilated hand; replantation; free flap; flow-through flap
Multi-lobed groin flaps for coverage of extensive soft tissue defects involving multiple digits and palm or dorsal hands

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Objectives / Interrogation: The purpose of this study was to report the feasibility of free vascularized multi-lobed groin flap transfers for hand coverage or for donor sites coverage after finger reconstruction.

Methods: From January 2018 to July 2018, 5 cases suffered multiple soft tissue defects on hand were reconstructed using multi-lobed groin flaps. One patient had skin defects on dorsal hand and proximal area of dorsal skin on index to little fingers, and was reconstructed using a free groin flap with randomized separating distal part of flap into 4 lobes to cover dorsal fingers. The second patient had dorsal hand defect from dorsal wrist extended to middle phalange of index to little finger, which was reconstructed using two lobed groin flaps, so that the four lobes could cover 4 injured fingers individually. The arteries of two groin flap were anastomosed to two ends of a Y-shape vein graft, which was end-to-side anastomosed to radial artery. The third patient had dorsal skin defect on index to little fingers, and was reconstructed using a 4-lobed groin flap based on the superficial circumflex iliac artery and superficial inferior epigastric artery. The arteries were anastomosed to radial arteries through a Y-shape vein graft. These three patients had a large size of dorsal hand soft tissue defects in the hand and in several fingers. Multi-lobed groin flaps based on superficial branch and deep branch were used to cover the donor site defects after finger reconstruction in another two cases.

Results and Conclusions: All the flaps survived except a small size of marginal area necrosis in the case with dorsal skin reconstruction of four fingers. The small wound healed without surgical intention. The repaired fingers generally had acceptable cosmetics and pinch function of these fingers are also acceptable. The sensation of these fingers generally were less than ideal. Free vascularized multi-lobed groin flaps are a useful method for multiple soft tissue defects on hand and fingers. The flap is reliable and cosmetics and pinch function after transfer to the hand is acceptable. However, the sensory recovery of the reconstructed fingers is still a concern after extensive trauma and flap coverage.

Keywords:
multi-lobed flap; groin flap; SCIP; vein graft
Non-Contrast Magnetic Resonance Imaging of Perforators in Preoperative Evaluation of Anterolateral Thigh Flaps

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Objectives / Interrogation: The anterolateral thigh (ALT) flap is a commonly utilized perforator-based flap used in upper extremity reconstructive surgery. Previous studies have used MRA and CTA to image the ALT. However, these techniques require contrast or radiation. No prior studies have investigated the efficacy of using non-contrast magnetic resonance imaging (MRI) to assess ALT perforators. Our study investigates the efficacy of using non-contrast MRI to characterize the number, location, and course of dominant skin perforators of the ALT.

Methods: We queried our institutional database for 100 non-contrast thigh MRI exams from July 2013-July 2018 that included an axial fat suppression sequence from the lesser trochanter (LT) to the distal musculotendinous junction of the rectus femoris. We excluded studies with artifact that precluded reliable evaluation. All images were analyzed with OsiriX (Pixmeo SARL, Geneva). Perforator course, size, and location relative to bony landmarks were determined.

Results and Conclusions: Of 100 exams, 277 perforators in 170 legs were identified. Of these, 101 were septocutaneous (36.46%) and 176 were musculocutaneous (63.54%). An average of 1.63 perforators were visualized in each leg (min 1; max 4). The average perforator diameter was 2.53mm (SD 0.5). For n=22 perforators where the ASIS and patella were captured on imaging, the average site of perforator exit along the ASIS-patella line was 0.5 (SD 0.08; min 0.372, max 0.64). Perforators are shown in Figures 1 and 2.
Figure 1. Non-contrast axial T2 Fat suppressed slabbed maximum intensity projection image of the thigh in a 21 year-old woman for evaluation of anterolateral thigh perforator anatomy prior to surgery demonstrates the course of a prominent septocutaneous perforator (red arrowheads) arising from the descending branch of the lateral circumflex femoral artery.
Perforator course, size, and location can be measured using non-contrast MRI. Non-contrast MRI is a low-morbidity imaging modality that may serve as an effective tool to aid in preoperative planning for use of the ALT flap.

**Keywords:**
Non-Contrast MRI, Anterolateral Thigh Flap
Distally based sural neuro-fasciocutaneous perforator flap for foot and ankle reconstruction: surgical modifications for flap pedicle and donor site closure without skin graft

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Objectives / Interrogation: The conventional procedure of distally based sural neuro-fasciocutaneous flap enables the blood supply and venous drainage by increasing the width of the adipofascial tissue and preserving tiny venous return routes. Moreover, skin graft is a common method for donor site closure, which may influence the aesthetic appearance. The purpose of the study is to modify the pedicle of the flap and to design a relaying flap for the donor site closure without skin graft.

Methods: 12 patients undergoing the modified distally based sural neuro-fasciocutaneous perforator flap for foot and ankle reconstruction were included in this study. The surgical modification for flap pedicle is described. A peroneal-based perforator, a superficial vein, and the vascular axis of the sural nerve should be included in the pedicle. A Z-shape skin incision was used to explore the perforator vessels and a relaying island perforator flap was used to close the donor site without skin graft. Flap survival, complications, flap swelling degree and aesthetic satisfaction were evaluated. The links between the perforator vessels and the accompanying vascular axis around sural nerve were verified in 8 fresh cadavers.

Results and Conclusions: The linking vessels were constant occurrence in 8 cadavers and 12 cases during operation. All flaps survived completely without necrosis. Neither arterial ischemia nor venous congestion was noted. The diameter width and the length of the pedicle ranged from 1.0 to 2.0 cm and 4 to 10 cm, respectively. A relaying perforator island flap was used in 8 cases for donor site closure and no skin graft was performed. No serious donor site complications happened and all patients were satisfied with the aesthetic outcomes at the final follow-up.

The modification for the pedicle of the distally based sural neuro-fasciocutaneous perforator flap is considered as a reliable method for foot and ankle reconstruction. A relaying flap for the donor site closure without skin graft should be recommended.

Keywords:
Modification; Neuro-fasciocutaneous flap; Perforator flap; Donor site
Defining displacement thresholds for surgical intervention for distal radius fractures - a Delphi study

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Objectives / Interrogation: Distal radius fractures are very common yet controversy exists regarding which require treatment and is reflected by significant variation in surgical intervention rate. Evidence regarding which fractures would benefit from intervention is varied and largely poor quality.

This study had three aims; identify which radiographic parameters are clinically important; quantify the threshold of displacement at which intervention should occur and investigate which patient factors influence the decision to intervene.

Methods: A modified three round Delphi study was carried out and responses were qualitatively analysed.
The Delphi panel was composed of three groups of national and international expert surgeons:
Hand and wrist surgeons,
Trauma surgeons,
International researchers.
46 participants initially agreed to take part. 43 completed the first round and all then completed three rounds.
Participants were asked questions based around case vignettes in patients of three ages (38, 58, 75 years).

Results and Conclusions: For all age groups ulnar variance was ranked as the most important extra-articular parameter, step was ranked as the most important intra-articular parameter.
Agreed thresholds were the same for all parameters for patients aged 38 and 58. Surgeons would intervene with +2 mm ulnar variance, 10 degrees dorsal tilt, 2mm step and 3mm gap. In patients aged 75 the agreed thresholds were 20 degrees dorsal tilt, 3mm step and 4mm gap, consensus was not achieved for ulnar variance.
Mental capacity, pre-injury functional level and medical co-morbidities were ranked as the most important factors influencing the decision to intervene. Qualitative analysis suggested that pre-injury function was the main theme within these factors.
Our findings provide useful advice about which parameters should be measured and radiographic thresholds for intervention. These thresholds may then be modified depending on important patient factors. This information can help guide clinicians with management decisions and reduce variation.

Keywords:
wrist fracture; distal radius fracture; outcome; malunion
The effect of social deprivation on fragility fracture of the distal radius

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Objectives / Interrogation: Social deprivation has been shown to be associated with many adult fractures including distal radius fractures but the mechanisms for this are unclear. The aim of this study was to identify if deprivation was associated with falls risk, mechanism of injury or osteoporosis in patients with a fragility fracture of the distal radius.

Methods: Details of all patients aged 50 years and over presenting with a radiographically confirmed fracture of the distal radius over a one year period, were prospectively recorded. Patients were sent a questionnaire pack including questions regarding place and mechanism of injury, comorbidity assessment, falls risk assessment tool and FRAX assessment of bone health and fracture risk.

Results and Conclusions: 333 out of 521 eligible patients completed the questionnaire (279 female; 54 male, response rate=64%). There was no difference between characteristics of responders and non-responders (p=0.58). DRF rate was higher in deprived quintiles (p=0.040). Less falls occurred in the home in deprived patients (Q1/2: 35%; Q3-5: 48%, p=0.037) with more falls outdoors (Q1/2: 39%; Q3-5: 24%, p=0.001). There was no difference in height at which falls took place with most from standing height (Q1/2: 81%; Q3-5: 86%, p=0.336). Linear regression analysis found no relationship between deprivation rank and FRAX scores (major fracture risk: p=0.274, hip fracture risk: p=0.283) but demonstrated a significant relationship between deprivation and increased number of falls risk factors (p=0.002). Mean number of falls risk factors was higher in the two most deprived quintiles (Q1/2: 3.62: Q3-5: 2.79, p=0.028).

We have identified increased falls risk as an important reason for DRF in deprived patients. Knowing which patients are at highest risk allows interventions to be efficiently targeted. We would recommend resources should be targeted towards patients from deprived areas and focused on specific falls prevention strategies.

Keywords:
wrist fracture; distal radius fracture; osteoporosis, social deprivation
Development of three dimensional digital preoperative planning software for the distal humerus fractures

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Objectives / Interrogation: To reproduce anatomical reduction and appropriate implant placement during the osteosynthesis, we developed a 3D preoperative planning software for the elbow fractures. The objective of this study was to assess the usability and reproducibility of the 3D preoperative planning software for the osteosynthesis of distal humerus fractures.

Methods: 1. Trial application phase
From our database of previous elbow fracture patients, we investigated how much slice width of CT scan is appropriate for a 3D preoperative planning. We created 3D images of the fracture site from the different slice widths of CT data. Fracture reduction, implant choice and placement were simulated with those images. After the simulation, we compared 3D images created from postoperative CT images with those from the simulation.

2. Clinical application phase
3D preoperative planning were applied for four distal humerus fracture cases (mean age: 65.8, one male and three females). The preoperative planning were performed in order to determine the reduction, placement and choices of implants. Surgeons performed the reduction and the placement of implants while comparing images between the preoperative plan and fluoroscopy during surgery. After the operation, we carried out CT scans and verified accuracy of the reduction and implants choices and placements. The reductions were evaluated with an angle between the diaphysis axis and a line connecting the medial epicondyle with the lateral epicondyle (ΔC) and an angle between the diaphysis axis and the articular surface (ΔJ) in the coronal plane and distance between the anterior diaphysis and the anterior articular surface in the sagittal plane (ΔD) for the 3D images of distal humerus. The reproducibility was evaluated by the differences of the parameters between pre- and post-operative images.

Results and Conclusions: In the trial phase, it was found imaging slices less than 2mm was favorable to simulate reduction for the fragments. In the clinical application phase, the fracture types of the patients were A1, A3, C1 and C2 according to the AO classification. We applied double plates in three cases and a single plate in one case. The planned sizes of plates were used for all cases. In the results of reproducibility, differences of the measurements ΔC, ΔJ and ΔD were 2.0°±1.7°, 0.7°±2.4° and 1.9mm±3.7mm, respectively. 3D preoperative planning allows visualization of the reduction process and implant placement. It may be helpful for acquiring practical images of osteosynthesis.

Keywords:
distal humerus fractures, 3D
Role of an Adjustable Hinged Elbow Orthosis in the Rehabilitation of a Lateral Collateral Ligament Deficient Elbow: An In Vitro Biomechanical Study

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Objectives / Interrogation: Hinged elbow orthoses (HEO) are often used to allow protected motion of the unstable elbow. However, previous biomechanical studies have not shown HEO to improve the stability of an LCL deficient elbow. This lack of effectiveness may be due to the straight hinge of current HEO designs which do not account for the native carrying angle of the elbow.

The aim of this study was to determine the effectiveness of a custom-designed HEO with an adjustable carrying angle on stabilizing the LCL deficient elbow.

Methods: Eight cadaveric arms were mounted in an elbow motion simulator with the arm in the varus position. An LCL injured (LCLI) model was created by sectioning of the common extensor origin, and the LCL. The adjustable HEO was secured to the arm and its effect with 0°, 10°, and 20° (BR00, BR10, BR20) of valgus carrying angle was investigated. Varus-valgus angles and ulnohumeral rotations were recorded using an electromagnetic tracking system during simulated active elbow flexion with the forearm pronated and supinated.

Results and Conclusions: There were significant differences in varus and ER angulation between different elbow states with the forearm both pronated and supinated (P=.000 for all). The LCLI state with or without the brace resulted in significant increases in varus and ER of the ulnohumeral articulation compared to the intact (P< 0.05). The difference between each of the LCLI, BR00, BR10, BR20 states and the intact ranged from 3.8-6.2° for varus and 3.6-5.2° for ER. However, there were no significant differences in varus or ER of the ulnohumeral articulation between any of the brace angles and the LCLI state (P >0.05). The difference between each of the brace angles and the LCLI state ranged from 1.1-2.4° for varus and 0.5-1.6° for ER.

Conclusion
Although there was a trend toward decreasing varus and ER of the ulnohumeral articulation with the application of this adjustable HEO, none of the brace angles examined was able to restore the stability of the LCL deficient elbow. This lack of stabilizing effect may be due to the weight of the brace exerting unintentional varus and torsional forces on the unstable elbow. Previous investigations have shown that the varus arm position is highly unstable in the LCL deficient elbow. Our results demonstrate that the application of an HEO with an adjustable carrying angle does not stabilize the LCL deficient elbow in this unstable position. Varus arm positioning should be avoided in the rehabilitation programs of an LCL deficient elbow.

Keywords:
elbow; instability; lateral collateral ligament; PLRI, brace, hinged elbow orthosis; kinematic
Paediatric Carpal Injuries: Injury Pattern, Radiological Findings and Patient Care Pathway

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Objectives / Interrogation: The aim of this study is to characterize the injury pattern, review correlation between plain radiological and MRI findings, and the patient care pathway experienced by under 16's presenting with closed trauma of the wrist.

Methods: A prospective audit of consecutive cases of blunt wrist trauma referred to our tertiary hand and upper limb service was conducted between August 2017 and August 2018.

Results and Conclusions: 72 cases were included. The mean age is 12 years (range 7-16). 72% of patients presented within 48 hours of injury to the emergency department (ED), and 68% were referred to our hand service on the same day. 44% of cases were secondary to fall on an outstretched hand. Management from ED consisted of casting (43%), splinting (35%), volar slab (10%), sling elevation (1%) and none (11%).

The mean period between referral from ED to patients' initial review at the hand service was 4.5 days. 78% of patients described pain, 33% swelling and 22% reduced range of motion of the affected wrist. Plain film radiology revealed fractures in 17% of cases, no fracture in 54% and suspected fractures in 29%.

At the second review, 40% of patients described pain, 4% swelling and 7% reduced range of motion. On MRI, 18% of cases showed no injury, 6% other pathologies and 18% were awaiting scans. All fractures identified on plain film was confirmed on MRI, with an additional 31 carpal fractures seen (10 with suspicious features & 21 with no features of fracture on X-ray). The most common carpal fracture was scaphoid fractures. Other injuries identified on MRI included other non-scaphoid carpal fractures (5 trapezium, 4 each of capitate and lunate, 3 hamate, 2 triquetrum, 1 each of pisiform and trapezoid), metacarpal bases and distal radius fractures, TFCC injury and ganglion.

Patients under the age of 10 were the minority, consisting of 5 cases (7%). All were female, aged 7-9, and underwent MRI. Imaging revealed 2 scaphoid fractures, 1 triquetral fracture and no injury in 2 cases.

47 patients completed treatment, with a mean of 3.4 clinical visits (range 1-7), and mean 5.8 weeks of follow-up (range 1-14). 1 case required arthroscopy.

Paediatric carpal injuries are a relatively uncommon entity, and early detailed imaging in symptomatic wrists that fail to respond to immobilisation may allow earlier diagnosis and timely instigation of treatment. Refinement of the local carpal injury management algorithm based on the results of the prospective audit will be discussed.

Keywords:
Paediatric Carpal Fractures, Scaphoid Fractures
Treating women with De Quervain tenosynovitis in puerperium: is the corticoid infiltration effective?

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¹ HOSPITAL MARCIO CUNHA (IPATINGA)

Objectives / Interrogation: To evaluate if in women in puerperium the infiltration for De Quervain tenosynovitis is effective after another conservative treatments failed.

Methods: This is a prospective study performed in the period of march of 2018 and june of 2018, when 11 women and 13 wrists all of them in puerperium attended a hand surgery office.

10 were submitted a infiltration (1 refused) with betametasone and lidocaine for tenosynovitis De Quervain, 8 were in lactation period.

The average time of symptoms was 7 months (2 months to 2 years)
The average of follow up was 4.8 months (3 to 6 months)

7 women and 9 wrists were evaluated for this study, 3 women were not able to attend the proposal.

In 2 women (3 wrists) two infiltrations were performed, in 5, (6 wrists) one was done
6 right wrists, 3 left
5 patients, 6 wrists were not in lactation period anymore.

All the patients were treated previously with physiotherapy, anti inflammatory drugs and splints without success.

We collected data based on Quick Dash score before and after treatment, which was used for the results

Results and Conclusions: The Quick Dash score pre treatment was 59.5 in average (47.7 to 72.7)
After infiltration the score was reduced to 17.38 (0 to 86.3)

In only 1 patient (1 wrist) the Dash score had increased (the paciente was with symptoms for 2 years and was submitted to two infiltrations)

About the 5 patients (6 wrists) that were not in lactation period a, the Quick Dash score reduced considerably in 4 of them (4 wrists) - 0 to 4.5 points.

We conclude that infiltration with betametasone in patients in puerpery period leads a good result, and this consideration is special for the ones out of lactation period, when the literature shows a resolution of symptoms

The weaknesses of this study was the little time of follow up and few number of patients

We think that for the improvement obtained, and the simple and low cost procedure, this should be considered in a puerperal women refractory to other treatments, specially in non lactation period.

Keywords:
De Quervain, tenosynovitis, corticoid, infiltration, puerperium
Asymmetric 6-Strand Flexor Tendon Repair - Biomechanical Analysis using Barbed Suture

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Objectives / Interrogation: This study investigates the biomechanical performance of the Asymmetric flexor tendon repair technique using barbed suture. The Asymmetric repair technique using monofilament nylon suture was previously reported to have a higher tensile strength than the modified Lim-Tsai repair technique, but its repair stiffness and load to gap force were significantly lower. There is hence an unmet need to improve this technique and the substitution of nylon suture with barbed sutures may be the solution.

Methods: Two groups consisting of 10 porcine tendons each were repaired with the six-strand Asymmetric repair technique using V-Loc® 3-0 and Supramid® 4-0 respectively. The repairs were subjected to a mechanical tester for static testing. The ultimate tensile strength, load to 2mm gap force, repair stiffness, time taken to complete a repair and failure mechanism of the repairs were recorded and analyzed.

Results and Conclusions: All the repairs using V-Loc® 3-0 sutures had significantly higher median values of ultimate tensile strength (64.1N; 56.9N), load to 2mm gap force (39.2N; 19.7N), repair stiffness (6.4 N/mm; 4.7 N/mm) and time taken to complete a repair (9.4mins; 7.7mins). All the repairs using V-Loc® sutures failed by suture breakage while 80% of repairs using Supramid® sutures failed by suture pullout. The use of the barbed sutures in the Asymmetric repair technique, whilst more time consuming, has shown promising improvement to its biomechanical performance (i.e. better ultimate tensile strength, stiffness and resistance to gap formation).

Keywords:
Flexor tendon, Asymmetric repair; V-Loc
Trapezio-trapezoid (TT) hypermobility may increase range of thumb movement after trapezio-metacarpal (TMC) arthrodesis

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Objectives / Interrogation: We conducted kinematic analysis of the thumb using fresh cadaveric extremities to investigate the range of thumb circumduction after TMC arthrodesis with/without associated peri-trapezial resection procedure.

Methods: Eight upper arms were separated at the distal forearm and MCP joint. The hand and forearm other than the thumb ray were fixed to the laboratory table. We attached 3-D electromagnetic tracking sensors to the base and head of the 1st metacarpus. A 50-g load was applied at a point 20 cm distal from the TMC joint to generate the thumb circumduction. We then measured the magnitude of angular and rotational displacement of the 1st metacarpus during the movement. Data were collected in normal thumb (stage0), thumb with simulated TMC fusion (stage1), that with subsequent resection of the TT joint (resection width in 2mm, stage2), and with further resection between the 2nd metacarpal base and trapezium (stage3). The 1-2 intermetacarpal and scapho-trapezial ligaments were left intact during the experiment.

Results and Conclusions: The average range of angular movement of the normal thumb (stage0) demonstrated 58° and 66°, respectively, in radial and palmer abduction-adduction directions. After TMC arthrodesis (stage1), these angular movements showed significant reduction to 17° and 13°, respectively. Rotational movement of the normal thumb (42° and 34°) reduced significantly after the arthrodesis (8° and 5°). Following sequential T-T resection (stage2), the angular and rotational displacement increased significantly (37° and 25°, 22° and 13°, respectively) compared to the thumb with TMC fusion (stage1). These movements further increased in stage3 (49° and 39°, 34° and 25°, respectively), and demonstrated 71% and 78% of normal thumb motion.

TMC arthrodesis decreased the range of thumb circumduction; 24% (angulation) and 17% (rotation) of normal thumb motion. Hypermobility of TT and trapezio-2nd metacarpal joint contributed to remarkable increase of thumb movement without significant instability.

Keywords:
trapeziometacarpal joint arthrodesis biomechanics
A Comparative Analysis of 150 Thumb Polydactyly Cases from the CoULD Registry Using the Wassel-Flatt, Rotterdam, and Chung Classifications

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⁴ Washington University St. Louis (St. Louis)
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Objectives / Interrogation: The purpose of this investigation was to compare the inter-rater reliability of the Wassel-Flatt (WF), Rotterdam, and Chung classification systems in patients enrolled in a prospective, multicenter cohort study. Our hypothesis is that the WF, Rotterdam and Chung classifications would have similar inter-observer reliability for classification of 150 radial polydactyly cases.

Methods: Five pediatric hand orthopedic surgeons, one orthopedic resident, and one medical student independently reviewed clinical photographs and radiographs of 150 radial polydactyly cases from the CoULD (Congenital Upper Limb Database) registry. After completion of a training set, each rater classified each case according to WF, Rotterdam, and Chung classifications. The intraclass correlation coefficient (ICC) was calculated using two-way random measures with perfect agreement.

Results and Conclusions: To demonstrate that a full spectrum of cases was available, Table 1 exhibits the range of classifications as graded by the 7 raters:

<table>
<thead>
<tr>
<th>Wassel-Flatt</th>
<th>Range (%)</th>
<th>Rotterdam</th>
<th>Range (%)</th>
<th>Chung</th>
<th>Range (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I</td>
<td>2-6</td>
<td>Type I</td>
<td>2-7</td>
<td>Type I</td>
<td>12-54</td>
</tr>
<tr>
<td>Type II</td>
<td>10-43</td>
<td>Type II</td>
<td>21-25</td>
<td>Type II</td>
<td>10-43</td>
</tr>
<tr>
<td>Type III</td>
<td>4-10</td>
<td>Type III</td>
<td>5-11</td>
<td>Type III</td>
<td>5-19</td>
</tr>
<tr>
<td>Type IV</td>
<td>35-46</td>
<td>Type IV</td>
<td>45-52</td>
<td>Type IV</td>
<td>22-43</td>
</tr>
<tr>
<td>Type V</td>
<td>3-9</td>
<td>Type V</td>
<td>3-9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type VI</td>
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<td>Type VI</td>
<td>5-6</td>
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<tr>
<td>Type VII</td>
<td>3-15</td>
<td>Type VII</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unclassifiable</td>
<td>1-17</td>
<td>Type VIII</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Distribution of Radial Polydactyly According to the Devised Classification System by Rater

The ICC for inter-rater reliability was 0.93 for the WF classification, 0.98 for Rotterdam types I-VIII, and 0.88 for the Chung classification. On average, the raters felt that 59% of the thumbs were accurately captured in the WF, 90% of thumbs in the Rotterdam, and 48% of thumbs in the Chung classification systems.

While the Chung classification system provides the simplest description of thumb polydactyly (4 types) and was designed to better inform surgical treatment, it had the lowest inter-observer reliability and was considered to capture the clinical presentation in the smallest percentage of cases. The Wassel-Flatt classification provides more detail (8 types), and was intermediate in its inter-observer reliability and accuracy in capturing the clinical presentation. Although the Rotterdam classification is most complex, providing the most level of detail (8 types, with 5 subtypes for each, and 3 location descriptors for each), it had the highest inter-observer reliability when considering only type (not sub-types) and was considered to accurately describe the greatest proportion of cases.

Keywords:
polydactyly; thumb; congenital; hand deformities; classification
The medial femoral condyle free flap: An excellent option for difficult cases

List of authors:
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Objectives / Interrogation: The use of the medial femoral condyle free flap (MFCF) is a versatile option for the treatment of upper extremity nonunions and reconstructive procedures associated with bone loss or osteonecrosis. The benefit of this type of flap is the viability of the bone which favors primary ossification and increases bone density. Vascularized free bone flaps are especially useful for the treatment of recalcitrant nonunions, or non-unions that have failed three or more treatments to obtain consolidation.

Methods: Six patients were included in this report, 3 scaphoid fractures, two non-union and one avascular necrosis of the proximal pole, a recalcitrant non-union of the distal humerus, non-union of a wrist fusion secondary to distal radius excision resulting from Giant Cell Tumor and a thumb distal phalange reconstruction. Age range 37 years old (22-59), 2 females, 4 males, 3 right upper limbs and 3 left upper limbs, 3 right knee donor side and 3 left knee donor side, all patients underwent prior surgery before the MFCF, none of the patients were smokers, Diabetes was present in the patient with distal humerus fracture and the Giant Cell Tumor.

Results and Conclusions: In conclusion, the utility of the MFCF is immeasurably varied, achieving a 100% consolidation in all our cases. The MFCF graft can also be used to manage large bone defects, recalcitrant non-union, bone reconstructions, and management of scaphoid fractures. Achieving complete consolidation with good vascularity gives the patient the best chance of avoiding the development of debilitating osteoarthritis of the wrist joint. The consistent anatomy in the knee makes the MFCF graft easily identifiable, resulting in lower morbidity in the donor area. For these reasons, the authors consider the MFCF flap an excellent treatment option in the arsenal of methods treat non unions with low vascularity.

Keywords:
medial femoral condyle free flap, scaphoid fracture, scaphoid non union, scaphoid avascular necrosis, recalcitrant non union, thumb reconstruction, consolidation
Factors of distal ulnar morphology to affect symptomatic ECU subluxation and clinical results of anatomic ECU tendon sheath reconstruction

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Objectives / Interrogation: To evaluate the association between distal ulnar morphology and symptomatic extensor carpi ulnaris (ECU) subluxation and assess the results of anatomic ECU tendon sheath reconstruction.

Methods: Twelve patients with symptomatic ECU subluxation were included. They all treated with anatomic reconstruction of ECU subsheath. Preoperative and final range of motion of wrist joint, grip strength, disabilities of the arm, shoulder, and Hand (DASH) score, and patient related wrist evaluation score (PRWE) were checked to assess the clinical results. At final follow-up, we used ultrasound sonography to check the ECU stability. Ulnar variance, ulnar styloid process length, and ECU groove depth were measured to evaluate the association between distal ulnar morphology and symptomatic ECU subluxation. 24 wrists without ECU subluxation and 24 wrists with asymptomatic ECU subluxation were used as controls.

Results and Conclusions: Results: There were statistically significant difference in ECU groove depth between control and asymptomatic ECU subluxation groups. However, ECU groove depth, ulnar styloid length and ulnar variance showed no significant correlation with symptomatic ECU subluxation. After anatomic reconstruction of ECU subsheath, there was a statistically significant improvement in DASH score, PRWE score, grip strength and there was no ECU subluxation at the final ultrasound sonography.

Conclusion: We think that anatomic reconstruction of ECU subsheath is an effective operative method to stabilize ECU and there is no association distal ulnar morphology and symptomatic ECU subluxation, although asymptomatic ECU subluxation has a trend toward shallower ECU groove.

Keywords:
distal ulnar morphology, symptomatic ECU subluxation, anatomic ECU tendon sheath reconstruction
Precision in the design and division of the thenar flap: Achieving a good result without donor complications or PIPJ contracture

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Objectives / Interrogation: Background:
The thenar flap, first described by Gateman in 1926, has been extensively used in our unit and we have not observed the many criticisms. The thenar flap is usually indicated in volar oblique defects of the index and middle fingers. The main criticisms are donor site morbidity and joint stiffness. We have analyzed in detail the design and techniques required to achieve a good outcome.

Objectives:
By presenting our results and technique, we will dispel the following misconceptions:
The thenar flap results in unacceptable PIPJ stiffness
The donor site needs to be grafted
The thenar flap can only be used in the index and middle finger

Methods: 10 consecutive thenar flap cases were collected over a 6 month period. The demographics, medical history, outcomes, and complications were analyzed. Serial photographs were taken to document intra-operative technique, as well as the final outcome.

Results and Conclusions: Results:
All 10 flaps survived completely. All 10 cases regained full range of motion, and none developed a joint contracture. All donor sites were closed primarily without skin graft. All patients were satisfied with the functional outcome and aesthetic appearance.

The following technical refinements are key to achieving a good result:
The thenar flap must be precisely orientated with both the donor site and the final fingertip in mind.
The thenar flap is divided at 3 weeks, but after 2 weeks the flap and finger are exposed and mobilization is encouraged. This softens the flap, makes division easier and prevents joint contracture.
Secondary design depending on arborization during division is necessary to optimize coverage of residual defect.

Conclusions:
The thenar flap is a versatile flap that can be used to resurface a variety of fingertip amputations. The refinements above can prevent the complications commonly associated with the thenar flap.

Keywords:
thenar flap, aesthetic, precise design
New Arthroscopic Classification of TFCC injuries

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Objectives / Interrogation: Due to several reports of other types of TFCC injury that was not in Palmer's classification, such as the dorsal or coronal tear or due to recent development of DRUJ arthroscopy, we need new thorough classification of TFCC injury both includes RCJ and DRUJ sides. We tried to classify our case series of consecutive 213 TFCC lesions in a year period.

Methods: From July 2014 to September 2015 (1 year 2 months period), 213 wrists of 211 TFCC injury patients who underwent first-look arthroscopy both in the RCJ and DRUJ were included in this study. There were 123 males and 88 females, right wrist of 116, left of 93 and 2 bilateral. Average age of arthroscopy was 39.1 year (range: 13-72). All data were recorded on cards and DVDs.

Results and Conclusions: Results. On radiocarpal arthroscopy, 191 TFCC injuries were categorized as traumatic and 48 as degenerative. The central TFC lesion (Class 1) was noted in 21 wrists: among them, 13 slit tears, 2 flap, 1 double transverse slit, 2 oblique, 1 coronal, and 2 bucket handle tears were found. The radial tear (Class 2) was in 5 wrists including 4 intra-disc tear and 1 rim tear. Peripheral tear (Class 3) was found in 165 including 150 ulnar tears, 10 dorsal, 1 distal, 2 palmar and 2 horizontal tears. 48 wrists indicated degenerative tear (Class 4). On DRUJ arthroscopy, traumatic TFCC injuries were found in 19 wrists, subclassified into proximal slit and proximal fibrillation (Stage 1) in 4, partial RUL avulsion (Stage 2) in 1, relaxed RUL (Stage 3) in 3 and complete RUL avulsion (Stage 4) in 17. Isolated injury was found in 144 wrists (67%), double lesions were found in 65 wrists (30%), and triple injuries were found in 4 wrists. Conclusions. We classified TFCC lesion based upon RCJ (Class 1-4 as the site of injury) and DRUJ (Stage 1-4 as the degree of RUL tears) arthroscopic findings. This system works very well. One third of our series indicated combined double or triple lesion that included lesions onto the RCJ and DRUJ. To diagnose TFCC lesion thoroughly, both RCJ and DRUJ arthroscopy are necessary.

Keywords: triangular fibrocartilage complex injury, arthroscopy, classification
Partial excision of volar plate and dorsal capsulotomy in patients with post-traumatic ankylosis of finger joint in the hand

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Objectives / Interrogation: Post-traumatic ankylosis of the finger joint is one of the complications after traumatic hand injury. If there is no improvement through conservative treatments, surgical treatments can be considered. Although several surgical techniques such as dorsal capsulotomy and release of the accessory collateral ligament have been suggested, the result was not satisfactory. The purposes of this study are to suggest new surgical technique to restore finger joint motion and to present the surgical outcome of this technique.

Methods: We retrospectively reviewed 14 patients, 7 males and 7 females, who were diagnosed as post-traumatic ankylosis of finger joint, underwent partial excision of volar plate and dorsal capsulotomy between January 2014 to June 2016 and followed up for more than one year. There were ten metacarpophalangeal (MCP) joints and four proximal interphalangeal (PIP) joints. The average interval between the initial injury and the surgery were 60 (range, 10 to 120) months.

Results and Conclusions: Of the ten MCP joints, the average range of motion was improved from 31 degrees to 92 degrees one year after surgery. Of the four PIP joints, the average range of motion was improved from 20 degrees to 77 degrees one year after surgery. There were no acute complications such as instability, infection, and wound dehiscence. All the patients were satisfied with the surgical outcomes.
Because this technique does not release both collateral ligaments, the joint stability can be maintained. We can also safely release volar plate and dorsal capsule through anterior and posterior dual approaches. Partial excision of volar plate and dorsal capsulotomy can be one of the good options in patients with post-traumatic ankylosis of finger joint.

Keywords:
ankylosis, volar plate excision, dorsal capsulotomy
Does enzymatic debridement allow us to perform conservative treatment on clinically deep hand burns? A retrospective review.

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Objectives / Interrogation: The hands are one of the main locations of burns. In deep second- and third-degree burns, the gold standard of treatment is surgical debridement and subsequent coverage, which can result in suboptimal esthetic and functional results. The aim of our study is to assess whether treatment by initial enzymatic debridement (NexoBrid®) of deep second-degree burns and third-degree burns prevents the need for surgery.

Methods: We carried out a retrospective study of 53 hands with deep burns treated in our center from May 2015 to December 2016. Two experts evaluated the initial photographs of the burns and classified them as surgical or nonsurgical (interobserver kappa statistic 0.83). These assessments were compared with the actual need for surgery for each hand.

Results and Conclusions: Sixteen of the 32 (50%) hands that the experts considered surgical spontaneously epithelialized. Four of the 17 hands (23.5%) that were not considered surgical required a split-thickness skin graft for healing. Enzymatic debridement helps to preserve viable tissue, which reduces the number and extension of surgical interventions, thus favoring better results.

Keywords:
deep burns, hand, enzymatic debridement
New simple technique for syndactyly separation

List of authors:
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Objectives / Interrogation: Web reconstruction in finger syndactyly using a hexagonal dorsal skin flap and a straight midline incision gives a good cosmetic and functional result with little need for skin grafts.

Methods: We developed an easy technique to be used in simple complete (SC), simple incomplete (SI) and complex (C) syndactyly separation without the need of skin graft.

In C and SC nailfold and fingertip reconstruction is done using a technique described by Buck-Gramcko¹¹. Tourniquet is used. Rigorous defatting is done, preserving the digital neurovascular bundles. Wounds are closed with absorbable sutures. Soft dressing is applied for 2 weeks. Patients are discharged the same day.

Skin incision and site for skin graft

Follow-up (FU) was scheduled at 2 weeks, 6 months and 1 year. Scar treatment with silicone sheets/gloves was started at 3 weeks by our occupational therapist.

Parents’ satisfaction of functional and cosmetic outcome was assessed at last FU using a VAS scale (0-100).

Results and Conclusions: 20 patients (16 male, 9 left, 5 bilateral) underwent 30 web reconstructions (16 SI, 8SC, 6C) using our technique at median 16 (11-43) months of age. The level of the web was at PIP in 11 and at DIP in 5 of the 16 children with SI. Skin graft taken from outside the incision site was required in 1 patient (C). None of the patients were lost to follow-up, mean 11 (4-43) months. Complications (excessive scar formation, infection, circulatory or sensory problem) occurred in 1 SC patient who developed a post-operative infection, and web creep at 6 months. Mean functional and cosmetic VAS scores were 95 (63-100) and 90 (45-100).
Simple complete and simple incomplete syndactyly. Pre- and post-operative images 12 months from second surgery.

This new technique for simple and complex syndactyly yields a good cosmetic and functional result with little need for skin graft.

**Keywords:**
syndactyly, webspace reconstruction

**References:**
Dorsal bone-ligament-bone reconstruction of chronic, isolated lunotriquetral instability Technique and clinical results

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Objectives / Interrogation: Isolated lunotriquetral (LT) ligament injuries are not common wrist injuries and, hence, surgical procedures range from conservative treatment over arthroscopic debridement to soft tissue reconstructions and even arthrodesis. The purpose of our case series is to present one surgical option with a bone-ligament-bone graft treating isolated chronic LT ligament instabilities.

Methods: Despite of knowledge of the more stable palmar ligament we stabilized the arthroscopically proven instability with a dorsally implanted bone-ligament-bone (BLB) graft harvested from the capitohamatal joint. The graft was fixed with one screw in each bone block and the LT joint was transfixed using a headless compression screw (HBS). 5 patients were treated at our institution between September 2009 and January 2017. All patients were assessed with range of motion (ROM), grip strength, radiographic stress views, the Michigan Hand Questionnaire (MHQ) and DASH score pre- and postoperatively.

Results and Conclusions: All patients (4 men, 29.3 (19-40) years; 1 woman, 35 years) suffered from an isolated chronic LT instability and were followed up between 6 months and 6 years after surgery. The ROM remained minimally decreased to preoperative. The grip strength improved (34kp to 46kp). The MHQ at final follow up ranged between 66 and 100%. On average the DASH score improved from 70.3 to 33.3. Subjective pain varied between 0 and 6 using NRS depending on stress load.

3 of 5 HBS screws were removed. One patient showed a breakage of the HBS screw at last follow up with a dynamic instability of 1mm opening with radial abduction compared to the other side. The stress views of the other patients did not indicate an instability. No osteoarthritis could be seen in the final radiographs in all patients.

All patients returned to and since have kept their previous activity levels and occupation until last follow up.

All patients showed a significant improvement in DASH score and grip strength. Previous activity levels were achieved without exception, even though one breakage of the HBS screw was observed.

The dorsal BLB reconstruction can be a reasonable surgical option in patients with isolated chronic LT instabilities, preserving wrist kinematics better than an arthrodesis. However, it can be discussed whether the more complicated procedure is superior to a conventional fusion.

Keywords: wrist, lunotriquetral, instability, reconstruction
Chronic, isolated lunotriquetral instability Biomechanical testing of the Bernese surgical treatment and review of the literature

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Objectives / Interrogation: Chronic lunotriquetral (LT) instability is rare and, hence, a variety of different treatment options exist. Up to date best results for chronic LT instability have been shown with soft tissue reconstruction techniques, which are technically demanding or are non-anatomic. Less demanding options include the arthrodesis with a reported high complication rate.

A technique combining the advantages of both existing techniques would be preferable. Using the dorsal bone-ligament-bone (BLB) reconstruction, we tested a less demanding technique that provides stability but also is thought to save the kinematics of the carpal bones.

We present the current literature and the biomechanical test results of our technique with a dorsally implanted bone-ligament-bone (BLB) graft.

Methods: A literature review using pubmed was performed. The anatomy, epidemiology, biomechanics and published treatment options of LT instability are summarized.

For biomechanical testing, 10 cadaveric forearms were evaluated with computertomography (CT) in different loaded positions. LT ligaments were sequentially sectioned. BLB reconstruction were performed harvesting the graft from the capitohamatal joint. Initially, the LT was also transfixed using a compression screw (CCS) simulating arthrodesis. At last the CCS screw was removed and the reconstruction alone was tested. CT’s were performed at the beginning and after each single step. A 3-dimensional software calculated the motion between the carpal bones in comparison to the normal wrist after each of the steps.

Results and Conclusions:
Sectioning of the dorsal part of LT had little effect on kinematics, however sectioning of the palmar part in addition, resulted in an increased mobility in the LT joint.

Arthrodesis showed to increase significantly the motion in the adjacent joints up to fourfold difference.

Restoration of the physiological kinematics could partially be achieved after removing the CCS screw testing the reconstruction alone. Compared to totally cut LT ligament the reconstruction showed less motion without significance, but was not as stable as the uncut ligament.

We present and compare the used BLB graft reconstruction to other techniques. Biomechanical testing with BLB grafts is satisfactory. Compared to arthrodesis, more physiologic carpal kinematics resulting in less straining of the adjacent joints was measured.

Keywords:
Surgery for cubital tunnel syndrome in patients with diabetes - a prospective study of patient reported outcome measurements using national quality registries

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Objectives / Interrogation: To evaluate if diabetes affects outcome after surgical treatment for cubital tunnel syndrome.

Methods: Data from the National Quality Register for hand surgery procedures (HAKIR) were combined with data from the Swedish National Diabetes Register (NDR) to evaluate patients who had surgery for cubital tunnel syndrome 2010 - 2016. Outcome was assessed by QuickDASH (Disabilities of Arm, Shoulder and Hand) preoperatively, and at three and 12 months postoperatively. A simple linear regression was used to predict QuickDASH scores at 12 months based on the following variables: diabetes, gender, type of surgery (simple decompression or transposition) and age at time of surgery. Mann-Whitney U-test with post hoc Bonferroni correction and Chi2 were used to compare groups. Each treated hand was analysed as a separate statistical entity.

Results and Conclusions: During the study period, 1394 cases were surgically treated for cubital tunnel syndrome. We found no significant differences in QuickDASH scores between cases with or without diabetes (Table 1), neither pre-operatively nor postoperatively, irrespective of type of diabetes. No differences in QuickDASH scores were observed between those with and without diabetic retinopathy.

Patients' QuickDASH scores at 12 months increased by 9 (95% CI 3-14; p=0.002) points if the patient was a female and by 11 points (95% CI 2-19; p=0.019) if the surgical method was a transposition. Patients with diabetes had a smaller improvement in QuickDASH scores than patients without diabetes (Table 1).

<table>
<thead>
<tr>
<th></th>
<th>No diabetes (n=1232)</th>
<th>Diabetes (n=162)</th>
<th>p-value (diabetes vs. no diabetes)</th>
<th>Diabetes with no retinopathy (n=49)</th>
<th>Diabetes with retinopathy (n=43)</th>
<th>p-value (retinopathy vs. no retinopathy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female (n, %)</td>
<td>610 (50)</td>
<td>65 (40)</td>
<td>0.024</td>
<td>21 (43%)</td>
<td>14 (33%)</td>
<td>0.477</td>
</tr>
<tr>
<td>Age at surgery (years), median [IQR]</td>
<td>51 [41-60]</td>
<td>61 [54-67]</td>
<td>&lt;0.0001</td>
<td>62 [55-65]</td>
<td>59 [48-64]</td>
<td>0.203</td>
</tr>
<tr>
<td>Diabetes type 1 (n, %)</td>
<td>35 (22%)</td>
<td>5 (10%)</td>
<td></td>
<td>25 (58%)</td>
<td>&lt;0.0001</td>
<td></td>
</tr>
<tr>
<td>Transposition/decompression</td>
<td>157/1040</td>
<td>13/148</td>
<td>0.076</td>
<td>7 / 42</td>
<td>2 / 41</td>
<td>0.166</td>
</tr>
<tr>
<td>Total QuickDASH score preoperative median, [IQR]</td>
<td>50 [27-66]</td>
<td>48 [39-64]</td>
<td>0.87</td>
<td>55 [41-68]</td>
<td>43 [32-64]</td>
<td>0.644</td>
</tr>
</tbody>
</table>
Patients with diabetes benefit from surgical treatment for cubital tunnel syndrome almost to the same extent as patients without diabetes, regardless of type 1 or type 2 diabetes. Presence of retinopathy did not influence outcome among cases with diabetes. A higher risk for residual problems, as defined by higher postoperative QuickDASH scores, was observed in females and after ulnar nerve transpositions.

**Keywords:**
ulnar nerve entrapment, diabetes mellitus
How trapeziometacarpal arthritis and scaphotrapeziotrapezoidal arthritis affect the postoperative recovery of carpal tunnel syndrome.

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Objectives / Interrogation: Carpal Tunnel Syndrome (CTS) is the most common peripheral compression neuropathy primarily affecting postmenopausal women. Trapeziometacarpal (TMC) and scaphotrapeziotrapezoidal (STT) arthritis is also commonly encountered in postmenopausal women. The purpose of this study is to examine the prevalence of TMC and STT arthritis in patients with CTS, and to analyze how the arthritis affect the postoperative recovery of CTS.

Methods: 123 hands who underwent carpal tunnel release between 2002 and 2017 were studied. The patients consisted of 34 men and 89 women, with a mean age of 65.8 (33–92) years old. The mean follow up period was 11.7 (3–24) months. The severity of the TMC arthritis was determined using Eaton's classification. The patients were divided into four groups; joints with TMC stage 1 or less without STT arthritis were classified as group N (63 hands), joints with TMC stage 2 and 3 were classified as group TMC (39 hands), joints with TMC stage 4 were classified as group TMCSTT (12 hands) and joints with just STT arthritis were classified as group STT (9 hands). For the evaluation of CTS, pre and postoperative manual muscle testing (MMT) of abductor pollicis brevis (APB) and distal motor latency (DML) detected on the APB muscle was examined. These results were cross compared between group N and the rest of the groups.

Results and Conclusions: The electrophysiological study showed that the mean preoperative DML had no statistical difference among the groups. The mean postoperative DML was 4.53ms for group N, 4.97ms for group TMC, 4.51ms for group TMCSTT and 4.83ms for group STT, showing statistical significance between group TMC and group N. However, when we performed one-way covariance analysis to exclude the influence of age, age adjusted mean DML was 4.66ms for N group and 4.85ms for group TMC, which showed no statistical difference.

The muscle strength recovery of APB revealed that, the number of the cases with MMT 3 or less showed no statistical difference preoperatively. However, postoperative evaluation showed that while only 14 hands (22%) in group N and 1 hand (11%) in group STT showed MMT 3 or less, 16 hands (41%) in group TMC and 5 hands (42%) in group TMCSTT failed to achieve over MMT 3, showing statistical significance between group TMC, TMCSTT and group N.

We conclude that the prevalence of TMC and STT arthritis was 41.5% and 7.3% in patients with CTS. The presence of TMC arthritis in patients with CTS negatively affects the postoperative recovery of the APB muscle after carpal tunnel release.

Keywords:
CTS, TMC arthritis
Severity diagnosis of carpal tunnel syndrome using sagittal view of MRI

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2 Tokyo Medical Center (meguro-ku, Tokyo)

Objectives / Interrogation: MRI has been gradually spreading for diagnosis of carpal tunnel syndrome. Most reports have been used axial images for the diagnosis, however, we focused on sagittal view of T2 fat suppression because pathology of the entrapment point can be well-described. The purpose of this study is to clarify the usefulness of sagittal view of MRI on diagnosis of carpal tunnel syndrome, and to compare with clinical or electrophysiological severity.

Methods: Sixty-three hands of 55 patients with carpal tunnel syndrome (19 males, 44 females, average age: 62.3 years) were included. All patients' wrist underwent simple MRI, and pseudo-neuroma was high signal on the sagittal image of T2 fat suppression. The maximum anteroposterior diameter (AP-D) and the distance between the proximal end of the high signal area and the wrist joint (LT-D) were measured. We also evaluated clinical severity according to Hamada's classification (Stage I: positive sensory disturbance without thenar muscle atrophy; Stage II: with thenar muscle atrophy; Stage III: impossible for thumb opponents). Motor nerve conduction study was performed and distal latency (DL) was measured, and more than 6.5 msec. was considered as severe group. We compared the AP-D and the LT-D and Hamada's classification and DL.

Results and Conclusions: There was significant positive correlation coefficient between the LT-D and DL (r=0.52, p<0.05), but not significance between the AP-D and DL. There was no significant correlation between the AP-D or LT-D and Hamada's classification. The cut-off value of the AP-D obtained using the ROC curve was 2.9 mm, which was significantly associated with Hamada stage II and III (p = 0.01). Similarly, the LT-D cutoff value was 8.9 mm, which was significantly related to severe group of DL (p = 0.04). Although high reliability of diagnosis for patients with carpal tunnel syndrome has been reported using axial view of MRI, we focused on sagittal view of MRI because constriction and/or pseudo-neuroma can be described. This study revealed that patients with more than 2.9 mm of AP-D and more than 8.9mm of LT-D could be diagnosed as severe group on clinical and electro-physiological studies. We believe carpal tunnel syndrome should be diagnosed using MRI without electro-physiological studies.

Keywords:
carpal tunnel syndrome, MRI
Reconstruction of multiple adjacent large finger pulps with the modified sensate free proximal ulnar artery perforator flap

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Objectives / Interrogation: To study the clinical effect of the reconstruction of multiple adjacent large finger pulps with the modified sensate free proximal ulnar artery perforator flap (PUAP).

Methods: From February 2013 to May 2016, 29 fingers in 13 patients with adjacent large finger pulp defects crossing the DIP joint were reconstructed by the modified sensate free PUAP. In order to reconstruct the sensation of two pulps in each patient (26 pulps), both of the proximal and distal ends of the cutaneous nerve in PUAP were dissected and anastomosed. There were 8 fingers in 4 patients with the index and middle finger pulp defects, 12 fingers in 6 patients with the middle and ring finger defects, and 9 fingers in 3 patients with the index, middle and ring finger defects. The flap size was from 5 cm × 3.5 cm to 7.5 cm × 4 cm, and the perforator artery was anastomosed with the digital artery in 7 cases and with the joint branch of digital artery in 6 cases. The artificial syndactyly of two or three digits were divided in 7 and 12 weeks accordingly after the flap transfer.

Results and Conclusions: 12 flaps survived uneventfully except the venous congestion was found in one flap which was salvaged successfully by acupuncture bleeding. Also, no congestion or ischemia occurred right after releasing the artificial syndactyly. The time of follow up was from 11 - 32 months with the average of 18 months after the last surgery. The static two point discrimination of the two groups was (7.08 ± 1.14) mm and (8.23 ± 2.12) mm, in which the pulp sensation was reconstructed respectively by the anastomosis between the digital nerve and the proximal or distal end of the cutaneous nerve in PUAP. These 26 sensate pulp flaps were also assessed by the Semmes-Weinstein monofilament test with the result of diminished light touch in 18 pulps and diminished protective touch in 8 pulps. The total active motion in all 29 fingers was (249±5.8) °. No patients but 2 suffered slight cold intolerance in the 2 insensate pulps. Conclusion The modified sensate free proximal ulnar artery perforator flap is a practical alternative for the reconstruction of multiple large adjacent pulps with satisfactory functional and aesthetic outcomes. Through anastomosing the proximal and distal end of the cutaneous nerve through PUAP with the unilateral digital nerve of two adjacent fingers, reliable sensation of the both pulps could be reconstructed.

Keywords:
Perforator flap; skin defect; Ulnar artery; Fingertip injury; Free transfer
Frozen thumb replantation: cases report

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Objectives / Interrogation: There is few report on replantation of a finger which has already been frozen. We report a case of successful replantation and functional recovery of a finger which was frozen before it was brought to us for replantation surgery.

Methods: A 59-year-old woman sustained a traumatic amputation of the right thumb. Her family members mistakenly put the thumb directly in ice (about -20° C), causing the thumb to freeze entirely. When she came to our hospital 5 hours after her injury, we saw that the severed thumb was frozen and was as hard as a stone. We put the thumb in the 5 ° C refrigerator freezer and the ice melt slowly. We replanted the thumb 2 hours later, after the frozen thumb was completely thawed and softened. We anastomosed two superficial dorsal digital veins, the proper radial digital artery of the thumb and the proper digital nerve of both sides.

Results and Conclusions: The thumb survived when the patient was followed up 6 weeks post operation, and the replanted thumb start to function.
Before this case, we replanted a 9-year-old girl's severed thumb. Her parent also mistakenly put the thumb directly in ice, which was also replanted successfully. We conclude based on the present case and our previous case that the frozen severed thumbs can survive after replantation.

Keywords:
frozen, replantation
Repair of a long finger defect with transfer of a great toe flap combined with second toe joint and iliac bone graft

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Objectives / Interrogation: We present the method of repairing 32 fingers with a great toe flap combined with the proximal interphalangeal (PIP) joint of the second toe and the iliac bone graft.

Methods: Between January 2010 and January 2018, 32 fingers with traumatic loss distal to the metacarpophalangeal (MP) joint were reconstructed with transfer of a great toe flap was combined with the proximal interphalangeal (PIP) joint of the second toe and the iliac bone was grafted. The second toe was grafted with the iliac bone. The free groin flap was used to repair the skin defect of the great toe.

Results and Conclusions: 32 cases of reconstructed finger and free groin flap survived completely. 1 finger was re-explored 8 days post operation owing to arterial embolism. We found the reconstructed fingers has sufficient length, but not good enough sensation and finger joint motion. However, because of the normal MP joint, these reconstructed fingers still can have basic function.
Transfer of a great toe flap combined with PIP joint of second toe and iliac bone graft can be used for reconstruction of finger loss with acceptable outcomes. However, the range of active motion of the reconstructed finger and lack of good recovery of sensation remain problems of this method.

Keywords:
reconstruction, second toe joint, iliac bone graft
Mechanics of a smith's fracture. -Caused by falling on the palm of the hand with wrist dorsal flexion-

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Objectives / Interrogation: Smith’s fractures generally occur when falling on a flexed wrist; however, orthopedic trauma surgeons often encounter distal radius fractures with volar displacement in patients who have allegedly fallen on the palm of their hands. In our survey, 62% of patients were injured on the palm of the hand. However, it is not known the mechanism of Smith’s fractures. The aim of this study was to reveal the pathogenesis of Smith’s fracture

Methods: The research plans are performed through a step-by-step investigation. First, to predict the type of distal radius fracture with finite element model (FEM), we created a 3D FEM from CT data of the wrist and analysis fracture pattern. Second, to obtain experimental proof of Smith’s fracture occurring upon the application of an impact on the palmar side using fresh frozen cadaver. Finally, to predict stress distribution on the distal radius when Smith’s fracture occurs.

Results and Conclusions: As the angle between the long axis of the forearm and the ground decreases, the fracture line shifts to the volar side and Smith’s fracture was predicted by FME when its angle was small. In cadaver study, Smith-type fractures were occurred in seven of 10 wrists. In FEA study to predict stress distribution, compression force was applied on the lunate fossa and transmitted to the volar side of wrist. Tensile stress was generated at the dorsal side of the wrist. Therefore, the dorsal cortical bone broke by traction force, and a proximal fragment was dorsally displaced by rotation moment.

In conclusion, Smith’s fractures occur not only as a result of falling on the dorsum of the hand during volar flexion, but also as a result of falling on the palm of the hand during dorsal flexion.

Keywords:
Smith fracture, finite element model, cadaver
EPINEPHRINE-LOCAL ANESTHESIA - NO TOURNIQUET FOR CARPAL TUNNEL RELEASE - 66 CASES

List of authors:
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Objectives / Interrogation: A recent development in Hand Surgery is the use of epinephrine-local anesthesia without tourniquet. This method is allegedly safe and allows checking digital mobility. The goal of this study is to assess the intra and postoperative efficacy and comfort of this innovative anesthesia in 2 groups of patients with carpal tunnel release (CTR). Interrogations were: Incidence of arm pain, complications, amount of bleeding, patient satisfaction, length of hospital stay.

Methods: 66 CTR were performed through a mini-open approach, divided in 2 groups: a) n=27: 2% lidocaine + 0.5% bupivacaine + epinephrine 1:200.000 + light sedation by anesthesiologist; b) n=39: 2% lidocaine + epinephrine 1:200.000. Descriptive, comparative, retrospective, observational study through a phone inquiry on: 1) Pain at needle prick, injection or during surgery; 2) Additional anesthetic requirement; 3) Length of analgesia; 4) Dyspnea; 5) Brachialgia; 6) Nausea - Vomiting; 7) Hospitalization ; 8) Care by a family member; 9) Time to eating; 10) Post-op medication; 11) Sleep quality; 12) Dressing staining; 13) Future choice of a different anesthesia.

Results and Conclusions: There were 66 patients: 17 males and 49 females, with a mean age of 66.9 ys. (21-90), operated on between 2008 and 2018. All the cases were performed on an outpatient basis. Post-op hospital stay was 1-3 hours. Bleeding was minimal and did not hinder the surgery. All the patients were satisfied and would choose this procedure instead of general or regional anesthesia. They did not report intra or post-op side-effects, regardless of the group which they belonged to. They also did not show statistic difference regarding comfort. Anesthesia length was mostly more than 6 hours, especially with the addition of bupivacaine. CTR under local lidocaine + epinephrine, without tourniquet, has been safe and with no complications. Bleeding was minimal and visualization clear. Bupivacaine addition lengthens the analgesia time. Benefits for patients were: No intra nor immediate postoperative pain, neither local nor at the usual placement of the tourniquet; and less hospital stay. The inherent simplicity of the operating room should reduce costs. Though the participation of an anesthesiologist is adviceable, it is not mandatory, depending on local regulations. We do not recommend performing the surgery outside an operating room, nor to omit a pre-surgical evaluation.

Keywords: no tourniquet carpal tunnel release local epinephrine anesthesia
IFSSH19-648

Long-term follow-up of scapho-lunate reconstruction with the DRAW technique

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Objectives / Interrogation: Aim of this study was to evaluate the long-term effectiveness of the DRAW technique, which is a personal arthroscopic-assisted minimally invasive technique to reconstruct the scapholunate (SL) ligament using the trapezoid-to-second metacarpal joint bone-ligament-bone graft.

Methods: Between January 2009 and June 2014, thirty-one patients underwent the arthroscopic-assisted minimally invasive technique to reconstruct the SL ligament. All patients presented with chronic (>6 weeks) SL dissociation (19 Geissler type III, 12 Geissler type IV lesions) and no signs of arthrosic degeneration. Briefly, the surgical technique consisted in: SL rotatory subluxation reduction and stabilization with percutaneous K-wires, trapezoid-to-second metacarpal graft harvesting that was eventually advanced and secured within a tunnel created through the SL bones. A volar cast in neutral position of the wrist was applied and maintained in place for about 2 months when K-wires were removed and active range of motion exercises began. Follow-up visits were performed at 3, 6, 12 months, and every year afterwards. Radiographic, functional, and subjective outcome measurements were collected during the outpatient visits. Statistical analysis was performed with a significance threshold of P < 0.05.

Results and Conclusions: Mean follow-up was 71.55 months (range 50 to 115). All the grafts were in place with no SL synostosis or any carpal bone necrosis reported. No progression toward SLAC was observed in any patient. Only four patients had SL gap > 3 mm at the final follow-up however they returned to a pain-free wrist that allowed returning to their daily life activities. Patients were returned to work by the end of the 4th month and to contact sports and heavy jobs by the end of the 6th month. All the radiographic, functional and subjective outcomes analyzed not only significantly improved between the preoperative period and the 24-month follow-up but they also were maintained at the last follow-up or further improved (wrist mobility, grip strength). The DRAW technique ensures anatomical SL ligament reconstruction through a minimally invasive arthroscopic-assisted technique that does not require extensive capsulotomy, hence dramatically lowering the risk for reduced postoperative wrist mobility. The restored normal kinematics was also demonstrated by the long-term follow-up, where functional outcomes were even improved, while wrist degenerative changes were prevented.

Keywords:
Wrist, scapho-lunate, ligament, arthroscopy
Comparison between dorsal capsuloplasty techniques for chronic injuries of the scapho-lunate ligament: Viegas vs Berger.

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Objectives / Interrogation: All the many surgical techniques reported in medical literature for the reconstruction of the scapho-lunate ligament show benefits as well as complications, especially regarding stiffness. This study compares two dorsal capsuloplasty techniques widely used and validated for the treatment of chronic partial scapho-lunate ligament injuries: Berger vs Viegas techniques.

Methods: This is a retrospective study of 39 patients (25 females and 14 males) aged between 14 and 59 years (mean value 31.6yrs. ± 13.22) suffering from chronic partial scapho-lunate (SL) ligament injury corresponding to type III in Geissler's classification. They were divided into two groups of 20 subjects each; group A received Viegas' technique while group B received Berger's technique. All patients reported a history of direct blunt trauma to the wrist. Inclusion criteria were as follows: chronic partial tear of the ligament (Geissler type III); absence of joint chondropathy; follow-up up to 6 months. These were assessed both pre- and post-operatively by measuring function (PRWHE), grip strength (JAMAR), radio-lunate and scapho-lunate angles and by evaluating flexion-extension range of motion.

Results and Conclusions: The outcome revealed clinically and statistically significant differences in favor of Viegas' technique in terms of recovery of autonomy, recovery of grip strength, reduction in the SL angle and, finally, recovery of wrist flexion. The study showed that Viegas' capsuloplasty is more effective than Berger's in terms of grip strength recovery, recovery of disability, range of motion, especially flexion, and correction of the carpal angles, especially the SL. The Authors believe that this is due to the biomechanical properties of Viegas technique. We also believe that this study also provides interesting information regarding the indication of one technique over the other to treat Geissler' type III lesions in relation to type of patient, work and sport activity performed.

Keywords:
capsuloplasty, wrist, scapho-lunate, ligament, reconstruction
Can we make tendon transfers shorter? Biomechanical comparison of different suture techniques

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Objectives / Interrogation: In tendon surgery early mobilisation is the key to have superior outcomes. It reduces adhesion formation, improves tensile strength, vascularity and cellularity of the repair site. The side-to-side (STS) technique was developed to provide the adequate strength to allow early mobilisation. The original description suggests 50mm overlap region. The idea of this study was to measure the strength and stiffness of STS sutures with smaller overlap region, to find the minimal length needed. We tested the Pulvertaft (PT) repair and three types of the STS repair with 50mm, 40mm, 30mm overlap region.

Methods: Flexor digitorum profundus tendons were freshly harvested from mangalica pig front legs. We used standard 7mm wide tendons. For the PT technique we used the 3 weave modification with cross-stitch sutures at the insertions, and 2 stitches at both ends. For the STS repair we measured the wanted overlap region, secured it with two end stitches, and made the running cross sutures on both sides of the repair. All mechanical tests were carried out using a fatigue testing machine (Instron8874). The free ends of the repairs were wrapped in wet gauze and secured with clamps. All tendons were pre-conditioned, were allowed to stress-relax for 30secs, and then were elongated to failure. The tendons were kept wet with physiological saline solution. We measured load of first failure, ultimate load and repair stiffness.

Results and Conclusions: All but one failure occurred in the repair region, one occurred at the clamp. PT repairs failed with the graft tendon pulling out of the recipient. STS repairs failed with longitudinal shearing of the tendon fibers. The ultimate load (highest force till failure) was significantly higher at all of the STS repairs than the PTs. There was no significant difference between the various STS repairs at ultimate load. The stiffness (slope of the linear region of the load deformation curve) of all the STS repairs were higher than the PT repairs.

The main result of this study was that the STS suture method tested here produced stronger and stiffer repairs compared to the tested variation of the PT repair. The 30mm overlap STS suture strength is not significantly lower than the STS repair with the 50mm overlap. All tested repairs provide more than enough strength to allow early mobilisation. STS repairs offer more strength, more stiffness, thinner reconstruction site than the PT repair. The 30mm overlap region also can be used on shorter tendons which otherwise would need grafting.

Keywords:
Side-to-side suture technique, early mobilisation, tendon surgery
Scaphoid fractures with scapho-lunate ligament involvement: instability or ligamentous laxity? Role of arthroscopy and pinning

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Objectives / Interrogation: The aim of this study is to evaluate the role of arthroscopy in the treatment of scaphoid fractures; and in particular we investigated if ligament alterations found arthroscopically corresponded to actual lesions or just laxity. Furthermore, we evaluated if treatment through the pinning of the scapholunate joint can alter the results.

Methods: We performed a retrospective study on 39 patients that underdrew surgery from 2010 to 2016 for scaphoid fractures. Patients were divided in 4 groups (A, B, C, D) based on the surgical technique adopted and the finding of a lesion of the scapholunate ligament: A - fixation with a percutaneous screw without the use of arthroscopy, B - arthroscopy assisted fixation with a percutaneous screw without signs of scapholunate ligament lesions, C - arthroscopy assisted fixation with a percutaneous screw with signs of partial scapholunate ligament lesions, treated through pinning, D - arthroscopy assisted fixation with a percutaneous screw with signs of partial scapholunate ligament lesions, not treated.

The inclusion criteria were B-type scaphoid body fractures (B1 and B2). Exclusion criteria were proximal fractures, pseudarthrosis or severe arthritic degeneration.

Results and Conclusions: Of 29 cases treated with arthroscopy assistance only in 9 cases there were no scapholunate ligament lesions. In the other 20 cases, according to the Geissler classification, there were 2 type I lesions, 5 type II lesions and 13 type III lesions, no type IV lesion was detected. Our results show the pain to be modest (VAS scale). The ROM results show a small difference (the average ROM 6° in group A, 3.89° in group B, 10° in group C, and 7.3° in group D).

The results were on average good to excellent in all groups. In our study groups we observed no statistically significant differences of the outcomes analyzed.

From our experience and results the treatment of acute partial scapholunate lesions through pinning is not necessary. The differences between our 4 study groups are not statistically significant and so the 4 treatment options should be considered equal.

Keywords:
arthroscopy, scaphoid, fracture, wrist
Ulnar head offset to restore DRUJ stability

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Objectives / Interrogation: The distal radioulnar joint (DRUJ) is essential for forearm rotation. Stability is provided by the articulation of the ulnar head with the sigmoid notch and the supporting soft tissue stabilizers (TFCC and distal oblique band of the interosseous ligament or DIOL). In some cases of DRUJ dysfunction, an ulnar head replacement is necessary to address pathology in the bony structures. In lieu of using a constrained DRUJ prosthesis, surgeons often rely on reconstructing soft tissues to provide DRUJ stability. However, this is difficult and stability is frequently poorly restored. We hypothesize that by incorporating an offset on the ulnar head implant that can be dialed into the rotational position to where it is most beneficial, tension will be reintroduced to the DIOL and additional stability will be provided.

Methods: Cadaveric forearms were used to measure the relative displacement of the ulna during simulated push pull (piano key sign) testing of the wrist. The ulna was fixed to a rigid beam and the hand was pinned through the 2nd-5th metacarpals allowing the radius to be rotated and fixed in supination, neutral, and pronation. The initial location of the radius was measured under a 5lbF preload. Gradual loads were applied up to 20lbF and the resultant displacement was measured. The TFCC was then excised to create DRUJ instability. The magnitude and direction of instability was measured by comparing radial displacement under load to that of the intact specimen. The ulnar head was then replaced with an ulnar head arthroplasty of the same size as the native head. Measurements were then repeated using a standard ulnar head (no offset) and repeated with a 2mm offset ulnar head. Specimens were tested in pronation, neutral, and supination and with the direction of the offset dialed into full pronation, neutral and full supination.

Results and Conclusions: The addition of a 2mm offset decreased displacement of radius relative to the ulna in all positions but most effectively in the direction in which the offset was dialed. Conclusion: A directed 2mm ulnar head offset may improve stability of the DRUJ joint after ulnar head replacement.

Keywords:
DRUJ instability, ulnar head arthroplasty, offset
Biomechanics of External Fixator of Distal Radius Fracture, a new approach: Mutifix Wrist

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Objectives / Interrogation: The management of distal radius fractures includes several techniques, starting from cast immobilization till surgery through different treatments: plates and screws, external fixators.
Aim of this presentation is to assess and evaluate which are the key factors that may affect the stability and stiffness of the Mutifix wrist and to present the clinical experience related to the implant for this new external fixator device

Methods: The new external fixator device named Mutifix Wrist ® is based on the use percutaneous pins or K wires linked to ax external support that ensures rigidity to the whole construct.
Mutifix Wrist is an external fixator whose main body is made of a shapeable aluminum alloy that can allocate multiple k-wires having random orientations.
The holes on the aluminum bar can house K wires whose diameter varies between 1,5 mm and 2 mm and whose orientation depends on the fracture characteristics and on the reduction strategy adopted.
Thanks to this, the device is versatile and can adapt to different patient's and fracture's characteristics. The k wires are clamped to the bar with the use of a dedicated tool by plastic deformation of the bar around the holes. In addition to this a 5 mm carbon bar can be connected to the main frame body to stiffen the construct. The carbon bar is linked to the aluminium bar through the steel clamps at the end of the main fixator body and allows (as an option) to place additional out of the plane clamps to fix additional pins in multiple planes. These k wires are fixed to the carbon bar through an optional clamp.
K wires or pins allows to cross the fracture and to fix small bone fragments in case of comminuted fractures.
This external fixator, non-brindging, is a very versatile device because it allows to place pins or wires in multiple directions, angulations and planes achieving an optimal reduction in different kind of fractures.

Results and Conclusions: Compared to ORIF with plate the use of an external fixator is an easy method, reduces the risk of damage for surrounding soft tissues, permits to maintain the obtained reduction. Moreover, is a really versatile technique that allows to manage both intra and extra articular fractures.

Keywords:
wrist, fracture, external fixation, radius
Interposition arthroplasty with the Amandys pyrocarbon implant in rheumatoid wrist

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Objectives / Interrogation: Management of the pancarpal arthritis in rheumatoid wrist is controversial. The most common treatment is total wrist fusion, but total wrist replacement offers a motion-preserving alternative. The purpose of this study is to present the results of the interposition arthroplasty with the Amandys pyrocarbon implant in rheumatoid wrist.

Methods: We performed a retrospective review of 28 interposition arthroplasties for rheumatoid wrist arthritis. Eighteen females and 5 males were included, with a mean age of 55.7 years. The mean follow-up was 45 months. We measured range of motion, grip strength, pain (VAS). Function was evaluated preoperatively and at the last follow-up with the DASH and PRWE scores.

Results and Conclusions: Results Mean range of motion in flexion-extension was maintained while mean inclination and rotation range of motion, mean grip strength, pain and function scores who showed significant improvement. The mean range of motion increase postoperatively from 65° to 70° in flexion-extension, from 25° to 35° in inclination and from 130° to 147° in rotation. The mean grip strength increase from 10kg (54% of the contralateral side) to 17 kg (78%). The mean pain score decreased from 6,3/10 to 2,5/10. The mean PRWE score decreased from 62/100 to 27/100. The mean QuickDash score decreased from 63/100 to 33/100. All patients were satisfied or very satisfied. Three patients had an early reoperation for repositioning their dislocated implant. No implant had to be removed.

Conclusions Amandys arthroplasty is a reliable alternative to total arthrodesis or total wrist prosthesis in rheumatoid wrist. The implantation technique must be rigorous in order to avoid technical errors that can lead to potential implant instability. Indications must be limited to a well-aligned wrist with competent capsular structures.

Keywords:
wrist, rheumatoid arthritis, arthroplasty, implant, pyrocarbon, interposition
Biomechanical Comparison of Trapeziectomy and Suture button suspension-plasty versus Trapeziectomy and FCR ligamentous reconstruction for Thumb Carpometacarpal Arthritis

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Objectives / Interrogation: Osteoarthritis of the trapezio metacarpal joint is common and disabling. Several procedures have documented success in treating pain and instability. Central to the majority of the treatment is trapeziectomy. Our objective was to compare the results of suture button (SB) suspension-plasty and FCR tendon ligamentous reconstruction after trapeziectomy under cyclical loading of a mechanical model designed to simulate lateral pinch of the thumb and index finger.

Methods: 18 fresh-frozen below elbow cadaver specimens were used, they were randomly assigned in two groups: 9 underwent trapeziectomy and suture button and 9 trapeziectomy and FCR suspension procedure. Scapho-metacarpal distance was measured using fluoroscopy before and after trapeziectomy, and either type of reconstruction and biomechanical testing which was conducted on a servo hydraulic load frame (Bionix Landmark, MTS, Eden Prairies, MN) to simulate lateral pinch. Fixed amount of weights were tied to the sutures connecting the tendons of flexor pollicis longus (FPL, 300g), adductor pollicis (AdP, 150g), and abductor pollicis longus (APL, 200g).

Results and Conclusions: The mean scapho-metacarpal distance pre-trapeziectomy for the FCR reconstruction group (n=9) was 11.13 mm with a standard deviation of 2.18 mm. The average post-trapeziectomy space for the FCR specimens (n=9) was 8.38 mm with a standard deviation of 1.63mm. This difference was statistically significant (p=0.0006).
The mean scapho-metacarpal distance pre-trapeziectomy for the Suture button group (n=9) was 9.3 mm with a standard deviation of 2.87 mm. The average post-trapeziectomy space for the SB specimens (n=9) was 6.63 mm with a standard deviation of 3.07 mm. This difference was statistically significant (p=0.0022).

For the matched pairs, the post testing subsidence was 2.66 mm (SD 2.04) for the SB specimens (n=9) and 2.74 mm (SD 1.68) for the FCR specimens. This was statistically insignificant (p=.53).

Biomechanical testing indicates there is statistically significant subsidence after trapeziectomy and either FCR reconstruction or Suture Button reconstruction. However, when both procedures are compared, there is no statistically significant difference in the subsidence (p=0.53) between Trapeziectomy and FCR and Trapeziectomy and SB suspension.

Suture button suspension shows biomechanical results that are comparable to FCR interposition.

Keywords:
Suture button suspensionplasty, thumb carpometacarpal arthritis, trapeziectomy, tightrope, basal joint, FCR interposition
Return to employment after carpal tunnel release (REACTS): a prospective cohort study

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Objectives / Interrogation: To explore when and how patients return to different types of work after carpal tunnel release (CTR) and to identify the key factors predicting the duration of post-operative sick leave.

Methods: Participants with CTS (carpal tunnel syndrome) were recruited pre-operatively from 16 UK sites. Eligibility criteria included: working in paid employment for more than 20 hours per week and no history of CTR. Demographic, clinical, functional and occupational details were collected at baseline. After CTR, participants were followed-up weekly until return to work with a symptom diary, and by self-reported questionnaire at 4 and 12 weeks. Operative details were extracted from the medical records.

Results and Conclusions: Results:
A total of 222 individuals were recruited (61% female). Mean age was 51 years (SD 9.9) and mean body mass index was 29.6 (SD 6.1). Most participants had experienced CTS symptoms for more than a year and 40% were expecting bilateral CTR via staged procedures. Fewer than half of participants were diagnosed with classic CTS according to Katz hand diagrams. Mean Atroshi CTS-6 scores were 3.3 (SD 0.9) for the right and 3.4 (SD 1.0) for the left.

Nineteen percent of participants were self-employed, 77% were employed with a permanent contract and seven individuals had a temporary or zero hours contract. Forty-four percent of participants worked in manual occupations using the National Statistics Socio-Economic Classification. Median expected work absence after CTR was 14 days (IQR 14-28 days); 17.5 days for manual workers (IQR 14-28 days) and 14 days for non-manual workers (IQR 10-28 days).

Study follow-up will be completed in January 2019. The return to work processes and timescales will be summarised descriptively and a Cox Proportional-Hazards analysis will be used to determine the key factors influencing return to work time among this cohort.

Conclusions:
There is a lack of evidence-based information advising when patients might expect to be able to return to different occupational duties after CTR and these findings will help shape future guidance. We have recruited a cohort of patients undergoing CTR and will describe the reported time taken to return to different types of work. Analysis of the determinants of return to work time may identify potential targets for the development of interventions to improve return to work outcomes after CTR.

Keywords:
Carpal tunnel syndrome, carpal tunnel release, return to work, sick leave

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Objectives / Interrogation: The aim of this study was to use a routinely collected data generated in the NHS in England to identify the incidence of revision CTD surgery, and the patient factors associated with revision. The secondary aim was to identify the rate of other complications following CTD surgery.

Methods: Validated procedure codes (OPCS codes) were prospectively collected as part of routine care were used to identify primary and revision CTDs in adults from April 1998- 2017. Disease status was defined by ICD-10 code. Patients were followed up until death or April 2017. Where possible, episodes were linked for those who had undergone both primary and revision CTD to calculate time to revision. Cox regression analyses were used to identify factors influencing revision.

Secondary complications studied included trigger finger, tenosynovitis, wound dehiscence, wound infection, tendon injury and median nerve/ vascular injury.

Results and Conclusions: 855, 832 primary CTDs were undertaken, 68% in women, with a significant peak in surgeries undertaken in women between 45-60 years of age. 29,288 (3.4%) of patients underwent revision CTD in the 19 year period; 18,737 primary CTDs were linked with a revision on the same hand. The median time to revision was 351 days (IQR 144 to 966). Time to revision was significantly influenced by male gender, increasing age and a past medical history of diabetes. The overall rate of complications in the first 30 days after surgery was 0.05% and 0.34% for complications occurring at any time following surgery.

Using real world data over 19 years, the incidence of revision CTD in England was 3.18 per 1000 person years. A history of diabetes, increasing age and male gender were significant factors in revision. Over 50% of patients that undergo revision do so within one year of primary surgery and the overall complication rate is very low.

Keywords:
Carpal Tunnel Syndrome; Revision Surgery; Epidemiology; risk factors; complication
Darrach's procedure in total wrist arthroplasty

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Objectives / Interrogation: Concomitant painful arthrosis in the radiocarpal and DRUJ joint may be treated by combining total wrist arthroplasty (TWA) with resection of the distal ulna (Darrach's procedure). Results following Darrach's procedure combined with TWA and Darrach's procedure performed on wrists with previously implanted TWA are presented.

Methods: From 2001 to 2017 Darrach's procedure was performed on 30 (25 Motec®, 5 ReMotion®) of 164 prosthetic wrists, either in combination with (17/30 wrists) or median 14 (2 to 55) months following TWA implantation (13/30 wrists). The patients completed the QDASH and PRWHE scores and graded radial and ulnar sided wrist pain preoperatively and at follow-up. AROM (flexion, extension, radial and ulnar deviation), forearm rotation, and grip strength were measured.

Results and Conclusions: In one patient a dorsally prominating ulna end caused rupture of the extensor tendons to the 3.-5. fingers two months after the procedure. He was reoperated with tendon transfer and further shortening of the ulna. Additional ulna shortening (re-Darrach) was done in two patients after 15 and 31 months due to continuing pain and radiological impingement between the radius and the shortened ulna. In 6/30 patients the arthroplasty was revised to a new arthroplasty (5) or arthrodesis (1) due to muscular imbalance (1) or loosening of the distal (3), proximal (1) or both components (1) after median 3.2 (0.5-9) years.

Two years after combined TWA and Darrach's procedure (n=17) there was a significant improvement in PRWHE (65 vs 27), Q-DASH (50 vs 26), radial sided wrist pain at rest (31 vs 16) and activity (64 vs 31), ulnar sided wrist pain at rest (38 vs 10) and activity (65 vs 21), supination (59 vs 73°), AROM (74 vs 110°) and grip strength (JAMAR 13 vs 19 kg) (p<0.05). Pronation (80 vs 77°) was unchanged.

Darrach's procedure performed on wrists with TWA in situ (n=13) resulted in significant improvement of ulnar sided wrist pain at rest (39 vs 15) and activity (72 vs 36) two years later (p<0.05), without affecting pain on the radial side of the wrist at rest (18 vs 17) or activity (34 vs 35). Pronation improved significantly (76° vs 82°, p<0.05). Supination (72 vs 79°), AROM (104 vs 103°) and grip strength (JAMAR 19 vs 20 kg) remained unchanged.

Conclusions: Darrach's procedure results in ulnar sided pain relief and improves function in patients with TWA and painful DRUJ arthrosis.

Keywords:
Distal radioulnar joint, DRUJ, arthrosis, osteoarthritis, total wrist arthroplasty, TWA
3D finite elements study of stresses in the wrist and effect of different osteotomies used in Kienböck's disease.

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Objectives / Interrogation: In Kienböck's disease, conservative surgical techniques aim to decompress the lunate. Many osteotomies are proposed. most involve the radius, the ulna or the capitate. Seven procedures were compared in terms of unloading by the authors.

Methods: To validate the comparison, a 3D finite elements model was built. The model was obtained from the segmentation of CT scans of an healthy wrist and imported into a finite element calculation software (Abaqus-Dassault systems). Authors add the ligaments, the cartilage shell and the TFCC with physical properties according to the litterature.
The radius axial shortening (AS), lateral closing (LC), medial closing (MC), the Camembert osteotomy without (C) and with Sennwald osteotomy (CS), the capitate shortening without (Ca) and with the hamate (CaH) shortening were compared.

Results and Conclusions: The different osteotomies were simulated, and the contact forces and stresses were recorded. In the anatomical model, the loads towards the forearm are brought by the scaphoid at 56%, the lunate at 30%, the triquetrum at 14%.
In AS they are respectively 41%, 29%, 28%;
in LC 50%, 45% and 5%;
in the MC 20%, 61%, 18%;
in the Ca 79%, 11%, 10%;
in the CaH 70%, 5%, 25%;
in C 53%, 29%, 18%;
in the CS 80%, 0%, 20%.
In this model, The osteotomies that best discharge the lunate are the CaH osteotomy and the CS osteotomy. Compared to initial model, the CaH osteotomy overloads ulna, whose contact force increases from 14% to 25%. In the CS, most of the stresses are supported by the scaphoid, the ulna overload is minimal and the lunate discharge is complete. The Camembert-Sennwald osteotomy seems, in this model, to best unload the lunate, without overloading the ulna.

Keywords:
Kienböck's disease, unloading, Osteotomy, Camembert, Radius, Capitate
Our results with distal radioulnar joint hemiarthroplasty

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Objectives / Interrogation: Painful distal radioulnar joint (DRUJ) can be a consequence of distal radial fracture, ulnar impaction syndrome or general inflammation disease. Intact DRUJ is a prerequisite for normal load transfer from the hand to the forearm under heavy lift. After resection of distal ulna (Darrach procedure), which is the standard treatment in many centres for painful DRUJ, the biomechanics will be negatively changed, patients experience often painful impingement between the ulnar stump and the radius and instability of the forearm. Ulnar head replacement can reconstruct the normal load transfer and publications show good results up to 11 years follow up. Our intention is to show our short term results with uHead ulnar head prosthesis.

Methods: This implant consists of an uncemented stem and a head, both made of cobalt-chrome. The head includes two holes for placement of stitches against the TFCC and the ECU subsheath.
Nine patients were operated with uHead implant at our hospital between 2014 and 2017, all women, mean age of 66 years (range 48-82), 6 in the right hand. The diagnosis was osteoarthritis of the DRUJ without instability; 8 distal radius sequel and one psoriatic arthritis. Two patients received partial and one total wrist fusion at the same time, one operated with total wrist fusion earlier. The follow up was 9 (5-14) months.

Results and Conclusions: The mean pro-supinasjon ROM increased from 149 (80% of the other hand) to 163 degrees (92%). Grip strength increased from 10.1 (46%) to 12.4 kg (62%). VAS pain score decreased from 6.4 to 2.7, the Quick DASH score from 66.1 to 37.1 and the PRWHE from 73.4 to 37.6. All of the patients were satisfied with the results. We observed two complications, one irritation of the dorsal branch of the ulnar nerve and one loosening of the head from the stem. The latest was reoperated 3 days later; with removal of the stabilising stitches between the head and the soft tissues the problem became resolved. Since then we have dropped placement of these stitches.

Our results are promising, comparable with other published series. UHead implant seems to be a good solution to DRUJ arthritis without instability, however this well-documented implant is retrieved from the marked after fusion of the producer to a bigger company.

Keywords: DRUJ, osteoarthritis, hemiarthroplasty
A Rare Case of Seymour Fracture in an Adult with Non-Fused Growth Plates

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Objectives / Interrogation: Introduction

Longitudinal bone growth is influenced by a number of nutritional, hormonal and genetic factors. The mechanism for growth plate fusion is not fully understood yet. One hypothesis indicates that delayed fusion may be related to deficiency or resistance to oestrogen in adolescence. We present the first reported Seymour fracture (Salter Harris I) in an adult with failed growth plate fusion.

Methods: Case Report

A 19.5 year old man presented with a left (non-dominant) little finger open juxta - epiphyseal fracture of distal phalanx. This was consisted with a Seymour type fracture (Salter Harris I) with involvement of nail bed, germinal matrix and unugal subluxation. The injury was secondary to a fall from a bicycle 2 days prior to our clinic review. Five days post injury, the injury was managed with open reduction, nail bed repair (6/0 vicryl rapide) and one axial K-wire (0.9 mm) fixation. Further clinical assessment based on Greulich and Pyle (GP) and Tanner-Whitehouse (TW) revealed bone age of 14.5 and 14.3 years respectively. The K-wire was removed 4 weeks post-operatively and DIPJ was splinted for further 2 weeks. The patient regained normal extension of DIPJ post rehabilitation and was followed-up for 6 months without any functional deficit. A referral to endocrinology team was made to rule out any growth hormone, thyroid or pituitary related diagnoses.

Results and Conclusions: Conclusion

The correlation of radiological bone age was a key to guide our management of the first reported Seymour fracture in an adult. Actual age should not be the sole indicator to rule out juxta-epiphyseal fractures in adolescent patients. The management of Seymour fractures should be according to bone age rather than actual age.

Keywords:
Seymour, Fracture, Non-Fused, Bone Age
Interest of endoscopic release in recurrent carpal tunnel syndrome

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Objectives / Interrogation: A direct approach is the standard procedure for the treatment of recurrent carpal tunnel syndrome. However, this may be technically challenging due to adhesions and an increased risk of iatrogenic injuries. Endoscopic release of the median nerve within the carpal tunnel has become a well-controlled procedure, providing better anatomical vision than the conventional technique, thanks to the advances in technology. The aim of this work is to study the interest and feasibility of endoscopic release in the event of carpal tunnel recurrence.

Methods: Seven patients, with a mean age of 61 years old, presented a clinical symptomatology of carpal tunnel syndrome after an average of 6 years following initial surgery for median nerve release, by mini-open surgery in 6 patients and endoscopic surgery in one patient. Electromyography was positive in all patients and confirmed the recurrence. All patients were treated with endoscopic carpal tunnel revision surgery. They were informed of the risk of conversion to open surgery and all were reviewed and clinically evaluated.

Results and Conclusions: Endoscopic release was successfully performed except in one case in which the anterior carpal retinaculum did not deviate sufficiently in its distal part due to its thickness. We undertook an open conversion to complete the release. In all cases, the anatomical elements were visualized in order to protect them before section of the anterior carpal retinaculum. All patients were satisfied and reported an improvement in symptomatology.

Recurrence after carpal tunnel surgery is rare and should trigger a search for incomplete release in the majority of cases. Open surgery is the most commonly used technique and some authors advocate neurolysis of the median nerve associated with a protection flap as required. The interest of endoscopy is to visualize all the anatomical parts such as the median nerve, flexor tendons and the superficial palmar arch, in order to protect them before safely cutting the anterior retinaculum on its ulnar side, unlike with the open approach. Neurolysis exposes the patient to a risk of iatrogenic nerve damage. We believe that, for a first recurrence, it is sufficient to perform a simple release without any associated procedures. This study shows that endoscopic release of recurrent carpal tunnel can be safely performed with good results. Mastering the endoscopic technique is essential and reverting to open surgery must be the rule for cases with difficult visibility.

Keywords: recurrent carpal tunnel, endoscopic release, median nerve
Infection rates following carpal tunnel decompression in the community. Experience from the U.K.

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Objectives / Interrogation: The demand for elective hand surgery in England is predicted to double by 2030 as compared to 2011. With such increase in demand, the U.K. must seek strategies to reduce costs of treatment whilst still maintaining standards of care. Carpal tunnel decompression (CTD) performed in a treatment room rather than in theatre may provide an alternative setting whilst achieving cost savings. As yet, there are no U.K. based studies that identify the risk of infection following surgery performed in a treatment room and there are no studies whatsoever assessing the qualitative outcomes from patients undergoing hand surgery outside a theatre environment.

Our aim in this study was to identify the incidence of infection following CTD when performed in a primary care setting and to assess the qualitative outcomes following the procedure via patient reported outcome measures (PROMs).

Methods: A prospective review was performed in all patients undergoing open CTD in one single primary care centre by a single surgeon between January 2012 and August 2017. All identified patients within the study period were asked to complete the Boston Carpal Tunnel Syndrome questionnaire (BCTQ). This was completed before surgery and again at 6 months following surgery via postal questionnaire. A superficial infection was defined as an infection treated by antibiotics, either enteral or intravenous. A deep infection was defined as a collection requiring surgical debridement in theatre. Independent and paired t-test statistical analysis using SPSS V.23 (IBM Corp.) was performed to test significance of qualitative outcomes.

Results and Conclusions: Completed outcomes were available for 335 patients. The average age at time of surgery was 59 (range 26 - 94). Seventy per cent of cases were female. Sixty-two per cent of patients had surgery on their dominant hand. Two superficial infections requiring treatment with antibiotics were identified resulting in a superficial infection rate of 0.6%. There were no deep infections identified. There was a statistically significant improvement in both symptom and functional outcomes following surgery with results comparable to other studies where surgery was performed in theatre.

We believe that carpal tunnel decompressions performed in a treatment room is both safe and effective and surgeons should consider this as an alternative setting to the main operating room.

Keywords:
Infection, Carpal tunnel syndrome, decompression
JOINT SPACER - A NOVEL THERAPEUTIC OPTION FOR RHIZARTHROSIS

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Objectives / Interrogation: Thumb basal joint arthritis that affects up to 11% and 33% of men and women in 50s and 60s, respectively, is treated by several surgical techniques (Menon's interposition or LRTI arthroplasty, Mini TightRope CMC Technique). By using RegJoint spacer and avoiding resection of FCR or APL tendon, we simplify and shorten the surgery. We hypothesize that this new technique is a better alternative for rhizarthrosis operation, because it reduces post-OP pain and shortens the time until complete recovery.

Methods: In 92 pts (aged 43 - 81 years) with rhizarthrosis, dorsoradial longitudinal incision at the base of the thumb was performed. We created a capsular flap with a distal base over the TMC joint, following partial or complete resection of the trapezium. Thereafter, we inserted the RegJoint disk spacer and firmly sutured the capsule. In 23 pts we performed additional beak (volar) ligament reconstruction with APL or FCR tendon. Patients began with physiotherapy after 3 weeks of immobilization. Thereafter, we monitored their recovery for 1 year post-OP by performing QuickDASH score, VAS, Kapandji's 10-point functional score, Mayo wrist score and X-ray. The statistical significance of improvements were tested with 1W RM ANOVA (p < 0.05).

Results and Conclusions: All monitored parameters statistically significantly improved until the first month post-OP. Average measures of QuickDASH score reduced from 43.5 pre-OP to 34.5, 26.4 and 21.3 1m, 3m and 1y post-OP, respectively. Average VAS score, which was 7.1 pre-OP, also improved to 5.7, 3.1 and 1.9 1m, 3m and 1y post-OP, respectively. Kapandji's functional score improved from 4.7 point pre-OP to 5.9, 8.1 and 9.2 point 1m, 3m and 1 year post-OP, respectively. Mayo wrist score that was 45 preOP improved to 54, 69 and 76 1m, 3m and 1 year post-OP, respectively. Pre- and post-operatively X-ray controls were made to evaluate the distance between the base of first metacarpal bone and the remaining trapezium/distal pole of scaphoid. The average distance statistically significantly increased from 0.3 mm to 3.1 and 3 mm after 1 and 3 months, respectively. Until the 1st y post-OP the distance narrowed to 2.1 mm.

Using this novel and feasible technique of rhizarthrosis therapy, the final recovery outcomes are at least comparable to the other surgical techniques. Most importantly, we can perform earlier mobilization with significantly lower pain and stable (well-positioned) base of first metacarpal, which enables earlier return of patient to the workplace.

Keywords:
Joint spacer, TMC arthrosis, rhizarthrosis
Treatment of congenital upper limb muscular hypertrophy in hand

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Objectives / Interrogation: To introduce the hand deformity of congenital upper limb muscular hypertrophy and the treatment strategy.

Methods: From May 1992 to October 2012, 13 cases of congenital upper limb muscular hypertrophy were diagnosed by clinical characteristics, operative exploration and pathology result. The primary or other secondary macromelia were excluded. There were 8 males and 5 females with an average age of 6 (2 to 20 years). The presentation of the hand deformity, intraoperative exploration, the surgical treatment and outcomes were reviewed.

Results and Conclusions: Results The deformity of hand mainly includes excessive spreading in metacarpophalangeal (MP) joint, hyper-abduction of the thumb to radial and palmar side and hypertrophic web spaces, ulnar deviation and flexion deformity at the MP joints and cross finger deformity. Intraoperative findings include multiple aberrant intrinsic and extrinsic muscles with abnormal origin, insertion and orientation, and increased volume. The main surgical choice was proper resection of the aberrant muscles, abnormal musculature and skin to reduce volume of the thenar and hypothenar eminence, correction of hyper-abduction on thumb and little finger and correction ulnar deviation and flexion of the MP joint. Other treatment strategies included metacarpal osteotomy to correct cross-finger deformity, surgical release skin and soft-tissue to correct MP joint flexion, relocation and stabilization the central band to help correcting ulnar deviation and flexion of the MP joint. All the patients got different degrees of cosmetic and functional improvement with an average follow-up of 2.5 years.

Conclusions The hand deformity of congenital upper limb muscular hypertrophy was mainly attributed to congenital aberrant intrinsic and extrinsic muscles with abnormal insertions and orientation, and increased volume. Surgical corrections can improve the appearance and function of the hand to different degrees.

Keywords:
Congenital upper limb muscular hypertrophy; hand deformity; treatment
Bilobed Flap in Hand Clinodactyly Reconstruction: Technique Description and Result Appraisal

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Objectives / Interrogation: Clinodactyly is a congenital hand deformity that is characterized by coronal angular deviation and may occur in thumbs or fingers . Surgical treatment is indicated for severe angulations. Among described techniques, one of the options consists of bone alignment by wedge-shaped addition osteotomy of the anomalous phalanx. Such alignment maneuver creates a problem in skin cover, along with soft tissue tension at the concave aspect of the deformity. Hence, some sort of skin flap is required for the adequate operative wound closure. We aim to demonstrate the aforementioned technique, and to assess the results of bilobed flap in the treatment of hand clinodactyly.

Methods: Retrospective study of patients that were submitted to this surgical procedure between January 2008 and January 2017. Five patients were included in the study, including nine operated digits. Surgical indication consisted of angular deviations above 30 degrees. Patients with thumb deformities, as well as those deformities associated to syndromes, were not excluded from the study. Functional and cosmetic outcomes with the technique were assessed, as well as complications and the satisfaction rates of the family.

Results and Conclusions: All patients had satisfactory functional and cosmetic results, with a mean skin healing of 18.6 days. Among nine operated digits, only one of the patients presented vascular compromise at the distal portion of the first flap lobe, albeit without necrosis or the need for any additional procedure. Patients were followed up on a minimum of 12-month interval. No deformity recurred during the observation period.

The use of bilobed flap for the treatment of hand clinodactyly is a good option for skin cover after the osteotomy.
Bilobed Flap in Hand Clinodactyly Reconstruction

Keywords:
ELECTROSPUN PLGA NANOFIBERS ON COLLAGEN AS A NERVE CONDUIT

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Objectives / Interrogation: Defects in peripheral nerve poses can pose as a difficult problem for surgeons to address. Many different techniques have been utilized to address this gaps including inserting a nerve conduit. We aim to develop an aligned biocompatible cell-seeded PLGA on collagen mat as a nerve conduit for use in peripheral nerve regeneration. Our previous work utilised skin fibroblasts but this current work utilised human mesenchymal stem cells differentiated into nerve cells. We will describe the method of constructing a tubular conduit from electrospun PLGA and the addition of collagen layer and human mesenchymal stem cells (hMSC) into this conduit.

Methods: The solvents used were poly lactic-co-glycolic acid (PLGA) PL85GA15 was used with Dichloromethane (DCM) and Dimethylformamide (DMF). We utilised the electrospinning technique. We analysed fiber morphology, average diameter and interfiber junction and tested for mechanical strength. The neural-differentiated human mesenchymal stem cell (hMSC) was seeded into the collagen-layered nanofibers and a biocompatibility assessment was done to assess cell viability. Aligned electrospun PLGA on a collagen sheet was rolled into a tubular conduit. The designed conduits were seeded with hMSC and investigated with physical, mechanical and microscopic analyses and the degradation rate was measured.

Results and Conclusions:
The electrospun fibres were elongated, relatively aligned and with a smooth surface. The fibres had a diameter of average length of 0.96 microns. The constructed aligned fibres were successfully seeded with mesenchymal stem cells which had further differentiated into neural cells.
The nerve conduits measured 40.0mm long, an internal diameter of 2.0mm and thickness of 1.03mm. The degradation study of nerve conduit showed the PLGA fibres did not degrade further after 12 weeks.

Using electrospun PLGA for nerve conduit construction is inexpensive and can be replicated. Fibres which are aligned improves growth of neurite and enhances maturation. Nerve conduit tensile strength is improved by adding collagen. This nerve conduit composed of collagen-layered PLGA and seeded with hMSCs is biocompatible and suited for nerve cell proliferation. Thus it has the potential to be inserted into a nerve gap in peripheral nerve surgery.

Keywords:
nerve conduits, PLGA, electrospinning, mesenchymal stem cells
Lunate preserving pronator quadratus pedicled bone graft in the treatment of Kienböck's Disease

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Objectives / Interrogation: Pronator quadratus (PQ) pedicled bone graft (BG) was one of the vascularized BG option for the treatment of Kienböck's Disease. We inserted a pronator quadratus pedicled bone graft to the avascular lunate with preserving the cortico-cartilaginous portion of the lunate.

Methods: Twenty seven patients with Kienböck's disease (three patients of Lichtman stage II, 13 patients of IIIA and 11 patients of IIIB) were treated by lunate preserving PQ pedicled BG between September 2005 and July 2014 and followed more than two years. There were 14 men and 13 women; the mean age at the time of surgery was 42.4 ± 13.4 years (range, 17-66 years). Radiological changes including lunate morphology, Lichtman stage and radiological parameters were compared between preoperative and final follow up. The wrist flexion/extension angle, grip strength, and Disabilities of the Arm, Shoulder and Hand (DASH) scores, pain VAS were also evaluated.

Results and Conclusions: Eighteen patients (66.7%) showed radiological improvement in lunate at least one of sclerosis, cystic changes or fragmentations after operation: sclerosis in 14, cystic changes in three, and fragmentation in five patients. The preoperative Lichtman stage was not changed in 23 patients, but aggravated in 4 patients. In radiological evaluations, Stahl index was significantly decreased after operation (p=0.012), but no significant differences were observed in the radioscaphoid angle and carpal height ratio. The grip strength was significantly improved after operation (p<0.001), but was not in wrist ROM. The mean DASH score was 16.7 ± 14.0 (range, 1.7-50.8) and 18 patients (66.7%) did not have any pain at the wrist during daily activity. Lunate preserving PQ pedicled BG could improve lunate morphology in some extent, but did not restore the already changed carpal malalignment. However, this technique was effective in pain control and grip strength improvement. This technique could be a useful alternative to previous vascularized BG techniques in the treatment of Kienböck's Disease.

Keywords:
Kienböck's Disease; avascular necrosis; lunate; pronator quadratus; vascularized bone graft
Outcomes after Long Gap Allograft Reconstruction in the Upper and Lower Extremities: A Retrospective Review

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Objectives / Interrogation: The use of processed nerve allograft (PNA) in peripheral nerve surgery is rapidly evolving. Favorable outcomes have been reported for PNA as compared to autograft in the upper and lower extremities, and cranial nerves, for gaps up to 70mm. Yet, there is limited data on reconstruction of gaps greater than 70mm. Autograft data is also limited in longer gaps, and shows mixed results. To evaluate the effects of PNA, we selected patients with insufficient donor nerves, to evaluate the use of allograft to reconstruct injuries with gaps greater than 70mm. The objective was to evaluate early outcomes for PNA repair of injuries greater than 70mm at an academic Level-1 trauma center.

Methods: Retrospective review of patients who underwent reconstruction with PNA greater than 70 mm was performed. All procedures were performed by fellowship trained hand surgeons. Functional recovery, Tinel's sign, and sensory tests were recorded for all postoperative follow-up visits. When possible, electromyogram testing (EMG), nerve conduction study (NCS) were obtained to quantify re-innervation. Acute and sub-acute nerve transfers were cataloged. Complications and revision procedures were also recorded.

Results and Conclusions: Ten patients were included in our study. Average age was 31 (range 21-41 years). Eight patients (80%) were male. Ninety percent of reconstruction were in the upper extremity with an average gap length after resection of 17cm (7.5-36cm). All patients had multiple connected allografts used during their reconstruction. Mean follow-up was 4 months. All patients showed signs of nerve regeneration through the PNA, and advancing Tinel's. Five patients had EMG/NCS studies, one of which had serial studies performed. Two patients showed return of activity in a motor unit of the reconstructed nerve. Seven patients underwent Semmes Weinstein testing, and demonstrated some return of sensibility in the nerve distribution. The two longer term follow up patients showed signs of motor return and increasing range-of-motion. No complications directly related to nerve reconstruction or revisions were observed.

All patients in our cohort have shown short-term improvement in strength, sensation, and functional outcomes after allograft reconstruction of nerve injuries with gaps greater than 70 mm. Quantitative assessment of recovery is ongoing but encouraging. Early data suggests that long-term follow-up may show the use of allograft in nerve gaps greater than 70 mm to be a promising reconstructive option.

Keywords:
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TFCC foveal tear with distal radius fracture

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Objectives / Interrogation: Purpose: This study aims to evaluate the hypothesis that TFCC foveal tear is accompanied by distal radius fracture (DRF) with severely dislocated distal fragment of the radius. We also determined which specific radiological parameters were associated with TFCC foveal tear.

Methods: Methods: We retrospectively reviewed consecutive 137 patients with unstable DRFs treated by arthroscopic ORIF during a 3-year periods from July 2015. There were 111 female and 26 male, 64 right and 73 left hands, mean age 70y.o. According to AO classification, type A were 24, B were 5, and C were 108 cases. Radiographic parameters such as radial inclination (RI), ulnar variance (UV), volar tilt (VT) of preoperative standard PA and lateral radiographs were measured in all cases. At operation, TFCC foveal insertion was observed arthroscopically by DRUJ approach or radiocarpal approach through teared TFCC disc proper if possible. The TFCC foveal insertion was divided into two groups (normal and tear). Tear group included both complete and partial tear of TFCC foveal insertion. We compared the radiographic parameters between two groups by T test. We conducted the logistic regression analysis to investigate parameters associated with TFCC foveal tear by odds ratios (ORs) and 95% confidence intervals (CIs) for RI, UV, and VT and the ROC analysis to investigate the cutoff value.

Results and Conclusions: Results: There were 40 cases in tear group and 97 in normal group. The mean RI, UV, VT of two groups (tear/normal) was 13.8/17.1, 4.1/2.4, -21.4/-8.9, respectively. All these parameters were statistically significant different between two groups (p= 0.015(RI), 0.024(UV), and 0.0009(VT)). Logistic regression analysis demonstrated only the VT was significantly different (OR: 0.971, 95%CI: 0.9510 to 0.992, p=0.0058). The ROC analysis showed the VT had the area under the curve at 69.1%. Using a cutoff of -13.2 degree, VT had 58% specificity and 75% sensitivity for TFCC foveal tear. Conclusion: Our data demonstrated the distal radial fragment of DRF with TFCC foveal tear dislocated more severe than that with normal TFCC fovea. If the VT of preoperative radiograph is smaller than -13.2 degree, the TFCC foveal insertion should be observed directly or arthroscopically.

Keywords:
TFCC, Fovea, Arthroscopy, Radius, Fracture
Suture Technique with strain relief for repair of flexor tendons of the zone II of the hand

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Objectives / Interrogation: To assess the joint mobility of patients submitted to primary repair surgery of the flexor tendon injuries of the hand with the modified Kessler- Kleinert technique associated with a dynamic anchorage pull out suture, for relieving the tension at the Kessler- Kleinert suture.

Methods: Eight patients from eleven fingers with injuries occurred within maximum 5 days with short-incised or short-blunt cuts referred from the Emergency Room of the institution. All patients received were informed consent and clarified prior to surgical procedure, and performed under WALANT anesthesia. The surgical technique was based on the Kessler- Kleinert type tenorrhaphy with 4-0 mononylon core plus epitendon running suture with 6-0 mononylon. At the end a double-loop was added with 3-0 nylon monofilament running parallel to this tendon inside the tendon sheath, anchoring proximally and distally to the initial terminal-terminal repair. With this technique we obtained a reinforcement of the tendon ends: thus protecting the suture site. The dressing and placement of an orthosis or plaster splint were applied, the immobilization was removed and the patient was referred to the occupation therapy service, where they were encouraged to use both: actively and passively operated finger

Results and Conclusions: The results of the passive and active measurement of the range of motion (TAM) at the MTF, IFP and IFD joints of the affected fingers during the period of postoperative follow-up at the different occasion showed a considerable gain with statistical significance $p<1$. The Multiple Comparisons analysis of Bonferroni and the ANOVA method were used. The Disabilities of the Arm, Shoulder and Hand (DASH) Score showed a Satisfaction Level of 8.75. According to Strickland’s criteria we had 8- fingers (72.27%) excellent results, 18.18 %. 2- fingers(18.18 %) good results and 1- finger (0.9%) regular results. All patients were evaluated in the first week after the surgical procedure, after the third week, at 3 months and 6 months of post operative follow up. This considerable gain in amplitude in the early phases of the postoperative recovery may be related to the immobilization release, achieved early due to the anchorage suture technique which allowed early active motion. No infection, pull out suture failure occurred

Keywords: flexor tendon injuries, "no man's land", zone II of Verdan, dynamic anchor pull-out loop, early mobility.
Abstract no.: IFSSH19-675

**Oral presentation or poster presentation**

**Fractures and Dislocations Hand**

**Headless screws versus Bouquet in intramedullary fixation in unstable neck metacarpal Fractures in active patients: A Randomized Study**

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**Objectives / Interrogation:** Background: Despite the high prevalence of unstable neck metacarpals fractures (boxer's fractures) there is still no consensus concerning the preferred method and ideal moment of treatment, especially in active patients where the time or type of management can have a strong psychological impact on the outcomes.

Purpose: To compare ROM (range of motion), working return time, VAS (visual analogue score), quick DASH (disability arm, shoulder and hand) and radiographic outcomes of two methods of definitive internal fixation in active patients in boxer's fractures, operated in the first week.

**Methods:** prospective, randomized trial, included fifty patients, mean age years (range, 18 - 40 years) were randomized and treated to definitive intramedullary fixation using 2 headless screws (n=20) or bouquet (2 or 3 k-wires) (n=20). The patients were assessed on working time return, ROM (range of motion), patient reported outcome QuickDASH (disability arm and shoulder and hand), VAS (visual analog scale) and radiographic evaluation at 6 months.

Type of study/level of evidence Therapeutic II

**Results and Conclusions:** Results At 6 months, there were no differences between the two groups in terms of ranges of motion, postoperative pain (VAS), or Quick DASH score. The overall complication rate was 4.76% in the screw group, compared with 5% in the bouquet group.

Conclusions In treatment of the active patients with unstable boxer fractures, headless screws and bouquet fixation prove to be safe and reliable treatment. The outcomes were similar into groups.

**Keywords:**
boxer's fractures, metacarpals fracture, cannulated screws, minimal invasive, intramedullary fixation, surgical treatment, randomized trial.
Histological Evaluation of Processed Nerve Allograft Following Nerve Banking in Revision Limb Salvage Procedure.

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Objectives / Interrogation:
Nerve reconstruction is an essential part of limb salvage. Processed nerve allograft (PNA) utilization is a growing component of limb salvage. Revisions to limb salvage can unfortunately be a necessary multi-step process. Nerve banking has been proposed as a means of preserving sacrificed nerve autografts in the past, however no study has evaluated the banking of nerve allografts. We present the histological assessment of banking nerve allograft by burying it within a patient's muscle during revision limb salvage.

Methods:
We performed a retrospective review of patients that underwent PNA reconstruction of peripheral nerve injuries who had complications necessitating take down of previously placed graft. PNA was salvaged by burying their graft within the patient's own muscle. The histopathology of the in situ banked nerve graft after storage in the patients muscle was qualitatively compared to the histopathology of the nerve graft before original implantation.

Results and Conclusions:
Two patients were included in our case series. Patient 1 had a right ulnar nerve injury from a gunshot wound. He underwent ulnar nerve reconstruction using PNA. Five days post-operatively, the patient had wound necrosis in the region of the reconstructed nerve. The graft removed from the original reconstruction was implanted in the intact triceps muscle. Two weeks after banking, the patient underwent revision ulnar nerve reconstruction and the banked allografts were removed for evaluation. Patient 2 had a brachial plexus injury secondary to a motor vehicle collision. The patient underwent significant brachial plexus reconstruction with PNA. Twelve days post-operatively, the patient sustained an unsalvageable vascular complication and underwent amputation. The Graft was salvaged and implanted into the pectoralis major muscle. Two days post-amputation, patient underwent TMR and banked grafts were removed for evaluation. Histologic analysis of the in situ banked graft as compared to nerve graft pre-implantation reveals good structural preservation, presence of Schwann cells, and no signs of cellular infiltration from rejection or reaction.

We present a novel technique of nerve allograft banking within intact muscle tissue. Histopathologic slides showed no qualitative difference between pre-implantation and salvaged allograft. This study suggests that acellular nerve allografts are safe and retain adequate integrity after in situ muscle banking.

Keywords:
Comparative study of the use of antibiotic therapy and antibiotic prophylaxis in the treatment of Swanson Type I open fractures of the hand.

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Objectives / Interrogation: Prophylactic antibiotic treatment after orthopedic surgery is a controversial issue. The present study aimed to compare the efficacy of antibiotic therapy with that of antibiotic prophylaxis in the treatment of Swanson type I open fractures of the hand.

Methods: The prospective study involved 179 patients presenting Swanson type I open fractures of the hand, all of whom were submitted to conventional surgical treatment in a trauma reference hospital during 16 months. Group 1 patients (n = 92) were hospitalized for 3 days and received intravenous antibiotic therapy (four doses of cefalotin per day; 140 mg/kg/day). After release, patients received four oral doses of cefalexin per day (30 mg/kg/day) for 7 days. Group 2 (n = 87) patients remained in hospital for only a short period (less than 24 hours) during which they received intravenous antibiotic prophylaxis (three doses of cefalotin) every 4 h. No oral medication was prescribed after release. Both groups were followed-up each week for 1 month after the injury. Standard statistical methods were applied to evaluate frequency distributions, the Fisher exact test was employed to establish the statistical significance of frequency association and differences were considered statistically significant for p inferior to 0.05.

Results and Conclusions: The study population comprised more males (90.5%) than females. Crushing was the most frequent cause of injury (29.6%). Seventy-five patients (41.9%) presented lesions (180 in total) of soft tissues associated with the fractures, with a significant predominance (p < 0.001) of lesions of the extensor tendons. The infection rate among the overall population was 2.2% (two cases in each group) with no significant differences between the groups. Antibiotic prophylaxis is as effective as antibiotic therapy for complementing surgical treatment of Swanson type I open fractures of the hand to avoid early infections, which may contribute to shorter hospitalization periods.

Keywords:
Open fracture, Infection, Antibiotic therapy, Antibiotic prophylaxis
Mid-term results of K-now total elbow arthroplasty

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Objectives / Interrogation: K-now total elbow is a non-constrained elbow prosthesis designed and manufactured in Japan. K-now total elbow arthroplasty (TEA) is mainly indicated in the elbow with rheumatoid arthritis. The most significant feature of this prosthesis is that humeral component is modular and condylar size can be adjusted with different size of humeral stem. Since we started using this prosthesis, ten years has passed. We reviewed the mid-term results of this total elbow and tried to elucidate inherent complications.

Methods: Since 2007, we started using K-now TEA in patients with rheumatoid arthritis with severe elbow joint destruction. Between 2007 and 2013 we performed 20 K-now TEAs on 19 cases with RA. At a follow-up of seven years two months on average, one had died of unrelated cause. There were 17 women and two men with a mean age of 63 years (34 to 72). All of them except the deceased were reviewed radiologically and clinically assessed using Japanese Orthopaedic Association elbow performance score (JOA elbow score). The joint destruction was rated as Larsen grade 4 in 11 elbows, grade 5 in seven elbows and one ankylosed elbow.

Campbell approach was used to expose the joint. Sizes of the ulnar component, condylar component and the humeral stem are predetermined. At surgery, trial component is inserted to see the snug fit. Then, condylar component and the humeral stem is assembled and firmly fixed by tightening the posterior screw. Ulnar component is fixed using bone cement. Soft tissues are sutured primarily, and the elbow is kept in the splint for 10 days.

Results and Conclusions: One patient developed metallosis in the affected elbow joint and condylar prosthesis was revised after three years four months. At revision, diffuse metallosis was noted and the screw fixing the condylar prosthesis to the humeral stem was found to be loose. In no other patients, metallosis, breakage or loosening of the either stem was found radiologically. The averaged JOA elbow score improved from preoperative 51 points to postoperative 83 points, including the revised patient. The mean arc of flexion/extension improved from preoperative 116/29 degrees to postoperative 131/26 degrees on average. Pronation/supination improved from preoperative 52/68 degrees to postoperative 72/78 degrees.

In conclusion, K-now total elbow arthroplasty has proved to be a durable elbow prosthesis. However, there is a risk of development of metallosis when the screw that connects condyle and the stem becomes loose.

Keywords:
rheumatoid arthritis, total elbow arthroplasty,
The Effect of Carpal Alignment on Post-Operative Range of Motion After Four Corner Fusion in Wrists with Type 1 Lunates

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Objectives / Interrogation: Restoring carpal alignment during four-corner fusion (4CF) to neutral position has been discussed in the literature as an important factor in range of motion preservation. To date, there have been limited studies focusing on whether the amount of capitate radial overhang relative to the lunate has an impact on functional outcomes. In this study, we explored the effect of specific parameters of carpal alignment on range of motion and grip strength of patients with lunate type 1 wrists treated with 4CF.

Methods: A retrospective chart review of a single-surgeon’s practice over a six-year period was conducted to identify 15 patients with 15 lunate type I wrists who underwent 4CF for SLAC or SNAC. All wrists were treated with headless compression screw fixation. Primary functional outcomes included percentages of maintained pre-operative flexion-extension arc (FEA) and grip strength. Pre- and post-operative radiographs were analyzed to obtain lunocapitate and radiolunate angles and the amount of capitate radial overhang relative to the lunate. Scatterplots of primary functional outcomes were created to visualize data distribution against carpal alignment parameters and Pearson correlation coefficients were compared.

Results and Conclusions: Pre-operative lunocapitate angle (LCA) was the strongest predictor of percentage FEA maintained post-operatively, with many patients having actually improved their range. The greater the LCA pre-operatively, the greater maintained range post-operatively ($r = 0.77$). Furthermore, LCA correction was positively correlated with percentage maintained FEA ($r = 0.52$). Reduction of capitate radial overhang relative to lunate was negatively correlated with percentage maintained FEA ($r = -0.54$); meaning that greater the overhang and the less this articulation was reduced, the better post-operative range of motion outcomes patients were able to achieve. The relationship between radiolunate angle and functional outcomes was negligible. Grip strength was not strongly correlated with any alignment parameters.

Keywords:
four-corner fusion, carpal alignment
Non-vascularized ulnar nerve graft reconstruction as an efficient treatment for brachial plexus paralysis

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Objectives / Interrogation: Brachial plexus paralysis is a serious injury for which different forms of treatment are available. The aim of this study was to evaluate the functional outcome of non-vascularized long ulnar nerve graft reconstructions for the restoration of elbow flexion in patients presenting complete brachial plexus injury.

Methods: The retrospective cross-sectional study involved 14 patients who had undergone 25 non-vascularized reconstructive graft procedures during 1999-2009 at two hand surgery reference hospitals. Elbow flexion force was evaluated throughout the follow-up period (average 40 months) using the Medical Research Council muscle strength scale.

Results and Conclusions: The average age was 25 years among the predominantly male gender (92.8%), and motorcycle accidents constituted the principal (71.4%) cause of injury. The left side of the body was affected in 57.1% of cases, and denervation time varied between 4 and 14 months. Most patients presented the C5 stump intact, and this was the donor root in 14 cases. The priority outcome was elbow flexion, with ulnar nerve grafting being performed in the musculocutaneous (n=9), median (n=6), radial (n=4), axillary (n=1), posterior fascicle (radial and axillary) (n=3), and lateral fascicle (median and musculocutaneous) (n=2) nerves. Outcomes of reconstructive surgeries were considered very good (M4; n=6), good (M3; n=8), substandard (M2; n=5) and poor (M0/M1; n=6).

Non-vascularized nerve grafts can be indicated for the treatment of complete brachial paralysis. The procedure is technically easier than vascularized graft reconstructions, and does not require vascular microsurgery thus reducing the time of anesthesia and the need of microscope or magnifying glass.

Keywords: nerve, plexus, brachial plexus, ulnar nerve, nerve graft, Non-vascularized
THE USE OF RADIAL SENSITIVE NERVE GRAFT IN NEUROTIZATION OF MUSCULOCUTANEOUS NERVE FOR TREATMENT OF BRAQUIAL PLEXUS AVULSIONS

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Objectives / Interrogation: Brachial plexus trauma is increasingly prevalent, and restoring active elbow flexion is a treatment priority. The most effective techniques, in relation to the avulsion lesions, involve the neurotization for the biceps-brachial muscle, either with graft or nerve transfer.
This study presents a surgical technique that uses the radial sensitive nerve as a graft for the neurotizations of musculocutaneous nerve from accessory nerve in the treatment of avulsions of the brachial plexus to restore elbow flexion, and evaluates the results obtained with the technique.

Methods: A cohort study of patients with traumatic brachial plexus lesion submitted to this surgical technique and followed at a reference hospital from June / 2009 to August / 2017. Twenty-two patients were included, reassessed regularly for a period of 2 years after surgery. The elbow flexion strength was classified according to the Medical Research Council scale which ranks from 0 (no contraction) to 5 (normal motor force).

Results and Conclusions: The majority were male (94.4%) and the age ranged from 16 to 45 years. The most prevalent age group was 20 to 29 years. The majority of lesions (18 cases, 81.8%) were with total impairment. The mean time between the trauma and the surgical procedure was 195 days. The results were evaluated after 3, 6, 12 and 24 months. At the end of this study, it was observed that 54.5% of patients had M4 strength and 77.2% of good results with effective force M3 or higher.
Radial sensory nerve grafting allows the grafting of up to 25cm grafts, presents a convenient surgical approach and close to the donor site facilitating per operative technique. In addition, it does not generate sequelae and there is no postoperative functional loss, since the patient already presents the deficit previously in the total lesions of the plexus. The present study presents similar results to the literature: the review found success rates of 51.3% to 100% in neurotizations for the musculocutaneous nerve (force equal to or greater than M3).
The radial nerve graft technique showed several advantages in the surgical procedure, in addition to success rates similar to other grafts already reported in the literature, which favors this procedure.

Keywords:
nerve, plexus, brachial plexus, radial sensitive nerve, nerve graft
Length changes of distal accessory band of Interosseous membrane during forearm rotation - a 3D CT study in vivo

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Objectives / Interrogation: Interosseous membrane of the forearm plays very important role in forearm stability. The early studies described five ligamentous components in the interosseous membrane of the forearm (central band, accessory band, distal oblique bundle, proximal oblique cord, and dorsal oblique accessory cord) and classified them into 3 portions (distal, middle and proximal) according to their location. In the present study, we investigated in vivo length changes of ligaments from distal and middle portions (central band, distal accessory band and distal oblique bundle) during forearm rotation to understand the function of the ligaments.

Methods: Computed tomography of six adult forearms from six healthy volunteers was obtained at 5 forearm positions: maximum pronation, 45 degrees pronation, neutral position, 45 degrees supination and maximum supination. According to previous anatomic study we marked out the attachments of each ligaments on 3-dimensional models of the radius and ulna. The 3-dimensional ligament lengths' path between attachments during forearm rotation were measured and calculated based on computer modeling and simulation.

Results and Conclusions: The three portions of central band presented same fashion during the forearm rotation: the length increased significantly from maximum pronation to neutral position, but it stayed almost static from neutral position to supination. However, the distal accessory band and distal oblique bundle showed the same fashion, which was different from that of central band: the length increased significantly from maximum pronation to neutral position, but it decreased significantly from neutral position to supination. The distal accessory band has the length changes similar to those of the distal oblique bundle, which is very different from those of the central band. The findings suggest that distal accessory band functions in conjunction with the distal membranous portion of the interosseous membrane of the forearm.

Keywords:
Interosseous membrane, 3D-CT, in vivo
Outcome of Stretching for Treatment of Trigger Finger in Patients on Hemodialysis

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Objectives / Interrogation: Trigger finger is common in hemodialysis patients. The main treatments for trigger finger are steroid injections and surgery. This retrospective study aimed to evaluate the therapeutic effects of passive finger extension and active finger flexion exercise as conservative treatment in hemodialysis patients.

Methods: Between April 2011 and March 2017, 58 trigger fingers of 29 hemodialysis patients (10 men and 19 women) (HD group) were enrolled in this study. The mean age was 61.2 years and the mean follow-up duration was 10.9 months. All patients were instructed in the stretching method at the first visit, and the flexor tendon sheath was concurrently injected in some of the patients at their request. The modified Wolfe classification score was recorded, and compared between first and last visits. The number of injections, recurrence rate, and surgical rate were evaluated using medical records, and compared with those in non-hemodialysis patients with trigger finger (non-HD group) who were evaluated during the same period.

Results and Conclusions: There was significant improvement in the Wolfe classification score between the first and last visits. In the HD and non-HD groups, 22.4% and 43.2% did not receive injections, recurrence rates were 48.3% and 23.3%, and surgical rates were 24.1% and 4.8%, respectively. The non-injection rate was lower in the HD group. The recurrence and surgical rates were significantly higher in the HD group.

The number of hemodialysis patients has increased, and long-term dialysis patients are also increasing in Japan. Trigger finger in hemodialysis patients is reportedly prone to occur in multiple fingers, and is likely to recur. Our findings showed that the recurrence and surgical rates were significantly higher in the HD group than in the non-HD group. However, stretching is an easy and noninvasive treatment, and is worth trying before surgery.

Keywords:
Hemodialysis, Trigger finger, Stretching
RED BLOOD CELL TRANSFUSION AND ITS ASSOCIATION WITH FREE FLAP THROMBOSIS

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Objectives / Interrogation: to establish the relationship between the use of perioperative transfusions and the development of vascular pedicle thrombosis in free flap procedures

Methods: Retrospective cohort comparing the incidence of vascular pedicle thrombosis over the first 7 postoperative days (168 hours) considering the exposed group as patients who received blood transfusions in the 24 hours prior, during or 24 hours after surgery; versus the Unexposed group, patients who did not receive transfusions during that period of time. Kaplan Meier survival curves were developed and compared; the incidence rates were estimated and a proportional risk regression was done to adjust for confounding variables.

Results and Conclusions: Results: 157 free flaps in 135 patients were included. The incidence of vascular pedicle thrombosis was higher among patients transfused (30.2%) versus the non-transfused (15.8%). When adjusting for clinical confounding variables, the hazard ratio was calculated at 2.68 (95% CI: 1.09 to 6.59).

Conclusion: Perioperative red blood cells transfusion is associated with a higher risk of vascular pedicle thrombosis. Because no association was established between pre-surgical anemia and free flap survival, the decision to transfuse shall be based on the individual clinical condition of each particular patient, rather than on a range of hemoglobin or hematocrit.

Keywords:
Free flap; Free tissue transfer, Microsurgery, Thrombosis; Blood transfusion.
Tendon Healing Strengths after Repair with Three Different Configurations in a Chicken Model

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Objectives / Interrogation: Objectives: To evaluate tendon healing strengths after different suture constructs in a chicken tendon repair model.

Methods: Materials and Methods: Sixty chicken flexor tendons were repaired with the following three repair configurations: a two-strand Kessler suture (group 1); a two-strand core suture with an additional circle loop repair (group 2) and a four-strand core suture repair with three separate stitches of peripheral suture (group 3). Biomechanical of flexor tendons was measured by a material testing machine. Twenty-six repaired tendons were tested to record healing strengths at week 4 and twenty-eight tendons were tested to record baseline repair strengths on day 0. The others were used to take photos for observation of suture constructs. We conducted power analysis and obtained a sufficient power of above 70% that proved the sample size to be adequate. Analysis of variance with Tukey post hoc test was used for comparison of the means of the data among the different repair methods groups.

Results and Conclusions: Results: At weeks 4, the ultimate strength of tendon in group 3 was 57.3 ±19.5 N, which was 10 times higher than that of the tendons in group 1 (5.7±1.1 N) (p<0.001). The strength of the tendons in group 2 (34.9±15.8 N) was only 60% that of the tendons in group 3 (p=0.024), which was nearly 6 times higher than that of group 1 (p=0.003). Baseline repair strengths of tendons was significantly different among three groups on day 0. Tendons in group 1 showed the lowest repair strength (5.5±0.9 N) and the tendons in group 2 were 8.4±1.4 N. Tendons in group 3 showed the highest repair strength (14.4±2.6 N) than two other groups (p<0.001). We found that the multi-strand repair techniques significantly increase the healing over the first four weeks after surgery with about 400% increase in the strengths (for both groups 2 and 3), but the strengths of the tendon with a two-strand repair (group 1) does not significantly change over the 4 weeks of tendon healing.

Conclusions: Multi-strand repair techniques enhance tendon healing strengths and significantly increase the healing after surgery, but a two-strand core repair does not significantly change the healing strength of the healing tendon. The increase of the strength by the multi-strand repair is more evident when a more stable repair configuration is used.

Keywords:
Flexor tendons; healing strengths; suture constructs
Comparison of healing strengths of flexor tendons repaired with two multi-strand configurations in a chicken model

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Objectives / Interrogation: Objectives: To investigate the tendon healing strengths between two multi-strand configurations in a chicken model.

Methods: Materials and Methods: Fifty-six chicken flexor tendons were repaired with two four-strand configurations: a four-strand repair consisting of a two-strand core Kessler suture with an additional circle loop repair (group 1) and a four-strand core Kessler suture repair with three separate stitches of peripheral suture (group 2). The healing strengths of the repaired tendons were measured at weeks 2, 3 and 4 after repair and were analyzed statistically. The data was analyzed with two-way analysis of variance. Tukey test was used for comparison of the means of the data between the different repair methods groups at the same time-points and between different two points. We set the level of significance at p<0.05.

Results and Conclusions: Results: At weeks 2, tendons in two groups showed the similar mean ultimate strengths (6.5±1.6 N in group 1 and 7.0±2.3 N in group 2). At weeks 3, the ultimate strength of tendons in group 2 (17.1±4.9 N) was statistically different from that in group 1 (12.2±3.1 N) (p=0.033). At weeks 4, the healing strengths of tendons in group 2 (64.3±19.6 N) was significantly higher than that in group 1 (40.7±24.7 N) (p=0.039). In group 1, the means healing strengths of the tendons increased from 6.5 N at weeks 2 to 12.2 N at weeks 3 and to 40.7 N at weeks 4; the percent increase was 86% from weeks 2 to 3 and 234% from weeks 3 to 4, respectively. In group 2, the percent increases in the strengths were much greater (144% increase from weeks 2 to 3, and 276% from weeks 3 to 4).

Conclusions: The four strength repairs with three separate stitches of peripheral suture produce greater healing strengths of the repaired tendon than that of a repair of two-strand repair with one circle loop suture.

Keywords: Tendons; healing strengths; multi-strand configurations
Medium to long term outcomes of pyrocarbon total PIP joint arthroplasty

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Objectives / Interrogation: Pyrocarbon total arthroplasty is an established treatment option for arthritis of the proximal interphalangeal joint (PIPJ). We hypothesized that despite the varied results published in literature, pyrocarbon for total PIPJ arthroplasty can produce reliable and effective outcomes.

Methods: 101 total PIPJ arthroplasties have been performed in 75 patients since 2002. Prior to surgery, 14 patients completed baseline questionnaires and 52 had their range of motion measured. These were compared to 44 joints assessed at 5 years or later after surgery. 31 joints were assessed between 5 - 9 years and 19 joints at equal or greater than 10 years (6 joints were seen at both time points). Assessments included QuickDASH and PRWHE questionnaires and measures of range of motion, grip and pinch strength. Non-parametric Wilcoxon rank sum test for independent samples was used for analysis.

Results and Conclusions: Visual Analogue Scale pain decreased from a median of 68 at pre-operative assessment to 1 at equal or greater than 10 years (p=0.0001), while satisfaction increased from 7 to 98 at the same intervals (p=0.03). QuickDASH and PRWHE scores improved from 46.6 and 71 respectively at pre-op assessment to 29.5 and 18.5 at equal or greater than 10 years after the surgery (QuickDASH not significant, PRWHE p=0.002). Global Rating of Change showed a median of +6 for symptoms and +5 for function. Range of motion increased from baseline to 5 - 9 years (flexion 70° compared to 50° before surgery, p=0.004). There is a slight reduction in flexion and an improvement in extension (decrease in fixed flexion) at 10 years (flexion 60° compared to 50° before surgery, not significant). Grip strength was maintained after arthroplasty (not significant). Eight joints are known to have undergone revision surgery: 5 revisions to other arthroplasty (4 silicone, 1 pyrocarbon total due to secondary trauma), 2 revised to joint fusion (one a result of secondary trauma at 7 years post index surgery), and one with details unknown. An additional six have undergone secondary surgery without revision for tenolysis/release.

This is a large case series with 19 patients followed up for 10 years or longer. Results compare favourably with published series in clinical and functional outcome measures. Joint revision rate is low and reoperation rates comparable to other studies. Pyrocarbon for total PIP joint arthroplasty can produce reliable and effective outcomes.

Keywords:
PIP joint, Arthroplasty, Pyrocarbon, Osteoarthritis
Results of dorsal and volar reconstruction of scapholunate ligament with FCR tendon

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Objectives / Interrogation: The technique for scapholunate ligament (SLL) reconstruction described by Corella yields reliable and satisfactory results in patients with static or dynamic scapholunate dissociation.

Methods: Seven patients underwent dorsal and palmar reconstruction of the SLL with part of the FCR tendon using the Corella technique. We modified the original technique by reducing the arthroscopic to a mini-arthrotomy technique in order to minimize surgery time. The main goal was to avoid injury to the carpal extrinsic ligaments and the posterior interosseus nerve. So far we report on our first 7 patients with a minimum follow up of 8 months, at least 3 more patients will follow until time of presentation. Clinical and radiological outcomes were measured pre- and postoperative in a prospective manner.

Results and Conclusions: Patients were between 24 and 68 years of age at surgery; all were male. The operative hand was dominant in 57%. There was an average 5,5 months from the time of injury to surgery (range, 2 - 30 mo). A total of 86% had a static deformity.

Results of the Quick DASH showed an average of 7,7 (SD 4,7) postoperative. Grip strength (Jamar dynamometer) showed postoperative 42,0 kp (SD 9,9 kp) at the operated side versus 53,6 kp (SD 10,9) at non-operated side. Pain in rest (0-100, visual analog scale) improved from 0,8 (SD 1,2) preoperative to 0,7 (SD 1,5) postoperative, Pain in activity improved from 6,8 (SD 1,8) to 2,8 (SD 2,5).

Flexion-extension total arc of movement reduced from 109 degrees to 107 degrees (SD 12,0).

On x-ray, the SL interval improved from 5,6 mm (SD 1,5 mm) to 5,0 mm (SD 2,0 mm). The SL angle improved from 74 degrees (SD 5,7) to 70 (SD 8,6).

6 out of 7 patients would do the surgery again, 5 resulted in pain reduction, 6 were satisfied with the result, all 7 got back in their original occupation.

In our cohort this technique results in a satisfactory pain relief. The other clinical parameters were not statistically significant. On x-ray only in 3 of 7 patients we could improve the SL intervall (reduction of > 1mm) or the SL angle (reduction > 5 °) although all had obvious reduced SL intervall and angle intraoperative. In more than 50% the tendon reconstrucction seems to fail over time. Possibly and we think most likely the FCR tendon does not heal within the carpal trabecular bone but at the cortical bone which is exposed only limited by this technique.

Keywords:
scapholunate ligament static deformity corella
UPPER LIMB SURGERY FOR NON-COMMUNICATIVE PATIENTS WITH SEVERE SPASTICITY: THE ROLE OF THE CARER BURDEN SCORE

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Objectives / Interrogation: Severe upper limb spasticity (ULS) can lead to difficulties with personal care and hygiene. Washing, dressing, trimming nails can be painful, poorly tolerated and in cases of severe contracture nearly impossible.

Despite the high incidence of acquired brain injuries and subsequent ULS in developed countries, there are only a few papers demonstrating the benefits of upper limb surgery with regards to improved ease of care postoperatively in patients who are unable to communicate. The Carer Burden Score (CBS) has been used to document improved ease of care in patients with ULS after Botulinum Toxin injections into target muscles. We applied the CBS to our patients preoperatively and again once treatment was finalized to document improvement in ease of care.

Methods: The patient's main carer was asked to fill in the CBS preoperatively and once treatment was finalized. The CBS grades for activities - cleaning the axilla, dressing the patient, cleaning the palm and cutting the fingernails - according to the degree of difficulty encountered from 0 to 4.

The most common procedures performed were wrist fusion, superficialis to profundus transfer, and neurotomies of the deep branch of the ulnar nerve and motor branch of the median nerve. In many cases the intrinsic muscles had to be released.

We assessed 49 limbs with the CBS pre-operatively and after 3 months.

Results and Conclusions: In all cases we found a significant drop in the CBS, supporting our statements of improved ease of case post spasticity surgery.

Ease of care for patients with ULS can be improved by Botulinum Toxin injections, as shown by several studies. However, the effect of Botulinum Toxin lasts for about 3 months only. Surgery brings a more lasting effect in ease of care which should translate into long term reduction of health costs.

Keywords:
Spasticity; Carer Burden Score
Peripheral nerve torsion

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Objectives / Interrogation: Nerve torsion is a rare cause of peripheral nerve palsy and their etiologies are not well known. They are sometimes misdiagnosed as compressive neuropathies and the treatment and clinical results are different with compressive neuropathies. The purposes of this study are to describe the clinical differences between peripheral nerve torsion and common compressive neuropathy and to present the stages and possible pathomechanism for peripheral nerve torsion with three cases of peripheral nerve torsion which had the different degree and symptoms severity of nerve torsion each other.

Methods: We described the history, neurological symptom and physical examinations, findings of ultrasonographic images and electrodiagnostic studies, and the surgical appearances and degree of the torsion with three cases of peripheral nerve torsion. Also, the possible pathomechanism of nerve torsion was presented and the final clinical results were evaluated with the neurological physical examination, ultrasonographic images, and electrodiagnostic studies.

Results and Conclusions: One patient had radial nerve torsion and the others had median nerve torsion in the upper arm. At first, two of them were misdiagnosed as posterior interosseous nerve syndrome or anterior interosseous nerve syndrome though the lesions existed in the upper arm. All patients needed surgical treatment. The three patients had the different degree of nerve torsion each other. Also, all the nerve had the restriction of nerve gilding due to nerve adhesion and had its branch around nerve torsion site, which pulls the main nerve. It suggested important clues about the pathomechanism of peripheral nerve torsion. The symptoms were gotten better in two patients though it was not changed in one patient after surgery. Accurate localization and diagnosis with electrodiagnosis and ultrasonography are very important for the treatment of peripheral nerve torsion.

Keywords:
peripheral nerve, torsion, radial nerve, median nerve, ultrasonography, electrodiagnosis, diagnosis, treatment
Active von Frey filament test: new technique for evaluation of hand tactile sensation measuring in continuous variable units

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Objectives / Interrogation: To measure and analyze the tactile sensation of human hand, several devices have been introduced. Von Frey filament test is a mainstay in clinical setting, however, the results can be affected by variable factors such as touch speed. Moreover, the differences between two adjacent grades of filaments are too large to detect fine change. We developed a new tools for evaluation of tactile sense (active Von Frey filament test; AvF), and hypothesized that AvF show different pattern of measured values.

Methods: The AvF was developed to provide an accurate force for human skin sensation. The touching force of the AvF started at 1mgf much lower than 1st grade (8mgf) vF. D’Arsonval movement is chosen as an actuator. After acquiring IRB approval, 32 normal subjects were examined. In the autonomous zone of the median and the ulnar nerve, i.e., index and 5th finger volar tip were examined using AvF and vF without vision. Each measured value was collected and the correlation between AvF and vF was evaluated.

Results and Conclusions: Mean value of AvF was significantly higher than that of vF (111.3±46.9 vs 24.1±9.8) (p<0.01) with larger variance. Spearman correlation coefficient between AvF and vF was 0.341.

AvF can provide more precise values with continuous units for tactile sensation. Values of AvF and that of vF might be not that correlated.

Keywords:
Sensory test, objective, active Von Frey filament test
Ideal cup position in trapeziometacarpal joint arthroplasty: a biomechanical cadaver study

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Objectives / Interrogation: It has been suggested that in trapeziometacarpal total joint arthroplasty, the trapezial cup should be positioned parallel to the proximal articular surface of the trapezium (PAST). This suggestion was based on radiographic measurement of the range of motion of healthy joints. The goal of this study was to biomechanically test this statement.

Methods: 7 fresh frozen cadaver hands were mounted in a test jig and the different thumb musculotendinous units were loaded. An Arpe metacarpal stem was implanted and combined with 3D-printed trapezium cups. These cups were available in 17 different inclinations relative to the PAST (neutral and 10°, 20°, 30° or 40° of palmar, dorsal, lateral or medial inclination). For every cup inclination, stability of the prosthesis was assessed through its entire passive range of motion (flexion, extension, abduction, adduction, retropulsion and opposition). Outcome was dislocation or not. All these measurements were performed with both 15° offset and straight necks. Logistic regression was used to determine the odds ratio for dislocation and its significance for the different oblique cup inclinations compared with neutral cup placement.

Results and Conclusions: With the cup in neutral position relative to the PAST, no dislocations were observed in any direction of thumb motion. In flexion, a significantly higher dislocation rate was observed when an offset neck was combined with the cup in 30° or more of dorsal inclination. Using a straight neck increased the risk of dislocation, starting at 10° of dorsal cup inclination. In opposition, the number of dislocations was significantly higher when a straight neck was combined with the cup in 10° or more of dorsal inclination, an offset neck with the cup in 20° or more of dorsal inclination, or both stem types with the cup in 30° or more of medial inclination. In adduction and retropulsion the prosthetic joint dislocated with the cup in 30° or more of lateral inclination. Cup inclination is an important factor in prosthetic joint stability. Ideally the cup should be placed parallel to the PAST. Flexion and opposition are the motions that are most prone for dislocation. We recommend the use of an offset neck and to avoid placement of the cup in dorsal inclination relative to the PAST.

Keywords:
Trapeziometacarpal joint arthroplasty - PAST line - cup position
Intraosseous tension-band wiring for displaced Bennett's fracture

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Objectives / Interrogation: Bennett's fractures still represent a challenge in hand surgery because of the articular involvement, the difficult management of the small fragment and the stability of fixation. Several fixation techniques have been described, such as percutaneous pinning, k-wires, screws, external fixation and arthroscopically assisted fixation. Tension-band wiring has also been described as a reliable technique and it's employable even in presence of a very small fragment. We propose a refinement of the already described tension-band wiring technique in order to preserve all its advantages but with less invasiveness and allowing an easier removal of the device.

Methods: By means of a standard Wagner J-shaped incision at the base of the first metacarpal, the fracture is exposed and reduction is obtained with direct visualization of the articular surface. A k-wire 1.2mm is inserted from the dorsal aspect of the metacarpal base through the fragment until the exposure of 2-3mm of its tip at the volar side. A second k-wire is then used to perforate the metacarpal, parallel but just 5mm distal to the first k-wire. A 0.4mm metal cerclage loop is then passed through the second hole and anchored to the tip of the first k-wire. Dorsally the two tails of the cerclage are then twisted and secured around the tail of the k-wire, previously bent and cut, applying the desired compression. A removable splint is applied in the immediate post-op time and assisted rehabilitation starts within a week. We have treated three cases with this technique so far and in just one case the device has been removed ten months after fixation. The removal took just five minutes under local anesthesia by means of a small dorsal incision, removing the k-wire first and then extracting the metal cerclage with no need to cut it.

Results and Conclusions: All the fractures achieved the radiological consolidation within 6 weeks and the full range of motion was recovered within 3 months in all cases. The satisfaction of the patients was high and there were no complications even at the time of second surgery.
In conclusion, tension-band wiring for treatment of Bennett's fractures gives several advantages comparing to other devices such as a stable fixation even with very small fragments, a strong compression at the site of fracture and a low cost. Furthermore, our intraosseous refinement of the technique allows the removal of metal devices very easily in a safe and minimally invasive way.

Keywords:
Bennett, fracture, hand, tension-band
Morphologic characteristic of the first web space in congenital thumb duplication in infants

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Objectives / Interrogation: To analyze the morphologic characteristic of the first web space in thumb duplication in infants (1.5-3 years old) and to assess reliability of three palmar thumb abduction measurement methods about the first web space.

Methods: 130 patients (110 duplication thumbs and 20 tenosynovitis with one side) were involved in between February in 2016 to June in 2018. 18 months to 3 years old, average age was 23.1 ± 6.1 months. According to Wassel classification, we classified the 110 thumbs in type I (2), type II (18), type III (7), type IV (48), type V (6), type VI (12), type VII (17). One observer used the special vernier caliper and goniometer to measure the first web space distance in Cambridge-Keeling method, the intermetacarpal distance (IMD) and intermetacarpal angle (DIMA) between the first and second metacarpal in 130 patients to acquire the both sides data. The other one observer measured 50 normal sides (including 20 patients in tenosynovitis and 30 cases in duplication thumbs) independently to determine the intraobserver reliability. Compared the difference between thumb duplication and the normal side using paired t test.

Results and Conclusions: There were 38 thumbs in total in Wassel type I, II, III and type IV without the first metacarpal upright ulnar deviation. The first web space distance, IMD and DIMA were 2.59 ± 0.46 cm and 2.47 ± 0.39 cm, 3.47 ± 0.45 cm and 3.39 ± 0.37 cm, 41.84 ± 3.22° and 41.81 ± 3.39° between normal and unnormal sides, without statistically significant difference (the distance: t=3.372, p=0.451, IMD: t=1.529, p=0.144, DIMA: t=0.224, p=0.826). There were 72 thumbs in Wassel type IV with the first metacarpal head ulnar deviated and Wassel type V, VI, VII totally. The first web space distance, IMD and DIMA were 2.68 ± 0.33 cm and 2.19 ± 0.47 cm, 3.47 ± 0.36 cm and 3.02 ± 0.53 cm, 42.32 ± 3.87° and 35.35 ± 6.73° between normal and impaired side, with statistically significant difference (the distance: t=5.257, p=0.000, IMD: t=4.585, p=0.000, DIMA: t=7.730, p=0.000). The mean values of the first web space distance in 130 normal thumbs was 2.62 ± 0.33 cm. The IMD and DIMA were 3.48 ± 0.31 cm and 43.43 ± 3.43°. The intraclass correlation coefficient (ICC) values for intraobserver reliability about the first web space distance, IMD and DIMA were 0.74, 0.80 and 0.71, respectively. The first web space narrowing in thumb duplication was mainly in Wassel type IV with the first metacarpal ulnar deviation and Wassel type V, VI, VII. ICC of the first web space distance, IMD and DIMA indicated substantial reliability to assess the first web space in little children.

Keywords:
Thumb duplication; First web space; Measurement; Child Pre(2-5).Inf(1 - 23 mo)
Outcome of 32 pollicisations for thumb hypoplasia or aplasia during the period 1987-2016

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Objectives / Interrogation: Pollicisation of the index for thumb hypoplasia or aplasia is performed to create pinch and cylinder grip. The objective was to investigate the clinical outcome in our institution.

Methods: Twenty-five consecutive patients (32 thumbs) had their anomaly classified using OMT, modified Bayne and modified Blauth criteria. Associated anomalies, operative technique, complications, and additional surgeries were recorded. Reach Out©, QuickDASH©, EQ-5D©, and visual analogue scales (VAS) on thumb function and appearance quantified upper extremity function and life quality. Thumb ROM, Kapandji score, sensibility, grip and pinch strength, and results of four functional tests were recorded.

Results and Conclusions: Age at time of operation was median 26(12-101) months. 3/25 patients had unilateral CULA as their only malformation. 16/25 had bilateral CULA, and 13/25 had a syndrome. 14/25 underwent additional upper limb surgery. For 11/32 thumbs, there was abnormal axis formation of the entire ipsilateral upper limb. Modified Buck-Gramcko technique was used in 31/32 pollicisations. There was one iatrogenic vein laceration repaired micro-surgically, and one postoperative thumb malrotation, which required a later osteotomy. Further 5/31 cases had additional thumb surgeries. Twenty-three patients/30 thumbs came for follow-up (94%), aged median 12(2-33) years. Patients >8 years reported median VAS 78(5-100) on thumb function, and median VAS 72(14-100) on thumb appearance. Adult patients reported inclusion of their thumb in pinch grip median 92(10-100)% of the time, and in cylinder grip median 97(3-100)% of the time. Reach Out was median 17(1-37), QuickDASH was median 7(5-39), EQ-5D-3L index was median 1.00(0.62-1.00), and EQ VAS was median 90(50-100). Active arc motion was median 38(0-70)° in the IPJ, and median 50(0-105)° in the MCPJ. 24/30 thumbs could palmarly be abducted to the tip of the 3rd finger. 15/30 thumbs had a Kapandji score of 6 or higher. Grip strength was median 25(3-65)% of reference values, and pinch strength was median 30(0-79)% of reference values. All thumb pulps had intact 2-3 mm two-point discrimination. For 26/30 thumbs, picking up a pearl, a dice and a table tennis ball was easy. The sticker test was easy in 18/30 cases.

Conclusion: Most patients were satisfied with their result. Abnormal anatomy was found in the pollicised indices of the four patients who failed all four functional tests (immobile joints due to severe RLD modified Bayne type 4, or absent flexor tendons).

Keywords: pollicisation, thumb hypoplasia, radial longitudinal deficiency, mirror hand, five-finger hand
Case report of a complex fracture (C3-3 distal radius - Gustilo Type II - Type 3 DRUJ) associated with a B2 scaphoid fracture at the dominant arm and resorption bone edema with scaphoid fracture at the contralateral wrist.

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Objectives / Interrogation: High energy impact injuries of the wrist entail complex fracture patterns of the wrist and ligaments injuries, depending on the dynamic and the position of the hand at the time of the trauma. The lesions are often bilateral and occur in male patients with high functional demand.

We report a case of a 51 years old male with bilateral wrist lesions that occurred in a car accident. Right dominant wrist: plurifragmentary dislocated radius fracture with lesion of the sigmoid cavity (AO C3-3; Gustilo type 2; Fernandez type 3), multifragmentary distal ulna fracture with DRUJ lesion associated with bone and soft tissue loss (DRUJ Fernandez type 3), and scaphoid fracture (Herbert and Fisher B2).

Left wrist: it was investigated with x rays with no sign of fracture. After 10 weeks he underwent a magnetic resonance that showed a dislocated scaphoid fracture with bone edema and bone resorption.

Methods: At first the patient was treated in another hospital. He underwent a damage control stabilization of the fractures with external fixator and dermal substitute in the area of the exposition. 3 weeks after the trauma he came at our attention showing no sign of infection. We removed the external fixator and we fixated the fracture with volar plate and screws, filled the bone defect with a graft, we removed the dermal substitute and we covered it with autologous dermal grafting. The scaphoid fracture was stabilized with a staple and percutaneous k-wire.

The left wrist was stabilized with a staple and bone grafting (omolateral olecranon).

He executed biophysical stimulation for two months after surgery in both wrists.

Wounds were medicated periodically. Clinical and radiological follow up was completed every month.

Results and Conclusions: At 2 months follow up the fractures showed signs of consolidation and wounds healed. At 3 months the patient returned to work. 1 year after, right wrist AROM was 50° of flexion, 55° of extension, 10° of radial deviation and 5° of ulnar deviation. Left wrist AROM was 80° of flexion, 70° of extension, 10° of radial deviation, 30° of ulnar deviation. We did not notice any complication.

The fixation method we choiced for this case provided high compression in the area of the bone graft. Early mobilization avoided stiffness and the onset of algodistrophy. Biophysical stimulation aided bone graft integration and fracture healing.

This is a rare bilateral complex lesion. Early treatment and absolute stability of the fracture assured a good clinical and functional outcome.

Keywords:
wrists; fracture; scaphoid; external fixator, graft; biophysical stimulation; trauma; druj
Plate fixation for unstable displaced distal radius fractures in children

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Objectives / Interrogation: Fractures of the wrist account for 25-36% of all pediatric fractures. Although pediatric fractures have remodeling potential, unstable fractures and fractures with a rotational deformity require reduction and fixation. More invasive volar plate fixation is less popular in pediatric patients. However, volar plate fixation enhances anatomic reduction and allows for functional postoperative treatment. This may lead to less redislocations, malunions, and improved functional outcome. To the best of our knowledge, only one case study is available which describes volar plate fixation for a displaced distal radius fracture in a 13-year-old child.
The purpose of this study was to present the functional outcomes of pediatric patients treated with volar plate fixation for unstable displaced distal radius fractures.

Methods: In this retrospective observational cohort all pediatric patients surgically treated for unstable distal radius fractures between September 2010 and July 201 were reviewed. Patients aged between 4 and 17 years treated with volar plate fixation were included. The primary outcome was the Patient Rated Wrist Evaluation (PRWE) after at least 12 months follow-up. Secondary outcomes were range of motion and grip strength compared to the uninjured wrist, postoperative radiological parameters, complication and incidence of plate removal.

Results and Conclusions: A total of 26 patients with a median age of 12.5 years were included. Median PRWE was 3 after a median follow-up of 29 months. range of motion and grip strength did not differ significantly between the injured and uninjured wrist. In two patients stiffness was reported as a complication, which was successfully treated with physical therapy. No wound infections were found. Plate removal was performed in 15 patients.
Volar plate fixation for unstable displaced distal radius fractures in children provides excellent functional outcomes.

Keywords:
distal radius fracture, pediatrics, volar plate fixation, functional outcome
The Mangled Hand and Forearm - Algorithm for Treatment

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Objectives / Interrogation: Mangling injuries of the upper extremity usually provoke significant disability of hand function and have a lasting psychological impact on the patient. In the absence of a structured approach to the treatment of these injuries, the surgeon can easily get lost in the chaos of mangled tissues. In this presentation an algorithm for the diagnosis and treatment of the mangled hand and forearm will be presented.

Methods: Eighteen patients with 19 mangled hands and forearms were operated and followed for an average period of 8 years. Demographic information including; age, sex, etiology and mechanism of injury, diagnostic and surgical procedures was recorded. The hand cases were classified and evaluated using Del Pinal’s classification. The diagnostic algorithm contains two main points; assessment of the vitality and functional capacity of the available tissues and the judgment of which structures should be saved and which should be sacrificed in order to maximize final hand function. The therapeutic strategy contains two stages: Acute and Reconstruction. The main therapeutic principles are: 1) saving the life, and 2) saving the most important functions of the hand. The treatment is characterized by multiple operations until an acceptable level of hand function is achieved.

Results and Conclusions: Eight out of 11 operated hands were restored to an acceptable function. Acceptable function, according to Del Pinal’s definition is a hand with an opposition-capable thumb and two or 3 movable digits. Five cases were originally classified as “crippled hand” and after reconstruction were evaluated as “acceptable”. Three of the injured hands were originally classified as “mutilated hand”. After treatment they were defined as “acceptable”. In 3 cases there was no change in the functional level. Sixteen patients did not achieve full range of motion in the hand. Eight of hands did not recover full sensation, and 3 of them had incomplete motor recovery. Two out of 6 replanted fingers necrotized and were removed.

Conclusion: Management of the mangled hand and forearm requires a completely different treatment approach than that of simple hand injuries. In order to achieve the best possible results, the lead surgeon must be capable to evaluating and prioritizing treatment options. The proposed algorithm gives a systematic approach on how to create a realistic plan for restoring integrity and function after these devastating injuries.

Keywords:
mangled, hand reconstruction,
Fingertip reconstruction with V-Y advance flaps combined with bone and nail bed grafts after amputation

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Objectives / Interrogation: Fingertip amputation is a common hand injury, especially in industrial areas. The ideal treatment is fingertip replantation. However, if the fingertip blood vessels are slender or the damages are severe, replantation makes no sense. This study aimed to provide an objective method of treating fingertip amputations with no indication for replantation is to reestablish functional and esthetic properties.

Methods: During March 2010 and October 2014, 15 patients underwent the treatment of V-Y advanced flaps combined with bone and nail bed grafts to fingertip reconstruction. Patients' age ranged from 18 to 69 years (mean 35.3 years). All patients underwent emergency surgery, with a time delay after injury of 4-12h (mean 7.1 h). In each case, the amputation was a crush or avulsion injury, making microsurgical replantation not feasible. The defects were located in the nail root in 11 cases and in the middle of nail in 4 cases, the area ranging 1.4 cm × 0.5 cm-1.4cm × 1.1cm in size.

Results and Conclusions: All the flaps and nails survived, and the incisions healed at I stage. The average follow-up time was 12mouths (6-28 mouths). The patients all satisfied with the appearance and the function of the reconstructed fingertip, average subjective satisfaction score was 8.87. The bone graft healed at 6-8 weeks. The mean two-point discrimination was 5-6 mm. The nails graft growth were all flat, no nails, but some slightly smaller than normal. All patients returned to their jobs. This study shows that V-Y advanced flap combined with bone and nail bed grafts to reconstruct fingertip with no replanted conditions could make the length of the finger and the shape of the nail preserved, and operation simple, which is a valuable new surgical method.

Keywords:
fingertip reconstruction,V-Y advance flaps,amputation
Mini-operative treatment of tennis elbow using bipolar radio-frequency

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Objectives / Interrogation: Lateral epicondylitis or tennis elbow is a noninflammatory, degenerative condition of the origin of the ECRB or EDC, associated with overuse and characterized by: absence of inflammatory cells, profusion of disorganized collagen and fibroblastic hypertrophy, nutritional flow is compromised, making it difficult for tenocytes to synthesize the extracellular matrix necessary for repair and remodelling. A principal aim in treatment of tendinosis is to establish a biologic healing response. The purpose of this study was to evaluate the long-term results, safety and effectiveness of using RF-based microtenotomy to treat tennis elbow.

Methods: It was prospective, nonrandomized, two-center clinical study. Into the study were involved 49 patients (28 men and 21 women) with symptomatic epicondylitis lateralis (tennis elbow) for at least 6 months and had failed conservative treatment. The average age of patients was 44,9 years (range: 26-57). Dominant limb was involved in 89% of the patients. As operative method we used bipolar microtenotomy of extensor carpi radialis brevis and/or common extensor tendon using TOPAZ Microdebrider device (ArthroCare, EU). Before operation was done VAS, DASH and clinical examination. Postoperative clinical assessment: 2 and 14 day. Follow-up: 12 and 24 months after operation: VAS, DASH, USG, clinical examination. USG: LOGIQ e GE Healthcare device with a 7,7-15Mhz linear transducer.

Results and Conclusions: The dominant arm was involved in 89% with unilateral involvement. There were no perioperative or postoperative complications related to the procedure. The mean VAS decreased from 8,8 before operation to 2,6 (p=0,001). Postoperative DASH value was 21,6. There were found ultrasonography abnormalities 24 months after operation:
- focal hypoechoic area: 36 patients (74%)
- focal anechoic area: 16 patients (33%)
- cortical irregularity of the lateral epicondyle: 34 patients (70%)
- tendon thickening: 13 patients (27%)
- intratendinous calcifications: 11 patients (22%)
- increased vascularity: 9 patients (18%)

1. RF-based microtenotomy appears to be a safe and effective method for treating patients with chronic tendinosis.
2. Microtenotomy is a technically simple procedure to perform and is associated with a rapid and uncomplicated recovery. Pain relief was achieved rapidly in all patients and diminished even further with time.
3. Ultrasonography is a widely and inexpensive imaging study for assessing tendons providing useful information on the severity and stage of tendon pathology.

Keywords:
tennis elbow, minimal operative treatment, microtenotomy
Modified Brunelli technique for flexor tendons repair in zone II

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Objectives / Interrogation: The repair of flexor tendon lesions in Zone II remains one of the most challenging problems in hand surgery. The functional outcome depends to both a very accurate surgery and a very intensive hand therapy. We will present our experience by using a modified Brunelli technique, which moves the tension from the suture site distally, what allows the very early beginning of hand therapy and improve the quality of functional results.

Methods: Our method consists in using a two-strand suture repair by passing a 2/0 stitch through the tendon from its insertion to the proximal stump, and then back to the fingertip were is knotted in a tie-over fashion. A running 4/0 suture at the disruption level completes the procedure. This procedure allows the beginning of passive movements in the first postoperative day, the active movements in the second day, and movements against resistance after 3-4 days. We used this procedure in 156 patients, 115 men and 67 female aged between 6 and 75 years. One flexor tendon was disrupted in 139 patients, two in 11, three in 3, and four in three. Both the profundus and sublimis tendons were interested in 101 patients. Digital nerves disruption was found in 113 patients, and a skin defect in 23 patients.

Results and Conclusions: The average follow-up was 14 months. All patients continued to have the same social life and were able to work in the same place. No problem on the finger pulp related to the tie-over suture was recorded. We had only one rupture. According with the scoring system proposed by Strickland, our results can be judged as excellent in all the cases (regain of 75-100% of normal active movement). According with the scoring system proposed by Lister, the results can be judged as good (regain of flexion to within less than 3cm of the distal palmar crease) in 30% of cases, and as very good (regain of flexion to within 1cm of the distal palmar crease and an extension deficit less than 15 degrees) in 70% of cases. Moving the tension from the repair site to the finger pulp allows the very early beginning of the active mobilization against resistance. This contributes to a very good modeling of the tendon, minimal adhesion formation, and avoids the joints stiffness and the extension deficit of the interphalangeal joints.

Keywords:
Wide-awake local anesthesia no tourniquet (WALANT) proximal row carpectomy

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Objectives / Interrogation: Wide-awake local anesthesia using no tourniquet (WALANT) hand surgery is a still gaining popularity. WALANT has been used by hand surgeons when operating on skin, nerve entrapments, tendons and bones. The limits of hand surgery under local anesthesia are permanently being pushed further.

We report a proximal row resection performed under local anesthesia in WALANT: The 57 years old patient underwent multiple surgery for "trapeziometacarpal arthrosis". Due to the persistent, pain her general practitioner organized a consultation in our tertiary center. During clinical evaluation, she indicated the center of the wrist as "source of pain". Flexion and extension of the wrist was very painful. The power grip was 11 kg at the examined hand versus 28 kg on the contralateral hand. The radiographs show a lunocapitate joint arthritis. The patient is not willing to undergo four-corner fusion or wrist arthrodesis therefore we propose a proximal row carpectomy in WALANT.

Methods: We injected 8 ml Lidocain 2% with ephedrin and 10% natrium bicarbonats around the wrist and 2 ml intra-articulair.

After transvers skinincision and a radial based capsular flap we extirpated bones radial and ulnar to the common digital extensor with help of a burr.

Results and Conclusions: Perioperative painscore was VAS 0.

We offer technical insights on how to perform this procedure as well as the main advantages, which are associated with using WALANT proximal row carpectomy.

Keywords:
WALANT proximal row carpectomy
Functional outcome of distal interphalangeal joint arthrodesis

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Objectives / Interrogation: Distal interphalangeal joint (DIPJ) arthrodesis can be used to treat pain, deformity, or instability associated with arthritis of DIPJ. It is not common procedure, but effective for creating a painless stable joint. The purpose of this study was to analyze DIPJ pathologies, clinical and functional outcomes of DIPJ arthrodesis with K-wires.

Methods: From April 2010 to December 2017, we retrospectively analyzed 10 patients who underwent DIPJ arthrodesis. Among them, 5 cases were treated for degenerative arthritis, 2 cases for traumatic arthritis, 2 cases for infection and 1 case for congenital synostosis. The mean follow-up period was 14.5 months, with an average age of 57.4 years. Four of the cases were in the fifth finger, 4 cases in the third and 3 cases in the second finger. Arthrodesis was done with K-wires except 1 case with cannulated headless screw. Plain radiographs were used to assess radiological results. Clinical and functional results were assessed by VAS score, DASH score, fusion angle, pulp and side pinch power, and grip strength.

Results and Conclusions: Radiologically, joint congruency was maintained in all cases. Mean DASH score was 8.5, and VAS score was 1.2. For complications, 1 patient had pin site infection, which was cured after conservative treatment. In an infection case, we did revision surgery for nonunion, and achieved fibrous union. The other cases fused successfully, including 1 fibrous union. Mean pulp and side pinch power were 78.5% and 75.2% of normal side, respectively. Mean grip strength was 82.2% of normal side. When compared fibrous union to bony union cases, mild decrease in pulp and side pinch power of fibrous union group was seen (71.2% and 70.2% VS 78.5% and 75.2%), but grip strength (90.4% VS 92.2%) and DASH score (7.2 VS 8.5) were similar.

In the treatment of DIPJ pain with variable causes such as degenerative, traumatic, infection or congenital deformity, arthrodesis results in satisfactory functional outcome even with fibrous union.

Keywords:
Functional outcome, osteoarthritis of DIPJ, arthrodesis of DIPJ
Choosing the Flap in Complex Injuries of the Hand

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Objectives / Interrogation: Coverage of complex tissue loss in the hand after severe traumas by crushing or avulsion is very challenging. These defects involve generally all the anatomical structures. The difficulties in repairing such a compromise hand are primarily related to the necessity to obtain an as good as possible functionality. The key of obtaining a good functional rehabilitation is to perform, whenever is possible, both the reconstruction and coverage as an all-in-one procedure.

Methods: We take into account the cases with very complex injuries involving all the structures of the hand. In 70% of our cases we used local or regional perforator flaps, and in 30% of cases free flaps.
In case of need to cover soft tissue defects over repaired fractures, vessels, nerves and tendon lesions, we prefer to use-whenever is possible-local or regional perforator flaps; if the skin defect is to big, a free flap is preferred.
For composite skin and bone defects we use generally composite flaps including bone.
For amputations or devascularized segments with skin defects, a free flow-through flap is used.
For amputations of different segments, and especially of the thumb accompanied by skin defects, we cover the defect with a free flow-through-flap which is used in mean time to revascularize one or more toe transfers.

Results and Conclusions: All the hands treated by this protocol survived. The failure rate of the flaps was comparable with the one in the literature. By using local/regional perforator flaps we experienced no complete necrosis, but only a transitory venous congestion (20%) followed by a superficial necrosis in 5% of cases. We lost 2 free flaps out of 45 (4.4%). We obtained a satisfactory functional rehabilitation of the reconstructed hand in 10% of cases, a good one in 40% of cases, and a very good one in the remaining 50%.

Conclusions
In complex injuries of the hand the modality of reconstruction is up to the team experience. The use of local/regional perforator flaps has a very good indication in small and medium skin defects, and only in the purpose of coverage. The use of free flaps remain the gold standard in solving big composite defects. The emergency all-in-one reconstruction and the beginning of kinetotherapy as soon as possible after surgery are the key stone of a good functional recovery.

Keywords: -
Fate Mapping the Developing Limb Bud to Decipher the Origin of Congenital Hand Differences

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Objectives / Interrogation: The processes of developmental patterning occurs in the embryo long before anatomical structures are visible. When these unseen developmental processes such as cell signalling and fate specification go wrong, however, congenital hand differences can occur. To understand where specific tissues are derived from and how they are patterned, developmental biologists undertake ‘fate mapping’ in model organisms, such as the chicken and mouse in order to establish the origins of the tissues that comprise the limb. We present the next generation of limb bud fate mapping using novel transgenic chicken embryos (Roslin Chameleon) that have a Cre-inducible, multi-fluorescent Cytbow construct. This method was used to determine the origins of the radius and ulna, structures that have been neglected in previous fate maps due to technical constraints.

Methods: Embryos were generated from a cross between heterozygous Chameleon males and stock hens generating eggs. These embryos allow implanted Cre protein within cells in the limb bud mesenchyme to exhibit fluorescence, even through cell multiplication, and therefore structures could be traced through their subsequent development. After 7 days, limb buds were fixed and processed for histology and immunohistochemistry, Optical Projection Tomography or Light Sheet Microscopy. In order to create accurate fate maps, the location of the bead for each fluorescent limb was plotted onto a stage specific outline of the wing bud, split into six segments - the stylopod, anterior and posterior zeugopod, anterior, medial and posterior autopod. These sections were imposed on the early limb bud, depending on the eventual location of the fluorescence induced by each bead.

Results and Conclusions: Application of an agarose bead soaked in TAT-Cre protein acted immediately and transiently to induce recombination in the transgene in a limited number of limb bud cells. Expression of fluorescent proteins was equal, stable and exclusive, occurring within 5 hours of TAT-Cre application and within a 380um distance from the bead. A total of 18 stage 20HH limbs buds were successfully implanted and had resulting fluorescence. After anatomical examination, 2 were found to have labelled cells in the radius and 2 in the ulna. Extrapolation from the placement of the bead at stage 20HH allowed us to hypothesise the origin of the cells which give rise to the forearm. Such a fate map allows us to potentially decipher the origins of congenital hand differences such as radial or ulnar aplasia.

Keywords:
The usefulness of Disability of the Arm, Shoulder and Hand (DASH) in patients with shoulder disorders.

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Objectives / Interrogation: Disability of the Arm, Shoulder and Hand (DASH) is one of the most popular patients' oriented functional measures in the upper extremity and is widely used for patients with hand, finger, and elbow disorders, however, has rarely been used in patients with shoulder disorders. The purpose of this study was to assess the usefulness of DASH for patients with shoulder disorders.

Methods: Shoulder function of patients who underwent arthroscopic surgery for rotator cuff tear (RCT, n=58) and Bankart lesion (BL, n=112) were evaluated using DASH preoperatively and 3, 6, 9, 12, 18, 24 month postoperatively. Simultaneously, we evaluated Japan Orthopaedic Association Shoulder Functional Score (JOA score: Surgeons' oriented outcome measure), and isokinetic shoulder rotatory muscle strength. Isokinetic muscle strength was measured using Biodex System 3 (Biodex, NY) at 60 deg/sec condition, and contralateral peak torque ratio (injured side peak torque was divided by contra-lateral side peak torque). We assessed correlations between DASH, JOA score, and muscle strength.

Results and Conclusions: Preoperative DASH was 39.8 (SD:23.2) in patients with RCT, and gradually decreased to 4.1(SD:1.6) at 24 months after surgery. On the other hand, DASH was 13.2 (SD:13.0) in patients with BL, and significantly decreased to 6.9 (SD:6.6) by 6 months after surgery, and kept in low score later than 6 months. JOA was recovered to the same transitional change in patients with RCT and BL. There was significant correlation and coefficient between DASH and JOA score (r=-0.77, p<0.01). External peak torque ratio was also recovered to the same translation, and there was significant negative correlation between DASH and external peak torque ratio (r=-0.46, p<0.01).

In conclusions, the strong correlation between DASH and JOA score supported its validity and reliability in assessing shoulder function. DASH also reflected the isokinetic shoulder rotational muscle strength, and should be widely used in evaluating QOL in shoulder disorders. DASH was a very effective measure in patients with shoulder disorders.

Keywords:
DASH (Disability of the Arm, Shoulder and Hand), shoulder
Reversed Vascularized Second Metatarsal Flap for Reconstruction of Type IIIb and IV Thumb Hypoplasia with Reduced Donor Site Morbidity

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Objectives / Interrogation: To investigate the validity, efficacy and safety of utilizing a reversed vascularized second metatarsal composite flap for Manske type IIIb and IV hypoplastic thumb reconstruction, without impairing the functions of the donor site.

Methods: An osteocutaneous flap containing a section of second metatarsus and its distal head was transferred in reversed position to reconstruct metacarpophalangeal joint with trapezium remnant or the base of second metacarpus, dorsalis pedis artery anastomosed to residual radial artery or the common digital artery; great saphenous vein to cephalic or opisthenar vein. Donor site was reconstructed by a split half of the third metatarsus. Various staged reconstructions were commenced months later. The thumbs were evaluated with grip, key-pinoc and the skills in performing daily activities through a detailed VAS questionnaire.

Results and Conclusions: From May 2014 to Jan 2017, 15 patients, with 7 type IIIB, and 8 type IV thumbs were reconstructed. 13 metatarsal flaps had complete survival (86.7%). With average of 19.3-months follow-up, the reconstructed thumbs had pleasant appearance; The donor foot presented in good appearance without any sign of impaired function. X ray further evidenced good bone fusion in second and third metatarsal. Patients and parents have high recognitions and acceptance on the new thumb. Reconstruction of an unstable hypoplastic (Manske type-IIIB and IV) thumb with use of a vascularized metatarsus is an effective alternative to pollicization of the index finger, especially when parents insist on saving the thumb at all costs.

Keywords:
Thumb hypoplasia; Second metatarsal flap; Donor Site Morbidity; Microsurgery
An alternative direction of the borehole for ligament reconstruction after resection of the trapezium in basal joint osteoarthrosis: a comparative study in 32 cadaver hands

List of authors:
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¹Medizische Hochschule Hannover, PÅHW-Chirurgie (Hannover)

Objectives / Interrogation: Ligament reconstruction of the basal joint of the thumb after trapeziectomy is a common technique in patients with osteoarthrosis. For this procedure different donor tendons and techniques are described. However, there is no exact report about the best borehole direction in the basis of the first metacarpal bone to avoid proximalization and beware mobility. In this study we investigated an optimized borehole direction for ligament reconstruction.

Methods: In 32 cadaver hands trapeziectomy and ligament reconstruction described by Epping with splitted tendon of the flexor carpi radialis muscle was performed. In each first metacarpal bone we used two different borehole directions through the basis: "standard" and "Vogt". Radiological measurements were performed after trapeziectomy with and without ligament reconstruction through the two drill channels.

Results and Conclusions: The distance between the first metacarpal bone and the scaphoid after trapeziectomy and ligament reconstruction was 9.3 ± 2.7 mm when using the standard drill hole and 10.4 ± 2.7 mm when using the Vogt drill hole (p<0.01), respectively. The relative proximalization compared to preoperatively was 4 mm with the standard drill hole and 3 mm with the Vogt drill hole (p<0.01). The distance between the first and second metacarpal bone in anterior-posterior radiographs was 7.9 ± 2.9 mm when using standard drill hole and was 6.2 ± 2.1 mm when using the Vogt drill hole (p=0.001), respectively.

In ligament reconstruction after trapeziectomy using the splitted tendon of the flexor carpi radialis muscle described by Epping proximalization can be reduced using a special drill hole in the basis of the first metacarpal bone.

Keywords: Basal joint osteoarthrosis; trapeziectomy, ligament reconstruction
Comparison of SCAphoid fracture osteosynthesis by MAGnesium-based headless Herbert screws with titanium Herbert screws: protocol for the randomized controlled SCAMAG clinical trial

List of authors:
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2 Amedon GmbH (Lübeck)
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5 StatSol (Lübeck)

Objectives / Interrogation: Comparison of SCAphoid fracture osteosynthesis by MAGnesium-based headless Herbert screws with titanium Herbert screws: protocol for the randomized controlled SCAMAG clinical trial

Methods: The trial is designed as a multicenter, blinded observer, randomized controlled parallel two-group post market trial. Approximately 190 patients will be randomized (1:1) with stratification by center either to titanium or magnesium-based compression screws. Follow-up is 1 year per patient. Surgical procedures and aftercare will be performed according to the German treatment guideline for scaphoid fractures. The first primary endpoint is the patient-rated wrist evaluation (PRWE) score after 6 months. The second primary endpoint is a composite safety endpoint including bone union until 6 months, no adverse device effect (ADE) during surgery or wound healing and no serious ADE or reoperation within 1 year. The third primary endpoint is the difference in change MRI artifacts over time. Non-inferiority will be investigated for primary endpoints 1 (t-test confidence interval) and 2 (Wilson's score interval) using both the full analysis set (FAS) and the per protocol population at the one-sided 2.5% test-level. Superiority of magnesium over titanium screws will be established using the FAS at the two-sided 5% test-level (Welch test) only if non-inferiority has been established for both primary endpoints. Secondary endpoints include quality of life.

Results and Conclusions: This study will inform care providers whether biodegradable magnesium-based implants are non-inferior to classical titanium Herbert screws for the treatment of scaphoid fractures in terms of wrist function and safety. Furthermore, superiority of magnesium-based implants may be demonstrated using MRI, which is used as surrogate endpoint for screw degradation.

Keywords:
Herbert screw - Magnesium alloy - Quality of life - Scaphoid fracture - Titanium alloy
Arthroscopic distal hemitrapeziectomy versus open distal hemitrapeziectomy without interposition in osteoarthritis of the first CMC joint; Two year follow up results of a randomized controlled trial

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3 Haga Hospital (Den Haag)

Objectives / Interrogation: For osteoarthritis of the CMC thumb joint, trapeziectomy is described as the treatment with least complications. Removal of the total trapezium, gives a higher chance to shortening and collapse of the thumb, with less postoperative strength. Distal hemitrapeziectomy doesn't have these drawbacks. The last years there is more experience in arthroscopic surgeries for the CMC thumb joint.
The objective of this study is to compare arthroscopic with open hemitrapeziectomy without tendon interposition in a randomized controlled trial.

Methods: All patients with Eaton and Littler grade 2 or 3, seen on the outpatient clinic, with failed conservative therapy, were asked to participate in the study. After obtaining informed consent, patients were randomized to either open or arthroscopic distal hemitrapeziectomy. Patients filled in the Patient Reported Wrist and Hand Evaluation (PRWHE) and hand measurements were done preoperatively and at 3, 6, 12 and 24 months postoperatively.

Results and Conclusions: We included 87 patients; 42 in the open group and 45 in the arthroscopic group. The mean operation time for the open technique was 25min and 35min for the arthroscopic technique (significant p=0.00).
The preliminary results are shown in Image 1.

<table>
<thead>
<tr>
<th></th>
<th>Pre-operative</th>
<th>12 weeks</th>
<th>26 weeks</th>
<th>1 year</th>
<th>2 years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Patient Reported Outcome Measurements (PROMs)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>PRWHE Total (0-100)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open</td>
<td>71</td>
<td>45.5*</td>
<td>35.5*</td>
<td>9.0*</td>
<td>5.8*</td>
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<tr>
<td>Arthroscopic</td>
<td>64.0</td>
<td>57.5</td>
<td>35.7*</td>
<td>19.7*</td>
<td>11.5*</td>
</tr>
<tr>
<td>PRWHE Pain (0-50)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Open</td>
<td>36.0</td>
<td>23.0*</td>
<td>20.5*</td>
<td>6.0*</td>
<td>3.5*</td>
</tr>
<tr>
<td>Arthroscopic</td>
<td>36.0</td>
<td>30.5</td>
<td>20.0*</td>
<td>11.0*</td>
<td>8.0*</td>
</tr>
<tr>
<td>PRWHE function (0-50)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open</td>
<td>32.5</td>
<td>21.5*</td>
<td>14.3*</td>
<td>4.8*</td>
<td>1.8*</td>
</tr>
<tr>
<td>Arthroscopic</td>
<td>30.5</td>
<td>28.3</td>
<td>15.0*</td>
<td>7.8*</td>
<td>2.5*</td>
</tr>
<tr>
<td>Satisfaction (Good to Excellent in % of total patients)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open</td>
<td>-</td>
<td>43.4%</td>
<td>55.9%</td>
<td>74%</td>
<td>79%</td>
</tr>
<tr>
<td>Arthroscopic</td>
<td>-</td>
<td>32.5%</td>
<td>48.5%</td>
<td>61.1%</td>
<td>68.4%</td>
</tr>
</tbody>
</table>

| **HAND Measurements** | | | | | |
| JAMAR (in Kg)         | | | | | |
| Open                 | 19.3          | 15.9     | -        | 23.6*  | 24.9*   |
| Arthroscopic         | 22.7          | 15.6     | -        | 28.2*  | 28.2*   |
| ROM Kapandji (degrees)| | | | | |
| Open                 | 9             | 10       | -        | 10     | 10      |
| Arthroscopic         | 9             | 10       | -        | 10     | 10      |
The PRWHE showed significant improvement at 26 weeks, 1 year and at 2 years for both groups, compared to preoperative (no significance between groups). Satisfaction was good to excellent for the open group in nearly 80% and nearly 70% for the arthroscopic group. The grip power also improved significantly at 1 and 2 year follow up for both groups, compared to preoperatively. The range of motion with Kapandji was 9 preoperative and improved to 10 for both groups at follow up. These are the preliminary results of our RCT arthroscopic versus open distal hemitrapeziectomy. The results show a significant improvement for both techniques after 1 and 2 year follow up, but not between groups, except for operation time. At the time of the congress, we will present the results of 87 patients with a minimum of 1-year follow up and 50 patients with a minimum of 2 year follow up.

**Keywords:**
carpometacarpal thumb joint, osteoarthritis, hemitrapeziectomy, arthroscopic
Intraoperative NCS During Open Carpal Tunnel Release: A Pilot Study

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2 Chicago Hand and Orthopedic Surgery Centers (Oak Brook Terrace, Illinois)

Objectives / Interrogation: Operative management of carpal tunnel syndrome (CTS) involves release of the transverse carpal ligament (TCL) and often the volar antebrachial fascia (VAF). Evidence of a difference between TCL and TCL+VAF release is lacking. We aimed to conduct a pilot study to measure changes of intraoperative nerve conduction velocity (NCV) after CTS surgery and compare outcomes of variable degrees of decompression.

Methods: Patients aged 18-65 years diagnosed with idiopathic CTS and who failed conservative management were included in this study. Cases were excluded if they had prior surgical release, had diabetes, acute CTS, trauma, or cervical spine radiculopathy. Outcomes included motor and sensory amplitude and latency. Electrodes were placed on the skin intraoperatively, along the abductor pollicis brevis, index finger, and forearm. TCL and VAF release were performed in the usual manner. Outcome data were recorded at baseline, after TCL release, and after TCL+VAF release. A single-tail t-test was then performed for analysis.
Intraoperative Electrode Placement

Results and Conclusions:

<table>
<thead>
<tr>
<th></th>
<th>Baseline to TCL Release</th>
<th>TCL to TCL+VAF Release</th>
<th>Baseline to TCL+VAF Release</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean % Change</td>
<td>% Change SD</td>
<td>P value</td>
<td>Mean % Change</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Change in Motor and Sensory Amplitude and Latency from Baseline to TCL and VAF Release

<table>
<thead>
<tr>
<th>Motor Amplitude</th>
<th>-10.8</th>
<th>26.0</th>
<th>0.11</th>
<th>5.1</th>
<th>8.9</th>
<th>0.07</th>
<th>-7.4</th>
<th>25.0</th>
<th>0.18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Latency</td>
<td>3.8</td>
<td>10.1</td>
<td>0.18</td>
<td>1.0</td>
<td>16.0</td>
<td>0.39</td>
<td>-3.8</td>
<td>9.6</td>
<td>0.19</td>
</tr>
<tr>
<td>Sensory Amplitude</td>
<td>8.7</td>
<td>60.0</td>
<td>0.15</td>
<td>4.1</td>
<td>64.0</td>
<td>0.46</td>
<td>-14.0</td>
<td>33.0</td>
<td>0.06</td>
</tr>
<tr>
<td>Sensory Latency</td>
<td>-10.3</td>
<td>21.0</td>
<td>0.13</td>
<td>7.1</td>
<td>26.0</td>
<td>0.21</td>
<td>-16.0</td>
<td>33.0</td>
<td>0.10</td>
</tr>
</tbody>
</table>

10 patients were included in this study. From baseline to TCL+VAF release, mean motor amplitude, mean motor latency, mean sensory amplitude and mean sensory latency decreased (p>0.05). There were no statistically significant differences in mean sensory or motor function between TCL and TCL+VAF release.

The lack of significant findings suggests that NCV may not be useful for assessing intraoperative improvement. As a pilot study, we highlight the need for future research in the form of case-control studies to determine the utility of intraoperative NCV. These studies should be conducted with larger numbers of patients and multiple hand specialists.

Keywords:
Carpal Tunnel Release, CTR, EMG, NCV, Intraoperative
Simultaneous bilateral distal biceps tendon avulsions: Simultaneous versus staged repairs. A report of two cases and literature review.

List of authors:
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¹Hospital Madre Teresa (BELO HORIZONTE)

Objectives / Interrogation: Distal biceps tendon avulsions are uncommon and can be treated non-operatively or surgically. Surgical treatment is often requested by people that desire strong supination on their activities. Only a few cases of simultaneous bilateral distal biceps tendon avulsions are published and no consensus exists on the management strategy: staged or simultaneous repair.

Methods: This paper presents two patients with simultaneous bilateral distal biceps avulsions, and brings reviewed literature with only eight cases published. All patients were men, with a mean age of 44 years old. The first case report is a 32 year-old male who heard a pop in both arms associated with acute pain. He was trying to roll a car back over on the road and presented bruise in both forearms and loss of supination power. The hook test was abnormal bilaterally and the patient had a history of anabolic steroid use. Magnetic resonance imaging (MRI) showed bilateral complete distal biceps tendon avulsion and staged surgical procedures were performed. The second case is a 46 years old male subject that presented to the hospital, one week after a painful pop in both elbows during a preacher biceps curl. He had no history of anabolic steroid use and there was marked bilateral proximal biceps migration and a mild bruise in both forearms. The hook test was abnormal bilaterally. MRI showed bilateral complete distal biceps tendon avulsion, and he was submitted to simultaneous repair.

Results and Conclusions: After reviewing the collected published experiences it was found that some articles were based on chronic tears and others had acute lesions, among which half were treated surgically simultaneously and others staged. All of them had satisfactory outcomes, assuming that chronicity of the lesion and the management strategy selected may not interfere in the final result.

One downside of the simultaneous approach is the functional limitation due to initial immobilization. However, some authors demonstrated that immediate elbow mobilization after repair of the distal biceps was not associated with failure. A drawback of the staged approach is the possibility of initiating a heterotopic ossification (HO) cascade as happened with the first case of this paper; therefore a HO prophylaxis might preclude that outcome.

Although a high heterogeneity was found regarding the lesions and its treatment, a simultaneous or a staged approach might be used when operating on these lesions. Both yield satisfactory outcomes.

Keywords:
ebowl; distal biceps; tendon; simultaneous; avulsion; repair
In-vivo 3D motion analysis of the wrist during dart-throwing motion after 3-corner fusion and RSL fusion

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³ University Hospital Zurich (Zurich)

Objectives / Interrogation: Cadaver studies showed a better dart-throwing motion (DTM) after radioscapholunate (RSL) fusion compared to 3-corner fusion (3CF). The aim of the study was to measure the range of motion (ROM) of the wrist during DTM in patients after RSL fusion and 3CF with a 3D motion capture system and to compare it with healthy volunteers.

Methods: The kinematics of the wrist of twenty healthy volunteers as well as five patients after 3CF and five patients after RSL fusion were recorded during the performance of the DTM as well as three basic motion tasks (BMT). A marker set consisting of 13 skin markers was used to collect the kinematic data of the wrist with a 3D motion capture system. The maximum ROM was calculated from the BMT.

Results and Conclusions: During the DTM, 20 healthy volunteers showed a mean flexion-extension (FE) ROM of 99° and mean radial-ulnar deviation (RU) ROM of 44°. As expected after 3CF and RSL fusion, patients had a significantly reduced maximal ROM during BMT and DTM for the FE and RU ROM compared to the healthy controls (p<0.003). Comparing the two patients groups, the RSL patients had a significantly smaller RU ROM during the BMT than the 3CF patients (p<0.001), but the ROM during DTM did not differ significantly between the two patients groups. Regarding the ROM exploitation during the DTM, all three groups used between 61-66% of their maximal FE ROM, but for the RU ROM, the RSL patients used 131% of their maximal RU ROM, which is significantly more than the 3CF (85%) and healthy group (89%) (p<0.03).

These findings suggest that the ROM during DTM after 3CF and RSL fusion are similar, contradicting the traditional cadaver studies. After RSL fusion, patients had a better RU ROM during DTM, than during the BMT in the true RU plane.

Keywords:
dart throwing motion, 3-corner fusion, radioscapholunate fusion, 3D motion capture, kinematic analysis
The introduction of human Mesenchymal Stem Cells to clinically available nerve substitutes

List of authors:
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Objectives / Interrogation: We hypothesized that seeding human adipose derived Mesenchymal Stem Cells (MSCs) on the surface of clinically available nerve replacement treatments (Avance Nerve graft and NeuraGen Nerve guide) could provide extra biological support and potentially enhances the outcomes of these nerve substitutes.

Methods: An MTS assay examined the viability of human MSCs at different time intervals when a 2mm segment of Avance Nerve Graft (group I) or NeuraGen Nerve Guide (group II) was added to their environment (n=3 per group per time point). MSCs were seeded by using a non-traumatic dynamic seeding strategy, preserving the inner ultrastructure of the nerve substitutes. 1 million MSCs per nerve substitute were transferred to conical tubes containing either a 10mm Avance nerve graft or a 10mm NeuraGen nerve guide. The conical tubes were rotated in a bioreactor for 6, 12 and 24 hours after which cell counts were performed to obtain seeding efficiencies. The distribution of the MSCs was mapped with live/dead and Hoechst stains. Fixed cross-sectional sections of the seeded nerve substitutes were Hoechst stained to observe the migration of cells inside the graft.

Results and Conclusions: The viability of MSCs was not influenced by the presence of both nerve substitutes. For group I, a seeding efficiency of 18.23% was obtained after 6 hours, increasing to 66.46% after 12 hours (p<0.001) after which the efficiency decreased to 59.90% after 24 hours (p=1.00). For group II, the seeding efficiency increased from 52.08% after 6 hours to 94.17% after 12 hours (p=0.009) and decreased to 52.50% after 24 hours (p=0.009). Seeding efficiencies were significantly higher for group II after 6 and 12 hours of seeding (p=0.007 and p=0.025) (figure 1). Live/dead stains, Hoechst stains and SEM on all time points showed a uniform distribution of viable MSCs over the entire surface of both nerve substitutes (figure 2). Cross-sectional sections revealed that the MSCs were absent on the inside of group I, but were present on the inside of group II.

Conclusion: Viable human MSCs can be seeded on both nerve substitutes without harming the inner ultrastructure; 12 hours is the optimal seeding duration. Human MSCs were seeded on the surface of both nerve substitutes in a uniform matter. MSCs only migrated into the NeuraGen nerve guide during dynamic seeding. Our method showed to have great clinical potential to improve and individualize peripheral nerve repair.

Keywords:
Neuragen nerve guide, avance nerve graft, nerve reconstruction, stem cells
The effect of the coronoid nonunion on the terrible triad of the elbow.

List of authors:
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¹ Hospital Madre Teresa (BELO HORIZONTE)

Objectives / Interrogation: Lesions involving an elbow dislocation associated to a radial head and a coronoid process fractures are called the terrible triad of the elbow. Historically, this lesion often presents difficulties in its approach and unsatisfactory results such as instability, osteoarthritis and elbow stiffness. This study aims to evaluate the clinical and radiographic results of the surgical treatment of the terrible triad of the elbow and the impact of coronoid nonunion on outcomes.

Methods: There were collected 48 cases of terrible triad of the elbow treated operatively by the same hand surgeon. Seventeen patients were excluded and the final sample had 31 patients that were evaluated for an average of 25 months after surgery (range 13 to 51 months). There were 19 male and 12 female with an mean age of 43 years (± 14.5). In 17 patients the coronoid was fixed using the lasso technique, eight were fixed using screws or k-wires and six were not fixed. The radial head fractures was treated with osteosynthesis (14 patients), arthroplasty of the radial head (12 patients), or resection of a small fracture (5 patients). The lateral ligament complex (LLC) was repaired in all patients and the medial collateral ligament (MCL) was repaired in 5 patients. The patients were then divided in two groups: coronoid healing (C) and coronoid nonunion (CN).

Results and Conclusions: The coronoid healed in 18 patients (group C) and did not in 13 patients (CN group). The final average arc of flexion and extension was 111°. The average pronation was 69° and supination was 63°. The mean DASH was 13 and the average MEPI was 85. According to the MEPI, 24 patients (77%) had good or excellent results. There were 30% of failure of coronoid fixation non related to the fixation method. Despite this high rate, the results were not affected by the loss of coronoid fixation. There was no statistically significant difference between the results of patients in whom the coronoid healed and those with nonunion. The coronoid nonunion doesn't affect the final results in patients submitted to surgical treatment of terrible triad of the elbow.

Keywords:
terrible triad, coronoid fracture, nonunion, elbow
Scaphoid Hemi-Resection and Arthrodesis of the Radio-Carpal Joint (the SHARC Procedure) for Isolated Radio-Carpal Arthritis Provides Biomechanically and Clinically Functional Outcomes

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Objectives / Interrogation: Recessed arthrodesis of the radiocarpal joint with distal scaphoid hemi resection can reduce pain and provide functional motion through the mid carpal joint.

Methods: 27 patients with advanced radiocarpal arthritis (11 patients following failed treatment of complex distal radius fractures, 8 patients with scapholunate advanced collapse, 4 patients with scaphoid nonunion with advanced collapse and 4 patients following failure of treatment for transcaphoid perilunate fracture dislocation) were treated with a procedure to recess the lunate and proximal pole of scaphoid into the metaphyseal bone of the distal radius, resection of the distal one half of the scaphoid was also performed to allow enhanced motion of the capitate head within the midcarpal joint as a "universal joint". Fixation of the lunate and proximal scaphoid was achieved through flexible tension plates. Controlled early active motion was begun one week after surgery (patients have been followed for an average of 6.8 years, range 2-14 years).

Results and Conclusions: Results
All 27 patients developed a stable union at the arthrodesis site. None had hardware problems and there were no infections. Range of motion increased from an average preoperative total arc of flexion-extension of 32° to 61°; to a total arc of flexion extension of 68° to 110° (range 42° to 110°). Pain ratings on a visual analog scale decreased from an average of 8.7 to 1.2. Twenty-five of 27 patients demonstrated significant increase ability in their activities of daily living. One patient had persistent stiffness and was not pleased with his limited motion but had significant pain relief. One patient developed mid carpal arthritis and was converted to a total wrist arthroplasty.

Conclusion
Scaphoid hemi resection and limited arthrodesis of the radio-carpal joint is a viable motion sparing procedure for isolated radiocarpal arthritis. Although there are limitations in the total degree of movement, the motion which persists is functional, pain relief has been substantial and the long-term (4-16 yr) follow-up suggests minimal deterioration. This procedure is technically straightforward and appears to be a viable alternative to total wrist arthrodesis when the mid carpal joint is reasonably spared. Revision to total wrist arthroplasty remains a viable salvageable procedure

Keywords:
Preliminary results of vein wrapping for treating hyperaesthesia of the superficial sensory radial nerve.

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Objectives / Interrogation: Hyperaesthesia of superficial sensory of radial nerve following decompression of de Quervain tenosynovitis is relatively common. The oversensitive pain is described as a sharp-slicing pain located over the radial aspect of the dorsum of wrist till the base of the thumb. The pain occurs continuously even at rest. Although in most cases, hyperaesthesia is successfully treated with opioids, adjuvant medication (antidepressant, anticonvulsant, baclofen or topical local analgesia) and physiotherapy (transcutaneous-electro-nerve-stimulator and desensitization), some authors propose for surgical procedures (adhesiolysis, neurolysis, vein wrapping). A few authors reported success in treating hyperaesthesia for median nerves. However, to our knowledge, there is no case report of vein wrapping in treating hyperaesthesia of the superficial sensory of the radial nerve.

Methods: We report vein wrapping in treating hyperaesthesia of the superficial sensory of radial nerve following surgery for de Quervain. An 80-year-old male with chronic left wrist pain was diagnosed with de Quervain tenosynovitis and underwent surgical decompression of the first extensor compartment. The pain of this left wrist did not resolve more than a year despite regular physiotherapy and medication. The pain was described as a "sharp" pain even on slight touch at the dorsal radial aspect the wrist with the pain score of 8. There was no weakness of wrist, fingers or thumb in extension.

Results and Conclusions: Using the same incision from previous surgery, the superficial sensory of radial nerve was identified and we noticed the nerve was covered with previous fibrous tissue. It was pale, irregular and swollen. There was no neuroma of the nerve. We harvested the dorsal vein of the wrist, 6 cm in length, and wrapped it cylindrically around the affected nerve. Immediately on day 1 postoperative, the sharp pain of wrist reduced from 9 to 5. We assessed the pain score in the clinic in 2 weeks, 4 weeks and 6 weeks. The pain score was decreasing on each occasion. The patient was satisfied and improved in his wrist motion.

Keywords:
vein wrapping, hyperaesthesia, superficial radial nerve, sensory
Dynamic wrist radiographs in wrists with and without ganglion cysts

List of authors:
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2 Ghent University Hospital (Ghent)

Objectives / Interrogation: The exact pathophysiological mechanism of ganglion cysts of the wrist is still not completely understood. The aim of the study was to investigate if carpal instability plays a role.

Methods: Thirty-three patients with a dorsal or palmar ganglion of the wrist and 33 patients without cysts were included in the study. Standard anteroposterior and lateral radiographs of the wrist, clenched fist and anteroposterior views with the wrist in ulnar deviation were taken. Radiological parameters that may indicate carpal instability were measured and compared between the two groups, including: the width of the scapholunate joint space on anteroposterior views and the scapholunate, capitulunate and radiolunate angle on the lateral views.

Results and Conclusions: No statistical significant difference in scapholunate gap and scapholunate and radiolunate angle could be found between the two groups. Mean capitulunate angle measured 13.5° in wrists with a ganglion and 8.1° in wrists without. Although this difference was significant, the values were within the normal range.

Conclusion:
Carpal instability may not play a role in the etiology of ganglion cysts.

Keywords:
ganglion wrist carpal instability
A Trial for effective subchondral support during volar locking plate fixation for distal radial fractures with cannulated screws

List of authors:
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Objectives / Interrogation: In volar locking plate (VLP) fixation for distal radius fracture, it is significant to put the distal screws next to subchondral bone, which minimizes the postoperative correction loss, which is related to the clinical outcome. We developed a method for effective subchondral support operation with using cannulated screws at distal screw holes of VLP and assessed the utility.

Methods: 39 cases of distal radial fracture in 39 patients were included in the study. Global Form (Nexmed, Chiba, Japan) was employed for internal fixation to treat distal radial fractures. The mean patient age was 62.1 years, and the mean follow-up period was 460.1 days. According to the AO classification, there were 13 patients with type A and 26 with type C. At all the distal screw holes, 0.8 mm guide wire was inserted along the subchondral bone with feeling the touch of bone and a 2.4 mm cannulated locking screw was set in the position. We evaluated postoperative clinical outcomes on postoperative corrective loss in radiographs, minimum distance between distal screws and the radial subchondral bone (MD [mm]) in CT images, the Modified Mayo Wrist Score (MWS), and DASH score. Statistical analysis was done with the unpaired two-tailed Student's t-test.

Results and Conclusions: The mean amounts of correction loss were VT-2.2°, RI-2.29°, and UV+0.85 mm, and the mean MD was 1.59 ± 1.60. Regarding MWS, the results were "excellent" in 24 patients, "good" in 10, "fair" in 5 and "poor" in 1. The mean DASH score was 7.7. The Pearson's coefficients of correlations between the mean MD and the amounts of correction loss with respect to VT, RI, and UV were 0.11, 0.08, and -0.35, respectively, and a weak correlation was observed with the UV. No statistically significant difference was found between MD and the clinical outcome (p = 0.45).

Our trial can be useful for effective subchondral support with screws to treat distal radius fractures.

Keywords:
subchondral support, distal radius fracture, cannulated screw
Macrodactyly: literature review and author's experience.

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Objectives / Interrogation: Macrodactyly is an unusual congenital deformity, characterized by the exaggerated growth of a finger or segment, leading to a poor function limb and unacceptable aesthetic. There is no specific cause and different surgeries should be chosen depending on patient's conditions and clinical presentation. This study objective to collect data from the literature including epidemiology, pathophysiology, clinical presentation and classification; understand the different surgical techniques already described, their indications and results; and report the author's experience.

Methods: It has been done literature review about macrodactyly in databases and medical records. The author's patients were follow since the first medical appointment until 2017. Some patients were lost in contact. It was obtained pictures of patients hands, before and after surgical treatment.

Results and Conclusions: Literature shows an incidence of macrodactyly of 0.9%, manifesting at birth or at the first three years of life, predominantly unilateral. Soft tissues and bones are enlarged, with the palmar face and extremities being more involved. Most are not genetically inherited, but may be associated with syndromes as Ollier, Maffucci, Klippel-Trenaunay-Weber, and Proteus. Theories about the etiology include pathological alteration of the peripheral nerve, increased blood supply or hormonal disturbance. The pathology is divided in four types, being type 1 the more common, related to lipofibromatosis. Indications of surgical treatment are exaggerated and progressive growth, angular deformity, carpal tunnel syndrome and causalgia. Among the surgical techniques are found from soft tissue procedures, such as slimming of the fingers, resection of nerve segments, towards processes such as epiphysiodesis, shortening, filming or amputation of the distal phalanx, osteotomies for correction of deformities, falangectomy and amputation of the whole finger or segment. The main surgical indications among author's patient were exaggerated and progressive growth.

The multiplicity of presentations of macrodactyly and the variety of surgical techniques described makes the treatment challenging. The author concludes that it was not possible to select a single surgical technique for all patients and the treatment is always individualized. It is important to instruct parents about prognosis and results, once it will not be possible to obtain a normal segment despite correct treatment.

Keywords:
Macrodactyly, treatment, exaggerated growth
Preliminary results after ulnar shortening osteotomy using a "low-profile" locking plate with an ulnopalmar approach

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Objectives / Interrogation: The most common cause for symptomatic ulnar impaction syndrome is either a malunion after distal radius fracture or the congenital ulnar plus variance. Decompression of the ulnocarpal joint with ulnar shortening osteotomy is the commonly used treatment. The purpose of the study was to investigate the effectiveness of ulnar shortening osteotomy using a new, "low-profile" locking plate. With this device the closure of the osteotomy gap is performed with a compression spindle.

Methods: Between June 2016 and March 2018 ulnar shortening osteotomy was performed in 20 patients using the new locking plate. 12 patients were male and 8 patients female at a mean age of 46 years. The indication for ulnar shortening was in 8 patients a malunion after distal radius fracture, in 12 patients a congenital positive ulnar-plus variance. 14 of the 20 patients underwent a previous arthroscopic debridement of the TFCC area. The osteotomy of the ulna was done in all patients in an ulnopalmar approach and the osteotomy in 45° degrees. Arc of motion, grip strength (Jamar Dynamometer), pain (using the Visual Analogue Scale) and activities of daily living (DASH Score) as well as radiological outcome were assessed.

Results and Conclusions: Mean follow-up time was 11.3 months. There was a significant pain reduction (VAS; 7.2 to 2.2, \(p<0.05\)) and improvement of function (DASH; 50.44 to 27.4, \(p<0.05\)). Range of motion and grip strength improved as well compared to the contralateral side. The average ulnar shortening was 3.5 (1.5-7) mm. Bony union was achieved in all patients after a mean time of 4 months. Overall patient satisfaction was rated by 18/20 patients as very good, 1/20 as good and 1/20 as not good. There was no implant associated complication. The mean time required to return to work was 4.7 months. Ulnar shortening osteotomy using a low profile locking plate allows for an exactly defined oblique osteotomy as well as a safe closure of the osteotomy gap using a compression spindle. There was no nonunion or other implant associated complication in our series. Overall patient satisfaction was high.

Keywords: ulnar impaction syndrome, ulnar shortening osteotomy
Trigger finger in ocean rowing - a hindrance to performance

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Objectives / Interrogation: Trigger finger is a mechanical condition that can result following repetitive finger movements. Ocean rowing is an expanding extreme sport that typically involves periods of weeks to months doing little other than repetitive rowing strokes. In our experience, a high proportion of ocean rowers suffer from trigger finger(s). We aimed to identify the prevalence, severity and longevity of the condition in this cohort following an ocean crossing.

Methods: Prospective observational study. Ocean rowers who planned to start a crossing in 2018 were identified using the Ocean Rowing Society (ORS) online portal. All rowers were consented to take part prior to departure and asked to fill out a survey containing a trigger finger self-scoring system on arrival.

Results and Conclusions: 98 people were registered to attempt an ocean rowing crossing in 2018, of which 88 were a part of the Talisker Whisky Atlantic Challenge (TWAC) race. A high proportion of responses documented suffering from painful clicking and locking of the affected digit. Symptoms were often present in more than one finger and were commonly bilateral.

Trigger finger is a common complaint amongst ocean rowers and can have an effect on performance. Triggering can prevent sufficient grip strength on the oar, resulting in ineffective strokes and the danger of damaging or losing an oar in bad weather. Interestingly, those that did suffer from the condition reported complete resolution of symptoms without treatment.

Keywords:
trigger finger, ocean rowing, hand injury
Hypertrophic nonunion after ulnar shortening osteotomy with low profile ulnar shortening plate

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Objectives / Interrogation: The most common and critical complication after diaphyseal ulnar shortening osteotomy is delayed union or nonunion. The authors describe 2 cases of hypertrophic nonunion after diaphyseal ulnar shortening osteotomy with low profile ulnar shortening plate and recommend the reasonable treatment with additional mini-plate fixation.

Methods: Additional mini-plate fixations were performed for all hypertrophic nonunion without bone grafting. Serial four planes simple radiography were taken after the additional mini-plate fixation until osteotomy union.

Results and Conclusions: One nonunion was united at 1 month and another was united at 2 months after the additional mini-plate fixation. Hypertrophic nonunion after diaphyseal ulnar shortening osteotomy with low profile ulnar shortening plate can be reasonably treated with additional mini-plate fixation without bone grafting.

Keywords:
diaphyseal ulnar shortening osteotomy, ulnar impaction syndrome, hypertrophic nonunion, treatment
Tetanus Quick Stik - is the NHS missing a trick?

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**Objectives / Interrogation:** Lacerations and open hand fractures make up a significant proportion of admissions under hand surgeons. These patients require determination of tetanus immunity to allow prophylaxis if deemed at risk of contamination. Studies show that 57% of patients are unable to recall seroprotection status. The "Tetanos Quick Stik®" (TQS) is a 10-minute bedside test for tetanus immunity that boasts 100% specificity and 80% sensitivity. We aimed to identify the potential cost saving of the TQS at a tertiary plastic surgery centre.

**Methods:** Retrospective literature searches of EMBASE, Medline, Pubmed and Google Scholar were conducted. Search terms included "tetanos quick stik", "tetanus prophylaxis" and "cost analysis". Financial data on tetanus prophylaxis was collected from the clinical coding and pharmacy departments. Published statistics were then applied to our hospital data.

**Results and Conclusions:** Studies have demonstrated that TQS can avoid treatment with vaccine or tetanus immunoglobulin (TIG) in 77% of patients. Our hospital spent £21,376 over the financial year 2017/18 on vaccine doses and TIG. Using published data, we have identified a potential cost saving of £7162.18 (34%) in our centre alone and £8,929.86 across the whole trust.

The TQS is a cost effective bedside tool, available on NHS Supply Chain, that has potential to make significant cost savings in the NHS. We have developed a protocol that is being implemented in our trust for tetanus prophylaxis in the ED.

**Keywords:**
tetanus, tetanus quick stik, bedside testing, laceration, open fracture,
Gene interaction profiles of differentiated and undifferentiated adipose derived mesenchymal stem cells dynamically seeded onto a processed nerve allograft

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Objectives / Interrogation: The gene expression profile of adipose derived mesenchymal stem cells (MSCs) seeded onto a substrate varies depending on the cells interaction with the remaining extracellular matrix. The effect of undifferentiated cells or cells differentiated into Schwann-like cells seeded onto a processed nerve allograft is unknown. The purpose of this study was to determine the gene expression profiles of differentiated and undifferentiated MSCs before and after seeding onto a processed nerve allograft in order to determine the mechanism of action of both stem cell types when used in peripheral nerve repair.

Methods: 65 sciatic nerve segments from Sprague-Dawley rats were harvested and decellularized. MSCs were harvested from Lewis rats and cultured. Half of the MSCs were differentiated into Schwann-like cells. Undifferentiated MSCs and differentiated MSCs were dynamically seeded on the surface of the decellularized allografts. The interaction between cells and the nerve graft was evaluated by qPCR-analysis of neurotrophic (GDNF, PTN, GAP43, PMP22), angiogenic (CD31, VEGF1), extracellular matrix (ECM) (COL1A1, COL3A1, FBLN1, LAMB2) and regulatory cell cycle genes (CAPS3, CCBN2).

Results and Conclusions: Seeding of undifferentiated MSCs led to enhanced expressions of neurotrophic (NGF, GDNF, PMP22), ECM (FBLN1, LAMB2) and regulatory cell cycle genes (CCNB2), mostly after 7 days, while the interaction with differentiated MSCs led to enhanced expressions of neurotrophic (NGF, GDNF, GAP43), angiogenic (VEGF1), ECM (FBLN1) and regulatory cell cycle genes (CASP3, CCNB2) within the first week.

Conclusion: Undifferentiated and differentiated MSCs have a different baseline gene expression, which changes after seeding onto a processed nerve allograft. Differentiated MSCs were observed to express high regenerative gene levels in the first 72 hours after seeding, while undifferentiated MSCs expressed high regenerative gene levels a week after seeding. These findings imply that both cell-types effect nerve regeneration in different stages and that a combination of undifferentiated AMSCs and differentiated AMSCs might lead to superior nerve regeneration.

Keywords: Differentiated MSCs, undifferentiated MSCs, gene expression, nerve regeneration, stem cells, nerve allografts
Acute Compression of the Median Nerve at the Elbow by the Lacertus Fibrosus: Biomechanical Translation from Partial Rupture of the Biceps at the Myotendinous Junction.

List of authors:
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Objectives / Interrogation: Objectives
Patients with acute partial distal biceps rupture develop acute median nerve compression due to a shift of the Lacertus Fibrosis.

Methods: Methods
A series of 18 consecutive cases of acute median nerve compression in the antecubital fossa is presented resulting from an extremely forceful injury to the elbow. In all cases, a sudden severe attempt at elbow flexion was performed against a severe counterforce resulting in immediate severe pain radiating from the elbow down to the forearm. The pain was severe, persistent and unremitting and worsened with passive elbow extension and forearm pronation. Duration of symptoms was 3-16 months until definitive diagnosis was made. Multiple diagnosis including "elbow strain", medial and/or lateral epicondylitis were erroneously entertained and patients were treated with a variety of modalities unsuccessfully prior to definitive treatment. Surgical decompression was performed in all cases.

Results and Conclusions: Results
Evidence was found at the time of surgery of partial rupture of the distal myotendinous junction of the biceps brachii creating increased tension across the median nerve by a tethered lacertus fibrosis. Common characteristics found in all cases included: identifiable forced flexion injury against resistance; severe unremitting pain from the time of injury especially with resisted elbow flexion, passive extension and pronation, or direct compression over the antecubital fossa; evidence of partial rupture of the distal myotendinous junction of the biceps at surgery; and prompt complete persistent relief of symptoms following surgical decompression.

Conclusion
Awareness of the potential for acute compression of the median nerve by the lacertus fibrosis following a severe flexion injury can prevent erroneous diagnosis and improper treatment. It can help the treating surgeon differentiate this entity from the more chronic forms of compressive neuropathy. Surgical decompression provides definitive management with a predictably effective outcome.

Keywords:
Lacertus Fibrosis, acute median nerve compression, antecubital fossa, surgical decompression.
A sustainable model for teaching the management of upper limb conditions in Low and Middle Income Countries - experience from the British Foundation of International Reconstructive Surgery and Training (BFIRST)

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Objectives / Interrogation: Hand surgery training remains a vital part of surgical education in Low and Middle Income Countries (LMIC). Often neglected in respect to more ‘life-threatening’ conditions, the neglected injured or congenitally malformed hand has a profound impact on the quality of life of the affected individual. Traditional volunteering has focused on solving crises by performing surgeries in quantity, in short trips by surgeons with their trainees, with the educational component neglected. The British Foundation of International Reconstructive Surgery and Training (BFIRST) was set up as the charity arm of BAPRAS to teach plastic and hand surgery in LMICs. In close collaboration with other organisations, BFIRST aims to equip the local surgeon ‘so that one day they can teach their own’ through feedback, community-oriented curriculum and clear entrustible professional activities.

Methods: Hand surgery-specific projects were chosen for reflection for the purpose of this presentation. A total of five projects were included: Bangladesh, Cambodia, Sri Lanka, Vietnam and Zimbabwe. For each of this project, the specific needs of the country were analysed and experiences gathered from the volunteers, in conjunction with the local hosts. A strategy of Defining the curriculum, Designing the curriculum and Delivering the curriculum was used.

Results and Conclusions: Each of these five countries present with different needs. For example, there was a high proportion of electrical hand burns in Bangladesh and efforts were made to design a specific classification to guide the treatment. For Cambodia, valuable experiences were shared with expert collaborators that crystallised the theories of education including Pareto’s analysis, targeted workshops and robust feedback systems. In Sri Lanka and Zimbabwe, the focus was on congenital
hand anomalies; local surgeons asked for this and the specific curriculum was delivered. Finally, in Vietnam (and Cambodia), brachial plexus was the main focus and allowed competencies to be developed over a few years.

Keywords:
training, collaboration, brachial plexus, hand surgery, tendon transfers,
Augmented Mini External Fixation Provides Biomechanically Stable Support of Ulnar Sided CMC Fracture Dislocation

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Objectives / Interrogation: Objectives
Management of ulnar sided CMC fracture dislocations by means of ligamentotaxis provided through miniature spanning external fixation stabilization with precise but limited intra-articular fragment realignment and fixation with K wires can provide restoration of articular architecture and digital alignment while allowing early return to function followed by durable, positive patient reported outcomes.

Methods: Methods
10 patients (eight men, two women) received acute surgical repair of ulnar-sided CMC fracture dislocations with intra-articular comminution using K-wires & spanning miniature external fixators. Follow-up was ranged 1-8 years, average 3.4 years. All radiographs were reviewed and evaluated by two independent reviewers. Patients were asked to rate their level of pain, answer a series of patient perceived outcomes questions using the Quick DASH subjective outcome instrument for functional assessment.

Results and Conclusions:
Results
There were no major complications. There were 2 transient pin tract infections which resolved with oral antibiotics; no nerve or tendon injuries. All implants were removed in the clinic without need for additional surgery. All hands healed primarily with maintenance of a congruent joint space without radiographic evidence of displacement or subsequent arthrosis. Patient satisfaction was high and function was near normal with minimal if any pain (average 1.2 on VAS scale). All patient's felt they had returned to pre-injury hand function status.

Conclusion
Ulnar-sided CMC fracture dislocation tends to be an injury sustained by young males most frequently during an argument or moment of rage. Despite a potential for noncompliance in this group. Biomechanically advantageous augmented external fixation has promoted early return to function, minimal disability with maintenance of early motion and functional activities of daily living. Patients have been compliant in careful pin site care, returning for follow-up and especially fixator removal. As such we have found this surgical technique preferable to K wire fixation alone with casting. Our surgical technique with rehabilitation protocol will be presented.

Keywords:
ulnar sided CMC fracture dislocations, ligamentotaxis, Biomechanically advantageous augmented external fixation
Complications of semi constrained total elbow arthroplasty in non-rheumatoid patients: lessons learned with application in an active population with biomechanically restrictive implants

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Objectives / Interrogation: Objectives
Expanded application of TEA has been reported in patients with osteoarthritis, posttraumatic arthritis and in cases of severe trauma precluding fracture reconstruction, with reports of successful outcomes. Such patients, however, tend to be younger, more active, and therefore potentially place higher demands and stresses on current less than physiologic implants. We reviewed our institute’s experience in non-rheumatoid patients with the hypothesis of finding poor compliance with activity limitations and a high rate of complications

Methods: Methods
Over a ten-year period, the authors have implanted 64 linked total elbow arthroplasties in 64 patients (age 38-84, mean 58 years; 39 men, 29 women) with osteo or post-traumatic arthritis, or unreconstructable fractures. Initial results at two years demonstrated satisfactory results with a high satisfaction rate and a low complication rate with four early reoperations (6.4%), comparable to other published reports. But longer term follow-up at 4-10 years has demonstrated a higher implant related complication rate. Reoperation was required in an additional 21 patients (32.8%). Compliance with physical restrictions was minimal.

Results and Conclusions: Results
Total elbow arthroplasty has added immensely to our armamentarium of tools for the treatment of rheumatoid arthritis, especially in low demand patients who lead a sedentary lifestyle. Clearly, as indications for application of this technique have expanded to include a more active patient population, implant stresses and resultant failure rates have been found to increase with longer-term follow-up. These findings suggest a need to rethink implant design to become more responsive to physiologic loads demanded in more active patients and to counsel future patients as well as existing patients with current implants regarding the limits and potential failure of existing implant designs.

Conclusion
Future implant designs should incorporate more anatomic load sharing characteristics to accommodate the demands of this more active population of patients.

Keywords:
total elbow arthroplasties, non-rheumatoid patients
Computer Guided Templating for Osteotomy and Fixation of Complex Distal Radius Deformity Provides Cost-Effective and Anatomic and Biomechanically Superior Results to "Free-Hand" Surgery

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Objectives / Interrogation: Objectives
Three-dimensional computer modeling and generation of drilling and cutting guides can enhance precision by adding the ability to precisely correct deformity following malunion of the distal radius. The cost of this added technology ($2,500) may be offset by decreasing the operative time required for "free hand" surgical correction.

Methods: Methods
A cohort of 35 patients undergoing distal radius osteotomy were managed by "free hand" tri-planer osteotomy to correct rotation, angular, and length deformity. Healing rates, restoration of alignment, and tourniquet times were recorded for all cases. A prospective series of 14 patients with complex deformity of the distal radius were managed using three-dimensional CT guided computer generated modeling and templating utilizing the contralateral wrist in mirror image as a reference to correct deformity, using preoperatively fabricated drilling, osteotomy and bone removal guides. Postoperative imaging was used to compare outcomes with the contralateral wrist. Operative time was recorded.

Results and Conclusions: Results
Of the 35 patients in the 1st group, 5 had delayed or nonunion requiring re-operation; radial osteotomy surgical time averaged 173 minutes, average, radial & ulnar osteotomies, 271 minutes. There was a mean inability to correct length of 2.5 mm. Angle of inclination was restored to 7 degrees and volar tilt corrected to neutral. In group utilizing 3D templating length was restored to within 1 mm of the contralateral wrist. Angle of inclination was restored to 10 degrees. Volar tilt to 8 degrees. All but one patient healed primarily. Average time for radial osteotomy was 109 minutes, and for radial and ulnar osteotomy was 150 minutes. With "free hand" osteotomies, three patients developed infection. In the templating group there were no infections.

Conclusion
Cost effectiveness of precision templating is evidenced by an average decrease of 64 minutes OR time for radial osteotomy and 81 minutes for radius and ulnar osteotomy showed a significant reduction in OR costs ($4,153 and $5,256 and respectively in our institution). The potential for limiting infection by reduced operating time also adds to patient safety, while precision restoration of anatomy offers a greater potential for long-term successful outcomes.

Keywords:
"free hand", Cost effectiveness , reduction in OR costs, Three-dimensional computer modeling
INTRINSIC TENDINOPATHIES IN THE HAND

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Objectives / Interrogation: Objective:
The expression "Intrinsic tendinopathies in the hand" refers to mostly unknown entities that are rarely described in the bibliography but whose occurrence is increasingly frequent. For over 20 years the author has assembled many clinical observations to build a complex and original conception of the problem, describing 20 pathological entities classified in the following five groups:
1. Interossei muscles: first dorsal interossei, second dorsal interossei.
2. Extensor apparatus of the fingers: tendinitis of the extensor hood, tendinitis of the extensor apparatus central band.
3. Thenar muscles: proximal thenar zone, distal thenar zone, first metacarpal base zone.
4. Hypothenar muscles: distal tendinitis of the abductor digiti minimi, tendinitis of the opponens digiti minimi.
5. Related extrinsic extensor tendons: tendinitis of the extensor indicis proprius, tendinitis of the extensor digiti quinti proprius, tendinitis of the extensor digitorum communis vincula from the 3rd to the 2nd fingers, tendinitis of the extensor digitorum communis vincula from the 5th to the 4th fingers and/or of the 5th finger extensor digitorum communis tendon.

The clinical characteristics, the etiopathogenesis and the physical examination manoeuvres leading to confirm the diagnosis are described for every subgroup, and the resources for their treatment and prevention are also explained. We believe that these remarks, made upon the way of doing the clinical history, the use of means of diagnostic and therapeutic aspects, have allowed us to develop concepts that are useful for the management of this pathology.

Methods: Materials and Methods:
Over 20 years of files were reviewed. Careful clinical observation had followed to the identification, definition and characterization of 20 pathological entities.

Results and Conclusions: Results:
A useful and practical intrinsic hand tendinopathies classification is presented. It defines 5 groups according to their location in the hand, as well as 20 varieties according to the intrinsic tendon affected.

Conclusions:
A classification of intrinsic tendinopathies is presented according to their location in the hand. The concept of "intrinsic hand tendinopathies" is introduced and relevant issues are defined about their classification, diagnosis and treatment.

Keywords: Tendinopathies, intrinsic, Interossei muscles, Extensor apparatus of the fingers, Thenar muscles, Hypothenar muscles, Related extrinsic extensor tendons.
GANGLIONS IN THE HAND AND WRIST: A NEW CLINICAL AND SURGICAL APPROACH

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Objectives / Interrogation: Objective:
Surgical resection of the ganglions in the hand tends to be regarded as a simple intervention. However, this is far from real. For over 30 years the author has assembled surgical and clinical observations to build a complex and original conception of the problem. We believe that these remarks, made upon the way of doing the clinical history, the use of means of diagnostic aid and surgical aspects, have allowed us to develop concepts useful for the management of this pathology. The point of origin of the ganglion is not always to be found in a structure in the area of location of the cyst but may be far from it. Consequently, a number of cases are presented as “GANGLIONS OF ECCENTRICAL LOCATION” and a classification is proposed according to the location of the cyst and its point of origin.

Methods: Materials and Methods:
Over 30 years of files were reviewed. Careful dissection had followed the path of the pedicle to its origin.

Results and Conclusions: Results:
Nine groups were classified according to the location of the cyst and 43 varieties according to their points of origin. Conclusions:
A clasification of ganglions of the hand and wrist is presented according to the location of the cyst and its point of origin. The concept of “ganglions of eccentric location” is introduced and relevant issues are defined about their diagnosis and surgical management

Keywords:
Keywords: Wrist ganglia, Excision, Eccentric location ganglions, Point of Origin.
Long Term Outcomes of Congenital Hand Reconstruction Using Free Toe Phalanx Transfer Results in Minimal Donor Site Morbidity

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Objectives / Interrogation: Objectives
A report of pain & dissatisfaction in foot function in children having undergone free toe phalanx transfer as part of the reconstruction process for congenital hand difference has been recently reported. Having performed over 200 such procedures over 28 years, the authors have not appreciated this complication. We hypothesized using our technique of a dorsal approach with extensor tendon splitting, extra periosteal sharp dissection, careful flexor tendon preservation and extensor tendon repair, there is little, if any morbidity or functional impairment following free toe phalanx transfer.

Methods: Methods
44 children with multiple toe phalanx transfers at least two years post-surgery were administered the Oxford Ankle Foot Questionnaire for Children (OXAFQ-C) as appropriate, as well as the Foot and Ankle Ability Measure (FAAM). The patients families were also asked whether they were satisfied with the overall outcome of the surgical treatment, would they undergo the same treatment again, whether the upper extremity outcome justified the lower extremity morbidity (if any), and would they recommend the same surgical treatment to another child/family with a similar condition. All date was collected and analyzed by independent observers who had not participated in the care of the patients.

Results and Conclusions: Results
Almost universally, pain, function, activities, sports, footwear, were rated extremely highly (<1.0) Satisfaction in all areas was high (1.0), the only sense of mild dissatisfaction was in appearance (3.4), and having others at some time being unkind (4.2). Every patient / family (44/44) said they would go through the surgery again and would recommend it to others.

Conclusion
Free toe phalangeal transfer using the 2nd & 3rd toes of one or both feet can provide needed functional bone stock to congenitally hypoplastic digits as part of the reconstruction process. When performed carefully using a dorsal, extra periosteal approach with protection / preservation of the flexor tendon minimal foot complications and a high satisfaction rate can be expected.

Keywords:
Free toe phalangeal transfer,
Exploring the Axillary Nerve through the Deltopectoral and Axillary approaches: Is there a true "Blind Spot"?

List of authors:
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Objectives / Interrogation: The axillary nerve (AN) is at risk of iatrogenic injury during arthroscopic shoulder procedures that use anchors or sutures in the anteroinferior or inferior margin of the glenoid (6-o'clock position). This injury most frequently occurs in a so-called "blind spot" that is located between the surgical exposure limits of the medial deltopectoral approach and the posterior approach to the AN. The aim of this study was to evaluate the feasibility of exploring the 6-o'clock position using a lateral deltopectoral approach, extended as needed with an anterior axillary approach. We hypothesized that 1) the lateral deltopectoral approach allows neurolysis of the AN at the 6 o'clock position, and 2) that an axillary extension of this approach enables sufficient exposure for AN repair, graft or nerve transfer.

Methods: Four axillary nerves were dissected combining the deltopectoral approach-medial to conjoint tendon (A), the deltopectoral approach lateral to conjoint tendon (B) and the axillary approach (C) in three sequences: A-B-C, B-A-C and C-B-A. After the first approach was completed the proximal and distal margins were marked. Additional exposures with the second and third approach and the 6-o'clock position were also marked. When the three approaches were completed, the AN was excised and the amount of exposed nerve with the three approaches was measured.

Results and Conclusions: The deltopectoral approach using the medial interval to the conjoint tendon did not allow exposure of the AN at the 6 o'clock position. This exposure was accomplished using the lateral interval of the deltopectoral approach and the axillary approach. The deltopectoral approach lateral to the conjoint tendon allowed 28-46% length of AN exposure, including the 6 o'clock position, but not to the level of the terminal branches. The axillary approach was able to expose the terminal branches of the AN (but not the nerve-muscle junction) and the 6 o'clock position of the glenoid. A combination of the 3 approaches exposed 81-94% of the total length of the AN.

The deltopectoral approach allowed visualization of the AN at the 6 o'clock position when explored lateral to the conjoint tendon. The achieved visualization allows the surgeon to assess continuity of the nerve at the 6 o'clock position, perform neurolysis, but not perform nerve repair at this site. If nerve repair with or without graft or a nerve transfer is attempted, a combination of the 3 approaches should be used with an axillary extension of the incision.

Keywords: brachial plexus, axillary nerve, surgical exposures, iatrogenic injuries, shoulder
DISTAL RADIUS FRACTURES: INTERNAL FIXATION USING VOLAR LOCKING PLATES AND CORRELATION OF CLINICAL FINDINGS WITH PATIENTS’ SATISFACTION. EXPERIENCE OF OUR CLINIC

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Objectives / Interrogation: Distal radius fractures are 18% of all orthopedic fractures in adults. Besides their high frequency, they also have a wide range of age distribution and they can be the result of both high and low energy injuries. The best method of treating these kinds of fractures is still debatable. However, locked volar plating is widely used with good reported results

Methods: During the years 2015 and 2018, 83 patients (54 female and 29 male) were operated in our clinic. Their mean age was 51.3 years old. According to AO classification their fractures varied from type A2 to C3. In the majority of cases, closed reduction had been tried and was deemed unsuccessful, so we moved on to a surgical approach, using various volar locking plating systems. All the patients were operated by the same surgeon and were followed up from 6 to 24 months

Results and Conclusions: Patients were clinically examined (flexion - extension of the wrist, ROM of the wrist, grip strength, key - pinch strength) followed by radiographic check at 1, 3, 6, 12 and 24 months. There were no cases of wound infection. 4 patients were reoperated because they were under 40 years old and in these cases we routinely remove hardware one year after the operation. One patient suffered from FPL injury and was reoperated 2 years after the first operation. In order to discriminate between satisfied and dissatisfied patients, we used the Michigan Hand Outcome Questionnaire, Patient-Rated Wrist Evaluation and also DASH score. We observed that the patients felt more satisfied only when they gained back more than 85% of the ROM of their wrist. It is also worth mentioning the fact that patients, during their rehabilitation, sought to restore more of their grip strength than to improve their key-pinch strength

Distal radius fractures are peculiar type of fractures. Locked volar plating has very good results when assessed by an experienced and skilled surgeon. Patient's satisfaction is a complex idea and incorporates the success of the operation because it reflects the impact of the functional outcomes to the patient’s everyday life. However the relationship between patient's satisfaction and clinical measures of hand outcome has yet to be established

Keywords:
distal radius fractures, volar plating, patient's satisfaction
Smoking is associated with ulnar nerve entrapment: a birth cohort study

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2 University of Oulu (Oulun yliopisto)

Objectives / Interrogation: Our aim was to study whether smoking is associated with ulnar nerve entrapment.

Methods: The study population consisted of the Northern Finland Birth Cohort with expected date of birth in 1966 (N=8716). History of smoking, pack years, body mass index (BMI) and socio-economic status were recorded at the 31-year follow-up in 1997. Data on hospitalizations due to ulnar nerve entrapment neuropathies was obtained from the Care Register for Health Care. Hazard ratios (HR) with 95% confidence intervals (CI) and population attributable risk percentages (PAR%) were calculated adjusted for gender, BMI and socio-economic status.

Results and Conclusions: A total of 66 patients were diagnosed with ulnar nerve entrapment in the follow-up between 1997 and 2016.

<table>
<thead>
<tr>
<th>Ulnar nerve entrapment, n=66, n (%)</th>
<th>Healthy, n=8652, n (%)</th>
<th>Missing, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>34 (51.5)</td>
<td>4130 (47.7)</td>
</tr>
<tr>
<td>Women</td>
<td>32 (48.5)</td>
<td>4522 (52.3)</td>
</tr>
<tr>
<td>History of regular smoking, pack years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (sd)</td>
<td>8.81 (8.82)</td>
<td>3.76 (6.21)</td>
</tr>
<tr>
<td>No, n (%)</td>
<td>14 (24.6)</td>
<td>4197 (56.6)</td>
</tr>
<tr>
<td>10 or fewer, n (%)</td>
<td>19 (33.3)</td>
<td>2063 (27.8)</td>
</tr>
<tr>
<td>Over 10, n (%)</td>
<td>24 (42.1)</td>
<td>1149 (15.5)</td>
</tr>
<tr>
<td>Body Mass Index</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (sd)</td>
<td>25.14 (4.03)</td>
<td>24.57 (4.14)</td>
</tr>
<tr>
<td>Normal, n(%)</td>
<td>34 (53.1)</td>
<td>5084 (61.0)</td>
</tr>
<tr>
<td>Overweight/Obese, n(%)</td>
<td>30 (46.9)</td>
<td>3254 (39.0)</td>
</tr>
<tr>
<td>Socio-economic status, n(%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clerical workers, entrepreneurs</td>
<td>25 (39.7)</td>
<td>4576 (56.2)</td>
</tr>
<tr>
<td>Students, retired, unemployed</td>
<td>11 (17.5)</td>
<td>1193 (14.7)</td>
</tr>
<tr>
<td>Manual workers, farmers</td>
<td>27 (42.9)</td>
<td>2371 (29.1)</td>
</tr>
</tbody>
</table>

Ulnar nerve entrapment, smoking and background factors.

Smoking ten or fewer pack years before the age of 31 years was associated with more than doubled (HR=2.57, 95% CI=1.29-5.15) and smoking over ten pack years before the age of 31 years more than five times higher risk (HR=5.61, 95% CI=2.80-11.23) for ulnar nerve entrapment later in life compared to non-smokers in the adjusted analyses. PAR% for smoking (reference of no smoking) was 53.6 in the adjusted analysis.

<table>
<thead>
<tr>
<th>Covariates</th>
<th>HR (95% CI)</th>
<th>PAR%</th>
<th>Missing, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>History of regular smoking</td>
<td></td>
<td>53.6*</td>
<td>1550 (17.8)</td>
</tr>
<tr>
<td>No</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 pack years or fewer</td>
<td>2.57* (1.29-5.15)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Over 10 pack years</td>
<td>5.61* (2.80-11.23)</td>
<td></td>
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<tr>
<td>Gender</td>
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<td></td>
</tr>
<tr>
<td>Men</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>1.27 (0.72-2.25)</td>
<td></td>
<td></td>
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<tr>
<td>Body Mass Index</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overweight/Obese</td>
<td>1.15 (0.67-1.96)</td>
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<tr>
<td>Socio-economic status</td>
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<tr>
<td>Clerical workers, entrepreneurs</td>
<td>1.00</td>
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</tr>
</tbody>
</table>

2. August 2019, 11:37 CEST
Kaplan-Meier curve showing the survival of study participants with a history of regular smoking versus no history of regular smoking before the age of 31 in the study follow-up.

In our study, smoking was associated with an increased risk for ulnar nerve entrapment, accounting for a considerable proportion of increased risk.

**Keywords:**
ulnar nerve entrapment, smoking, tobacco, epidemiology, birth cohort
The Stener-like lesion of the radial collateral ligament of the thumb: an anatomic study.

List of authors:
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Objectives / Interrogation: Injury to the radial collateral ligament of the thumb is less common than on the ulnar side and often diagnosed in the chronic state. The counterpart of the Stener lesion on the radial side is very uncommon and only few reports in the literature can be found. The aim of this cadaver study was to evaluate the anatomy of the radial collateral ligament in relation to the surrounding structures.

Methods: 5 cadaver thumbs from participants of the willed body program were dissected. After splitting the EPL tendon the capsule was exposed and the radial collateral ligament was transected distally. After closure of the EPL tendon ulnar displacement of the first MCP joint was performed until the proximal stump penetrated the space between the EPL and APB tendon. This was repeated in full extension, 30 and 45 degrees of flexion.

Results and Conclusions: Results
In the position of 45° of MCP flexion a ulnar stress of 30° caused a Stener-like lesion of the radial collateral ligament of the thumb in full extension the fascial alignment of the EPL and APB remained tight and no Stener-like lesion was seen.

Conclusion:
On the radial side of the thumb increased flexion of the MCP joint in combination with ulnar stress increase the chance of creating a stinger-like lesion. During flexion of the MCP joint the fascial alignment between the EPL and APB tendon seems to widen which may predispose the distally ruptured radial collateral ligament to be loaded upon the extensor hood between the EPL and APB tendon when the radial stress is reversed into the neutral position.

Keywords:
radial collateral ligament, Stener like lesion
Fascia flaps: local and pedicled alternatives

List of authors:
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Objectives / Interrogation: Fascia flaps have an important role in soft tissue reconstruction of the hand when tendons are exposed. Both free flaps and local fascia flaps are available to the hand surgeon. In this retrospective study patients requiring soft tissue reconstruction of the hand with fascial flaps were evaluated.

Methods: 13 patients were identified, which underwent reconstruction of gliding surfaces or capsular structures with a fascial flap. In 6 patients the fascia only version of the posterior interosseous artery flap was used whereas in 3 cases a free temporoparietal fascia flap was applied. In 4 patients an ALT flap was used.

Results and Conclusions: All free flaps healed completely. In the local fascia flap into cases a distant tip necrosis developed which required repeated skin grafting. In one case persistent osteomyelitis required shortening arthrodesis. No amputations were necessary.

Conclusion: Fascia flaps embody a specific entity of flaps which are well applicable to soft tissue reconstruction of the hand were a thin and pliable reconstruction is mandatory. Although local options such as the fascia only intraosseous posterior flap are available, the microvascular tissue transfer has shown fewer complications in this series. Besides the ease of insetting, the available size of the free flap can be considered a major advantage.

Keywords:
fascia flaps
Grift Hand Spastic, tetraplegic, and obstetric paralysis

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Objectives / Interrogation: Personal Approach
Brief description of an anatomical analysis of "grift hand"
Different and known surgical procedures, indications, suggestions, difficulties and complications are mentioned in this presentation
A new surgical procedure is presented so as to facilitate and minimize time of the surgery with excellent results when treating such a serious deformity as "grift hand"

Methods: This practice is called "serpent technique", it corrects the intrinsical paralysed muscles. Adding to this procedure the Aponeuro- poli-dermodesis on the palm of the hand

Results and Conclusions: Considering this complex pathology, spasticity, tetraplegic and obstetric paralysis different procedures are performed simultaneously such as tendon lengthening, tendon transplant, and capsuloplasty
All the procedures should be in a one step surgery

Keywords: -
Complex osteotomies with patient specific guides

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Objectives / Interrogation: Sometimes corrective osteotomies may be challenging. Three dimensional osteotomies are difficult, especially if intraarticular cuts are necessary. Advanced computer based analysis and planning offers new possibilities. We planned to use this technique in selected cases and started our collaboration with "CARD - The Balgrist" end of 2016. This institute offers 3D analysis and patient specific guides, produced by "Medacta". The question was, if this technique results in clinical and economic satisfaction for the patient and the hospital.

Methods: In our clinic we collected 17 patients with complex, mostly posttraumatic deformities from wrist to elbow joint. In these cases bilateral 3D analysis were performed. In 11 out of 17 cases we did corrective osteotomies with patient specific 3D guides, planned by "CARD" and produced by "Medacta". The following pathologies were treated: intraarticular distal humerus malunion, radial neck malunion and deformity, proximal radius malunion with radial head subluxation, forearm shaft malunion, distal radius nonunion with severe deformity and DRU-joint dislocation, intrarticular distal radius malunion, congenital ulna minus-deformity, double metacarpal malunion, olecranon malunion.

Results and Conclusions: Bilateral 3D Analysis offers new possibilities, a specific insight in malunion and deformity. In combination with patient specific guides, osteotomies get easier, sometimes render possible and much more accurate as without guides. But it may be difficult to transfer the preop planning into the “in vivo” situation, due to soft tissue, scar tissue, unstable nonunion and the fitting of the guide to the bone. In our patients we received good results in all, the patient satisfaction was high. All osteomies healed.
The technique is very expensive and not covered by the german health system. But it makes sense to use this modern technique in selected complex cases, despite the high costs. In the german system osteotomies at hand level are not cost-effective, double osteotomies at forearm level cover the costs adequate.

Keywords:
patient specific osteotomy 3D planning health system
Scaphoid non-union - should we treat it arthroscopically?

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¹ hospital Lusiadas (Lisboa)
² hospital Lusiadas, hospital santanna (Lisboa)
³ hospital Lusiadas, centro hospitalar torres vedras (Lisboa)

Objectives / Interrogation: In the treatment of scaphoid nonunion, the aim of arthroscopy is to reduce risk and operative duration, shorten recovery and immobilization time and improve bone healing, preserving vascularity as much as possible and makes the procedure safer and more accurate.

The aim of this presentation is to analyze our results with this innovative treatment and to compare it with similar clinical cases that underwent open treatment in our institution.

Methods: Fifty four patients with scaphoid non-union were treated in our hospital from 2009 to 2017.
In the open group (n= 25), patients were treated with open reduction, debridement, cortico-cancellous bone graft from distal radius and fixation with a compression screw.
Arthro group (n= 29), were treated arthroscopically with focus debridement, distal radius cancellous graft when needed, and fixation with compression screw.
Post-operatively patients have the same protocol and were kept in a plaster for 4 weeks followed by splint for another 4 weeks, and they underwent hand therapy beginning at 6-8 weeks.
All the patients were revised at the final follow-up using the Modified Mayo Hand score, Visual analogue scale and radiological assessment in AP and profile

Results and Conclusions: Average age and male/female ratio of the patients in both groups were similar (Open: 35 years (19-69) and M:F ratio 14:2, Arthro: 28 years (20-61) and M:F ratio 14:1).
We lost three patients (12%) in open group and two patients (6%) in arthro group to follow-up.
In open group 20 patients (81%) achieved radiological union at an average follow up of 26 weeks (16-32). All patients but three (81%) achieved good functional outcome at mean follow up of 52 weeks (32-74).
In Arthro group, 27 patients (89%) achieved radiological union, at an average follow up of 17 weeks (16-27). At 52 weeks all patients but two, with proximal pole non-union, achieved good functional outcome.
The average final Mayo score was 78,3 in the Open group and 92,3 in the Arthro group.
There was a better range of movement in group B ( mean F/E 55-0-50) comparatively with group A ( mean F/E 47-0-39)
Arthroscopic treatment of scaphoid nonunions seems to bring a better functional outcome with shorter time to reach consolidation compared with the open treatment.
Both techniques present similar consolidation rates after one year.
Even if arthroscopy is a difficult technique, with a long learning curve, we believe arthroscopic treatment of scaphoid nonunions should be provided to patients if possible.

Keywords: scaphoid non-union, arthroscopy
Objectives / Interrogation: Describe the new technique "POLAR" for its acronym in English "Palmar oblique ligamentodesis for articular rescue" for the treatment of Bennet's fractures with small fragment, less than 1/6 of the articular surface (type 2A in the classification of the author), and its clinical application.

Methods: The technique described by the author is explained, and a series of 10 cases is presented, which present Bennet fractures, with joint involvement less than 1/6, with an age range of 25-42 years, injury time of 2-5 weeks. In these patients, the osseous fragment is removed and a bone anchor inserted to reattach the oblique palmar ligament at the base of the thumb, allowing early rehabilitation and functional recovery, with good articular stability.

Results and Conclusions: 10 patients were treated with this technique, 8 with bone anchors and 2 with intraosseus suture, followed by an early rehabilitation protocol. A minimum follow-up of 6 months and a maximum of 2 years was performed, Grip and index-thumb pinch dynamometry was on average 85% compared to the healthy side, without the presence of instability or pain, with minimal restriction in the Arcs of movement with respect to the non-injured side, all patients returned to work without limitation.
(Another study was conducted to complement this paper, performing finite element tests with computer simulations, presented in another abstract)

Keywords:
Bennet's fracture, palmar oblique ligament, thumb CMC dislocation
Acute scapholunate dissociation, "A" assembly an effective option for its treatment.

List of authors:
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1 Centro de Especialidades Ortopedicas (Quito)

Objectives / Interrogation: Objectives: To evaluate the result of the treatment with an "A" Assembly with percutaneous kirschner wires for the treatment of acute injuries of the scapholunate joint.

Methods: Methods: We performed a retrospective study for the evaluation of the results obtained with the "A" assembly for acute scapholunate dissociation. If we achieve an adequate reduction of the joint and we can maintain it during the acute scarring process, we will have a ligament that will be able to adequately fulfill its function. We propose the technique of an assembly in "A" with Kirschner wires for the treatment in acute, this technique consists of the placement of a first guide wire between the scaphoid and the lunate to help us as an axis for the closure of the affected joint in the trauma, once this is achieved we must also fix with a percutaneous wire the scaphoid towards the Capitate bone, this will act as an attachment element when placing the last wire from the lunate to the Capitate. We took all the patients operated by our team with this surgical technique from January 1, 2016 to June 30, 2018 and we evaluated the reduction obtained radiographically as well as the discomfort that the patient currently presents after the removal of the wires evaluating strenght, range of motion and pain.

Results and Conclusions: Results: In 7 cases we have used the "A" assembly for the treatment of Scapholunate lesions, we have achieved reduction of the joint in 100% of the cases, verifying the same radiologically. Radiological studies have been carried out with follow-up Immediately, one and 3 months after the injury, in 1 case a scapholunate dissociation was again identified in the third month, although clinically it remained asymptomatic. We evaluated the pain, range of motion and strength at 3 and 6 months, comparatively with the contralateral wrist. In the VAS scale the pain maintained an average of 2/10 (1-6) at 6 months post-trauma, the mobility arches reached an average of 80% (90-70) on the contralateral side and the strength reached 80% on the contralateral side.

Conclusions: The assembly in "A" in the acute injuries of the scapholunate joint is a valid treatment for its management, allowing an adequate primary healing of the ligaments, achieving pain relief, maintenance of the force and the range of motion in functional ranges.

Keywords:
Scapholunate joint, Kirschner wires
Iatrogenic nerve injury following steroid injection for thumb basal joint arthritis - A rare complication

List of authors:
Qureish Vanat*, Manish Gupta1, Dominic Power1
1 Queen Elizabeth Hospital NHS Trust (Birmingham)

Objectives / Interrogation: Intra-articular steroid injections are commonly used for symptomatic relief in early degenerative arthritis (Eaton Grade 1 & 2) of the basal joint of thumb. This is considered a relatively safe procedure with few complications such as variable symptom relief, skin depigmentation and the occasional infection reported in literature.

Methods: We report and describe a case that was complicated with an iatrogenic injury to a branch of the superficial radial nerve. This was confirmed on surgical exploration. The neuroma was excised and the proximal nerve end was protected with a synthetic neural cap.

Results and Conclusions:
This is a rare complication of a commonly performed simple procedure and has not been previously reported in published literature. We will discuss the possible aetiology of this iatrogenic injury in our patient and make recommendations for prevention, early diagnosis and management.

Keywords:
iatrogenic, nerve injury, neuroma, superficial radial nerve, basal thumb joint
Trapeziometacarpal arthroplasty, Case report with Ball and socket type prostheses.

List of authors:
Fidel Cayon*, Gabriel Alegria1
1 Centro de Especialidades Ortopedicas (Quito)

Objectives / Interrogation: Objective: To evaluate the pain, strength and mobility arches in the trapeziometacarpal joint in patients undergoing MAIA Prosthesis (Group Lepine, France) placement by the same hand surgeon from January 1, 2015 to June 30, 2018

Methods: A retrospective study of case reports was carried out, taking all the cases operated by the same hand surgeon in which trapeziometacarpal MAIA prostheses (Group Lepine, France) were placed. The patients were evaluated before the surgery with the VAS scale and the grip strength with a pulse dynamometer, after the surgery and with a follow-up of up to 3 years we evaluated the result again and compared it with the same measures of the contralateral hand.

Results and Conclusions: Results: Four patients were operated performing the arthroplasty, all with grade III rhizarthrosis according to the Eaton-Glickel classification, all cases underwent total arthroplasty with ball and socket type prostheses with dorsal joint approach. All cases were a dominant hand. The 4 patients improved their strength achieving 80% of the grip strength in relation to the contralateral side, the mobility arcs compared to the non-operated side reached 90% in all of them, all patients reported pain relief. No complications were reported.

Conclusion: the MAIA prosthesis (Lepin Group, France) is an adequate surgical option for the treatment of Rizarthrosis in patients with grade III classification that achieves adequate pain relief and functional mobility.

Keywords:
Trapeziometacarpal joint, Eaton-Glickel Classification, Ball and Socket Prostheses
TOTAL ARTHROPLASTY OF THE PROXIMAL INTERPHALANGEAL JOINT USING SEMI CONSTRAINED PROSTHESIS: CASE SERIES

List of authors:
Gabriel Alegria*, Fidel Cayón
1 Centro de Especialidades Ortopedicas (Quito)

Objectives / Interrogation: OBJECTIVE: To evaluate the outcomes (range of motion, function, and pain relief) of the semi constrained prosthesis in posttraumatic arthritis.

Methods: METHODS: A single surgeon performed proximal interphalangeal (PIP) total replacement arthroplasty (TRA) in 3 joints using a dorsal approach. Patients with posttraumatic arthritis or osteoarthritis of the PIP joint were included. Range of motion, pain, satisfaction, postoperative key pinch and grip strength, and Disabilities of the Arm, Shoulder, and Hand questionnaire data were collected. Complications, component integration were noted. Average follow-up was 24 months (range, 6-24 mo).

Results and Conclusions: RESULTS: Total arc of motion averaged 40° before surgery and improved significantly in all patients, for an average postoperative arc of motion of 61°. Grip strength averaged 30 kg in the affected hand and 35 kg in the contralateral hand after surgery. VAS score improved from 5 to 1. Postoperative key pinch strength averaged 6 and 7 kg in ipsilateral and contralateral hands, respectively. The average Disabilities of the Arm, Shoulder, and Hand score after surgery was 14. No coronal plane deformity or postural deformity was observed. Good component integration and range of motion were observed in all joints.

CONCLUSIONS: The semi constrained prosthesis to dorsal approach to PIP TRA can result in excellent range of motion, function, pain relief and good satisfaction with minimal complications in patients with osteoarthritis or posttraumatic arthritis. The dorsal approach offers the advantages of wide exposure and allowing early postoperative motion. This case series demonstrates compelling data for a prospective PIP TRA in patients with osteoarthritis and posttraumatic arthritis.

Keywords:
Interphalangeal joint, Prostheses
RADIOCARPAL WRIST ARTHRODESIS WITH CANNULATED SCREWS, CASE REPORT

List of authors:
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1 Centro de Especialidades Ortopedicas (Quito)

Objectives / Interrogation: OBJECTIVE: The aim of this study was to evaluate an alternative for wrist fusion by using cannulated screws.

Methods: MATERIAL AND METHOD: Total wrist arthrodesis is commonly performed using fixation plates, which can produce soft tissue irritation, often require removal, and limit the ability to position the hand in space. Cannulated screws (Acutrak 2 Headless Compression Screw System) for wrist fusion from Acumed, USA were used according to the manufacturers' instructions. The articular surfaces of the radius, scaphoid, lunate, and capitate were debrided, and a cannulated screw inserted from the base of the radial styloid and dorsal radius to the carpal joint. Cancellous allografts were added to the decorticated wrist bones. One wrist was treated with this technique and followed for a minimum of 6 months. Indications for fusion was old arthritis secondary to SLAC. Patient was evaluated before surgery and at final follow-up using the VAS pain score and grip strength measurements using a hand-held dynamometer.

Results and Conclusions: RESULTS: The patient improved his grip strength and decreased his pain score. Was suitable fusion united, and no dorsal soft tissue problems or required implant removal. This device deliver stable fixation, facilitates hand placement, and does not require removal.

CONCLUSIONS: The use of cannulated screws for radiocarpal fusion is a good easy alternative for wrist fusion without the problem of the size of the plate device commonly used.

Keywords:
Arthrodesis, Wrist, Cannulated Screws
Development of method for measuring the thumb pronation and palmar abduction angles during opposition movement using a three-axis gyroscope

List of authors:
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2 Tokyo Medical and Dental University, Graduate School of Medical and Dental Sciences, Dept. of Functional Joint Anatomy (Tokyo)
3 Keio University (Kanagawa)

Objectives / Interrogation: Thumb opposition is vital for hand function and involves pronation and palmar abduction. The improvement of pronation is often used as one of the evaluation items of the opponensplasty method for severe carpal tunnel syndrome. However, most of the studies used substitution evaluation methods for measurement of the pronation angle. Thus, there is still no appropriate method for measuring thumb pronation angle accurately in carpal tunnel syndrome patients. In recent reports, a wearable gyroscope was used to evaluate upper extremity motions and it can be possibly used for accurate measurement of the thumb pronation angle along the three-dimensionally moving bone axis. Thus, we investigated the reliability of measuring thumb pronation using a gyroscope and evaluated whether this method can be used to detect opposition impairment.

Methods: The participants were volunteers with unaffected upper limbs (32 hands) and patients with carpal tunnel syndrome (27 hands). The pronation and palmar abduction angles during opposition movements were measured using a three-axis gyroscope that included a three-axis accelerometer. The gyroscope was fixed onto the first metacarpal bone and the thumb phalanx.

Results and Conclusions: The pronation and palmar abduction angles of the metacarpal bone and the palmar abduction angles of the phalanx significantly decreased in the carpal tunnel syndrome group.

<table>
<thead>
<tr>
<th></th>
<th>Control (n=32)</th>
<th>CTS (n=27)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pronation (degree)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metacarpal bone</td>
<td>31 (22.8-26.3)</td>
<td>20 (16.5-24.5)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Phalanx</td>
<td>21.5 (15.3-30.0)</td>
<td>23 (23.5-33.5)</td>
<td>0.76</td>
</tr>
<tr>
<td>Palmar abduction (degree)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metacarpal bone</td>
<td>25 (21.8-29.3)</td>
<td>18 (13.5-24.0)</td>
<td>0.004</td>
</tr>
<tr>
<td>Phalanx</td>
<td>55 (46.5-62.3)</td>
<td>43 (33.0-49.0)</td>
<td>&lt; 0.001</td>
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</tbody>
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The range of motion during opposition movement

The pronation angle of the metacarpal bone during opposition movement peaked later than the palmar abduction angle in all hands. We were able to measure the thumb pronation and palmar abduction angles using the three-axis gyroscope, and this tool was able to detect impairments of thumb opposition due to carpal tunnel syndrome. This could be a tool for measuring thumb and finger angles and for detecting impairments caused by various diseases.

Keywords:
Thumb opposition, pronation, gyroscope
Resting Forearm Position and its Relevance to the Dart Thrower's Motion

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Objectives / Interrogation: We propose that the net effect of forearm rotational motion is to keep the oblique DTM (Dart Thrower's Motion) axis aligned with the visual axis during wrist motion in order to improve accuracy through visual control. We also propose that the default resting position of the forearm places the hand approximately 35° pronated relative to the vertical axis, which brings the oblique axis parallel to the visual axis.

Methods: For the first aim, we used the optical motion capture system (Optotrak Certus®) with infrared emitting surface markers to perform an integrated 3D upper limb kinematic analysis on 4 subjects. For the second aim, we examined 20 normal volunteers using motion analysis technology to ascertain the comfortable resting position of the dominant and non-dominant limbs.

Results and Conclusions: The targeting phase (coupled, biplanar motion) occurs when the oblique plane axis aligns with the visual axis at approximately 35° of forearm pronation. The targeting phase is the only portion of oblique plane activity which demonstrates true DTM (coupling of flexion/extension and radial deviation/ulnar deviation). When asked to rotate into a comfortable resting position, subjects adopted a mean resting forearm posture of 37° of pronation. The average comfortable resting forearm position of the non-dominant limb was found to be angled approximately 6 degrees greater in pronation when compared to the dominant limb. This difference was statistically significant.

The majority of function in oblique plane activities takes place in the extension/radial deviation quadrant, in pronation. There is little utilisation of the flexion/ulnar deviation quadrant or supination during dart-throwing motion activities. The targeting phase is the only phase demonstrating true DTM (collinear coupling of flexion/extension and radial deviation/ulnar deviation). The comfortable resting position of the forearm is in approximately 37° pronation, which corresponds to the position required to align the oblique plane axis with the visual axis.

Keywords:  
THE USE OF AUGMENTED REALITY AND ENHANCED TECHNOLOGIES IN HAND SURGERY: A SYSTEMATIC REVIEW

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Objectives / Interrogation: Augmented reality utilizes a set of technologies that superimposes digital information into the real world and is a rapidly growing field. In Surgery, augmented reality may provide the surgeon access to radiological and sonographic images enabling for better contextual surgical planning and navigation; a feature which may be very fruitful in hand surgery due to the small structures encountered and the dynamic nature of operations. A systematic review exploring the use of augmented reality and enhanced technologies in hand surgery is therefore warranted to explore current augmented reality technologies and to guide future augmented reality-related strategies that can be used in Hand Surgery.

Methods: A systematic literature search of Medline, EMBASE, and Web of Science databases was performed using appropriate search terms in order to identify all applications of Augmented in hand surgery from inception to September 2018. All articles were reviewed by two authors and a qualitative synthesis performed of those articles that met the inclusion criteria. The systematic review and results were conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta Analysis (PRISMA) guidelines.

Results and Conclusions: A total of 282 articles were identified for title and abstract review. Fourteen studies met the inclusion criteria. Most of the applications of augmented reality and enhanced technologies relate to dynamic infrared thermography with some benefits being highlighted with its use. The feasibility of augmented reality in hand surgery has been demonstrated in specific indications. Augmented reality in Hand Surgery is still in its infancy. As technology develops, it is expected that the use of augmented reality and other enhanced technologies will become more commonplace in the field of hand surgery.

Keywords:
Augmented Reality; Hand Surgery; Orthopaedic Surgery: Plastic and Reconstructive Surgery
Ligament Reconstruction and Tendon Interposition and Partial Trapeziectomy for Pantrapezial Arthritis

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Objectives / Interrogation: The purpose was to evaluate whether removing the scaphotrapezoid joint (STJ) when performing a Ligament Reconstruction and Tendon Interposition (LRTI) for pantrapezial arthritis resulted in any clinical or radiographic compromise compared to LRTI alone.

Methods: In a consecutive cohort of 198 thumbs having surgery for CMCJ +/- pantrapezial arthritis, 78 patients were selected to generate two closely matched cohorts and a cross-sectional review was completed of both clinical and radiological outcomes at an average of 41 months (range: 6 - 203). 43 thumbs with no STTJ arthritis had LRTI alone. 35 with pantrapezial arthritis had LRTI and excision/interposition of STJ.

Results and Conclusions: When comparing LRTI vs LRTI plus partial trapeziectomy the only significant difference, though small, was in favour of the LRTI for satisfaction VAS (median 99 vs 90.5/100). Grip strength, lateral pinch strength, tip pinch strength, Kapandji score, pain on normal activity, Patient Rated Wrist Evaluation or QuickDASH score showed no significant differences. Radiographic analysis did not demonstrate significant differences (mean degrees: LRTI vs LRTI plus partial trapeziectomy) for radio-lunate (RL) angle (11 vs 13), capito-lunate angle (12 vs 11), scapholunate angle unloaded (55 vs 54), scapholunate angle loaded (50 vs 49). In both groups 10 patients had a RL angle > 15 degrees. In the LRTI plus partial trapeziectomy group, 2 had scaphoid and lunate extension; with 3 observed in the LRTI group.

We demonstrated that there was no increased risk of poorer clinical outcome or the development of a DISI deformity following resection of the proximal pole of the trapezoid with tendon interposition in the residual gap. The management of pantrapezial arthritis with LRTI and proximal trapezoid excision and STJ interposition appears satisfactory on short to medium term clinical and radiographic follow-up.

Keywords:
Ligament reconstruction, Tendon interposition, Pantrapezial arthritis, Osteoarthritis,
Surgery and Rehabilitation Following Revision Open Carpal Tunnel Release with Hypothenar Fat-pad Flap

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Objectives / Interrogation: Scar adhesions of the median nerve in the carpal tunnel (CT) following open carpal tunnel release (OCTR) can result in recurrent CT syndrome with pain, sensory and motor deficits. Revision surgery with pedicled hypothenar fat-pad flap (HFPF) aims to prevent re-adherence of scar tissue and improve perineural vascularity. This study reports the outcomes of patients undergoing revision OCTR with HFPF.

Methods: This is a prospective study of a consecutive sample of 13 patients (14 wrists) who underwent revision OCTR with HFPF and were assessed preoperatively and at 6 weeks, 3, 6 & 12 months or greater post-op. 6 wrists (42.9%) were female and 11 (78.6%) dominant. Median patient's age at surgery was 60 (range 39 - 78) years and median follow-up time was 14 (range 1.5 - 36) months. Nine wrists had had one prior operation, three wrists had had 2, one wrist had had 3, and one wrist had had several prior operations. Median interval from most recent CTR was 36 (range 4 - 240) months.

The following measures were used for assessment: Levine's CT Questionnaire (LCTQ), QuickDASH and Patient Rated Wrist and Hand Evaluation (PRWHE), pain (Visual Analogue Scale), grip and pinch strength, and improvement using the Global Rating of Change (GRC). Comparisons are made between data collected before the surgery and at most recent follow-up equal or greater to 12 months (n=7). Results are reported as median (25% - 75%).

Results and Conclusions: LCTQ scores for symptoms decreased from pre-operative value of 3.6 (1.9 - 2.7) to 2.5 (1.3 - 1.4) at last follow-up. PRWHE scores dropped from 41.5 (15 - 57) at baseline to 16.3 (1.6 - 55.4) at last follow-up, paralleled by QuickDASH scores which dropped from 42.5 (22.7 - 54.6) to 31.8 (13.6 - 43.2). Pain diminished throughout the time course from 41 (15.3 - 60.5) to 7.5 (4 - 39).

Grip and pinch strength were maintained from baseline to most recent follow-up from 20.3 (10.9 - 28.8) to 16.1 (9.3 - 22.9) in grip, 4.0 (2.0 - 5.5) to 5.3 (2.9 - 5.6) in lateral pinch strength and 3.5 (2.3 - 5.0) to 2.9 (2.4 - 3.8) in tip-to-tip pinch strength. Finally, GRC scores for symptoms and function were positive and tended to increase from 5 (3.3 - 6.8) at 6 weeks post-operative to 6 (0 - 7) at final follow-up and from 3 (-2 - 5.5) to 4 (-1 - 5.5) respectively.

These results, combined with those presented in the literature, suggest that OCTR with HFPF shows outcomes better than revision without flap while being much simpler than other pedicled and free flaps.

Keywords:
Carpal tunnel, Revision surgery, Hypothenar fat-pad flap
Stress behavior in CMC thumb in Bennett's fracture: Finite element analysis

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Objectives / Interrogation: Evaluate the effort that occurs in a normal CMC thumb during grip and index-thumb pinch in comparison with a joint with a Bennett's fracture.

Methods: A 3D reconstruction using the Mimics® software was performed on images obtained by CT of a healthy right hand. A solid model was generated using design software to perform the finite element analysis. Subsequently, we proceeded to simulate a Bennett's fracture by performing an axial cut corresponding to 1/6 of the articular surface of the first metacarpal and removing the resulting fragment. The software used for the simulation by finite elements was Ansys®. The solid models were assigned cortical bone and cartilage properties as appropriate: a Young's modulus of 18 GPa and a Poisson's coefficient of 0.2 for bone (Gislon, Stansfield, & Nash, 2010), and a Young's modulus of 10MPa and a Poisson's coefficient of 0.45 for cartilage (Carrigan, Whiteside, Pichora, & Small, 2003). Both between the cartilage with the trapezius, and between the cartilage and the metacarpal, a rigid fixation contact was established.

The next step was to generate the mesh which was refined in the contact surfaces with 0.4mm elements to improve the analysis in those points. Subsequently, an axial compression force was applied on the distal articular surface of the metacarpal as illustrated in Figure 3, with a value of 66.1N simulating the force that is exerted on the metacarpophalangeal joint when grip force is made. To simulate the role of the ligaments that stabilize the joint when making a clamp, the movement of it was limited only on the axial axis of the metacarpal.

Results and Conclusions: The simulated model does not show a significant difference between the efforts that occur in the joint when it is healthy or when it presents a Bennett type fracture, which seems to indicate that in this type of fractures the joint is not subjected to greater stresses than those who would be subjected in a normal situation.

It could support the advantages of the P.O.L.A.R technique (presented in other abstract)

Keywords: finite element analysis, Bennett's fracture, stress behavior
Four-corner fusion in SLAC & SNAC wrist surgery: Does method of fixation really make a difference?

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Objectives / Interrogation: Four-corner fusion (4CF) has traditionally been reported to have a higher complication rate with similar functional outcomes as the PRC. To date, there have been limited comparisons that specifically focus on whether the fusion method utilized in 4CF affects functional outcomes and complication rates. In this study, we explored the differences in outcomes of two different fixation methods in 4CF and how these compare to traditionally reported 4CF outcomes in the literature.

Methods: A retrospective chart review was conducted to compare headless compression screw (HCSF) versus staple fixation (SF) in four-corner fusion for SLAC or SNAC wrist in a single surgeon’s practice over a ten-year period. Primary functional outcomes included pre- versus post-operative flexion-extension arc and grip strength, complication rate and time to union. Two-tailed T-tests were used to compare the outcomes of HCSF and SF methods. The Chi-squared test was used to evaluate the complication rates associated with each method.

Results and Conclusions: Sixty-two patients with sixty-four wrists were identified; 38 wrists were treated with HCSF and 26 with SF. The majority of patients were male (84%) with an average age of 60.2 years and 52.9 in the HCSF & SF groups, respectively. Patients were followed on average for a 10-month period. HCSF patients had improved flexion arc post-operatively (108% of pre-operative arc), whereas SF patients lost an average of 30.4% or 27.9° of their pre-operative range (p-value:0.00003). Grip-strength was improved in both groups. A statistically significant higher complication rate was associated with SF (50%) versus HCSF (13.2%). Hardware failure (3), hardware associated pain (4), dorsal impingement (2) and infection (3) were the most common complications of SF, whereas neuropraxia (2) and hardware failure (3) were the most common complications associated with HCSF. The higher complication rate and equivocal functional outcomes traditionally reported for 4CF may be associated with specific fixation methods such as the SF.

Patients treated with SF have a statistically significant greater loss of flexion-extension arc post-operatively, are immobilized longer, experience a higher rate of complications and re-operations. Various fixation methods are available for 4CF, however functional outcomes and complication rates are inconsistent among these methods.

Keywords: four-corner fusion, fixation, staples, headless compression screws, SLAC, SNAC
Long Term Outcomes of Medial Epicondylectomies

List of authors:
Libby J Anderson*1, Mark Ross1
1 Brisbane Hand and Upper Limb Research Institute, Brisbane Private Hospital (BRISBANE)

Objectives / Interrogation: We hypothesized that medial epicondylectomy is a safe and effective method to treat medial epicondylitis and ulnar neuritis, with good medium to long-term patient outcomes.

Methods: This is a study of a consecutive sample of 29 patients who underwent medial epicondylectomy and were assessed preoperatively and at 3 & 6 months and 2, 3, 4 or 5 years after surgery. 2 patients had medial epicondylectomy alone and 27 patients also had ulnar neurolysis, 7 of whom had additional procedures such as removal of osteophytes (2 patients), debridement (2 patients), biopsy (1 patient), medial collateral ligament reconstruction (1 patient) or removal of plate (1 patient). 7 participants (24.1%) were female and 12 (41.4%) had surgery on the dominant side. Median patient's age at surgery was 49 (range 24 - 75) and median follow-up time was 12 months (range 3 - 60 months).

We measured pain and satisfaction (Visual Analogue Scale), Patient-Rated Elbow Evaluation (PREE), function (QuickDASH), Global Rating of Change (GRC), and grip and pinch strength. Results are reported as median (25% - 75%). Comparisons are made between preoperative values (n=28) and one year after surgery (n=14) or last follow-up equal or greater than 2 years (n=8).

Results and Conclusions: Pain decreased from 46.5 (9.8 - 66.5) before surgery to 7.5 (3.8 - 26.5) at last follow-up, whereas satisfaction increased from 15.0 (5.3 - 51.3) to 90.0 (53.3 - 95.3). Function scores improved from baseline values of 43.7 (20.4 - 57.8) for PREE and 54.5 (22.2 - 64.2) for QuickDASH to 17.0 (7.2 - 37.8) and 20.5 (17 - 37.8) respectively at last follow-up. GRC scores for symptoms and function increased throughout the time course from 3 (1 - 5) and 3 (1 - 4) respectively at 3 months after surgery to 5 (3 - 7) and 4 (0 - 6) at last follow-up equal or greater than 2 years.

Range of motion increased slightly with flexion shifting from 135° (130 - 144) to 140 (138 - 149), extension from 0° (-2.5 - 5.5) to 6° (0 - 20.3), supination from 80° (77 - 85) to 85° (77.5 - 97.5), and pronation from 85° (75 - 90) to 82.5° (75.5 - 85). Grip and pinch strength tended also to increase from 31.3 (16.5 - 45.5) to 37.4 (36.8 - 48.3) kg in grip, 5.4 (4.0 - 7.6) to 6.5 (4.4 - 8.9) kg in lateral pinch strength and 4.0 (3.0 - 4.6) to 5.1 (3.5 - 5.8) kg in tip-to-tip pinch strength.

These results, combined with those from the literature, suggest that medial epicondylectomy is a safe and effective procedure to treat medial epicondylitis and ulnar neuritis.

Keywords:
Medial epicondylectomy, Medial epicondylitis, Ulnar neuritis
The Role of Neurolysis for Hourglass Constrictions in Chronic Parsonage-Turner Syndrome

List of authors:
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Objectives / Interrogation: Wide variability in recovery of patients affected by Parsonage-Turner syndrome (PTS) is now recognized, with up to 60% experiencing residual motor deficits or pain. Using high-resolution MRI and ultrasound (US), we routinely identify hourglass constrictions (HGCs) in affected nerves of patients with persistent motor paralysis from PTS. We hypothesized that patients with chronic PTS and HGCs would experience motor recovery and functional improvement following microsurgical epi- and perineurolysis of the constrictions.

Methods: Eight patients (3 F), ages 21-61 years, with chronic motor palsy from PTS and HGCs were treated with microsurgical epi- and peri-neurolysis of HGCs. Average time from symptom onset to surgery was 12.0 ± 4.7 months. Preoperative electrodiagnostic (EDX) testing and manual motor testing confirmed complete muscle denervation in the distribution of affected nerve(s). HGCs were identified in one or more nerves in all patients using 3.0 T MRI and US. Microneurolysis was indicated for the following: failure to improve clinical and EDX function after 6 months with 3 successive exams, each at least 6 weeks apart (n = 3), or 12 months without improvement since symptom onset (n = 5). Muscle strength was assessed pre-and postoperatively using the modified Medical Research Council (MRC) scale and EDX.

Results and Conclusions: Average postoperative clinical and EDX follow-up was 13 months (range, 4-29) and included data on 27 of 29 affected muscles. Thirty HGCs in 11 nerves were identified on imaging and confirmed intra-operatively, involving the pronator teres and anterior interosseous fascicles of the median nerve, suprascapular, axillary and radial nerves proper. One patient presented with bilateral disease. 7/8 patients experienced functional recovery and 6/8 experienced electrical recovery in the majority of affected muscles. Average MRC increased from 0.5 ± 1.1 to 3.3 ± 1.6 among the 7 patients with unilateral disease and from 0.3 ± 1.0 to 2.5 ± 2.0 for the entire cohort (p<0.01). EMG revealed significant motor unit recovery from axonal regeneration in 16/28 muscles (p<0.01). Microsurgical epi- and peri-neurolysis of HGCs in this small cohort was associated with significant electrical and functional muscle recovery at an average follow-up of 9.5 months. We recommend microsurgical epi- and perineurolysis of HGCs for patients with PTS motor palsy who fail to improve with non-operative treatment.

Keywords: parsonage, turner, syndrome, neurolysis, hourglass, constriction, nerve
carpectomy the proximal row vs arthrodesis four corner in patient with SNAC and SLAC

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Objectives / Interrogation: evaluate the functional outcome of patients with advanced lesions and collapse scapholunate advanced collapse scaphoid nonunion treated with proximal row carpectomy versus four corners arthrodesis.

Methods: A retrospective, cross-sectional descriptive study, which will be held in the city of Naucalpan, State of Mexico, in the Medical Unit of High Specialty (UMAE), Hospital of Traumatology and Orthopedics Lomas Verdes is made, the study population were rightholders patients Mexican Social Security Institute, 19 rightholders patients, not probabilistic consecutive cases operated on of carpectomy row proximal versus 52 patients after arthrodesis of 4 corners, consecutive cases nonprobability in the period from 2010 to 2015.

Results and Conclusions: 71 patients, 62 male patients (87.3%) and 9 female patients (12.7%) were analyzed. For Carpectomy were 14 male patients (73.7%) and 5 female patients (26.3%), for patients with four corners arthrodesis were 48 male patients (92.3%) and 4 female patients (7.7%) were included. SNAC 48 patients (67.6%) and 23 patients with SLAC (32.4%) were identified. Proximal row carpectomy 19 (26.8%) and 52 four-corner arthrodesis (73.2%) were performed. Of the total patients, 65 of them (91.5%) were enrolled without any complications, 3 patients with delayed consolidation (4.2%), with residual pain two patients (2.8%) and 1 patient with infectious process (1.4%) were identified. Reintegration time was an average of 5.83 months. The Wilcoxon rank test was performed wherein the variable postoperative pain and preoperative pain have significant value of p <.001. The same test was performed for the Quick Dash prior to the surgical procedure and Quick Dash after the surgical procedure with significant value of p <.001. U test of Mann-Whitney rank was performed for the two groups with a p <.411 for preoperative pain, postoperative pain ap of .037. Conclusions: The technique of four corners arthrodesis means more surgery time and costs that proximal row carpectomy, but the reincorporation of the patient is faster and satisfaction with the results is slightly higher, plus practically not observed a frequency of complications. Pain before the procedure and after the same was observed with a similar relief four corners arthrodesis and proximal row carpectomy, so the final decision to opt for some is directly related to the patient's occupation and physical demands over other factors.

Keywords:
carpectomy, arthrodesis four corner, snac, slac
DESCRIPTION AND OUTCOMES OF SURGICAL TECHNIQUE FOR TREATMENT OF SCAPHOID NONUNION WITH OLECRANON BONE GRAFT.

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² Hospital Maria Amélia Lins (BELO HORIZONTE)

Objectives / Interrogation: The best treatment for scaphoid nonunion remains controversial and this paper describes a surgical technique for the treatment of nonunion of the scaphoid with the rate of consolidation based on radiographs. The aim of this study is to demonstrate a less morbid procedure with good results when compared to several techniques described in the literature.

Methods: A group of 21 patients with the diagnosis of nonunion of the scaphoid was submitted to surgical treatment at an orthopaedic service from December 2013 to December 2017, however six had to be excluded from the research. It was obtained than, 15 cases who had the complete follow-up and medical records. The surgical technique used a palmar approach to access the scaphoid and clean the nonunion focus. An osteotome or a tweezers was kept in focus to maintain bone height, length and correct alignment. The fixation of the scaphoid with hadless screw was made prior to graft placement, in contradistinction to literate techniques. Subsequently, bone graft obtained from olecranon was positioned in the nonunion space. The wrist was immobilized with short splint postoperatively for 4 weeks, when rehabilitation was instituted. Patient’s radiographs were analyzed at all appointments until radiographic heal of the scaphoid were seen.

Results and Conclusions: All 15 patients were male such as literature data. The site of involvement was the middle third of the scaphoid associated with reabsorption larger than 5mm, subchondral cysts and malalignment. The mean age found was 35.2 years (18-53) and the most affected hand was dominant (60%). The average time to consolidation was 3.4 months (2-5) and all patients demonstrated consolidation on the radiographs in the postoperative follow-up. There was no need to use computed tomography or other image exams to diagnose the consolidation.

Recent techniques show high rates of consolidation, around 88% to 92% despite the type of bone graft (vascularized or non-vascularized). Some authors obtained consolidation with an average time of 6.2 weeks using vascularized graft, and others even 10.2 weeks. This paper shows 100% of heal using a non-vascularized ulna graft, with an average time of 3.4 months.

The treatment for scaphoid nonunion remains a challenge and this study brings a good option for the surgical technique with encouraging results when compared to techniques established in the literature.

Keywords:
scaphoid, nonunion, pseudoarthrosis, carpus, bone graft
Teriparatide can enhance bony union of beta-tricalcium phosphate in cases of corrective osteotomy post distal radius malunion: a case series

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Objectives / Interrogation: Teriparatide activates osteoblastic bone formation and effectively promotes bony union in distal radial fractures. Here we report two cases of distal radius malunion simultaneously treated using corrective osteotomy and beta-TCP with daily administration of teriparatide for osteoporosis.

Methods: The first case was a 64-year-old woman who underwent osteotomy for distal radius malunion. The surgery, which was performed 6 months after the trauma, comprised the following three steps: 1) an initial opening-wedge osteotomy, 2) implantation of an artificial bone graft (beta-TCP) in the bone defect, and 3) radius fixation using a volar locking plate. The patient was administered teriparatide injections (40 mg/day) for osteoporosis. Bony union was achieved within 3 months of surgery. The second case was a 57-year-old woman who also underwent osteotomy for distal radius malunion. The surgery, which was performed 5 weeks after the trauma, followed the same protocol as stated for the first case. This patient also received daily teriparatide injections for osteoporosis. Bony union was achieved within 7 weeks of surgery.

Results and Conclusions: Discussions:
Aspenberg, in his report, reported that teriparatide enhances bony union following distal radius malunion. In particular, autologous bone grafting is considered the gold standard for the treatment of segmental bone defects in patients with distal radius malunion treated using corrective osteotomy. However, in osteoporotic patients, it is difficult to obtain a good quality graft even from the iliac bone. Yasuda reported that, as an alternative to autologous bone graft, bony union can also be provided using an artificial bone graft. Interestingly, Jacobson, in an animal model, reported that an artificial bone graft supplemented with teriparatide provides good bony union. Teriparatide reportedly promotes bony union; however, no study has yet demonstrated its role in artificial bone graft healing. Conclusion:
The addition of teriparatide to artificial bone grafts allows early bony union. This study indicates that teriparatide could help enhance bony union. Further, this method may serve as an alternative method of autogenous bone grafting.

Keywords:
distal radius fracture , osteotomy , teriparatide , osteoporosis
HAND SURGERY IN A FIELD HOSPITAL IN COX’S BAZAR, BANGLADESH

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2 International Medical University (Kuala Lumpur)
3 96 Naval Hospital (Lumut)

Objectives / Interrogation: Cox’s Bazar is a border town in Bangladesh currently supporting approximately 1 million Rohingya refugees from Myanmar. The Malaysian government has sent the Malaysian army field hospital as part of a government to government initiative supporting the influx. The army orthopaedic surgeon had requested a hand surgeon to perform four difficult cases of hand surgery in May 2018.

Methods: The four cases were all children ranging in age between 1 year 3 months, 2.5 years, 3 years and 6 years old. They all involved the right hand. One case was due to the 6-year-old child being allegedly thrown into a fire by the military of a neighbouring country and suffered right ring and little finger severe dorsal contracture with ulnar deviation. The other three cases were domestic injuries of holding a burning charcoal, being involved in a burning house and an electrical burn. Two cases were categorized as severe such as the case above and a severe right wrist contracture with right 2nd -4th MCPJ hyperextension.

Results and Conclusions: The average time for operation was 2 hours. All surgeries required full thickness skin grafts from the groin / antecubital fossa. Instruments needed include a sharp Steven’s tenotomy scissors, Adson’s toothed forceps, K-wires of various sizes from 1.0 - 1.4 and a good K-wire driver. The K-wires are left for 2-3 weeks to allow the skin grafts to adhere. Caution is needed during the healing period as the dressings are changed as the patients' level of hygiene is questionable in a refugee camp.

Conclusion
Hand surgery for wrist and finger contracture release can be comfortably done in a limited orthopaedic setting with minimal levels of sterility.

Keywords: field hospital, Rohingyas, refugees, humanitarian
Early Experience with a Novel Synthetic Scapholunate Ligament Construct

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**Objectives / Interrogation:** It is hypothesised that use of a woven polyurethane "artificial ligament" is suitable for reconstructing the scapholunate ligament. We have previously described the mini Lockdown, a technique for entirely transosseous passage of a tendon graft through the proximal row [%1].

**Methods:** The mini Lockdown "artificial ligament" is anchored in the distal scaphoid, routed through drill holes in the proximal row and passed across the triquetro-hamate joint to be secured into the dorsal capitate. The proximal row tunnels are the same as employed in the "SLT" reconstruction [%1]. The mini Lockdown is used in three SL ligament reconstruction situations: 1. in place of temporary K-wire fixation following acute repair or late reconstruction, 2. in conjunction with a strip of FCR via the same transosseous proximal row tunnels (an augmented SLT), or 3. in isolation via the SLT tunnels (a mini Lockdown RASL). Sixteen study participants (1 female, 7 non-dominant) of median age (range) of 41.5 (15 - 60) years who had the mini Lockdown procedure since July 2016 were assessed prior to surgery and at 3, 6 and 12 months after surgery. Measures included Visual Analogue Scale (VAS), Global Rating of Change (GRC), PRWHE and QuickDASH patient reported questionnaires, range of motion and strength measures. Median time to follow-up (range) was 5 (3 - 12) months. Only the most recent follow-up equal or greater than 6 months is reported below.

**Results and Conclusions:** Patient-reported VAS median pain scores decreased from 46.0 to 10.0 and satisfaction increased from 13.5 to 87.0 from pre-operative assessment (n=16) to most recent follow-up (n=9). PRWHE and QuickDASH scores improved from 61.5 and 40 respectively at pre-operative assessment (n=16) to 21.0 and 15.9 at most recent follow-up (n=9). Active range of motion was assessed pre-operatively (n=13) and compared to most recent follow-up (n=9): median wrist flexion/extension decreased from 60/60° to 50/58°; supination/pronation increased from 85/89° to 88/90°; and median radial/ulnar deviation increased from 12/25° to 15/20°. Between pre-operative assessment (n=12) and most recent follow-up (n=9), grip and two-point pinch increased from 77.5% to 78.9% and 73.5% to 100% of the contralateral side respectively.

The mini Lockdown technique offers promising early results showing that it is capable of correcting and maintaining large and longstanding deformities. The design process is ongoing.

**Keywords:**
Artificial ligament, Scapholunate ligament, Surgical technique

**References:**
Do post-operative radiographs change the management following internal fixation of distal radius fractures?

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Objectives / Interrogation: The utility of obtaining routine post-operative radiographs following the internal fixation of distal radius fractures is poorly defined. The purpose of this study was to determine whether post-operative radiographs influence the current management of fractures of the distal radius following internal fixation.

Methods: We retrospectively reviewed all patients that underwent internal fixation of distal radius fractures over a five year period. We interrogated patient files to determine whether patients were returned to theatre on the basis of routine post-operative radiographs. A total of 543 procedures were performed with 1340 radiographs obtained on these patients over the ensuing six weeks.

Results and Conclusions: Of these patients only seven returned to theatre. All patients that returned to theatre were either symptomatic or had findings prompting revision that were also identifiable on intra-operative radiographs that had not been addressed intra-operatively.

The evidence did not support routine post-operative imaging following the internal fixation of distal radius fractures.

Keywords:
Distal radius, Fracture, X-ray
A case of atypical phenotype of bilateral polysyndactyly in Joubert syndrome

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Objectives / Interrogation: Joubert syndrome (JS), first described by Marie Joubert in 1968, is a congenital anomaly characterized by episodic hyperpnea, abnormal eye movement, ataxia, and intellectual disability. Congenital deformities of the extremities are mostly postaxial polydactyly of the hands and preaxial polydactyly of the feet. Typically, a y-shaped metacarpal bone between the middle and ring finger is seen on x-ray. Our patient had bilateral polysyndactyly of the ring finger from the middle phalanx to distal phalanx in the right hand and from the metacarpal bone to the distal phalanx on the left and polydactyly from the proximal phalanx to the distal phalanx of the right great toe. Here, we describe this atypical case in comparison with previous reports.

Methods: Case report: The patient was a male infant born in normal vaginal delivery with a weight of 3278g at 38 weeks and 3 days' gestation. He was referred to our hospital due to screening because of tongue tumor and hand malformations. Examination revealed abnormal eye movement, polydactyly of the ring fingers bilaterally, and polysyndactyly of the right great toe with the typical molar tooth sign on magnetic resonance imaging. There were no retinal, renal, hepatic, or orofacial defects. Our comprehensive literature search of PubMed on congenital hand anomalies in JS revealed that from 1968 to 2017.

Results and Conclusions: Only 12 reports have described about polydactyly in detail. The average of morbidity of polydactyly is 30.19% (8-100%). In our case, first, separation was successfully performed for the right hand and right foot, and then 3 months later for the left hand. The incidence of JS is between 1/80,000 and 1/100,000 live births. JS is classified into 6 types, pure JS, JS with ocular defect, JS with renal defect, JS with oculorenal defects, JS with hepatic defect, and JS with orofaciodigital defects. Our case was diagnosed as JS with orofaciodigital defects. Several candidate genes were published such as AHI1, CC2D2A, CEP290, ARL13B, C5orf42, TCTN2 in JS with orofaciodigital defect, but we have not done genetic testing yet. Considering the associated intellectual disability, it is important to make use of the fingers easier by surgery because of the lack of active flexion in the right ring finger. Careful observation and guidance for the patient and the family are also important.

Keywords:
Clinical and Radiological Outcomes of a Trapezometacarpal Interposition Implant

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Objectives / Interrogation: The Pyrocardan® trapezometacarpal interposition implant is a free intra-articular spacer composed of pyrocarbon. It is a biconcave resurfacing implant that is both ligament and bone-stock sparing. A primary indication for use is early- to moderate-stage trapezometacarpal osteoarthritis. This study examined survivorship, clinical and patient-reported outcomes with the Pyrocardan® implant. It was hypothesized that the postoperative outcome measures of the Pyrocardan implant would be comparable to those seen with LRTI surgeries and Bellemère's original series [1].

Methods: In this prospective case series, 33 patients (21 female) received a total of 39 Pyrocardan® implants from 2012 to 2017. Patients were assessed pre-operatively and at 6 weeks, 3 months, 6 months, 1 year, 2 years and beyond (long term) wherever possible. The post-operative pain and function outcome measures were analysed alongside a matched cohort of LRTI patients from our own institution. These results will be discussed in relation to Bellemère's published results [1].

Results and Conclusions: There have been no complications or revision surgeries for the series. One patient has had a subsequent MCPJ fusion. All 39 joints were followed up post-operatively at an average of 17 months (range 6 weeks - 5yrs). Average age at operation was 57 years (range 46 - 71). Thirty-four of the 39 joints were assessed greater than or equal to 6 months post index surgery. Outcome measure scores improved from pre-operative assessment to the most recent follow up equal or greater than 2 years. Median PRWHE score decreased from 65.7 to 17.5, median QuickDASH from 50.0 to 17.5 and on visual analogue scales median pain decreased from 63.5 to 13.0 and satisfaction increased from 8.5 to 90.0. Average grip strength at a minimum of two years was 28.7kg, as compared to LRTI (19.6kg) and Bellemere's series (25kg). In an age matched cohort assessed at a minimum of 2 years, average grip strength increased from 17kg pre-op to 28.9kg post-op in the Pyrocardan patients and from 17kg to 20kg in patients who underwent an LRTI procedure.

Pyrocardan provides a safe, effective treatment for pain relief and improved functional use of the hand for trapeziometacarpal arthritis. Patient-reported clinical outcomes were at least equivalent to LRTI and are comparable to Bellemère's original series [1]. Grip and pinch strength were better in the Pyrocardan series.

Keywords:
Osteoarthritis, Trapezometacarpal joint, Pyrocarbon

References:
1. P. Bellemère, E. Gaisne, T. Loubersac, L. Ardouin, S. Collon, C. Maes, Pyrocardan implant: free pyrocarbon interposition for resurfacing trapeziometacarpal joint., 2011, 30, S1, 28-35., Chirurgie de la Main
Stainless steel versus titanium volar multi-axial locking plates for fixation of distal radius fractures: a randomised trial

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Objectives / Interrogation: Titanium and stainless steel volar plating systems for distal radius fractures are both in common use in orthopaedic surgery. Titanium implants have been reported to have benefits including reduced implant stiffness, increased biocompatibility and diminished stress shielding compared to stainless steel implants, however tenosynovitis and extensor tendon ruptures have been reported in the use of titanium plates and may be less common with stainless steel implants.

This study aimed to determine the clinical outcomes and effectiveness of the two devices used to manage distal radius fractures.

Methods: This is a double blinded, randomised controlled trial with outpatient data collection investigating the effectiveness of the two interventions. Pain and satisfaction in a visual analogue scale (VAS), function measured with the PRWHE and QuickDASH, wrist range of motion and grip strength were measured. As expected from a randomised allocation study, no baseline differences were found between groups in demographic or outcome measures. Preliminary data are reported as median (25% - 75%) values.

Results and Conclusions: Data has been collected from 46 stainless steel and 49 titanium-plated forearms, 32 and 27 of which have had at least one assessment equal or greater to 3 months after surgery. Analysis at 3 months showed VAS pain and satisfaction to be 15.0 (7.25 - 45.75) and 78.5 (49.5 - 92.3) respectively for stainless steel participants and 15.2 (2.0 - 28.0) and 80.0 (45.25 - 96.0) respectively for titanium participants. At three months, PRWHE measured 26.0 (10.0 - 40.5) for the stainless steel group and 15.0 (5.50 - 43.5) for the titanium group, whereas QuickDASH scores were 15.9 (9.1 - 34.1) for the stainless steel group and 20.0 (2.3 - 40.9) for the titanium group. Measures of wrist range of motion were similar between the two groups at 3 months. Grip strength was 19.3 kg (14.3 - 22.0) and 17.0 (11.3 - 24.0) respectively. Three revisions per group were recorded at most recent follow-up (stainless steel 7 months (range 4 - 40) and titanium 5 months (range 0 - 33)). No differences were found to be statistically significant.

These results suggest that the plates are comparable in terms of their functional, clinical, and radiological outcomes, and that the revision rates do not differ. The outcomes of this study should allow surgeons to make a more informed choice between stainless steel and titanium volar locking plates when fixing distal radius fractures.

Keywords:
Distal radius, Fracture, Clinical trial, Volar plate
Preoperative Two Point Discrimination Predicts Response to Carpal Tunnel Release

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Objectives / Interrogation: Two-point discrimination (2PD) correlates to digital innervation and is used as a measure of carpal tunnel severity. However, there is no study to date that has assessed whether preoperative 2PD scores predict symptom severity or response to surgery. The primary aim of this study was to determine the predictive value of preoperative 2PD scores on postoperative symptom severity following carpal tunnel release.

Methods: All patients who underwent carpal tunnel release by a single fellowship-trained surgeon between 2014 and 2018 were retrospectively reviewed. Diagnosis was based on CTS-6 criteria, and surgery was offered based on failure of conservative management. Evaluation of static 2PD was performed and absent preoperative 2PD was defined as a measurement >10 mm. Pre- and postoperative QuickDASH and Levine-Katz scores were recorded. Pearson correlation coefficients assessed the relationship between preoperative 2PD scores, postoperative 2PD scores, and patient-rated outcome scores.

Results and Conclusions: Eighty-four hands were analyzed in this study. Mean post-operative follow-up was 1.8 years. Mean pre- and postoperative 2PD was 7.6mm (n=67) and 6.5mm (n=52), respectively. A higher initial 2PD was associated with an increased likelihood of improvement in 2PD postoperatively ($r^2 = 0.088$, $p=0.006$) unless 2PD was absent.

![Figure 1](image)

Figure 1. Percent of patients demonstrating improvement in 2PD score from pre- to postoperative based on preoperative most affected digit 2PD score.

Additionally, there was a positive correlation between pre- and postoperative 2PD ($r = 0.61$, $p<0.05$)
Patients with absent preoperative 2PD were the least likely to demonstrate postoperative improvement in 2PD from baseline with only 40.0% (6/20) of patients demonstrating improvement in contrast to 68.8% (44/64) patients otherwise (p = 0.03).

**Keywords:**
Carpal Tunnel Syndrome, Two Point Discrimination, Prognosis

**Figure 2.** Linear regression comparing preoperative 2PD score with (a) postoperative 2PD score (Pearson correlation, 0.780; P < 0.5) and (b) delta 2PD (Pearson correlation, 0.288, P = 0.006).
Investigation of nerve regeneration promoting factor in bioabsorbable nerve conduits coated with induced pluripotent stem cell-derived neurospheres

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Objectives / Interrogation: Introduction: We previously reported the effectiveness of a bioabsorbable nerve conduit coated with iPSc-derived neurospheres in young and aged mice. Transplanted neurospheres in the nerve conduit differentiated into S100 positive - Schwann-like cells and migrated adjacent to nerve stumps. These cells maintained their property and remained, and located in the vicinity of the axons at least 14 days after transplantation. Here, we investigated nerve regeneration promoting factor in bioabsorbable nerve conduits coated with neurospheres.

Methods: Methods: The nerve conduit (external diameter 2 mm, internal diameter 1 mm and length 7 mm) was composed of an outer layer of a poly lactide mesh and an inner layer of a porous sponge composed of 50% L-lactide and 50% caprolactone. Mouse iPSCs were neurally induced in vitro using a published protocol. The secondary neurospheres derived from mouse iPSCs were suspended in each conduit (2,600,000-4,000,000 cells per conduit) and cultured in the conduit for 14 days. We then implanted them in the left sciatic nerve gap (5 mm) as iPSc groups (young mouse; n=6, aged mouse; n=6). Bridging of the nerve gap using the nerve conduit alone was designated as the control groups (young mouse group; n=5, aged mouse group; n=5). We investigated gene expression of nerve regeneration factor in the nerve conduit by using real time PCR on Day4 and Day7 after transplantation and compared iPSc group with control group.

Results and Conclusions: Results: In the iPSc groups, on Day4 and Day7 after transplantation, gene expression of nerve regeneration promoting factors (ATF3, BDNF, and GDNF) was elevated compared with control groups.

Conclusion: According to in vivo imaging results in the same experimental system, the survival rate of transplanted neurospheres in the nerve conduit increases at the early phase (Day4 and Day7) after transplantation. From the results of this study, it is considered that the these neurotrophic factors and transcription factor increased in the nerve conduit at the early phase, which may promoted peripheral nerve regeneration.

Keywords:
induced pluripotent stem cell, nerve conduit, nerve regeneration
Can cross sectional area of median nerve predict the prognosis of local steroid injection for carpal tunnel syndrome?

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Objectives / Interrogation: The local steroid injection for carpal tunnel syndrome (CTS) is effect treatment modality which usually gives immediate symptomatic relief without invasive procedure. However, the long-term efficacy is frequent concern of injection therapy and it is not well known for prognostic factor to influence the result of local steroid injection. Our purpose of this study was 1) to report the long term success rate of sonography-guided local steroid injection and 2) to determine whether cross sectional area (CSA) of median nerve could be used for prognostic factor of steroid injection.

Methods: In a retrospective study, 37 patents with CTS were treated with corticosteroid injection guided by ultrasonography. CAS of median nerve was measured at lunate level when the median nerve had the largest size of CSA. Sixteen patients were classified as severe group according to CAS larger than 15mm^2. The other 21 patients were classified as mild group. Demographic factor, symptom, initial quick-DASH score, Boston carpal tunnel Questionnaires (BCTQ) and the result of nerve conduction study (NCV) was assessed at baseline. The injection failure was determined when the patients had symptomatic failure with or without re-injection and surgical release.

Results and Conclusions: Symptomatic failure rate was 51% (19 patients) in all patients. Eleven patients (30%) underwent carpal tunnel release after minimum 6 month follow-up (average 15 month).

The two group had similar baseline demographic factors. Thenar atrophy was more pronounced in severe CSA group (P=0.041). There were no significant differences in initial quick-DASH or BCTQ score, whereas amplitude of motor nerve conduction study and grade of NCV for severe CSA group was significantly severer than that of the mild CSA group. At last follow-up 50% of patients in the severe CSA group and 52% in the mild CSA group has symptomatic failure (P=0.886). Twenty five percent of patients in the severe CSA group required carpal tunnel decompression compared to 33% in mild CSA group (P=0.583)

In conclusion, Overall failure rate of steroid injection was 51%. The CSA dose not have prognostic value in prediction of the success of local steroid injection. In other words, the large CSA dose not preclude the possibility of long-term symptomatic relief after local steroid injection.

Keywords:
wrist, carpal tunnel syndrome, steroid injection, ultrasound, sonography, median nerve, cross sectional area
Robust genetic diagnosis of split-hand/foot malformation by exome sequencing

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Objectives / Interrogation: This study aimed to evaluate the genetic diagnostic yield and accuracy of exome sequencing for Chinese patients with split-hand/foot malformation (SHFM), a severe heterogeneous congenital anomaly characterized by hypodevelopment of the central ray of the hands and feet.

Methods: A cohort of 8 families and 4 sporadic patients with SHFM was investigated. Genomic DNA were prepared from peripheral blood of affected and unaffected individuals. Whole exome sequencing (WES) was performed to identify pathogenic mutations. Array-based comparative genomic hybridization (aCGH), cytoscan, qPCR, and Sanger sequencing was performed to validate the WES findings. WES data of an additional cohort of 24 patients with non-SHFM congenital hand anomalies were analyzed as a control.

Results and Conclusions: Pathogenic variants of TP63, c.G956A:p.R319H and c.T602A:p.L201H, were identified in two families. In the remaining patients, copy number analysis of the WES data identified pathogenic 10q24 duplication in 5 individuals out of 3 families, which was validated by cytoscan and qPCR. Duplication in 10q24 was not detected by WES in an additional cohort of 24 individuals with non-SHFM congenital hand anomaly. Importantly, qPCR analysis of the copy number of 10q24 region showed a definite consistency with WES in all individuals. Genotype-phenotype analysis showed no unique feature that can differentiate families with TP63 mutation and 10q24 duplication. Thus, our study demonstrated that WES was an accurate and sensitive method in detection of the pathogenic 10q24 duplication. Together with TP63 mutation, a single WES testing could yield a diagnosis rate of about 40% (5/12) for SHFM patients, at least in our cohort. Since there is no clear genotype-phenotype correlation, WES could be a cost-effective method for genetic diagnosis for SHFM.

Keywords:
split-hand/foot malformation, TP63, 10q24 duplication, genotype-phenotype correlation
The use of Integra® Dermal Regeneration Template (IDRT) in the reconstruction of post-traumatic soft-tissue defects of the dorsum aspect of the hand and/or fingers

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Objectives / Interrogation: Traumatic injuries of the dorsum aspect of the hand and/or fingers often leave soft-tissue defects with exposed bone, joint, and/or tendon. Required treatment includes skin grafting, local rotational, pedicle or free flap. The purpose of this study was to report our experience with use of Integra® dermal regeneration template (IDRT) followed by delayed split-thickness skin grafting (STSG) for management of complex dorsum soft tissue defects.

Methods: A prospective study was conducted on all patients sustaining dorsal traumatic soft tissue-defects of the hand and/or fingers with exposed bone, joint, and/or tendon, from September 2008 to October 2013, who were treated with IDRT, followed by STSG. Integra® grafting was performed 12 times in 14 wounds, 9 men and 3 women were included. The mean age was 37± 9 years (6-79). The dominant hand was involved in 5 cases (42%). The IDRT was applied to 6 hands, 4 fingers, 1 thumb and 3 hands and forearm. The mechanism of injury includes Do-it-Yourself accidents (DIY) in 3 cases, public roads in 5 cases, degloving injury in 1 case, necrotizing fasciitis in 2 cases and a work accident in 1 case.

Results and Conclusions: Mean follow-up of 48±6 months (27-85 months). Days from injury to Integra® application were on average of 6 days (0-24), and from Integra® placement to STSG an average of 27 days (21-41). The size of residual soft tissue defect ranged an average of 17cm² (6-150). Integra® and subsequent STSG take rate was 100% and the cosmetic results assessed with the Vancouver Scale was an average of 2 (1-4). In a case, there were defect of the extensor pollicis longus tendon, which required two staged tendon grafting reconstruction, with silastic rod placement during the first stage, followed by autogenous tendon graft 4 months later.

In conclusion, IDRT combined with secondary split-thickness skin grafting is an effective method for the treatment of wounds defects located of the dorsum aspect of the hand and/or fingers, with exposed tendon and/or bone and joint, with good functional and aesthetic results. This can potentially lessen the need for local rotational or free flap coverage. Moreover, in case of failure this technique does not cut the bridges to traditional repair.

Keywords: Integra; Dermal Regeneration Template; Neodermis; Soft-tissue defects; Soft-tissue Coverage; Traumatic
Bilateral Symmetrical Congenital Trigger Thumb and Middle Finger in a 2-Year-Old Child: A Case Report

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Objectives / Interrogation: Isolated congenital trigger thumb and trigger finger is well known in literature and has a developed treatment algorithm. Non-operative treatment in congenital trigger thumb has good clinical outcome in comparison to trigger finger. However, bilateral symmetrical congenital trigger thumb and finger is extremely rare and roles in treatment remains elusive.

Methods: We described a 2-year-old child presented with fixed thumb interphalangeal joint and triggering of middle finger both hands symmetrically. The patient was diagnosed with bilateral symmetrical congenital trigger thumb and trigger middle fingers. The symptoms of the left hand resolved non-operatively with physiotherapy but the pathology on the right hand required surgery. The A1 pulley was released in the right thumb and right middle finger. Subsequent release of the A3 pulley and ulnar head flexor digitorum superficialis of the middle finger was resected. The outcomes were good post-operatively and the patient and parents were satisfied with the treatment.

Results and Conclusions: Bilateral trigger finger in addition to trigger thumb is very rare and can be treated both non-operatively and surgically. The left hand of this patient received physiotherapy treatment and surgical treatment on his right. Both the symptoms on his right and left hand resolved with return to full function. There is more to explore on the possibilities of non-operative roles in treating bilateral trigger fingers and trigger thumb.

Keywords:
Congenital trigger thumb, Congenital trigger finger, Bilateral and symmetrical
Use of medial femoral condyle flap for treatment of non-union and avascular necrosis of the upper limb. Cadaveric study and morbidity analysis of 18 cases.

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Objectives / Interrogation: 1. To describe the vascular anatomy of the medial femoral condyle flap in a cadaveric study,
2. To demonstrate a relevant classification for the clinical practice.
3. Review our experience for the treatment of non-union, and avascular necrosis in the upper limb through a case series, making an emphasis on donor-site morbidity and Patient Reported Outcomes (PRO's)

Methods: First phase: twenty legs of 10 cadavers were studied with an intravascular injection of latex; the pedicle length, ramification pattern, and femur length was described.
Second phase: A retrospective study of 18 patients with avascular necrosis or non-unions of the upper limb, that were reconstructed with medial femoral condyle flap, was conducted. Time from injury to reconstruction, consolidation, and pain improvement was recorded. Higgins questionnaire was used in the 6th month follow-up in order to describe patient overall satisfaction, and complaints regarding both the donor and the receptor area in order to assess the outcomes with PRO's; X-rays of the knee used for flap dissection were utilized to further describe donor-related morbidity.

Results and Conclusions: In phase one, the pedicle raised from the genicular descending artery in 20 (100%) of the cases. Vascular anatomy variability was best described with “Y” and “H” patterns. “Y” pattern was more frequent being found on 13 (65%) the specimens. 94% of cases from phase two were secondary cases, that had received previous surgery. The average time from injury to reconstruction was 24 months, and to bone union was 2,5 months. All patients referred improvement in pain, and were satisfied with the results, no alterations were found on the X-rays. Conclusion: The medial femoral condyle is a flap with a rather consistent anatomy, which is better described with the "Y" and "H" classification. All patients reported improvement of pain, with minimal subjective and objective donor-site morbidity, making of the medial femoral condyle flap a very useful option for non-unions, and avascular necrosis of the upper extremity, even when multiple surgeries have been previously attempted and failed.

Keywords:
Medial femoral condyle flap, avascular necrosis, non-union, patient reported outcomes
Postoperative pain management to the patients with distal radial fractures without opioid

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Objectives / Interrogation: Postoperative pain control (PPC) to the patients is becoming more important practical issue that affects patient satisfaction, surgical outcome and safety. Many drugs were prescribed for PPC. However, the term 'Opioid Epidemic' is being used as the prescription of opioid has rapidly increased and raised the issue of opioid abuse. And the higher rate of opioid side effects in elders is a new problem that may require a longer hospitalization period. Therefore, PPC without opioid is becoming more important issue. The surgery to distal radius fracture (DRF) is one of the most common hand surgeries. Therefore, if PPC without opioid was possible in DRF patients, the opioid use in hand surgery might be considerably decreased. We hypothesized that PPC with non-opioid drugs could be sufficient for the patients with distal radial fractures.

Methods: Patients who scheduled for DRF surgery were the subjects of this study. Patients chose their anesthesia method between GA or BPB according to their own preferences. They were prescribed 2g of IV propacetamol every 6 hours after surgery. Additional 1g of IV propacetamol was prescribed for patients who complained of pain beyond VAS 3. And 50mg of tramadol was prescribed for the patients with uncontrolled pain by propacetamol.

We evaluated the pain experience of each patient 8 times from preoperative period (P0) to postoperative (P) 48 hours with VAS scale and the request for additional analgesics.

Results and Conclusions: To date, 55 patients have been enrolled in this study. And 43 patients chose BPB, and twelve patients chose GA. In BPB group, additional prescription of propacetamol except every 6-hour use was 49 times in 42 patients (97%), and the time of request of additional propacetamol were 5 at P3H, 31 at P6H, and 13 at P12H. In GA group, additional additional prescription of propacetamol except routine 6-hour use was 20g in all 12 patients, the time of request of additional propacetamol were 1 at P1H, 4 at P2H, 6 at P3H, 5 at P2 6H, and 4 at P12H. Tramadol was used in 8 patients (18%) in BPB group, and in 1 patient (10%) in GA group. There was no further request for additional analgesics after P24H. And there was no patient who needed tramadol prescription more than once.

In this study, pain of 82% of the patients in BPB group and 90% of the patients in GA group were successfully controlled without any opioid use. We believe that the use of non-opioids could be sufficient not to all, but to most of the DRF patients for their postoperative pain management.

Keywords:
Pain control, opioid, distal radius fracture
Comparison of radiation exposure of major organs between mobile CBCT and MDCT in hand and foot

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Objectives / Interrogation: Computed tomography (CT) imaging is often required for accurate diagnosis and treatment because of the complicated joint structure when trauma or disease occurs. There is a risk of exposing the main organs (brain, eye, thyroid, thymus, testis or ovary) to radiation exposure at the time of shooting. In the extremities, the use of recently developed mobile CBCT may reduce the risk of radiation exposure. The purpose of this study was to compare the radiation dose of major organs between mobile CBCT and MDCT and to evaluate the safety and usefulness of CBCT.

Methods: This is a prospective voluntary randomized study. This study was designed for adults who require CT scans for hand and foot disease or trauma from August 2017 to March 2018. The patients were divided into two groups of 20 patients each. Mobile CBCT was performed in group A and MDCT was performed in group B. Reference point corresponding to the major organs (brain, eye, thyroid, thymus, or testis or ovary) was set and attached a thermoluminescent dosimeter chip (TLD chip). After CT scan, the radiation dose irradiated on the TLD chip was measured.

Results and Conclusions: The surface dose at the center was not significantly different between group A and B. In hand CT scan, the surface dose of brain, eye, thyroid, and thymus was found to be 0.0022 mGy, 0.0025 mGy, 0.0038 mGy, 0.0049 mGy and 0.0023 mGy respectively, in group A, while average dose of 0.5046 mGy, 0.5255 mGy, 0.1482 mGy, 0.0909 mGy and 0.0062 mGy in group B. And there was a statistically significant difference between the two groups. In foot CT scan, Surface dose in gonads was 0.0032 mGy in group A and 0.0443 mGy in group B, which was lower in group A, which was statistically significant. The use of mobile CBCT in the CT of the hand and foot may reduce unnecessary radiation exposure to nearby organs other than the site. New studies are needed to reduce the radiation exposure of adjacent organs during the CT scan of the central part of the body adjacent to the critical organs such as the clavicle, spine, and pelvis. In the orthopedic area, it is considered that the conventional MDCT for extremity can minimize the damage caused by radiation exposure by performing radiation shielding on the part other than the center of scan.

Keywords: CBCT, MDCT, radiation dose, TLD chip
Replantations in Norway 2010-2017

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Objectives / Interrogation: The first replantation in Norway was performed in 1983. Since 1994 all replantations in Norway have been performed at one hospital. The number of replantations per year steadily increased, stabilizing between 50 and 70 per year for the last two decades, except for a 3 year period. We assessed the replantations performed in Norway between 2010 and 2017.

Methods: From 01.01.2010-31.12.2017 380 patients, 48 (2-92) years of age underwent replantation surgery. Of these there were 45 (12%) women and 32 (8%) children <18 years. 34 patients (9%) had proximal upper extremity amputations (13 wrists, 21 lower arms). 3 patients had toes/feet replanted, and one patient had his penis replanted. The remaining 342 patients had 512 fingers replanted, including 135 thumbs. The dominant side was amputated in 42% of the injuries. 82% of the injuries were classified as crushing injuries, 15% avulsion, and only 3% guillotine.

Results and Conclusions: 32/34 (94%) of the proximal upper extremity replantations survived. 338/512 fingers (66%), and 88/135 thumbs (65%) survived. Due to secondary circulatory failure 146/512 (28%) fingers underwent repeated microvascular surgery to restore circulation. This secondary surgery saved 58/146 (40%) fingers. During the follow up period, 56% of the replanted fingers needed further surgery after primary replantation, including secondary recirculation surgery, smaller wound revisions, coverage procedures, scar correction, tenolysis or pseuarthrosis surgery. 3/338 (1%) were amputated at a later stage because of pain, stiffness and bad function. The patients came from all over Norway, proportionately to population distribution in the different regions of the country.

Replantation is a demanding procedure for the patient with a long period of hospitalization and rehabilitation. Approximately half of the patients need more than one surgery. The surgery is technically demanding, time consuming and requires considerable resources both during the initial hospitalization and during follow up. Centralization to one centre has allowed us to gain, and maintain surgical experience despite a small population (5 million). The results are not quite as good as those cited from other centres, but the high percentage of crushing injuries may in part explain this.

Keywords:
Replantation, microsurgery, finger amputation
Echogenicity of palmar Dupuytren nodules is not a predictor of disease progression in terms of increase in nodule size

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Objectives / Interrogation: Activity of Dupuytren nodules may be measured with ultrasound. It has been suggested that early nodules appear hypo-echogenic, whereas older nodules appear iso- to hyper-echogenic. The aim of this study was to analyse whether echogenicity of Dupuytren nodules can be used to predict disease progression in terms of increase in nodule size and to calculate the reliability of measurement of echogenicity.

Methods: Sonographic assessment of a single Dupuytren nodule was performed in 91 patients participating in an existing longitudinal cohort at our hospital. Echogenicity of nodules was matched to growth, measured with physical examination, one year later, using linear regression analysis. A sensitivity analysis was performed, using data of a year prior to ultrasound. For the calculation of reliability, two observers scored the ultrasound images for echogenicity. The first observer scored the images twice and the second observer scored the images once. The inter- and intra-observer reliability were calculated using the intra-class correlation coefficient (ICC).

Results and Conclusions: Hypo-echogenicity did not predict progression in terms of increase in nodule size one year later (Beta=-0.019, P=0.748). Sensitivity analysis showed that hypo-echogenic nodules were more likely to have grown in the past year (Beta=0.173, P=0.011). However, these results were most likely influenced by nodules that had emerged in the year prior to ultrasound.

The reliability of measurement of echogenicity of Dupuytren nodules, measured by a single observer, was excellent (ICC=0.996, 95% CI: 0.993-0.998). The reliability of measurement of echogenicity of Dupuytren nodules by different observers was less satisfying, with an ICC of 0.688 (95% CI: 0.329-0.977).

Further research is necessary to define the relation between echogenicity of Dupuytren nodules and disease activity. When measuring echogenicity, the use of a single observer leads to more consistent results.

Keywords: Dupuytren disease, ultrasound, echogenicity, disease progression, reliability
Measuring Quality in Hand Surgery using Patient Reported Experience Measures

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Objectives / Interrogation: Patient-reported experience measures are becoming an international standard for measuring quality of healthcare delivery. Studies have shown that satisfied patients are more likely to have a positive outlook on their condition, and believe that their treatment will be effective. Consequently, they are more likely to play an active role in their treatment process, including participation in their rehabilitative programme. It is thus worthwhile to study the patients' experience of their hospital journey, and to assess patients' satisfaction in a meaningful way.

A huge proportion of patients requiring treatment in our Hand Surgery unit have their procedures done as a day surgery case. Our objectives are to understand the extent to which our current work processes meet the needs and satisfaction of our patient group, and to identify potential areas for improvement.

Methods: Patients who underwent a day surgery procedure were interviewed immediately after surgery, using a validated questionnaire. Their responses were tabulated and analysed.

Results and Conclusions: Preliminary results show the experience of Hand Surgery patients (both acute and elective) treated in the day surgery setting in a tertiary district hospital is positive.

We will describe our experience and methodology to collect patient reported experience measures in a day surgery setting.

These findings show that the patients' experience in healthcare delivery is an important component to be studied to improve the delivery of healthcare to meet expectations of patients.

Keywords:
The reliability of sonographic measurement of early palmar Dupuytren nodules

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Objectives / Interrogation: In the future, it is expected that treatment of Dupuytren disease (DD) will aim at disease control or regression of early disease. Ultrasound might be an accurate method to measure the outcome of such treatment. The aim of this study was to assess the reliability of sonographic measurement of palmar nodules.

Methods: Fifty patients with early disease nodules were assessed with ultrasound by two observers. The first observer measured the nodules twice. Four different aspects were measured in the transverse and sagittal plane: width, depth, circumference and cross-sectional area. The intra- and inter-observer reliability (intra-class correlation coefficient (ICC)) and the standard error of measurement (SEM) were calculated for each aspect.

Results and Conclusions: The ICCs for the intra-observer reliability were good (ICC: 0.724 [0.562-0.833] to 0.886 [0.808-0.934]), except for width in the sagittal plane (ICC: 0.671 [0.484-0.799]). The ICCs for the inter-observer reliability were lower (ICC: 0.385 [0.126-0.596] to 0.757 [0.538-0.869]). Overall, the intra-observer ICCs of area were highest (transverse: 0.847 [0.744-0.893] and sagittal 0.886 [0.808-0.934]). The SEM of area was 6.1 mm² in the transverse and 8.02 mm² in the sagittal plane.

Sonographic follow-up of Dupuytren nodules is reliable when performed by a single observer. The measurement of area is most reliable and is therefore recommended for future studies. However, not all detected changes can be interpreted as progression or regression, since measurements of both a single and different observers have a certain dispersion. A change beyond 6.1 and 8.02 mm² in the transverse and sagittal plane respectively can be considered as regression or progression.

Keywords:
Dupuytren disease, ultrasound, reliability
The Validity of PRWHE and QuickDASH as Outcome Measures Following Surgery to Treat Scapholunate Ligament Dissociation

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Objectives / Interrogation: Injury to the scapholunate ligament is a common cause of wrist instability. As there are no specific scores to report treatment efficacy, clinicians and researchers currently rely on generic upper limb patient-reported outcome measures, such as PRWHE and the QuickDASH. This study's aim was to evaluate the validity of these measures in detecting changes in patient outcomes after treatment of scapholunate dissociation.

Methods: 92 patients (15 female, average age 40.5) were retrospectively identified from a prospective cohort treated for wrist instability. Data was collected at baseline and at least one follow-up time point (3, 6, or 12 months). At each follow-up time point, subjects were assigned to one of four groups according to their reported global rating of change (PGRC) for both the symptoms (PGRCs) and function (PGRCf) categories. Groups were labelled: 0, PGRC (-7) to (0) inclusive - no change or worse; 1, PGRC (+1) to (+3) - small improvement; 2, PGRC (+4) or (+5) - medium improvement; and 3, PGRC (+6) or (+7) - large improvement. Analysis of variance (ANOVA) and Tukey HSD test for post-hoc multiple comparisons of means were used to test differences between groups in PRWHE and QuickDASH scores at each time point. The significance level was set at p=0.05.

Results and Conclusions: At 3 months, neither PRWHE nor QuickDASH showed significant differences between the groups according to PGRCs or PGRCf. At 6 months, neither score showed significant differences between the groups according to PGRCs; as for PGRCf, both scores showed significant differences between the two extremes (group 0 vs group 3) but failed to reveal differences in the mid-ranges (groups 1 and 2). At 12 months, PRWHE showed significant differences across groups 0 and 2, groups 1 and 3, groups 0 and 3 of PGRCs, whereas QuickDASH only showed significance between group 3 and each of the other groups; as for PGRCf, both scores showed significant differences between the extremes (group 0 and group 3) but failed to reveal differences in the mid-ranges of PGRCf (groups 1 and 2).

PRWHE and QuickDASH may not be able to detect nuances in functional changes at key time points in the context of wrist instability. These preliminary findings have implications for clinicians aiming to select valid and sensitive outcome measures and suitable time points for measurement. The results suggest that the development of a reliable, valid and responsive score for patients with wrist instability may be warranted.

Keywords:
Schapholunate. Wrist instability. Outcome measures. PRWHE. QuickDASH.
The Vascularized Dorsal Periosteal Curtain for Corrective Osteotomy of the Distal Radius

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Objectives / Interrogation: Corrective osteotomy of the radius frequently requires significant soft tissue releases to achieve correction. We propose a technique that utilises the releases to create a dorsal curtain of vascularised periosteum over the osteotomy site.

Methods: Surgery is performed through the usual volar approach to the distal radius. Following the usual release of brachioradialis, the periosteum is elevated over the dorsal radius for approximately 2 cm proximal to the osteotomy site. The osteotomy is performed taking care not to damage the dorsal soft tissue envelope. The proximal radius shaft is then pronated to allow further exposure and elevation of the dorsal periosteum which is then separated from the extensor tendons and divided 2 cm proximal to the osteotomy and left attached to the distal radial fragment. When the correction is made the distally based periosteal flap hangs down proximally over the osteotomy site, separating the bone graft from the extensors and providing vascularity for the graft.

Results and Conclusions: We have utilised this technique for many years without any significant complication. The correction of the radial deformity is usually straightforward because the technique ensures a thorough dorsal release. The cancellous graft appears to unite and remodel extremely rapidly and patients can usually return to activity at 6 weeks post osteotomy when union is seen.

We recommend the use of this technique for all distal radius osteotomies. It facilitates the requisite soft tissue releases, protects the extensor tendons from the bone graft, and encloses the bone graft with a vascularised layer of periosteum to expedite union and graft incorporation/remodelling.

Keywords:
Radius fracture, Malunion, Corrective osteotomy, Bone graft
Functional outcome of stage surgical treatment of nonunions of the distal humerus

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Objectives / Interrogation: Assessment of the effectiveness of surgical treatment of nonunions of the distal humerus.

Methods: The analysis of surgical treatment of 66 patients (43 men, 23 women) with the consequences of treatment of fractures and nonunions of the distal humerus was performed. The average age of patients consisted 47.2 ± 14.9 years. All patients have undergone surgery previously, but due to various reasons, consolidation of the distal humerus was not achieved. Patients were hospitalized in 6.2 ± 4.1 months after injury. During clinical investigation all of them had pathological mobility at the level of nonunion, movements in the elbow joint were significantly limited.

Results and Conclusions: In 18 cases the skin defect of the elbow region was substituted by vascularized skin flap. Treatment was started from osteosynthesis of the distal humerus with autogenous iliac bone grafting. After surgery - early rehabilitation was performed with changeable daily splinting in flexion and extension. After bone consolidation (approximately in 1 year or more after osteosynthesis) removal of fixators was performed with the simultaneous mobilization of the elbow joint. After the operation, an early rehabilitation treatment was also carried out using cast in full extension at night and at 90 degrees of flexion for a day time.

We evaluated results of surgical treatment with MEPS scale in 7-12 months after surgery. Good results were obtained at 79.4% of cases and satisfactory in 21.6% of patients. The outcome of the treatment depended on the severity of the primary injury, the time passed from the moment of injury and level of patient motivation.

Conclusions. Complex of reconstructive interventions (skin defects substitution, osteosynthesis and bone grafting, joint mobilization) in combination with early rehabilitation, allowed to obtain good results of treatment in 79.4% of cases in patients with the consequences of severe injuries of distal humerus.

Keywords: distal humerus, nonunions, surgical treatment, functional outcome
In Idiopathic Cubital Tunnel Syndrome, Ulnar Nerve Length and Instability Can Be Reduced by Repairing Osborne's Ligament after Simple Decompression

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Objectives / Interrogation: Three approaches are commonly used in the surgical treatment of idiopathic cubital tunnel syndrome (ICTS). In an attempt to reduce the risk of nerve traction and instability after simple decompression, Osborne's modification involves repairing the Osborne's ligament beneath the ulnar nerve after decompression. In this study, we aimed to evaluate the change in ulnar nerve length (UNL) following repair of the Osborne's ligament. Additionally, we aimed to compare Osborne's modified simple decompression (MSD) and conventional simple decompression (CSD) regarding the improvement in ultrasonographic grade of ulnar nerve instability (UNI) and the clinical outcomes.

Methods: 51 patients diagnosed with ICTS underwent surgery for cubital tunnel syndrome. 31 patients underwent MSD and 20 patients underwent CSD. In the MSD group, UNL was measured intraoperatively, in full elbow flexion and extension before and after the repair of Osborne's ligament. UNI during elbow motion was measured using ultrasonography preoperatively and at 12 months postoperatively. The following were recorded preoperatively and at 24 months postoperatively: visual analogue scale (VAS) score; Quick Disability of the Arm, Shoulder, and Hand (Quick DASH) score; grip strength; pinch strength; McGowan grade; and Wilson and Krout criteria.

Results and Conclusions: Results
In patients who received MSD, the UNL in full elbow flexion reduced significantly after repair of the Osborne's ligament (from 12.4±0.79 to 11.7±0.76 cm; p<0.001). At 12 months after surgery, the grade of UNI was lower in the MSD group than in the CSD group (p=0.009). At 24 months postoperatively, the clinical outcomes did not differ significantly between the MSD and CSD groups.

Conclusions
In patients who received MSD, UNL in elbow flexion reduced significantly following repair of the Osborne's ligament, and the grade of UNI was lower than that noted in patients who received CSD, without detrimental effect on clinical outcomes at 24 months postoperatively.

Keywords:
Cubital Tunnel Syndrome, Ulnar Nerve, Simple Decompression
Analysis of Brachial plexus injury following median sternotomy in cardiac surgery.

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Objectives / Interrogation: Brachial plexus injury (BPI) is a rare complication after median sternotomy. However there are only few reports with small number of cases, which describes the clinical findings in detail. The purpose of this study was to investigate BPI cases retrospectively who underwent median sternotomy for open heart surgery.

Methods: During 2014 to 2018, 1062 patients underwent cardiac surgery with median sternotomy and 10 patients (0.94%) developed BPI after surgery. All ten patients were male with an average age of 65.6 (45—72) years old. The surgical time, the affected side, the level of paralysis and the period from onset to the recovery of paralysis were investigated in these ten patients. Motor function was evaluated using Manual Muscle Testing (MMT).

Results and Conclusions: The mean surgical time was 457 (300—657) minutes. All patients had paralysis on left upper extremity. In all cases, sensory and motor nerve impairment developed in lower plexus. The average post-surgical muscle power was MMT 2.2 for extensor digitorium communis (EDC), 3.9 for flexor digitorum superficialis (FDS) and 2.7 for first dorsal interosseous muscle (IOD(1)). The average persistence of sensory deficit such as numbness or hypesthesia was 3.9 months. Two cases had persisted numbness for over a year after surgery. The average period for the recovery of motor weakness to at least MMT 4 was 4.2 months in EDC, 1.4 months in FDS and 5.6 months in IOD(1). In three cases which required 8 months for the recovery of IOD(1), the surgical time was over nine hours.

The mechanism of post-surgical BPI in cardiac surgery was reported to be due to compression of the plexus between first rib and clavicle during retraction of sternal halves and stretching of the plexus cord after median sternotomy. The risk factor of BPI after median sternotomy was reported that abduction of the arm to 90 degrees or more and the occurrence of first rib fracture. In this study, five out of ten patients' arms were fixed at abstraction of over 90 degrees during operation, and two out of ten patients sustained first rib fracture during operation. Also, we found that longer surgical time was correlated with poor motor recovery. BPI after median sternotomy is relatively infrequent complication, and not all patients recovered completely. It is necessary for the cardiothoracic surgeon should beware of this complication.

Keywords:
Brachial plexus injury, cardiac surgery, median sternotomy
The impact of illness perceptions, psychological distress and pain catastrophizing on self-reported symptom severity and functional status in patients with carpal tunnel syndrome

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Objectives / Interrogation: Previous studies have demonstrated the influence of illness perceptions on patient outcomes. Although several psychological factors have shown to be associated with self-reported severity in Carpal Tunnel Syndrome (CTS), illness perceptions have not yet been studied. Therefore, the aim of the present study was to examine the relation between self-reported symptom severity and functional status and psychological distress, pain catastrophizing and illness perceptions.

Methods: All patients with CTS who were scheduled for surgery in 1 of our 16 specialized hand clinics between September 2017 and August 2018 were asked to fill out online questionnaires regarding demographic data, comorbidities, psychological factors and clinical severity measures. A total of 674 CTS patients completed all questionnaires and were included. Our outcome measures were the functional status scale (FSS) and symptom severity scale (SSS) of the Boston Carpal tunnel Questionnaire (BCTQ). Psychological distress was measured with the Patient Health Questionnaire, pain catastrophizing with the Pain Catastrophizing Scale and illness perceptions with the Brief Illness Perception Questionnaire. Pearson correlation coefficients were calculated and hierarchical linear regression models were used to examine the relation between self-reported severity and psychological factors, when accounting for baseline characteristics and comorbidities.

Results and Conclusions: Psychological distress, pain catastrophizing and illness perceptions were significantly correlated with the FSS and SSS scores (correlation coefficients ranged from 0.21 to 0.46). Hierarchical linear regression models showed that variance in FSS score was explained for 15% by patient characteristics and comorbidities, 11% by psychological distress and pain catastrophizing, and 9% by illness perceptions. For the SSS score 8%, 12% and 13% was explained by these same sets of variables.

This study showed that psychological distress, pain catastrophizing and illness perceptions all play an independent role in self-reported severity of CTS complaints. The relation between these factors and self-reported symptom severity and functional status is important, as these factors together explain about a quarter of the variance in BCTQ scores. Future studies should indicate if and how clinicians should take this into account when they are consulted by patients with CTS.

Keywords: carpal tunnel syndrome, boston carpal tunnel questionnaire, psychological distress, pain catastrophizing, illness perception
Functional outcomes of the Adams-Berger Ligament Reconstruction for the Distal Radioulnar Joint Instability in 95 Consecutive Cases

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Objectives / Interrogation: To evaluate the outcomes and complication rate for Adams-Berger anatomic reconstruction of the distal radio-ulnar joint (DRUJ).

Methods: Retrospective chart review to evaluate adult patients that had undergone reconstruction of the DRUJ for instability with the Adams-Berger procedure between 1998-2015 within our institution. Charts were reviewed for patient demographics, mechanism of injury, outcome, surgery related data and complications.

Results and Conclusions: 95 wrists in 93 patients were included. Mean (SD) age at surgery was 37.3 years (+12.7 years) and follow-up time was 65.8 months (63.2 months). At the last follow-up, 90.8% of the patients presented a stable DRUJ, 3.4% had mild laxity, while 5.3% had signs of instability. Compared to preoperative measurements, grip strength had increased, and pronation and supination decreased. Patients reported improvement in overall pain scores, and none of the patients reported severe pain of their wrist at last follow up. Six patients suffered from ulnar neuropraxia.

Overall, graft survival was 87.4%. 12 patients had undergone revision surgery, with a mean time from primary reconstructive surgery to revision surgery of 13.3 months. Female and use of interference screw for graft fixation was associated with higher failure rates.

Conclusion: Our findings demonstrate that Adams-Berger anatomic ligament reconstruction of the DRUJ provides reliable long-term functional results with an overall graft survival of 87% at >5 years follow-up.

Keywords:
Adams-Berger procedure, DRUJ instability, DRUJ surgical treatment, DRUJ reconstruction, treatment DRUJ
A Significant Neuralgia caused by An Epidermoid Cyst: A Case Report

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Objectives / Interrogation: An epidermoid cyst is one of the common benign tumor-like conditions in the hand. We report the rare case that an epidermoid cyst induced significant neuralgia of the finger.

Methods: A 56-year-old female presented with significant neuralgia and mass of the right ring finger. 3 years prior to presentation, she had been bitten by a dog. After then, she recognized a growing mass at the site of bitten. 11 days prior to presentation, she recognized the sudden strong pain with her right ring finger as much as jumping up and down. On physical examination, a soft elastic mass was noted on the radial volar aspect of middle phalanx of her ring finger, with strong positive Tinel's sign from the radial volar aspect of metacarpophalangeal to middle phalanx. The Pain visual analog scale (VAS) of the ring finger was 5 / 10. MRI demonstrated a 1.1 × 1.1-cm round, well-circumscribed mass at the middle phalanx of her ring finger with low intensity on T1-weighted and high intensity on T2-weighted. We concluded the significant neuralgia was induced caused by the mass, then we performed surgical excision 6 days after from presentation. Capsule of mass adhered to surrounding tissues and the mass was filled with ash color myxoid substance. The digital nerve was wrapped by the mass and had hypertrophy from the mass to 3cm proximately. The site of nerve hypertrophy was filled with ash color myxoid substance from the mass. After excision of the mass, we squeezed the myxoid substance out from the digital nerve. After then, she had the improvement from the significant neuralgia. Histological examination confirmed the diagnosis of an epidermoid cyst. 1 and a half years following the excision, there was no evidence of recurrence and she remained the improvement that the pain VAS was 0 / 10.

Results and Conclusions: We concluded her significant neuralgia was happened when the myxoid substance of epidermoid cyst strayed into the digital nerve after epidermoid cyst adhered to the nerve.

Keywords:
An epidermoid cyst, Neuralgia of the finger
Changes in the morphology of the triangular fibrocartilage complex (TFCC) on magnetic resonance arthrography related to disruption of ulnar foveal attachment

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Objectives / Interrogation: The proximal ligamentous complex (PLC) of the triangular fibrocartilage complex (TFCC) inserts into the ulnar fovea and is the primary restraint of the distal radioulnar joint (DRUJ). The aim of this study was to assess whether a PLC with a distally prolapsing morphology is associated with the presence of a TFCC foveal tear on arthroscopy.

Methods: One-hundred thirty-two patients (134 wrists) who underwent MR arthrography and subsequent wrist arthroscopy between September 2014 and March 2018 were evaluated retrospectively. Distal prolapse amount of the PLC was measured on coronal MR arthrography by calculating the height-to-length ratio (HLR). Subjects’ demographics, ulnar variance, presence of a degenerative TFCC tear, and ulnar styloid nonunion were assessed. The association between specific variables and the presence of a foveal tear was investigated.

Results and Conclusions: Arthroscopy revealed a TFCC foveal tear in 101 wrists among 134 wrists. Univariable analysis showed that the HLR of the PLC was significantly greater in the foveal tear group than the intact fovea group (p < 0.05). Multivariable analysis showed that HLR had a positive association with a foveal tear (p < 0.001). Estimated cut-off value for the HLR was 41% (area under the curve [AUC] 0.77).

Conclusion: A PLC that has a distal prolapse pattern with a large HLR is associated with TFCC foveal tears. HLR of the PLC measured on coronal MR images can therefore be used as an additional predictor of tears of the foveal attachment of the TFCC.

Keywords:
triangular fibrocartilage complex, ulnar fovea, morphology, wrist arthroscopy, magnetic resonance arthrography
Ten-year outcomes of the Arpe prosthesis to treat osteoarthritis of the trapeziometacarpal joint

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Objectives / Interrogation: The Arpe implant is a total joint prosthesis to treat trapeziometacarpal osteoarthritis. Good survival rates have been reported at 5 years, but not many studies reported results at ten years follow-up.

Methods: Fifty patients with 66 Arpe prostheses were included in the study. Mean follow-up was ten years. It was noted if implants had been removed or revised. The Kaplan-Meier method was used to calculate survival analysis. Patients were evaluated with the disability of arm, shoulder and hand (DASH) and scores from 0 to 10 for pain, satisfaction and willingness to have the same operation again.

Results and Conclusions: At ten year follow-up, 7 out of 66 implants were explanted and revised with tendon interposition. The cup (with or without the neck) was replaced in 3 patients and only the neck was revised in 2. Ten-year survival was 87% when failure was defined as implant removal followed by trapeziectomy and tendon interposition. Ten-year survival was 82% when revision of the cup was also considered as failure and it was 80% when replacement of the neck alone was also considered as an endpoint. Of the 52 prostheses that were not revised mean DASH score was 11, mean pain score 1.2 and mean score for satisfaction 9.5.

It can be concluded that the majority of patients who did not undergo revisions were satisfied and had little or no pain. However, long-term survival of the Arpe prosthesis was moderate and patients should be warned that after ten years the risk for reoperation might be as high as 20%.

Keywords:
Variable Angle LCP Volar Rim Plate fixation for volar displaced distal radius fracture with volar lunate facet fragment

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Objectives / Interrogation: The volar locking plate dramatically improved the surgical treatment of the distal radius fractures. However, some fracture patterns remain difficult to treat. The volar shearing fracture with small volar lunate facet fragments is one of fractures to treat with the conventional volar locking plate. Variable Angle LCP Volar Rim Plate (DePuy-Synthes) is designed that can be placed past the watershed line to support the rim fragments. The objective of the present study is to report clinical results of Variable Angle LCP Volar Rim Plate fixation for volar displaced distal radius fracture with volar lunate facet fragment.

Methods: Five patients with distal radius fractures were examined. Inclusion criteria were volar displaced fractures with volar lunate facet fragment and the longitudinal size of the fragments was less than 15mm (mean 11.6mm, range 9.6 - 13.8mm). The mean age at the time of surgery was 50.6 (range 32 - 66) years old. The mean postoperative follow up period was 11.4 (range 8 - 16) months. Implants removal were performed in all patients after bone union confirmed by computed tomography. The range of motion, Mayo Writ Score at the final follow up period and complications were evaluated.

Results and Conclusions: Bone union was achieved in all patients without loss of reduction. The mean active extension was 74.4 (range 72 - 80) degrees and active flexion was 70.6.0 (range 68 - 73). The mean Mayo Writ Score was 86.0 (range 80 - 90) points. The complication was a pain or feeling of strangeness at the wrist flexion in four patients. Implant removal operative finding showed the compression of the flexor pollicis longus tendon by the distal end of the plate in one patient.

The Rim plate is useful to support rim fragments and to avoid postoperative displacement because of its high buttress effect. However, plate removal must be necessary because of the risk of complications such as flexor tendon problem and plate impingement. Rim plate must be indicated to rim fractures.

Keywords:
distal radius fracture, volar lunate facet fragment, rim plate
Dorsal Transosseous Reduction and locking plate fixation for Articular Depressed Middle Phalangeal Base Fracture

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Objectives / Interrogation: An articular depressed fragment at the base of the middle phalanx can be an obstacle to congruent reduction and stable fixation. This study assessed the outcomes of a transosseous reduction technique combed with locking plate fixation for the treatment of articular depressed middle phalangeal base fracture.

Methods: Between 2015 and 2017, seven patients (eight fingers) with intraarticular comminuted middle phalangeal base fracture were included in this study. The mean follow-up was 19.4 months (range, 12-30 months). All patients showed depression of the articular fragment on sagittal computed tomography (CT) scan and were treated with a transosseous reduction technique and dorsal locking plate fixation. Radiographic evaluation was performed to ensure restoration of a concentric articular surface postoperatively. Total active range of motion of the fingers, grip strength, and the quick Disabilities of the Arm, Shoulder and Hand (quick DASH) score were evaluated at the last follow up. Complications were also assessed.

Results and Conclusions: All fractures obtained bony union with a concentric joint. There was no significant loss of reduction during the follow-up period. The mean active proximal interphalangeal (PIP) joint and distal interphalangeal joint motion arcs at follow-up were 89° and 61°, respectively. The mean TAM of the affected finger and mean grip strength were 94% (range, 80-100%) and 94% (range, 86 - 100%) of the contralateral side, respectively. The mean quick DASH score was 2.3 (range, 0 - 9.1). All patients returned to work. No surgery-related complications occurred.

Conclusions
This technique provides satisfactory restoration of articular congruence and enables early joint mobilization of articular depression type fractures of the base of the middle phalanx.

Keywords:
articular depression, intraarticular fracture, middle phalanx, plate fixation, transosseous reduction
A Weak Part Of The Strong Hand: Hook Of Hamate Fractures

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Objectives / Interrogation: Some of the popular sports predispose to a specific injury: the hamate hook fracture which accounts for about 2-4% of all wrist fractures. They are not readily observed on conventional radiographic imaging and hence remain untreated or treatment is delayed. The aim was to identify sport activities that are associated with an increased risk of hamate hook fractures and to present an update on the current state of diagnostic and treatment options for these fractures.

Methods: Selective literature search was performed in PubMed and Google Scholar using the terms "hamulus ossis hamati fracture", "hook of hamate fracture", "sport injuries", "tennis", "rugby", "bouldering", and "golf". Due to the number of hits, 228 relevant original papers, case series, case reports and mainly meta-analyses, and review articles published until 2018 were included.
All relevant articles were obtained and evaluated for key points, including the mechanism of trauma, injury patterns, radiological imaging, treatment, and outcome.

Results and Conclusions: Due to popularity of classic sports, such as tennis or golf in an aging society, the risk of hamate hook fractures rises. It appears also that younger athletes performing sports such as climbing, bouldering, baseball or underwater rugby are associated with a higher injury rate to the hamate hook.
These can be caused by direct or indirect forces acting on the hamulus and the surrounding carpal ligamental structures and can occur as a single force overload or after repetitive trauma. In conventional radiographs, hook fractures are often missed on standard projections. The carpal tunnel view and special 45 degree oblique projection significantly increase the sensitivity. However, CT provides the most reliable imaging modality with a sensitivity of almost 100%. MRI offers the advantage of simultaneous detection of concomitant soft tissue injuries and microtraumas.
Non-displaced fractures near the base of the hook can be immobilized in a lower arm cast. Dislocated basal fractures and those in the middle third should be treated by internal fixation through an open or percutaneous access. Consolidation of distal fractures is unreliable with either conservative treatment or osteosynthesis. Therefore fragment excision is recommended. Overall, the results of conservative treatment are disappointing with a high rate of non-union.
In conclusion the hamate hook fracture is more relevant than you might think.

Keywords:
Hamulus Ossis Hamati, Hamate Hook Fracture, Wrist, Sports Injury, Stress Fracture
Brachial plexus injury associated with thoracic surgery

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Objectives / Interrogation: Brachial plexus injury (BPI) associated with thoracic surgery is a rare complication. We report the clinical feature of this condition and investigated the cause and pathophysiology.

Methods: Nine patients (8 males, 1 female) with BPI following thoracic surgery were included in the study. The mean age was 61.8 years (range 52-75). The affected side was right in 3 and left in 6 patients. Median sternotomy was performed in supine position for all patients and subclavian approach was indicated for 3 patients. We investigated the type of the palsy, clinical symptoms, factors to lead this condition, treatment and prognosis.

Results and Conclusions: The type of palsy was lower type BPI for all patients. Weakness of wrist extension and fingers flexion in 5 patients, and slight motor disturbances in 4 patients developed after the operation. Hypesthesia at the level of C7 or C8 in all patients and burning sensation in 3 patients developed postoperatively. Seven patients had the ipsilateral first rib fracture. Delay of motor nerve conduction velocity for ulnar nerve at ipsilateral cubital tunnel was found in 2 patients. All patients were treated conservatively. Pregabalin or duloxetine was administered for 3 patients who experienced burning sensation. Motor disturbances were recovered to MMT 5 in 6 patients and to MMT 4 in 3 patients after 3 - 6 months postoperatively. Sensory disturbances were recovered completely in 7 patients and slight numbness of ring and little fingers remained in 2 patients.

BPI was detected in 8 cases of 502 patients (1.6%) who underwent thoracic surgery with median sternotomy in our hospital. One case visited our clinic postoperatively from another hospital because of continuous sensory disturbance. We speculated that lower brachial plexus was compressed between first rib and clavicle due to excessive sternal retraction according with the fact that ipsilateral first rib fracture was found in 7 of 9 patients (77.8%). Before visiting our clinic, the influence of harvesting radial artery or continuous ulnar nerve compression at cubital tunnel during the surgery were suspected as the cause of the upper extremity symptoms.

After our instruction to the thoracic surgeons about this condition, diagnosis delay of BPI disappeared. All patients showed good recovery of motor and sensory disturbances within 6 months after the injury. We can contribute to prevention and early detection of BPI associated with median sternotomy by instruction to thoracic surgeons.

Keywords: Thoracic surgery, median sternotomy, brachial plexus injury
Fixed Flexion Deformity of the Middle and Ring Fingers in Adult Caused by Intramuscular Hemangioma of the Forearm.

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Objectives / Interrogation: Intramuscular hemangioma (IMH) of the upper extremity is extremely rare and mostly found in children. Due to its varying clinical presentations, IMH could be unrecognized. The author presents an unusual case of fixed flexion deformity of middle and ring finger in adult that was treated by surgical excision and post-operative outcomes.

Methods: The author described a 39-year-old female who presented with middle and ring finger flexion deformity that was unable to perform active and passive proximal interphalangeal (PIP) joint extension with deep forearm pain on the volar side for 3 years. After complete evaluation, the patient was diagnosed with IMH of flexor digitorum superficialis (FDS) muscle. Excision of the IMH was performed, intra-operatively passive extension of PIP joints was achieved. After 3 months follow up, no recurrence was observed and the patient regained full hand function. The patient was satisfied with the outcome.

Results and Conclusions: IMH of the upper extremity is an uncommon disease especially in adults. With vague clinical presentations, patients with finger flexion deformity and deep pain of the forearm, IMH should be one of the differential diagnosis. Early investigation should be performed and surgical removal remains the treatment of choice. Furthermore, tendon transfer should be reserved in case of functional deficits.

Keywords:
Intramuscular Hemangioma, Flexor Digitorum Superficialis, Finger deformity
Combined thenar and hypothenar hammer syndromes in a professional baseball player: a case report

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Objectives / Interrogation: The incidence of digital ischemia of the hand is rare, although it can arise in athletes participating in baseball, volleyball, and handball.

We describe a professional baseball player with occlusion of both the radial and ulnar arteries secondary to repetitive trauma to the palm of the hand. Open release of the ulnar artery resulted in complete relief and symptomatic improvement.

Methods: A 37-year-old male, a right-hand dominant professional baseball pitcher, presented with pain, cold intolerance and numbness that were aggravated for short periods in the right ulnar digits while pitching. Conservative medical treatment at a local hospital did not adequately improve his symptoms and he was referred to our hospital two weeks after symptom onset. Angiography revealed complete occlusion of the ulnar and radial arteries at the hypothenar and thenar muscles, respectively. Collateral circulation was evident from the radial artery with the flow into the deep palmar arch. Retrograde flow from the radial artery also reached the superficial palmar arch. In addition to chronic radial artery occlusion, we considered that recent ulnar artery occlusion had disturbed blood flow to the finger on the ulnar side.

Surgical revascularization was performed under general anesthesia.

The ulnar artery was compressed by fibrous tissues at two points on the hypothenar muscle. Resection of the fibrous tissues resulted in the resumption of pulsation in the artery. The symptoms immediately disappeared thereafter, and he resumed throwing activities four weeks after the procedure. Within one year of the procedure he was able to return to the mound to pitch in official games.

Results and Conclusions: Thenar and hypothenar hammer syndromes are rare. They are characterized by digital ischemia of the hand as a result of repetitive trauma at the level of the thenar and hypothenar eminence and damage to the radial and ulnar arteries, respectively. Our patient repeatedly placed the palm of his right hand on the ground during daily baseball bunt practice and repeated microforces to the palm apparently caused digital ischemia. Non-surgical treatment is generally considered as a first line. However, this patient was surgically treated because a conservative approach did not achieve symptomatic relief and he wished to resume play as soon as possible.

Keywords: thenar hammer syndrome, hypothenar hammer syndrome, digital ischemia, baseball player
Artificial Intelligence Based Distal Radius Fracture Detection

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Objectives / Interrogation: Distal radius fractures (DRF) are the most common fractures of the human body. The diagnose is traditionally based on clinical examination and x-ray pictures. The primary diagnosis is often carried out by a general practitioner with varying degrees of experience. Sometimes fracture or fracture displacement may be missed. Deciding the appropriate treatment can also cause problems. The past decades advances in computer sciences have made possible to develop artificial intelligence (AI) algorithms to analyse medical images. This is shown in other studies made with hip, shoulder and chest x-rays. In this study, we present the results of a convolutional neural network (CNN) for DRF detection.

Methods: Nearly 10 000 posteroanterior and lateral wrist x-ray views were extracted from radiological archive. The x-rays were identified by ICD-10 codes correlating with DRF and wrist bruises (as a control group). The anonymized dataset was divided into a training set, validation set and a held-out test set. The x-rays in training and validation sets were labelled by one hand surgery resident. The held-out test set, that was not used in neural network training, was labelled by three experienced consultant hand surgeons. After all the x-rays were labelled a CNN was trained using the training and validation sets. The results of the CNN were compared to the test set's ground truth set by the three hand surgeons. The development of the CNN was done in co-operation with third parties and hospital's AI experts.

Results and Conclusions: The preliminary results showed that CNN has great potential in DRF detection. The details are opened and discussed in the presentation. The sensitivity and specificity of CNN for DRF detection are promising and further development into a highly efficient tool is possible. Our preliminary results indicate that with added amount of wrist x-rays and further training a CNN will be a reliable aid in DRF detection. Continuous development, tests and validation in clinical settings are needed before a CNN can be used as a medical aid. The future challenges lie in assessing fracture dislocation and the anatomical changes caused by the fracture. AI algorithms will revolutionise medical image interpretation, from x-ray to 3D imaging, in the near future.

Keywords: radius; fracture; artificial intelligence; machine learning; CNN
Total Wrist Arthroplasty - Complications Management

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Objectives / Interrogation: For decades design and development of TWA has been accompanied by quite a few failures, so that it has been denied by most surgeons until today. The difficult and complex anatomy of the wrist caused different ways of development and often led into an impasse. Compared to knee and hip arthroplasties which could be conceived and developed further a consistent method could not be applied. But in the last years some new concepts established themselves, so that TWA is not only applied in individual cases. The indications could be expanded and standardized. Of course complications do occur as they also do in the other joints.

Methods: The presentation refers to more than 600 TWA's which have been performed since 2005. 44% suffered from Rheumatoid Arthritis, the remaining diseases consisted of osteoarthritis, posttraumatic arthritis and osteoarthritis, SLAC-wrist, SNAC-wrist, Kienböck's disease. Complications occurred in 4.3% of all cases. Other methods of complications management are available base on the type of TWA retrospectively. The purpose of this presentation is to demonstrate the varieties of those methods in typical cases of complications.

Results and Conclusions: The application of five different types of endoprotheses for TWA yielded an outcome of individual benefits and disadvantages.
For instance BIAX(DePuy) was soon abandoned due to insufficient fixation and subsequent loosening in the carpus. Generally good results were achieved with Universal II(KMI) with the advantage of screw fixation in the carpus. However this gain was annulled with requirement of the ulnar head resection.
With ReMotion(SBI/Stryker) ulnar head resection could be avoided. Complications occurred in the form of cystoid alteration of the metaphyseal spongyous bone of the radius and radial impingement. Maestro(Biomet) has the advantage of having a modular system with scaphoid augmentation. The superiority of Freedom(Integra), the follow-on generation of iUniversal II is demonstrated with its protection of the DRUJ. Thus complications management depends on the different types of endoprotheses. This presentation will discuss revision surgery, with and without TWA change, with view to management in infective situations. Since 2013 there have been 14 patients with TWA complications, with only one case requiring a wrist arthrodesis.
In our experience, it has showed that complications in TWA are controllable, and that TWA changes are feasible without the consequence of total wrist arthrodesis.

Keywords:
Total wrist arthroplasty - wrist arthritis - complication management in TWA
Lower Trapezius Transfer for Triceps Function in Obstetric Palsy; Review of Other Methods and Presentation of 15 Cases.

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Objectives / Interrogation: Since elbow extansion is a passive movement when shoulder is adducted and at secondary importance comparing elbow flexion, muscle transfer to triceps is not commonly mentioned in obstetrical palsy literature. This need was observed specially in patients whom had improved shoulder abduction with surgery but have limited elbow extansion.

Methods: Previously, we had operated on 13 patients with elbow extansion restoration ages between 5-16 years. We used brachioradialis muscle in 6 patients, brachialis muscle in 6 patients and posterior deltoid muscle in one patient with pros and cons of each method.
Later on depending on the anatomic studies for lower trapezius transfer in order to have better shoulder external rotation, we used ipsilateral lower trapezius muscle by elongation with tensor fascia lata graft to triceps muscle, in 15 obstetric palsy cases.

Results and Conclusions: Average elbow extansion was improved 50 degrees and shoulder abduction was improved 35 degrees in our patients. Ipsilateral lower trapezius transfer is a good tecnique for triceps function restoration with minimal donor site morbidity.

Keywords:
obstetric tendon transfer triceps
Psychological factors are more strongly related to pain in CMC-1 osteoarthritis patients than radiographic features

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Objectives / Interrogation: Conservative therapy for carpometacarpal (CMC-1) osteoarthritis is not effective for all patients. However, it is not possible to predict which patients will benefit. It is known that pain before treatment is associated with outcomes of therapy, but it is not clear which factors relate to pre-treatment pain. Therefore the aim of this study was to investigate which psychological factors are related to pain prior to conservative treatment in patients with CMC-1 osteoarthritis.

Methods: Patients were included at the start of conservative treatment for CMC-1 osteoarthritis. Pre-treatment pain was measured using the Michigan Hand Outcome questionnaire (MHQ). Psychological factors were defined as anxiety and depression, measured with the Patient Health Questionnaire-4 (PHQ), pain catastrophizing, measured with the Pain Catastrophizing Scale (PCS) and illness perception, measured with the Brief Illness Perception Questionnaire (B-IPQ). X-rays were scored on presence of osteophytes, subchondral sclerosis, subluxation, joint space narrowing, cysts and STT osteoarthritis.

Two linear regression models were fitted. Model 1 consisted of patient characteristics, such as age, gender and occupational intensity, and X-ray scores. In model 2 psychological factors were added to model 2.

Results and Conclusions: 255 patients were included in this study. 75% of the patients were female, mean age was 60 years and mean MHQ pain score was 47.1 (17.3). 7.8% of the patients reported elevated PHQ scores. The first regression model with patient characteristics and X-ray scores only accounted for 3% of the variance in MHQ-pain. After adding the psychological factors to our model, 42% of the variance could be explained.

Our results show that psychological factors are more strongly related to pain levels prior to treatment in patients with CMC-1 osteoarthritis than patient characteristics and X-ray scores. More research is needed to determine whether psychological factors will also affect treatment outcomes.

Keywords:
psychology; carpometacarpal osteoarthritis; non-surgical treatment
Reconstruction of Extensor Tendons in Multiple Subcutaneous Rupture of Rheumatoid Fingers

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Objectives / Interrogation: [Purpose]
Although various methods have been reported for reconstructing multiple subcutaneous tendon rupture in patients with rheumatoid arthritis, satisfactory results have not necessarily been obtained. We attempted a new reconstruction method in which the tendon of the proximal side was reversed and sutured to the distal side. Postoperative results and usefulness of this method were examined.

Methods: [Subjects]
The subject of this study were cases of subcutaneous rupture of multiple tendons. Twenty-seven patients with RA were able to follow up for more than one year after surgery. Two cases were men and 25 cases were women, and the age at the time of surgery was 29 to 82 years old.

[Reconstruction method]
For the two fingers on the ulna side, the proximal side tendon of either EDC 4 or EDC 5 was reversed and sutured to the ruptured tendons on the distal side. In addition, for the three tendon ruptured cases, the proximal side tendon of either EDC 3 or EDC 4 was reversed. EDC 5 tendon on the distal side was sutured to EDC 4 tendon, but in cases with short tendon on the distal side, EIP tendon was transferred to distal tendon of EDC 5 / EDM. After the surgery, the affected fingers were buddy taped with undamaged fingers, and active motion exercise was permitted from the early postoperative day. It was fixed with splint at the extension position of fingers and wrist during night.

Results and Conclusions: [Result]
At the time of investigation, the average angle of ROM (extension / flexion) of MCP joints was as follows. Cases with three tendons ruptured: long finger 0.71±9.32/73.6±9.88, ring finger 0.71±12.39/76.4±16.33, little finger 0±9.57/71.4±19.30. Two tendon rupture cases: ring finger -3.0±5.70/72.0±18.91, little finger 3.0±9.08 /70.0±23.18.

[Discussion]
Since myostatic contracture is the source of contraction force in ruptured muscle, it takes a long time to improve muscle contraction. However, excellent extension range is obtained as the muscle contraction of the ruptured muscle is recovered. In addition, it is considered that excellent range of motion is obtained because the reconstructed tendon runs similar to the normal tendon.

[Summary]
Our new reconstruction method of reversing the proximal side of torn tendon is a useful method for reconstructing multiple subcutaneous extensor tendon ruptures.

Keywords:
multiple tendon subcutaneous rupture, Reconstruction of Extensor Tendons, rheumatoid arthritis
LONG HEAD OF TRICEPS TRANSFER TO GAIN ELBOW FLEXION in 25 PATIENTS

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Objectives / Interrogation: Elbow flexion is the most important function of the upper extremity, hence loss of this function leads a major disability. Elbow flexion deficit can be seen in both congenital (arthrogryposis) and acquired (traumatic / obstetric brachial plexus palsy) conditions. We describe our results for the surgical technique of transfer of the long head of triceps transfer in traumatic and congenital cases.

Methods: We performed this transfer in 25 patients, ages between 2-45 years. The nine adult patients were suffering from traumatic brachial plexus injury while 16 young patients were arthrogrypotic or obstetric palsy sequel. We achieved 85-115 degrees of elbow flexion in obstetric and traumatic plexus patients while preserving elbow extension and 60-90 degrees of elbow flexion in arthrogrypotic patients.

Results and Conclusions: All patients were happy to gain hand to mouth function, elbow extension deficit is acceptable in acquired cases while in arthrogrypotic cases since shoulder abduction is not expected, partial triceps power loss almost never effects daily living. Although there are many muscle transfer methods (lat dorsi, pectoralis etc) to reanimate elbow flexion, we conclude that long head of triceps transfer is a reliable technique in both acquired and congenital cases.

Keywords:
obstetric tendon transfer triceps biceps
Management of shoulder internal rotation limitation in obstetrical palsy.

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Objectives / Interrogation: Muscle imbalance in a growing child can lead to bone and joint deformities. Obstetric palsy patients with incomplete recovery have glenohumeral joint problems because of imbalance between shoulder adductor and internal rotator(IR) muscles & abductor external rotatuar(ER) muscles. Although shoulder internal rotation contracture preventing shoulder abduction and external rotation in the most common problem in obstetric palsy patients with partial recovery; shoulder internal rotation limitation or external rotational contracture is a worse condition preventing hand to belly and back functions hence limiting daily activities.

Methods: Fourteen patients had operation to improve shoulder ER and Abduction 3-5 years ago. Although their Abd and ER degrees improved dramatically; two years after the operation they had internal rotation limitation despite vigorous physiotherapy. 15 patients did not have neither nerve nor palliative any operation before and had IR limitations preoperatively. During operation, posterior incision above spine of the scapula was performed, supraspinatus, infraspinatus and teres minor muscles, and acromion bone were encountered. The intraoperative observation was not only heavily scarred muscle fascias which needed relaxation but also shortened external rotator muscles which needed release and lateralization with V-Y fashion so that passive shoulder internal rotation movements were possible. At 3rd day postoperative rehabilitation program, active range of motion exercises were initiated. All cases were evaluated by using range of motion measurement and Mallet scale.

Results and Conclusions: Average age of the children was 6,3 years and The average follow-up period was 21 months. The preoperative values in terms of IR were 2º and postoperatively 20º. Degree of abduction was mean 136 before the surgery. After surgery, it decreased to 105º but with therapy it caught up preoperative values. Degree of external rotation value was mean 85º preoperatively. After the treatment, the external rotation value was measured 66,2º. The mean Mallet score improved from 18 preoperatively to 20 postoperatively. Although shoulder abduction, ER problems are far more common in obstetrical palsy patients, there a group of patients which had internal rotation limitations either occured spontaneously or surgically. Facing with the reality we operated on these patients to achieve better hand to midline and back functions.

Keywords:
obstetric shoulder contracture
NEW TECHNIQUE FOR RECONSTRUCTION OF DRUJ IN CHRONIC INSTABILITY WITHOUT ARTHROSIS

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Objectives / Interrogation: Disorders of the distal radioulnar joint (DRUJ) of different etiologies are relatively common and can severely affect wrist and forearm function. Acute lesions, if unidentified and treated, may evolve with chronic pain and instability, or degenerative disease in more advanced stages. Due to local bone characteristics, stability is mainly given by the soft tissues, among which the triangular fibrocartilage complex (TFCC) is the main structure. Restoration of DRUJ stability is the goal of treatment and the reconstructions constitute the main group when treating chronic non-arthrosic lesions. The objective of this paper is to describe a new technique of tenoplasty using a strip of flexor carpi ulnaris (FCU) tendon, for anatomical reconstruction of the DRUJ.

Methods: Five fresh cadavers without signs of lesions or previous surgeries in the upper limbs were selected and the surgical technique was applied to both wrists, totaling 10 reproductions performed by the same hand surgeon. Photographs and computerized figures were presented detailing the most important points of each steps of technique.

Results and Conclusions: The technique of this study presents several advantages when compared to the procedures already described in the literature, since it constitutes a reconstruction of the TFCC that tries to reproduce the anatomy closer to the normal, respecting the ligament origin and insertion points. This allows gain of stability in the sagittal and coronal plane, without limiting movement of pronou-supination. Other theoretical advantages of the study include performing only two bone tunnels, with reduced risk of iatrogenic fracture; maintaining a constant tension of the graft, without loosening over time characterizing a dynamic tenoplasty; conservation of the primary function of the FCU; and small need for dissection and short time to perform. The technique described is suitable for the stability restoration of the DRUJ in cadavers, with technical advantages over other described procedures, being a good alternative for the treatment of chronic instabilities of DRUJ without arthrosis.

Keywords:
distal radioulnar joint, triangular fibrocartilage complex, instability, reconstruction
Complications of Hardware Removal in Pediatric Upper Limb Surgery - Is It Safe?

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Objectives / Interrogation: Previous studies indicated that hardware removal may lead to increased morbidity and therefore, at least in adults, remains questionable for certain indications. However, risks such as corrosion or local reactions may be less likely in younger patients with current, improved hardware materials. We sought to determine complication rates of hardware removal in pediatric upper limb surgery, and establish potential risk factors for increased morbidity.

Methods: All children and adolescents who underwent hardware removal under sedo-analgesia or general anaesthesia after previous upper limb surgery (2006-2016) were retrospectively evaluated. Cases with ambulatory hardware removal were not included. We performed a chart review and extracted the following details at latest follow-up available: patient demographics, diagnosis, implant location (e.g. humerus, radius/ulna, phalanges), hardware material, duration of surgery, duration of hardware-in-place, complication grades according to Goslings et al. (grade 0-5) and Sink et al. (grade 1-5), respectively. Correlations were calculated to establish potential relationships between specific outcome parameters (BMI, duration of surgery, hardware-in-place) and complication grades.

Results and Conclusions: A total of 2,090 children were evaluated of whom 450 (222 males, 228 females; mean age 9.5 years) fulfilled the inclusion criteria for this study. Overall, K-wires (46%), plates (22%), external fixators (23%), intramedullary hardware (7%), screws (1%), cerclages (1%) and pins (0.2%) were removed; most common locations were the forearm (34%), humerus (24%), metacarpalia (9%), phalanges (8%) and carpalia (2%). The mean duration of surgery was 40 minutes (range, 2-620), mean time-in-place was 194 days (range, 2-4018). Complication rates were low overall, with most being grade 0 (n=373; 83%) or 1 (n=60; 13%) acc. to Goslings et al. and grade 1 (n=387; 86%) and 2 (n=43; 9%) acc. to Sink et al. No severe complications acc. to Goslings (grades 4,5) and Sink (grade 5) were observed. Five cases required postoperative ICU admission which thus classified them as Sink grade 4 (1.1%). We found no correlation between BMI, duration of surgery or hardware-in-place duration with classification grades.

To summarize, hardware removal under sedo-analgesia or general anaesthesia in the pediatric upper extremity is a safe procedure. However, despite this large group of patients analyzed, we were unable to find any particular determinants for possible complications.

Keywords:
Hardware removal, upper limb, congenital malformations, trauma, deformity
Radius metastasis: an unusual form of presentation

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Objectives / Interrogation: Metastatic cancer is the most common reason for a destructive bone lesion in adults. The hand and wrist are less commonly affected than the axial skeleton, and acrometastasis develop in less than 0.3% of patients with cancer.

Methods: A 69-year-old white male patient presented with a 2 days history of pain, edema, and decreased right wrist ROM. The patient denied any history of trauma, recent illness or fever. On physical examination there was mild swelling over the distal forearm and no warmth increase or erythema was identified, as well as no mass was palpable. The neurovascular structures were intact. An x-ray revealed a lytic lesion of the radius metaphysis with an associated pathological fracture. A renal cell carcinoma was diagnosed, with lung metastasis and one single bone metastasis in the right wrist. The patient underwent right total nephrectomy and started chemotherapy treatment. MRI confirmed a bone lesion at the distal end of the right radius 3 cm from the radio-carpal joint with 25 mm of longitudinal extension, destruction of the cortical bone, a small extra-osseous extension of the lesion and associated reactive edema of adjacent soft tissues. The decision was to treat this metastasis with a wide, local en bloc resection of the lytic lesion excision and fill the defect with iliac autograft (tricortical) plus fixation with a palmar distal plate of the radius. In the postoperative period, a splint was maintained for 4 weeks. Radiographs confirmed bone integration of the graft at 9 months. At follow-up the patient scored a VAS of 2/10 with mobilization of the wrist and almost normal ROM. Recurrence control with annual MRI was done, with no further disease at 5 years follow-up. The systemic disease also presented good response to the treatment instituted and seems to be estabilized.

Results and Conclusions: Acrometastasis can appear in patients of any age, with men being twice as likely as women to be affected. Rarely, they may be the first presentation of an occult silent cancer, mimicking a benign condition. In cases of RCC metastasis, one must aware that this type of carcinoma has an extremely unpredictable clinical course. But, a bone metastasis may be the first sign of the disease. Patients may present with pathologic fractures because the lesions weaken the integrity of the osseous matrix. Such lesions can be misdiagnosed. Our case describes an unusual presentation of metastatic RCC where a pathological fracture was the first sign of the disease that led to all the subsequent study made and the final diagnosis.

Keywords:
Radius metastasis; Renal cell carcinoma
Treatment of fracture dislocation of the elbow with Regan-Morrey Type I/II coronoid fracture: A retrospective analysis of clinical results

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Objectives / Interrogation: The best surgical protocol to treat fracture dislocation of the elbow with coronoid fracture remains unclear. The purpose of this study was to report the clinical and radiological outcomes of fracture dislocation of the elbow with coronoid fracture.

Methods: This is a retrospective case series of 20 consecutive patients who were treated for fracture dislocation of the elbow with Regan-Morrey Type I/II coronoid fractures between 2008 and 2017. The patients’ mean age was 49 years and the mean follow-up period was 12 months. Our surgical protocol included both repair of the lateral collateral ligament (LCL) and fixation or replacement of the radial head first, then repair of the medial collateral ligament (MCL) was additionally performed if the MCL had been confirmed as injured by preoperative MRI and/or intraoperative stress test. Only after that, if the instability remained, was coronoid repair performed. Patients were evaluated both radiographically and with a clinical examination at the final follow-up. Elbow instability was defined as clinical or radiographic evidence at the final follow-up. Outcome measures included elbow range of motion, forearm rotation, elbow stability, and radiographic arthritic changes. Clinical outcomes were assessed with Mayo Elbow Performance Score (MEPS).

Results and Conclusions: All 20 patients had a coronoid fracture, 11 patients had Regan-Morrey Type I fractures and 9 patients had Type II. Among the 20 patients, 12 patients had a terrible triad injury and 8 patients had a fracture dislocation with only coronoid fracture. Repair of the LCL was performed in all 20 patients (100%), and repair of the MCL was performed in 15 patients (75%). Repair of the coronoid fracture was performed in 2 patients (10%) with Type II. Among the 13 patients with a radial head fracture, open reduction and internal fixation in 12 patients and prosthetic replacement in one patient was performed. The mean arc of ulnohumeral motion at the final follow-up was 127° and mean forearm rotation was 155°. None of the patients demonstrated instability postoperatively. Radiographs revealed no arthritic changes. The mean MEPS was 95 points. In this study, the rate of MCL injury was as high as the rate of LCL injury in fracture dislocation of the elbow. The results suggested that fracture dislocation of the elbow with Regan Type I/II coronoid fractures can be effectively treated without repair of the coronoid, when repair of the LCL/MCL sufficiently restores stability of the elbow.

Keywords:
fracture dislocation of the elbow, coronoid fracture, medial collateral ligament
Investigation of preoperative image and pathological necrotic findings in scaphoid fracture pseudarthrosis

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Objectives / Interrogation: Preoperative image assessment for osteonecrosis in the proximal spicula is important for selecting the surgical technique to apply to scaphoid fracture pseudarthrosis. However, synostosis may also be obtained by nonvascularized bone graft, and actual divergence from image findings has been noted. Here, we report pseudarthrosis preoperative image findings and intraoperative pathological findings in comparison with the therapeutic outcomes of vascularized bone graft.

Methods: Taken from among vascular bone graft operations for 116 hands in treatment of vascular scaphoid fracture, the subjects in this study were 22 hands presenting pathological specimens of pseudarthrosis regions. The mean age of the subjects was 28.8 years, the male:female ratio was 20:2, the mean time from injury to surgery was 52.6 months, and the position of the pseudarthrosis was proximal:medial:distal in 8:13:1 hands. Surgery was performed by the Zaidemberg technique for 21 hands and the Makino technique for 1 hand. X-ray images assessed using the Ikeda classification showed filamentary in 2 cases, cystic in 7 cases, and sclerotic or transpositional in 13 cases. The preoperative MR images (obtained for 20 cases) for proximal spicule, T1, and T2 findings were compared with the peripheral carpal bones and assessed for signal intensity. Low signal intensity was found in both T1 and T2 in 8 cases and low T1 signal intensity alone in 7 cases. In the pathologic diagnosis, samples from within the proximal spicule of the pseudarthrosis were taken and assessed for osteonecrosis. The image findings, pathological diagnoses, and postoperative outcomes were investigated.

Results and Conclusions: In the pathological investigation, osteonecrosis was found in 11 cases (50.0%), with the position proximal in 6 cases (necrosis 75.0%), medial in 5 cases (38.5%), and distal in 0 cases (0%), and thus most often proximal. In the Ikeda classification, osteonecrosis was filamentous in 2 cases (100%), cystic in 4 cases (57.1%), and sclerosal or transpositional in 5 cases (6.7%). From MRI, osteonecrosis was both T1 and T2 in 4 cases (50.0%) and T1 alone in 5 cases (71.4%). The synostosis rate was 11 cases (100%) in the necrotic group and 10 cases (90.9%) in the non-necrotic group. Osteonecrosis findings by pathological examination did not necessarily match the X-ray or MRI findings, thus indicating that determination of osteonecrosis as a preoperative finding is difficult.

Keywords:
Scaphoid fracture pseudarthrosis, MRI, Osteonecrosis
Recovery Analysis of Two Point Tactile Discrimination Following Dorsal Cross Finger Flap

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Objectives / Interrogation: Fingertip injuries are common among the young working group of people in a developing country posing a great concern.
Sensation in the flap is imperative to the proper functioning of the reconstructed fingertip. The study conducted to observe the way to return of two-point tactile discrimination in different stages and conditions over the flap after division is a method of identifying adequate functional re-innervation of the flap.

Methods: A prospective observational study to measure the changes during the recovery of two-point tactile discrimination (TPTD) over the dorsal cross finger flap was carried out for a period of 6 months after flap division for each case. TPTD was measured in the dorsum before flap elevation (donor control) and from the corresponding opposite fingertip (control). Then TPTDs were noted from the day of flap division, 7th POD, 15th POD and thereafter monthly up to six months. Data were analyzed and compared on those days in-relation to age, sex, hand dominance, time to repair after injury and smoking.

Results and Conclusions: In this study, it was shown that the mean TPTD on the dorsum of the middle phalanx of the flap donor site (Donor Control) was 5.31 ± 0.79 mm and on the corresponding opposite fingertip (Control) was 2.79 ± 0.78 mm.
In the 1st follow-up on the 15th POD following flap division, the mean TPTD was 15.70 ± 1.31 mm, on 30th POD was 14.66 ± 1.14 mm, on 60th POD 13.74 ± 1.00 mm, on 3 months 13.10 ± 1.12, 4th & 5th months 11.87 ± 1.01 & 09.25 ± 1.09 respectively and at 6th months was 07.70 ± 0.92 mm.
The improvement was rapid between the 4th & 6th months where the mean improvement was 4.17 mm - the most significant improvement. It had been evident, TPTD on 6th months (7.7 mm) was reached just below the protective sensation cut off value of 8 mm in 83.4% cases. But no statistically significant differences were found in the two comparing age groups (< 30 years and > 30 years). In the same time, no statistically significant differences were found while comparing between sex, reconstruction time after injury, type of injury, hand dominance and even on smoking.
So, the cross finger flap for fingertip injury reconstruction is a good option for a resource-poor developing country.

Keywords:
Fingertip injury, Cross finger flap, TPTD
Transversal morphology of the sigmoid notch

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Objectives / Interrogation: Treatment of distal radioulnar joint instability remains challenging. The relative congruency of this joint depends among other structures on the morphology of the sigmoid notch. However, since the description on cadavers by Tolat and colleagues in 1996 there are very few data available on the morphology of the sigmoid notch in the transversal plane. The purpose of this study was to describe the shape and analyze variations of the transversal morphology of the sigmoid notch on axial T1-weighted magnetic resonance imaging (MRI) sequences in healthy patients.

Methods: 88 patients with suspected scaphoid fracture which underwent MRI and standard radiographs of the wrist were included in this study. Patients with history or proved wrist instability or prior radius surgery were excluded. The sigmoid notch was analyzed on T1-weighted MRI axial plane by two readers. Its shape was categorized in four groups according to the classification of Tolat. This rather subjective classification was confronted to more objective measurements and correlated to the shape of the radius and the curvature of the ulnar head.

Results and Conclusions: The morphology of the sigmoid notch is analyzed according to the classification of Tolat. Objective measurements of the different morphology variations, as well as correlations with the shape of the ulnar head, the ulnar variance and inclination of the distal radioulnar joint are assessed. Furthermore, the presence of a distal-volar lip on the radius is discussed; it has a similar aspect to the labrum of the shoulder and seems to correspond to a broader insertion of the volar radioulnar ligament. Its relation to the shape of the sigmoid notch is also analyzed. Transversal shape of the sigmoid notch is a potential factor influencing the stability of the distal radioulnar joint. Association with a distal-volar lip on the radius and valuable input for the surgical treatment of distal radioulnar joint instability are discussed.

Keywords:
sigmoid notch, distal radioulnar joint, morphology
Wrist Arthroscopy - lessons learnt from the first 100 cases

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Objectives / Interrogation: Wrist arthroscopy is technically demanding and complications-prone procedure due to intricate wrist anatomy and the steep learning curve. Published evidence suggests inverse relationship between the surgeon's experience and complication rate. This audit analysed the case-mix and outcomes of all arthroscopies performed by a single surgeon since the introduction of the wrist service within a busy plastic surgery hand unit, as well as the challenges faced during this novel process.

Methods: 113 consecutive primary arthroscopies were carried out over the 9-year period (2009-2018). 62% of the procedures were diagnostic and 38% therapeutic. The triangular fibrocartilage complex pathology was the commonest indication for investigation (47% of cases), followed by the scapho-lunate ligament injury in 27% and scaphoid fractures in 21%.

Results and Conclusions: There were no major complications - infections, neuromas, tendon or nerve injuries - in this cohort. A total of 7 (6%) minor complications were identified, 5 of which were in the first 4 years of the surgeon's practice. Iatrogenic partial thickness cartilage damage was observed intraoperatively in 6 patients (5%), all of whom were asymptomatic postoperatively. One localised postoperative synovitis at the site of 3/4 portal required subsequent surgical exploration and excision.

The first 100+ wrist arthroscopies carried out in our department have been delivered safely with complication rate comparable to that published worldwide. Wrist arthroscopy requires targeted subspecialist training, but with ongoing education and growing experience, it becomes safer and invaluably broadens the referrals to plastic surgery hand units. Lessons learnt will be covered as input to the colleagues involved in a similar practice setup.

Keywords:
wrist arthroscopy, complications, training
The use of the hipotenar fat flap for recurrence of the carpal tunnel syndrome surgery

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Objectives / Interrogation: Present a technical proposal and show the results of the hipotenar fat flap for the recurrence of failure or recurrence of carpal tunnel release

Methods: This is a retrospective study with a prospective data collection, all the surgeries performed by the same surgeon. Between February of 2014 and March of 2018, 20 patients were operated for carpal tunnel recurrence with the technique of hipotenar fat flap. 13 participate the study, not for exclusion criteria, but because 7 were not available to answer the questionaire or to sign up the formularie. The group were composed for 1 man and 12 women. Related to the side operated 5 were right side and 8 left side. The average time between the first and the second surgery was 3 years. The medium follow up between the surgery and final evaluation was 54 moths (6 months to 48 months). The technique consisted in a "L" approach beginning in the distal palmar crease, in line with the radial border of the 4th finger in a curve longitudinal fashion to the wrist crease, continuing transversely to the pisiform. The skin was elevated leaving the subcutaneous tissue (hipotenar fat pad) attached to the hand. Then, the carpal tunnel was open, and all the synovitis was taken off beneath the tendons, and the median nerve was cleaned as well, sometimes removing part of the epineurium. The flap was raised preserving its vascularity by branches of the ulnar artery. The flap was transposed to cover the carpal tunnel and the skin over it.

Results and Conclusions: The results were evaluated by the Quick Dash Score. The data was collect pre and pos operative. The average Quick Dash score was pre operative 80.65 (range 61.3 to 100), and pos operative 40.65 (range 11.3-70). The worst patients were those with multiple surgery in the same member or another, and those who were out of work, receiving benefits from social security (7 patients).

In this study, analysing the results, the hipotenar fat flap improves the symptoms of carpal tunnel recurrence, being a simple and low cost technique, and promotes a good coverage of the nerve and tendons, in a scared tissue surroundings, being a good option in this situation. Unfortunatelly, we observe that the results are very heterogenous, some patients that improved a lot, and some that not improved at all. The reason to that could be explained by many ways: time in between the two surgery (3 years in average), extend of impairment of the nerve, works compensation and clinical conditions in some of them.

Keywords:
hipotenar, flap, carpal tunnel syndrome, recurrence
Another neurotisation of n.axillaris

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Objectives / Interrogation: N.phrenicus is a classic extra-plexus donor of axons for re-innervation of the muscles innervated by n.musculocutaneus, n.suprascapularis, n.medianus, n.ulnaris, n.radialis, n.axillaris by performing end-to-end or end-to-side microsurgical anastomoses with nerve-grafts (n.suralis, n.saphenus). A new method of direct neurotisation of n.axillaris with n.phrenicus was presented as n.phrenicus is taken endoscopically in its full length immediately before it sank into the diaphragm. M1 contractions(MRC) of m.deltoideus was reported 2 months postoperatively. A major factor for successful neurotisation is time, most importantly, the donor / recipient nerve distance.

Methods: 4 adult patients with brachial plexus trauma are presented. Our approach to those with C5, C6, C7 avulsion and C8, Th1 neuropraxia was: 3 months after the trauma first stage of surgery treatment is presented- modified Oberlin method for restoration of elbow function is performed, as well as other nerve transfer was also carried out at the same stage:n.accessorius to n. suprascapularis. In the second stage neurotisation of n.axillaris is performed by taking full length of n.phrenicus endoscopically before it sank into the diaphragmatic musculature.

Results and Conclusions: M1(MRC) muscle contractions of m.deloideus are reported on the 2nd postoperative month. The length of the intrathoracic n.phrenicus is 22 cm. This shortens the reinnervation time with 7-12 months. For the period of March-September 2018 we have operated 4 patients with this methodology. The use of n. phrenicus as a donor nerve in the case of end-to-end coaptation does not lead to permanent impairment of respiratory capacity and pulmonary function of the patient. This is a revolutionary method of restoration of affected muscles after plexus brachialis trauma. A major factor in their successful neurotisation is the time. i.e., the donor / recipient nerve distance. The use of n.phrenicus with its full length as a donor shortens the re-innervation time of the impaired muscles. This is particularly important in patients who have not had pre-operative nerve stimulation of the denervated muscles or delayed treatment.

Keywords:
n.phrenicus, n.axillaris, nerve transfer
Restoring Functional Motion in the Arthritic Wrist through Circumduction

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Objectives / Interrogation: Object:
We hypothesize that functional wrist motion is lost in the arthritic wrist due to a combination of mechanical incongruity & pain. Restoration of functional motion is achieved through elimination of pain generators and reestablishment of adequate freedom of motion through a three dimensional envelope of motion allowing near-normal circumduction.

Methods: Materials:
Biomechanical studies performed in our laboratory have mapped out 3-D arcs of motion needed to carry out normal ADL tasks. These were compared to patients who underwent motion-sparing reconstructive wrist surgery (4-C-F, PRC, SHARC, TWA) who reported satisfactory wrist function following surgery / rehabilitation. Limitations in any direction were compared to the total circumductive envelope achieved clinically.

Results and Conclusions: Results:
Satisfactory ADL mobility parallels reestablishment of movement through a stable, pain-free circumductive arc of motion by means of limited arthrodesis, excision of mechanical obstruction, preservation of congruent healthy articular surfaces, or arthroplasty which restore wrist kinematics to near-normal.

Conclusion:
PRC, SHARC, TWA appear to restore central, unimpeded circumduction of roughly 60% of normal which provides adequate 3-D mobility for restoration of functional ADLs. 4-C-F results in a longer lever arm with increased stress at the R-C articulation which offers a more restrictive & less functional circumductive envelope.

Keywords:
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Epiphyseal stress fracture of the base of the middle phalanx in adolescent sport climbers

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Objectives / Interrogation: Epiphyseal stress fracture of the base of the middle phalanx is the most common injury among adolescent sport climbers and observed only in this sport. The purpose of this study was to evaluate subject characteristics, injury mechanism and clinical outcome.

Methods: All adolescent sport climbers with pain at the dorsal base of the middle phalanx with or without fractures (Salter-Harris Typ III) who were treated at our department between 2006 and 2018 were included in the study. A questionnaire was sent to all patients about their specific climbing and training habits. In climbers were the questionnaire was not sent back, the patient chart records were used only. All patients were treated conservatively with reduction of load and regular clinical and radiological control (either to document consolidation or to detect a late development of a fracture) every 2-3 months until pain disappeared.

Results and Conclusions: 28 climbers (21 male) with 67 affected fingers could be evaluated. 16 patients completed the questionnaire addressing injury details as well as training behavior before and after the injury. The mean age at the time of injury was 14.0 years (±1.4 years). Middle (58%) and ring (30%) finger PIP joint were found to be the most common sites of injury. All suffered from pain at the dorsal base of the middle phalanx while 16 patients had a fracture in 22 fingers, two of them developed the fracture only at a follow up control. Mean time for consolidation was 8 months (2-24 months). One patient who presented late showed a destruction of the epiphysis with severe joint surface incongruence and signs of osteoarthritis. 9 patients showed mild joint surface incongruence. 37.5% had only slight pain occasionally during climbing and 75% climbed still regularly at the same level or better as before. Nearly half of the patients (43.7%) included campus board exercises and one fourth of the patients (25%) trained specifically on small holds.

Epiphyseal fatigue fracture of the base of the proximal phalanx is a unique injury in adolescent sport climbers which can lead to severe damage of the growth plate with a joint surface incongruence when left untreated resulting in permanent impairment of the affected finger. Dorsal finger pain at the PIP joint in adolescent climbers must be assessed carefully and consultation of an experienced physician should be considered at an early stage and patients should be followed until the pain disappears, which may take several months.

Keywords:
Epiphyseal fracture, proximal interphalangeal joint, finger injury, climbing
Nitinol Intramedullary Fixation for DIP Arthrodesis Restores Biomechanically Stable Pinch and Grasp

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Objectives / Interrogation: Objective
The authors have hypothesized that an alternative technique for arthrodesis of the DIPJ of the fingers or IPJ of the thumb using pre-tensioned implants for intramedullary fixation can provide a high rate of satisfactory union and anatomic position with a minimal complication rate.

Methods: Methods
Twenty-one distal interphalangeal joint arthrodesis and 11 thumb interphalangeal joint arthrodesis were performed in 16 patients (10 women and 6 men). Age range between 6 and 79 years with a mean age of 62 years. In five patients a single joint arthrodesis was performed whereas in 11 patients more than one arthrodesis was performed. All patients included in this study were followed for a minimum of two years.

Results and Conclusions: Results
The mean time to healing was eight weeks with a range of six to ten weeks. By ten weeks, healing was noted in 31 of 32 digits. The healing was eight weeks with range of 6-10 weeks. By ten weeks there was healing noted in 31 of 32 digits. Only one patient with a delayed union after ten weeks demonstrated a fibrous union that was stable and non-tender. In all cases patients reported no pain at the arthrodesis site by three months postoperatively. There have been no hardware related problems and in no case was the hardware removed. The one patient with delayed union after ten weeks appeared to have formed a fibrous union which was stable and non-tender. All patients described complete absence of pain at the site of arthrodesis and complained of no significant pain or dysfunction by three months post-operatively. There have been no hardware problems and in no case was hardware removed. Functional pinch & grip strength was 80% of normal.

Conclusion
The surgical technique for arthrodesis of the distal joint of the fingers and thumb is straightforward. The technique employed in this series utilizes instrumentation which further simplify the surgical procedure, affords excellent apposition of bone, and intramedullary fixation of the arthrodesed joint. Variability in angle of the implants affords the surgeon the ability to place the fused joint in neutral 15 or 25 degrees of flexion as is needed for patient function. The absence of any hardware related problems, lack of infection and high rate of union, & excellent function indicates this to be a viable and attractive option for arthrodesis of the distal joints in the hand.

Keywords:
pre-tensioned implants , arthrodesis of the distal joint of the fingers and thumb
Radiofrequency Microtenotomy Treatment of Lateral Epicondylitis

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Objectives / Interrogation: Objective
Historically, attempts to surgically treat recalcitrant lateral epicondylitis have been associated with significant post-operative pain and a prolonged period of dysfunction. The authors have hypothesized that use of a minimally invasive radiofrequency coblation technique & arthroscopic synovectomy can provide enhanced early pain relief as compared to prior techniques.

Methods: Methods
The authors have prospectively evaluated 35 patients surgically managed with radiofrequency coblation of the lateral epicondylar tendon insertion and arthroscopy with synovectomy of a synovial "plica" when noted.

Thirty patients have been followed for a minimum of two years and up to five years. All patients were treated conservatively pre-operatively for a minimum of six months. In all cases, symptoms were present for a minimum of eight months and in some, up to four years. Pre-operatively patients rated their level of pain on a visual analog scale a mean of 8.6. Twenty-eight patients were found to have radiocapitellar synovitis which was arthroscopically resected. All patients were treated with the Topaz (ArthroCare, Sunnyvale, CA) Radiofrequency Coblation instrument. Perforations were made at 5mm intervals over a 3.5 X 2.5cm grid at the denervated insertion of the extensor musculature along the lateral epicondylar ridge.

Results and Conclusions: Results
Twenty-eight of thirty-five patients were found to have an inflamed synovial plica with erosive changes of the radial head. Post-operative pain ratings on the first day post-operatively averaged 6.3, by the second week 4.8, by six weeks 3.8, by 12 weeks 2.7, by six months 1, and by 12 months 0.9. Twenty-nine returned to pre-injury activities and sports by 12 weeks. Six patients stated that they have not returned to their pre-injury level of function and have had incomplete pain relief. All six of those patients were Workers Compensation patient who had other outstanding Workers' Compensation claims. But five said that they were substantially improved and would go through the surgery again.

Conclusion
Radiofrequency coblation has been shown in areas of tendinosis to enhance neovascularization in the area of treatment. Radiofrequency coblation along the lateral epicondylar ridge in conjunction with an arthroscopic synovectomy appears to enhance healing while minimizing post-operative pain experience, thus allowing a rapid return to functional activities.

Keywords:
Radiofrequency coblation, arthroscopic synovectomy
The effect of nitric oxide-releasing silica nanoparticle on revascularization and functional recovery in rat sciatic nerve crush injury

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Objectives / Interrogation: Nitric oxide (NO) is a pivotal biological molecule in revascularization and nerve regeneration process after peripheral nerve injury. Recently, biomaterial advances introduce NO-releasing silica nanoparticle, which may offer the controlled and sustained delivery of NO to the targeted tissues. We hypothesized that NO-releasing nanoparticle promotes revascularization and functional recovery in rat sciatic nerve crushing model.

Methods: Forty-eight Lewis rats were divided in two groups of 24 rats each. A standardized crushed sciatic nerve of group I was treated with NO-releasing silica nanoparticle in fibrin glue carrier. The crushed sciatic nerve of group II was augmented in fibrin glue without NO nanoparticle. Four rats from each group were sacrificed and micro-angiography using a colored polymer dye was performed to evaluate the neural capillary density of sciatic nerve. We evaluated the sciatic functional index (SFI) using the walking tract test weekly. We measured maximum isometric tetanic force of tibialis anterior (TA) muscle and posterior calf muscle weight at 3 and 6 weeks after injury. All results of TA muscle force and muscle weight were normalized to the contralateral side. We also evaluated the histomorphometry of sciatic nerve.

Results and Conclusions: Microangiography showed that NO-releasing silica nanoparticle increased the neural capillary density of the crushing site of sciatic nerve 3 days after injury. Sciatic function index of animals treated NO-releasing silica nanoparticle was better than that of animals without NO on 4 weeks after injury. NO-releasing silica nanoparticle reduced muscle atrophy on 3 weeks after injury in terms of wet muscle weight. NO- nanoparticle enhanced the TA muscle force on 3 and 6 weeks after injury, but a significant effect was apparent with a mean intergroup difference on 6 weeks after injury. The number of myelinated axon and muscle weight of animals treated NO-nanoparticle was higher on 3 weeks after injury.

In conclusion, our results suggest that NO releasing silica nanoparticle enhance the revascularization of rat sciatic nerve in early phase after crushing injury, promote axonal regeneration and functional recovery in the early phase based on evidences from morphometric analysis and sciatic functional assessment. These findings provide a possible new avenue of using exogenous nitric oxide therapeutically.

Keywords: nerve, peripheral nerve, nerve regeneration, nitric oxide, nanoparticle, silica nanoparticle, revascularization
FUNCTIONAL ASSESSMENT, QUALITY OF LIFE AND ASSOCIATED COMPLICATIONS OF RADIAL HEAD PROSTHESIS.
EXPERIENCE OF OUR CENTER

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Objectives / Interrogation: Radial head arthroplasty (RHA) is an increasingly frequent surgical intervention in our country, usually as treatment for radial head fractures or sequela. The objective of our work is to describe the functional results, complications and quality of life of patients who underwent RHA in our center.

Methods: All cases of RHA (Mason type III-IV radial head fractures) in our center have a minimum duration of follow-up of one year.

Next data was obtained from each patient: age, gender, laterality and type of fracture, type of stem, complications and associated fractures, range of motion and strength of both hands, and radiographic presence of loosening, osteoarthritis and heterotopic calcifications. Pain was evaluated according to the visual analogic scale (VAS). Functionality and quality of life of patients were assessed with DASH and SF-36 questionnaires, the satisfaction of the patient was evaluated with a subjective scale ranged from 1 to 10.

For the statistical calculation we use the S of Spearman (Correlations) and Mann Whitney U and Chi-square tests (Differences)

Results and Conclusions: 10 patients (4 women, 6 men), the mean age was 57.4 years. 2 fractures affected the right side. In 6 cases a long stem was used. Loosening, osteoarthritis and calcifications appeared in 30, 50 and 50% respectively. Average values of VAS, DASH and SF-36 were 3.1, 28.4 and 62.5% respectively. Personal average satisfaction was 8.5. There was an 80% of associated fractures, being olecranon and coronoid apophysis the most frequent ones. Complications occurred in 30% of cases.

Significative differences between both hands were only found on supination (p0.043), extension (p0.042), and pinch (p0.043) and grip strength(p0.037).

A significative correlation was found between grip strength of affected hand and DASH scale (s-0.705,p0.023).

A correlation was found between subjective satisfaction and next scales: DASH(s-0.772,p0.009) and VAS(s-0.665,p0.036), but satisfaction did not correlate with SF-36(s0.601,p0.066).

We found no relationship between SF-36, DASH, VAS and personal satisfaction and presence of loosening, osteoarthritis and heterotopic calcifications, as well as between type of stem and presence of loosening.

We concluded that RHA (Acumed®) achieves a high degree of satisfaction in our patients, nevertheless a decrease in their capacity for extension, supination and pinch and grip strength in affected hand was found. The subjective scale used to assess personal satisfaction correlates with DASH and VAS.

Keywords:
Radial head arthroplasty
Measurement of the distance between a line extending along the volar aspect of the radial shaft and the lunate rotation center on lateral view X-ray of the wrist

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Objectives / Interrogation: Changes of radiocarpal alignment occur after severe Smith fractures or fracture malunion, and sometimes cause pain, limited wrist motion, or functional disability. On lateral view X-ray of the wrist, a line extending along the volar aspect of the radial shaft is considered to roughly bisect the radial articular surface and the lunate. However, detailed measurements have not been reported. We expect such measurements to be useful in treatment of severe Smith fractures or fracture malunion. We measured the distance between a line extending along the volar aspect of the distal radius diaphysis and the lunate rotation center on lateral view X-ray of the wrist.

Methods: A total of 151 lateral wrist radiographs were randomly extracted from medical records of our institution between 2010 and 2017. Patient ages ranged from 12-92 years. Fractures, osteoarthritis, tumors, and rheumatoid arthritis were excluded. A lateral wrist radiograph was defined by the pisoscaphocapitate relationship, where the palmar cortex of the pisiform should lie between the anterior surface of the distal pole of the scaphoid and the capitate. After 3 points on the proximal articular surface of the lunate were randomly selected, we found a center of a circle passing through the 3 points as a lunate rotation center. A line parallel to the axis of the distal radius was drawn along the volar aspect of the distal third of the radial diaphysis. We measured the distance between the lunate rotation center and the extended line along the volar aspect of the radius. If the lunate center was posterior to the line, it was expressed as a minus value and if anterior, it was expressed as a plus value. Data were expressed as the mean ± standard error.

Results and Conclusions: The mean age was 55.5 ± 1.7 years old. Fifty-three were male and 98 were female. The right wrist was involved in 71 cases and the left wrist in 80. Most of the lunate rotation center was located at the center of the distal articular surface of the lunate. The distance between the lunate rotation center and a line extending along the volar aspect of the distal radius diaphysis was 0.09 ± 0.1 mm (-2.34-3.97 mm).

The lunate rotation center was approximately on a line extending along the volar aspect of the distal radial diaphysis. However, because of individual variation, the distance on the unaffected side should be used as a basic reference value.

Keywords:
Radius, Lunate, Wrist, Radiography
Contusion Neuropraxia of Cutaneous Sensory Nerves: Early Diagnosis and Treatment Reduces Chronic Pain Syndromes (Early Diagnosis Shortens Recovery Time)

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Objectives / Interrogation: Contusion neuropraxia of cutaneous sensory nerves in the upper limb is an under-recognised cause of chronic neuropathic pain. This study recommends a diagnostic criteria, and assesses if early diagnosis and treatment can lead to better outcomes.

Methods: Thirteen patients with contusion neuropraxia of cutaneous sensory nerves in the upper limb were recruited. Each case had clear inciting injury: blunt trauma, stretch injury, or chronic repetitive compression. Two of three were present: (1) local hyperalgesia, (2) distal paraesthesia and (3) a positive Tinel's sign. Clinical findings corresponded to a cutaneous nerve in the upper limb. Patients with concurrent fractures, muscle, tendon, ligamentous or open wound injuries were excluded from the study. All patients were treated conservatively and assessed at monthly intervals for up to three months.

Results and Conclusions: All patients experienced neuropathic pain with local hyperalgesia and sensitivity at the site of nerve injury. Ten participants (76.9%) fulfilled two out of three criteria with the rest of the participants (23.1%) fulfilling all three criteria. The interval between injury and definitive treatment averaged 9.5 weeks (range 0 - 48 weeks). The superficial radial nerve was the most commonly involved nerve (38.5%) followed by the median antebrachial cutaneous nerve (30.8%). At the end of the study period, four patients achieved excellent outcome (30.8%) and nine patients achieved good outcome (69.2%). Amongst patients who achieved an ‘excellent’ outcome, patients who presented earlier (mean 6.5 weeks, range 5 - 8 weeks) achieved their final outcome earlier than those who presented later (mean 21.70 weeks, range 8 - 48).

Contusion neuropraxia of cutaneous sensory nerves is a disease entity that can result in significant neuropathic pain that interferes with quality of life. Early recognition and definitive treatment can expedite the recovery process, lead to better outcomes, and avoid progression to complex regional pain syndrome. This diagnosis should be considered in all patients with a history of trauma who experience unremitting neuropathic pain and fulfil our diagnostic criteria.

Keywords:
contusion neuropraxia; cutaneous nerves; chronic pain syndrome; neuropathic pain; peripheral nerve
Enzymatic Debridement for Hand Burns: Function and Quality of Life One Year After Trauma

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Objectives / Interrogation: Over the last years, Enzymatic Debridement has become an accepted alternative for the treatment of severe burns. A topical burn eschar removal by the proteolytic enzyme mix NexoBrid® has certain important advantages when compared to Standard of Care. Most notably, it allows for a selective debridement, conserving adjacent tissue. This appears to be especially beneficial in severe burns of the hands, where conventional, “sharp” nectrectomy by knife or blade is usually accompanied by extensive functional damage.

Methods: Patients that were admitted to our hospital and had received Enzymatic Debridement on at least one burned hand between 2016 and 2017 were reexamined in our outpatient clinic one year after trauma. Range of Motion and grip strength were evaluated on both hands. Firmness and elasticity parameters were obtained by comparing scarred and unaffected skin by Cutometer® measurement. Patients were asked to complete DASH, SF-36 and the Ludwigshafen version of the Burn Specific Health Scale-Brief (BSHS-B) questionnaires to assess remaining functional deficits and present quality of life.

Results and Conclusions: Results:
As of today, 14 patients (9 male, 5 female) could be included in the study. Average TBSA was 12.6 %, 2.2 % TBSA were attributed to burns of the hands. As assumed, grip strength and range of motion were reduced on burned extremities. Firmness was increased, most elasticity parameters were decreased in the originally injured area when compared to unaffected skin. DASH showed significant functional impairment when compared to the average population, scores for emotional and psychological well-being were lower in the SF-36 questionnaire. However, BSHS-B scores were equivalent to those of a reference collective of burn patients.

Conclusions:
One year after trauma, patients with hand burns that were treated with Enzymatic Debridement still showed significant morbidity. Functional and psychological impairments were higher than in the average population but comparable to values observed in a reference collective of burn patients. Further examinations in the next couple of weeks, that will gain more results from a larger number of patients as well as a control group, are needed to clarify the current conclusions.

Keywords:
hand burns, enzymatic debridement, nexobrid
VOLAR PLATE RETENSIONING AFTER TRAPZIECTOMY AND LIGAMENT RECONSTRUCTION TENDON INTERPOSITION IN BASAL THUMB ARTHRITIS WITH HYPEREXTENSION METACARPOPHALANGEAL INSTABILITY

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Objectives / Interrogation: Hyperextension instability of the metacarpophalangeal (MCP) joint of the thumb leads to malfunction and bad outcomes of basal thumb arthritis surgical treatment. Loss of metacarpal height after trapeziectomy and ligament reconstruction tendon interposition (LRTI) can get MCP instability worse. Various techniques have been used to address this hyperextension depending on its severity.
In this study the authors describe their experience with the use of a volar capsular flap fixed with suture-anchor to the neck of first metacarpal bone to restore normal extension in grade 3 instability during basal thumb arthritis surgery.

Methods: From January of 2013 to January of 2018 12 thumb of 10 patients affected by basal thumb arthritis and MCP hyperextension were treated in the same time by trapeziectomy and (LRTI) and volar capsular retensioning. All cases were evaluated pre and post-operatively with VAS, ROM, MCF hyperextension, Jamar and Pinch Test, personal satisfaction and DASH scores with an average follow-up of 39 months (min 6 - Max 62). MCP arthritis was a contra-indication for this technique.

Results and Conclusions: 11 of 12 reported relief from pain, no hyperextension and improvement grip and pinch strength. At the follow-up there was an average reduction of pain from 8,2 to 2,1 VAS. MCF extension was from -10 to 5°; 9 of 10 patients were very satisfied with the results and were able to return to the precedent activities better than before. Improvement of DASH scores was detected. Radiographic controls revealed reduction of scaphoid-metacarpal height from 20 to 50% at follow-up.

We believe that volar plate retensioning is a good way to improve stability of metacarpophalangeal joint preserving motion in alternative to arthrodesis and simultaneous trapeziectomy and LRTI and volar plate retensioning is an appropriate way to treat basal thumb arthritis associated to Z deformity improving functional and subjective outcomes.

Keywords:
basal thumb arthritis, Z thumb, Hyperextension instability, rizhoartrosis
PRELIMINARY RESULTS OF LUNATE PIROCARBON PROSTHESIS - Multicentric Study

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Objectives / Interrogation: Current indications for treatment of post-traumatic or avascular necrosis of the collapsed lunate are proximal row carpectomy or proximal capitate resurfacing or TWA or wrist arthrodesis. Replacing of lunate can restore carpal height and delay major surgeries.
AIM: In this study the authors describe their experience with the use of a Pirocarbon implant for replacing of lunate in Kienbock stage IIIA-B and in post-traumatic avascular necrosis.

Methods: From September of 2016 to September of 2017 10 wrists were treated (3 III-A; 5 III-B and 2 failure of previous surgery for Kienbock disease). All cases were evaluated pre and post-operatively with MMWS, PRWHE and DASH scores with an average follow-up of 13 months (min 6 - Max 30).

Results and Conclusions: 9 of 10 reported relief from pain, small improvement in ROM and improvement strength. At the follow-up there was an average reduction of pain from 7,01 to 3,4 VAS. There was an improvement of grip and pinch force. 80% of the patients were satisfied with the results and were able to return to the precedent activities. Improvement of DASH and of PRWHE scores were detected. Radiographic controls revealed 5 cases of S-L diastasis especially in Kienbock III-B stage; no dislocation of the implant, no reduction in carpal height nor worsening of capito-lunate angle were founded.

Keywords:
Kienbock disease, Pirocarbon prosthesis, Lunate prosthesis
Pathologic Adipose Infiltration in Macrodactyly: the Mechanisms and Treatment Options

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Objectives / Interrogation: Macrodactyly is a rare congenital disease with manifestations involving overgrowth of soft tissues and bones. The abnormal overgrowth with or without hyperostosis and nerve enlargement seriously affects the appearance and function of digits or limbs, which poses a great challenge for plastic and hand surgeons. Due to a lack of understanding of the molecular mechanism and pathological features of adipose invasion in the disease, there has been controversy regarding the surgical strategy and timing of debulking. The biological characteristics including the genomic profiles and cytological markers of Mac-ADSCs and fat infiltration of nerve tissue of the macrodactyly were investigated in the study.

Methods: Whole exome sequencing, Sanger sequencing, cDNA microarray and bioinformatics analysis were performed to identify mutations, gene expression patterns and signal transduction pathway changes in the pathological adipose tissues. The cellular characteristics of adipose-derived stem cells in macrodactyly (Mac-ADSCs) were studied using normal abdominal subcutaneous adipose-derived stem cells (Sat-ADSCs) as control, including features of cell cycle, apoptosis and differentiation induction of adipocytes, osteoblasts and cartilage. Electromyography (EMG) in patients with type II macrodactyly was examined, with the expression of neural proteins and ultrastructural changes evaluated.

Results and Conclusions: The PIK3CA-C420R and E81K mutations were identified in macrodactyly patients. The expression of EGFL6, ANGPTL7, PTN, FGF1, SFRP4 and other relevant genes was significantly up-regulated. Mac-ADSCs showed increased proliferative activity as well as osteogenesis and cartilage differentiation potential, while the adipogenic differentiation capability was decreased. Co-existence of myelin sheath injury, nerve regeneration and functional compensation was found in type II macrodactyly patients. Dysfunction of PI3K-AKT pathway activation which interferes with cell secretion and extracellular matrix - receptor interactions is an important mechanism for the development of macrodactyly, suggesting PI3K-AKT as a potential target for medical intervention; The enhancement of osteogenesis and cartilage differentiation potential in Mac-ADSCs indicates that early defatting could potentially ameliorate the disease progression; The surgical decision to preserve or resect the enlarged nerve for type II macrodactyly patients should be determined according to the nerve injury and compensation situation of the digits.

Keywords:
Macrodactyly; Molecular biology; Cell biology; ADSCs; Nerve
The outcomes of the avulsed thumb's reconstruction

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Objectives / Interrogation: The aim of this paper is to present the functional and esthetic results when using different types of known flaps and, also, when using a combined of these techniques, for thumb reconstruction without microsurgery.

Methods: Our study is based on 42 patients, aged between 25 and 68 years old, who suffered an avulsion trauma and presented complete thumb amputation. In 12 cases, the amputation was at the level of the first phalanx, in 18 cases at the level of interphalangeal joint and in 12 cases at the level of the distal phalanx. For distal amputation, we used H. Rose technique in 5 cases and Hueston flap in 9 cases. In 10 cases of interphalangeal joint amputation, we used Mantero-Bertolotti technique with O’Brien flap. For the other 8 cases of interphalangeal joint amputation and for all cases of the first phalanx amputation, we designed a technique which associated decortication of the amputated segment, its osteosynthesis to the amputation stump and coverage with a neurovascular heterodigital flap (Littler), harvested from the nonfunctional board of the 4th finger, with the length of two phalanges.

Results and Conclusions: Results
We evaluated the patients in terms of age, trauma mechanism, surgical technique, mobility, sensitivity, cortical reintegration of the new thumb in those cases in which we used Littler flap, the donor site morbidity, number of days of hospitalization, social and professional reintegration, as well as the patient’s satisfaction. In order to test the cortical reintegration of the new thumb, one year after the trauma and reconstruction, we used the light touch deep pressure test, using the minikit Semmens Weinstein monofilaments test. We obtained a low value of the protective sensitivity, but satisfactory. The media of the 2PD (2 point discrimination) test was 6 mm, which is considered to be a good result. For the mobility, we used the Kapandji score, and we obtained values between 7 and 10.

Conclusions
For all of the cases the results in terms of functionality and aesthetics are very good. Using homo or heterodigital flaps, as unique or in association of different techniques, represent a very good solution to reconstruct the amputated thumb whenever the microsurgical replantation is not possible.

Keywords:
thumb, flap, reconstruction
Socioeconomic Factors predicting Outcome after Open Carpal Tunnel Release

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Objectives / Interrogation: We aimed to investigate the influence of socioeconomic factors, such as, education level, employment status, marital status, being foreign born and income, on the outcome after open carpal tunnel release (OCTR) for primary carpal tunnel syndrome (CTS).

Methods: Data from the National Quality Register for Hand Surgery Procedures (HAKIR) were combined with data from Statistics Sweden (SCB) to evaluate OCTRs performed 2010 - 2016. QuickDASH (Disabilities of Arm, Shoulder and Hand) questionnaires were filled out by the patients preoperatively and at three and 12 months postoperatively. Each treated hand was considered a separate statistical entity. Kruskal-Wallis, with post-hoc Bonferroni correction, or Chi2 were used to compare groups. In the linear regression analysis, all calculations were adjusted for age at surgery and gender.

Results and Conclusions: A total of 10770 OCTRs were performed during the study period. The regression analysis showed that patients with education from upper secondary school scored on average 6 (95% CI 3-8; p<0.0001) points lower in the 12 months postoperative QuickDASH than patients who had only gone to elementary school. Patients with higher education scored on average 13 (95% CI 10-15; p<0.0001) points lower on the 12 months postoperative QuickDASH than patients who had only gone to elementary school. Patients who had employment scored on average 13 (95% CI 10-15) points lower on the 12 months postoperative QuickDASH than patients without employment (p<0.0001). Patients who were born outside of Sweden scored on average 13 (95% CI 10-16) points higher on the 12 months postoperative QuickDASH than patients who were born in Sweden (p<0.0001). Widowed patients scored on average 6 (95% CI 2-11; p=0.007) points higher in the 12 months postoperative QuickDASH than patients who were not married. Patients with higher income had lower QuickDASH scores at 12 months. Relative change in QuickDASH between 0 and 12 months postoperatively did not differ between any of the groups, except between unemployed (median 23 [IQR 9-39]) and employed (27 [14-43]; p=0.004).

We conclude that lower education levels, being a widow, low income and immigrant status are associated with more persisting symptoms 12 months after OCTR for CTS, but these factors do not affect the relative improvement in QuickDASH. However, unemployment is associated with a smaller improvement in QuickDASH scores.

Keywords:
carpal tunnel syndrome, socioeconomic factors
Late shoulder anterior release in birth brachial plexus injury sequelae. Prospective study

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Objectives / Interrogation: Among birth brachial plexus injury sequelae, the lack of external rotation is common and responsible of clairon sign, which impair the whole upper limb. The shoulder was fixed in medial rotation thanks to external rotators weakness and medial soft tissue retraction. The humeral external osteotomy with muscles transfer was usually applied, but still not achieving correction in every kind of shoulder deformities, more over with results loss through time life. In this prospective study, we aim to evaluate the functional and anatomic results of late anterior release of old child and teenager.

Methods: Our series included 8 patients (1 male and 7 females), aged from 9 to 17 y.o. with different level of plexus injury. The follow up were from 1 to 36 months. The clairon sign was constant, associated sometimes to elbow, forearm and hand impairment. All of them had daily living and clothing difficulties with lack of autonomy, eating, and hygiene. Also suffering from cosmetics, less strength, and pain, involving social live and school education.

Patients were assessed at follow up regarding life quality enhancement, daily living, clairon sign correction, mallet score, range of movement, satisfaction and radiology results.

Results and Conclusions: We had five good results and patients were improved in terms of all criteria’s, and three of them with total plexus injury sequela had mild and bad results.

Our results of late anterior shoulder release in birth plexus injury are promising, and enable us to avoid sometimes using muscles transfer and humeral osteotomy in late childhood which neglect dislocation correction.

Keywords:
Erb's palsy, birth brachial plexus injury, children, shoulder, stiffness, release.
Volumetric, cellular and genic expression modifications of FDP striated muscle following flexor tendon division in a rodent model.

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Objectives / Interrogation: Background
Repairing of divided flexor tendons with an ad integrum hand flexion function is still a challenge. Moreover, due to initial extensive lesions or misdiagnosed injuries, repairs could be delayed or need tendon reconstruction with lower functional results than acute management.
Tenotomy has been studied across a wide range of species and always results in decreased muscle mass. Apart from the rotator cuff muscles in shoulder, fiber type and fat composition, myogenic and adipogenic expressions have not been investigated about digit flexor muscle bellies following tendon division.

Objectives and interrogation
In order to explain the lower results following delayed repair or flexor tendon reconstructions, we hypothesised that flexor tendon division are linked to muscle impairment with decreased muscle mass, decreased cross sectional area of muscle fibers and increased fatty invasion.

Methods: We used a rodent as animal model. Thirty two white New Zealand rabbits have been used and shared in eight groups of 4 rabbits after approval of the local Animal Ethics Committee. A complete division of FDP tendon has been made and four time points assessment at 1, 2, 4 and 6 weeks. A control group with only a skin incision (SHAM procedure) for each time point has been assigned.
The muscle wet mass, muscle volume, adipogenic and myogenic gens expression and histology have been assessed for each group.

Results and Conclusions: The muscle wet mass and volume decreased significantly at one week, four weeks and six weeks between experimental and sham groups. We noted a highly significant increase of myogenic master genes expression at two weeks with a likely inhibition feedback afterward. Adipogenic genes expression were slightly increased within the two first weeks and down regulated thereafter.
Histologic works showed decreased cross sectional area of muscle fiber without fatty invasion. We assisted also to a switch between the overall amount of slow and fast muscle fibers with a significant increase of fast fibers.

Conclusions
Decrease of mechanical stress applied in the muscle by tendon division is related to decreased muscle mass and volume from the first week. An attempt to reverse alterations is shown by upregulation of master myogenic genes within the two first weeks and fast fiber type increase. On the other hand, no muscle fatty invasion has been noted.

Keywords:
Forearm Skin Degloving. A case report

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Objectives / Interrogation: Skin degloving is well known in hand as "ring finger" with bad prognosis. It usually leads to finger necrosis and amputation. Recently some replantation were done with mild results. We aim to report a rare case of forearm degloving, with bonne, nerves, and tendons injuries. The skin was freed from muscles in removed-glove-shape with its fascia, leaving bare muscles, from elbow to the wrist. It was caused by violent car accident and the patient was passenger in the front seat. We call the mécanisme "car-door-forearm"

Methods: The skin was cleaned, and reimplanted as skin thin graft, after removing the whole fascia we fixed the associated lesions in the same time

Results and Conclusions: At the follow up of three years and half, the graft had completely healed with good function of the whole upper limb. The range of movement was good too with good hand function in terms of grip, pinch, and strength. Our good results in this rare case are encouraging. We can propose this procedure in such cases unless the skin is not too much damaged by the crash, and the underneath muscles are good enough likes to that the origin of the ongoing graft vessels. The associated injury reparation as a whole in the same time is a requirement in such case for the sake of limb salvage, and good function as the final purpose to this surgery.

Keywords:
Degloving, graft, skin, flap, forearm
Correction of the postoperative deviation deformity in duplicated thumbs

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Objectives / Interrogation: Residual deformities are often seen in thumb duplication after reconstruction, where the axis deviation is the most common. The purpose of this study was to describe our operation for correcting the postoperative deviation deformity, and to evaluate the appearance and function outcomes.

Methods: 54 thumbs with deviation deformity in 45 patients with thumb duplication after reconstruction in other hospitals were enrolled and operated between 2014 and 2017 in our hospital. The average age at time of surgery was 13.1 years old and the average time of follow-up was 31 months. The surgical procedures included osteotomy, reconstructing the joint capsule, tightening the collateral ligament, centralizing the extensor pollicis longus tendon, repositioning the abductor pollicis brevis muscle and arthrodesis. Kirschner wire fixation was applied for 4-6 weeks and brace fixation for 3 months. The subjective evaluation was given by patients or patients' parents on both the functional and cosmetic results. The modified Tada scoring system was used for objective evaluation.

Results and Conclusions: Results: In these patients with thumb duplication, the most common type was type IV (26/54) preoperatively according to the Wassel classification, and the right thumb was more affected (36/54). The mean range of motion (ROM) for the metacarpophalangeal joint (MCPJ) was 78° and at the interphalangeal joint (IPJ) was 56°. No joint instability in the MCPJ and IPJ was found, and slight mal-alignment was observed in 4 thumbs at the MCPJ and 7 thumbs at the IPJ. 39 good (72.2%), 13 fair (24.1%) and 2 poor (3.7%) was obtained based on the modified Tada scoring system. The patients or patients' parents were satisfied with the function and appearance of the reconstructed thumbs in 49 patients (90.7%).
Conclusions: Multiple surgical techniques should be chosen and applied according to the patients individually to achieve a satisfactory appearance and good function for patients with thumb duplication with postoperative deviation deformity.

Keywords:
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Functional and aesthetic reconstruction of the digital flexion contracture with full-thickness plantar skin grafting in children

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Objectives / Interrogation: Finger burns are often seen in children, and some patients with deep hand burns are treated with split-thickness or full-thickness skin grafts. The typical split-thickness or full-thickness skin grafts leave a notably different skin texture and hyperpigmentation. The purpose of this study was to describe our operation for treating the digital flexion contracture with full-thickness plantar skin grafting, and to evaluate the appearance and function outcomes.

Methods: The hematoxylin and eosin (HE) staining, Masson trichrome staining and Melan A immunohistochemical staining was tested for palmar skin, plantar skin, groin skin and burn scar. Full-thickness plantar skin grafting was performed between 2008 and 2015 for 18 fingers in 12 hand burn patients with digital flexion contracture. The average age at time of surgery was 14 months and the average time of follow-up was 5.6 years. The subjective evaluation was given by patients' parents on both the functional and cosmetic results. Scar appearances were assessed using a Vancouver Scar Scale (VSS). The modified Tada scoring system was used for objective evaluation.

Results and Conclusions: Results: The plantar skin shared similar attribute with the palmar skin histologically. Both the plantar skin and the palmar skin did not express the Melan A. The color of the grafts became similar to adjacent tissues. The average active range of motion (ROM) for the fingers was improved from 32° to 86° in MCP, from 23° to 84° in PIP, from 42° to 77° in DIP. 10 good (83.3%), 2 fair (16.7%) and no poor was obtained based on the modified Tada scoring system. There was no hypertrophic scar on the plantar donor site. The patients' parents were satisfied with the function and appearance in 11 patients (91.7%). Average VSS score was improved from 9.62 to 2.16.

Conclusions: The full-thickness plantar skin grafting could achieve a satisfactory appearance and good function for hand burn patients with digital flexion contracture.

Keywords:
Early Outcome of AO type C2 & C3 Distal Radius Fractures Treated with Single Broad Dorsal Plate Fixation. A Case Series.

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Objectives / Interrogation: Intra-articular dorsal distal radius fractures were conventionally treated with volar plating. Recent studies described the use of dorsal plating but most often used fragment specific plates.¹ Our goal was to evaluate the early outcome of broad dorsal plating of distal radius using low-profile, titanium, fixed angle locking plate system (Acu-Loc dorsal distal radius plate, Acumed) in AO C2 and C3 types of fractures.

Methods: 7 patients with distal radius fractures AO types C2 and C3 due to motor-vehicle accidents from 2015 to 2017 were managed surgically via dorsal plating using the above plate (broad dorsal engaging both radial and intermediate columns). Patient with brain injury was excluded. All surgeries were done by a single senior hand surgeon. Pre-operative CT wrist were performed. Pre- and post-operative wrist AP and lateral X-rays were evaluated. Clinical assessment of range of movement of the wrist, grip strength, QuickDASH, Patient-rated Wrist and Hand Evaluation (PRWE) and Modified Mayo Wrist Score (MMWS) were done at 12 months post-op.

Results and Conclusions: All patients were male. Median age was 27.6 years (range 15 to 59), 3 with AO type C2 and 4 AO type C3. Mean follow up was 28.4 months. 3 patients were referred after initial wrist external fixator application for dorsal subluxation, 1 of them was an open fracture Gustilo grade 1. Mean time from trauma to plating was 20.8 days, mean from external fixation to plating was 9.7 days. Mean pre-plating radial height was 7.3mm, radial inclination 14.3°, sagittal tilt -4.7°, intra-articular step was 4.6mm. Mean post-op radial height was 11.4mm, radial inclination 19.1°, sagittal tilt 0.6°, intra-articular step was 0.5mm. 2 patients required iliac bone grafting. Mean wrist movements post-op 1 year were flexion 60°, extension 59.3°, radial deviation 27.9°, ulnar deviation 27.9°, supination 85.7°, pronation 85.7°. Mean grip strength was 89.6% of the unaffected hand, corrected according to the 10% rule. QuickDASH score was 4.5, PRWE was 13.5, MMWS was 87.5 (good). At 1 year follow-up, there was no loss of reduction, no bone graft donor site or hardware-related complication and thus none required removal of implant. Patient self-reported average return to work with similar intensity was 4.5 months, mean self-reported satisfaction on visual analogue scores (0-10) was 8.1 (Good).

We conclude that single broad dorsal plating is effective in treating AO type C2 and C3 distal radius fractures.

Keywords:
broad dorsal plate, dorsal plating, intra-articular distal radius fractures

References:
The effect of surgery for base of thumb osteoarthritis on range of dart thrower's motion at the wrist in cadavers.

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Objectives / Interrogation: Dart thrower's motion (DTM) is considered the functional plane of motion at the wrist used in most activities of daily living. DTM is the plane of oblique motion from radial extension to ulnar flexion (Moritomo et al., 2007). It occurs at the midcarpal joint, specifically at the scaphotrapeziotrapezoid (STT) joint, guided by an oblique ridge on the distal scaphoid (Moritomo et al., 2000). The articular surfaces of the scaphoid, trapezium and trapezoid bones allow the wrist the characteristic DTM plane of oblique motion (Slutsky, 2010). Surgical treatment of thumb osteoarthritis is commonly performed, but their effect on DTM is not documented in the literature. It is therefore important to assess how this plane of motion is affected by surgery, to provide patient information for better outcome. The aim of this study is to identify the range of DTM and compare it with the effects of simulated basal thumb osteoarthritis surgeries (STT joint fusion, distal pole of scaphoid excision and trapeziectomy).

Methods: Thirteen fresh-frozen cadaveric specimens were dissected and placed in a specially designed jig to measure the range of DTM.

Specialised Jig for DTM

Jig for producing and measuring DTM

Simulated STT fusion was performed on all specimens and DTM measured. Post STT fusion measurements were recorded afterwards to ensure fusion did not alter control range. Distal pole of scaphoid excision was then performed on left side specimens and trapeziectomy on right side specimens. Measurements taken for each and all results were compared using t-tests.

Results and Conclusions: Arc of dart thrower's motion averaged 117° in intact wrists. Simulated STT fusion reduced the range of DTM significantly to an average of 104° (87% of control, \(P=.00004\)). Neither distal pole of scaphoid excision (average 117°) nor trapeziectomy (average 121°) significantly altered the range of DTM.

Theories on DTM suggest that free movement occurs between the scaphoid trapezium trapezoid through range. Our results of STT joint fusion are consistent with this theory. However, DTM is not be affected by distal pole of scaphoid excision or trapeziectomy, providing better pre-operative decisions.
Keywords:
Dart thrower’s motion, thumb osteoarthritis, scaphotrapeziotrapezoid fusion, distal pole of scaphoid excision, trapeziectomy.
SARCOMA SINOVIAL OF THE HAND: DIAGNOSIS AND TREATMENT. A RARE CASE REPORT AND LITERATURE REVIEW

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Objectives / Interrogation: Soft tissue sarcoma (STS) of the hand is rare. To achieve the best possible functional and cancer-related outcomes, surgical excision must be combined with early reconstructive surgery and multidisciplinary care.

Methods: A 30-year-old man was presented complaining of painless mass over thumb finger of the right hand. At physical examination he had pulsatile pain over the thenar eminence and positive Tinel sign. Ultrasonography and MRI study showed a highly vascularized nodule. Extirpation was carried out, showing compression of the tenar motor branch of the median nerve and both collateral nerves of the thumb. Pathological anatomy (PA) and immunohistochemically proved diagnosis of synovial sarcoma grade 2 of the FNCLCC system. Local study was performed and malignant edge was observed. No malignant extension lesions were identified. Surgical block resection was performed including thenar musculature, both collaterals and ulnar collateral bundle. ALT flap of the left limb was used to covered the skin defect. PA confirmed the diagnosis of synovial sarcoma and treatment with adjuvant RT was completed. The patient had a good functional outcome and at 6 months of follow-up no local or distance recurrence is observed.

Results and Conclusions: Synovial sarcoma is one of the most misdiagnosed malignancies of soft tissues, due to slow growing pattern, benign radiological features and pain similar to traumatic pain. STS are initially diagnosed as myositis, haematoma, synovitis, bursitis and delay in diagnosis is common. There is no significant correlation between previous surgical excision and risk of local recurrence. According to Gaurish SKS et al. regional lymph node dissection is not required. Treatment involves excision with a margin of clearance (1-2 cm) followed by reconstruction. Success reconstruction is determined by stable wound coverage, preservation of health, function and sensation. Free flaps offer durable and well-vascularized tissue of sizes greater than those achievable with local or regional flaps. They can provide coverage of vital anatomical structures, as well as minimize the effects of radiation injury on these structures. Awareness of this rare tumor can hasten diagnosis, and this can increase survival. Therefore, a high index of suspicion should be kept in mind, particularly when evaluating young people. Physical examination as well as correct imagen tests, would improve the diagnosis, associated with a multidisciplinary care.

Keywords:
synovial, sarcoma, hand, diagnosis, treatment, multidisciplinary
Effect of wrist injury and treatment on the dart throwing motion

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Objectives / Interrogation: This study aims to investigate the effect of both conservatively and surgically managed wrist trauma on the dart throwing motion (DTM) and to explore any relationship between DTM and patient-rated wrist evaluation (PRWE) scores.

Methods: For this study, 21 patients with unilateral wrist trauma were recruited during their first appointment to the hand therapy clinic. Patients were categorised in three groups based on their injury and type of treatment. Each patient was asked to perform DTM using a dart-like object, including object release, with both hands. Clinical measurements, including goniometric measurements of DTM range of motion and PRWE scores, were recorded by hand therapists at each appointment. Grip strength measurements were performed if it was considered appropriate by the therapist. Wrist kinematics were measured using a nine-camera optical motion capture system and a robust regression analysis was used to define the DTM plane orientation. All measurements were repeated on ten patients during a follow-up appointment, once they were discharged from the clinic. Wilcoxon signed-rank tests were used to assess all differences.

Results and Conclusions: Regardless of the type of the injury, all patients were able to perform DTM. Significant differences were found in the range of motion along DTM between the injured and the healthy hand at the start of the therapy (p=0.001). At the time of discharge, no differences were observed between the two hands (p>0.5). No significant differences were found in the DTM plane orientation between the injured and the healthy hand at early stages of the rehabilitation (p>0.8). The PRWE scores presented significant differences at the two stages of the therapy (p=0.008). A correlation was defined between the PRWE scores and the product of the range of motion along DTM and the grip strength measurements. These findings suggest that although wrist injury has a significant effect on the range of motion of the wrist, the orientation of the DTM plane is not affected equally. The correlation of patient-rated scores with objective functional measures, such as the range of motion along DTM and the grip strength, can further confirm their validity and improve our understanding of the underlying factors affecting these questionnaires.

Keywords:
dart throwing motion, wrist
EXTRAVASATION OF RADIOGRAPHIC CONTRAST MATERIAL IN THE HAND: CASE REPORT AND LITERATURE REVIEW

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Objectives / Interrogation: Contrast extravasation is a known but rare complication of imaging test. Various studies consider the rate of extravasation during CT in figures ranging from 0.03%-0.17%

Methods: A 73-year-old man was programmed for another contrast tomography scan to monitor his portal hypertension disease. At the start of the contrast injection, the patient experienced swelling and pain in the hand. No contrast was visible in the thoraco-abdominal images. Local ice and analgesic treatment was recommended. 4 hours after the scan, given increasing pain and swelling of the hand, the patient presented at the emergency department. Physical examination showed tense and swollen hand, with blisters and no loss of sensation. Capillary refill was normal and pain not increased with passive movements. No signs of compartment syndrome were present. We considered conservative approach measures as our first option. Ice, elevation of the forearm, intravenous administration of corticosteroids, analgesic treatment and empiric antibiotic with amoxicillin/clavulanic acid. Evacuation of the multiples blisters at dorsal and volar aspect of the hand and the forearm was carried out. After 24 hours, the symptoms and physical examination improved. Swelling and pain had significantly decreased. There were no new blisters. Two days after, his hand recovered the normal aspect and full active mobilisation of the hand commenced and the patient suffered no long-term sequelae.

Results and Conclusions: There is no general agreement regarding the best approach for the management of extravasation. Elevation of the limb is often useful to reduce edema and cooling the injection site with ice packs is useful in limiting inflammation. The injection of hyaluronidase has also been recommended for patients with large extravasation volumes. Corticosteroids, vasodilators, and other drugs have also been proposed, but most studies have not shown its efficacy. Review of the literature reveals that extravasations of non-ionic contrast of up to 150 ml can be managed conservatively without long-term sequelae. Surgical drainage or liposuction within 6h can be effective, and saline washout as originally describe by Gaul has been shown to be helpful. Urgent surgical drainage and aspiration has been effective when a compartment syndrome has occurred.

Early identification and appropriate management are essential when extravasated volume is large and the clinical signs and symptoms suggest severe injury including compartment syndrome and soft tissue necrosis.

Keywords:
extravasation, contrast, hand, injury, treatment, review
ZASH: The Zurich appearance score for hands. A validated instrument to assess appearance of hands with and without malformations. Preliminary results

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Objectives / Interrogation: Surgical corrections of hand malformations modify function and appearance, with the latter often being the main indication for surgery. Outcome measurements must therefore include quantitative assessment of hand appearance with patient and parent related outcomes (PRO) to appreciate the effectiveness of therapy. The aim of this study was to develop and validate an instrument for assessing hand appearance in children with hand malformations.

Methods: An instrument, called the Zurich Appearance Score for Hands (ZASH), was developed based on previous literature and expert meetings. It is the sum score of 5 questions with items regarding overall appearance, skin and scarring, proportions, number of digits and distortion of fingers. Items were rated on a 5-point-Likert scale ranging from 'not good at all' to 'very good' and added to a sum score. 3D photorealistic images of 18 hands with and without hand malformations were developed with Maxon Cinema 4D for validation of the instrument. Three standard views of each hand, including the palm, the back of the hand and a lateral view, were embedded in the questionnaire and presented to participants on a tablet computer. Up to now, these images have been rated by 267 healthy lay persons (14-78 years).

Results and Conclusions: The ZASH had good internal consistency (alpha=0.69) and was most strongly correlated with "overall impression", followed by "skin and scarring", "number of fingers", "distortion of fingers" and "proportion of individual parts". Furthermore, statistical analysis of the ZASH revealed good interrater reliability (intraclass correlation 0.59 to 0.76) and good stability over 2-4 weeks (mean r = 0.47). No gender effects were found, while age effects were present, with older participants rating the appearance of hands more favorable than younger participants.

Conclusions:
The ZASH is the first validated instrument for quantitatively assessing hand appearance. It is suitable for parents and proxies to assess children's hands and as a PRO for older patients with congenital malformations. Further testing among age groups and professionals is ongoing to finalize the instrument.
The ZASH has the potential to be useful to assess the appearance of adult hands with other conditions as well. However, specific validation for these conditions must be performed before it can be recommended more universally.

Keywords:
Hand, appearance, score, assessment, patient related outcome, malformation, outcome
COMBINED IPSILATERAL FRACTURE OF DISTAL RADIUS AND SCAPHOID TREATED WITH LOCKING PLATES. WHEN IS IT NECESSARY? CASE REPORT AND LITERATURE REVIEW

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Objectives / Interrogation: Ipsilateral fractures of the distal radius and scaphoid are rare, approximately 0.7 to 4% of all upper extremity fractures, with few reports described. Headless screw fixation is the current gold standard of surgical repair for scaphoid fractures. However, maintaining reduction of certain types of scaphoid fractures is challenging with a compression screw.

Methods: 44-year-old woman arrived into our hospital due to precipitation of second floor. Radiographs showed pelvic fracture and closed left distal radius fracture (type A3 of AO classification) and left scaphoid fracture (type B2 of the Hebert classification). After stabilization of the patient and performed the first damage control; definitive surgery was performed 5 days later. Open reduction and internal fixation of radius fracture was performed with an Aptus plate. Initially, percutaneous reduction of the scaphoid fracture was attempted with percutaneous screw, but stabilization was not achieved due to poor bone quality. Intraoperative radiographs showed comminution and third fracture fragment, so volar approach and open reduction and internal fixation reduction with AptusHand was performed. After a rehabilitation program, excellent functional result was achieved, with a joint balance of supination/pronation 80º-85º, radial/ulnar inclination 25º-30º, full fist closure and 6mm sensibility discrimination in all fingers. No pseudoartrosis was observed.

Results and Conclusions: Recent series, reintroduced volar plating as a valid fixation option in a small subset of scaphoid fractures. Plate fixation may offer superior fixation, particularly those with comminution, nonunion, segmental bony defects, and osteopenic or osteoporotic bone. CT scan could by necessary in this type of radius associated with scaphoid fracture because of usually result of high-energy mechanisms and radiographs cannot see the comminution, specially on scaphoid bone. Goodwin J et al. reported this year that there were no differences in load to failure between fixation methods In simulated osteoporotic bone, the locking plate had a 28% greater load to failure as compared with screw fixation.

Consideration of bone quality is also important when choosing a method of fixation. In cases of comminution scaphoid fractures, locking plate fixation is better to achieved a good anatomic reduction and stabilization of the fracture with excellent functional outcomes.

Keywords:
Scaphoid, fracture, volar, plate, fixation
DISTAL RADIUS FRACTURE NONUNION: SERIES OF COMPLICATIONS IN A CASE REPORT

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Objectives / Interrogation: Distal radius fracture nonunion is uncommon, occurring in less than 1% of fractures. Healing problems in the distal radius seem to be related to unstable situations, such as concomitant fracture of the ulna, and to an inadequate period of immobilization.

Methods: A 60-years old female was presented into our department with a distal radius fracture (23-A2 of OTA classification) of her right wrist. According to the characteristics of the fracture cast immobilization was applied. After removed it, she complained about pain at pronosupination movement and physical examination revealed pain at the triangular fibrocartilage complex (TFCC). 3 months later, NMR showed no signs of consolidation of distal radius fracture and a rupture of fibrocartilage type 1B of Palmer classification. We performed a correction osteotomy of the distal radius length. In addition, arthroscopy was performed showing normal status of TFCC. Rehabilitation program was completed, and she complained about persistent pain at distal radioulnar joint (DRUJ). We decided to perform a shortening osteotomy of the distal ulna by an acquired ulnar impaction, 1 month later, radiographs showed a rupture of the osteosynthesis plate and screws. CT scan confirmed the diagnosis of non-union. Osteosynthesis plate was removed and curettage, bone graft substitute and new osteosynthesis with longer plate was performed. 8 months later, CT scan showed complete consolidation of ulna osteotomy but no signs of union at radius. Ulna plate was removed and debridement of the focus fracture with autologous iliac cancellous bone graft was performed, 8 months later, the patient achieve good functional outcome and no pain was documented.

Results and Conclusions: Nonunion should be suspected if there is continuing pain after immobilization in combination with a progressing deformity. The low incidence of distal radius nonunion can be attributed to many factors, including impact of the fracture fragments, their location in the metaphyseal bone, and the fact that they typically result from low-energy falls, indicating less soft-tissue disruption. The main surgical procedure for nonunion distal radius is open reduction, freshening of nonunion, iliac crest bone grafting to achieve as much radius length as possible and stable internal fixation using a plate construct.

Non-union of distal radius fracture is rare. Carefully planned open reduction and fixation can help to achieve rapid bone union with satisfactory functional outcome.

Keywords: nonunion, radius, fracture, complications
ACTUALIZATION RESULTS OF OUR PROSPECTIVE STUDY WITH COLLAGENASE CLOSTRIDIUM HISTOLYTICUM: SERIE OF 100 CASES, 5 YEARS FOLLOW-UP

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Objectives / Interrogation: Collagenase injection is a non-surgical option for Dupuytren disease. We ought to analyse the results in our prospective serie of cases at 5 years of follow-up.

Methods: Prospective study collected data was performed from the first 100 CCH injections performed at our institution since 2012. Statistical analysis was made for 18 variables. We'll focuse specially in the recurrence rate and necessity of a new infiltration or surgery. Recurrence was defined as the apparition of a palpable cord with retraction greater than 20º

Results and Conclusions: 89% male, with a mean-age of 64'27. 94% right-handed. Fifth finger was affected in 47%, fourth 27%, both 11% and others 15%. MCP were the most injected joints, 79% of cases, followed by PIP 18%. Complete extension was achieved in the 83'54% of cases (86% of MCP joints and 56% of PIP joints), incomplete extension in 12'66%, and in 3'8% of cases there was no extension. There were statistical significant differences (p= 0,008) between treated joints and extension achieved. Nor statistical significant differences (p=0'462) were found between treated finger and extension achieved, neither between treated joint and complications rate (p; 0'248). In total the rate of recurrences was 16%; 1% at 6 months, 5% at 1 year, 4% at 2 years, 3% at 3 years, 1% at 4 years and 2% at 5 years' follow-up. Recurrence affected the Fifth finger in 75% of cases. In 43,75% of cases, PIP were the affected site, MCP joints in 18,75% and combination of both in the rest of the cases. PIP joint mean recurrence degrees was 42,3º, and 40,5º at MCP. Treatment after recurrence consisted in open surgery procedure for 31,25% of the cases, new collagenase injection for 31,25% and no procedure in other cases.

CCH is effective in the treatment of Dupuytren MCP and PIP joint contractures, in mid-term follow-up. Most studies are short term and there are few data on recurrence, however, recurrence PIP rate are high and we should consider this at long follow-up because the advantage of initial lower cost and quick recovery of CCH comparing to surgery might be dud if those patients need another infiltration or surgery.

Keywords: Collagenase, injection, dupuytren, treatment, results
Treatment of Bennett Fractures with Tension Band Wiring Technique through a Small Incision in 32 Patients

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Objectives / Interrogation: Objective: To introduce a tension band wiring technique for the treatment of Bennett fractures through a small incision, which allows early motion of the first carpometacarpal joint.

Methods: From January 2015 to May 2017, 32 Bennett fractures in 32 patients were treated with open tension band wiring. The mean age of the patients was 34 years (range, 20 to 52 years). There were 30 male and 2 female patients. There were 31 dominant hands and 1 nondominant hand. The mean time between the injury and operation was 7 days. The average joint surface involvement was 41%. All injuries were associated with carpometacarpal joint subluxation. We prefer a small dorsal incision 0.5 cm in length. The volar fragment was fixed to the first metacarpal with tension band wiring. Joint motion was started 2 days after surgery. At the final follow-up, motion of the thumbs and pinch and grip strength of the hands were assessed.

Results and Conclusions: Results: No fixation failure was noted. Radiographic fracture healing was attained in all patients at an average period of 4 weeks. Patient follow-up lasted 26 months (rang, 24 to 29 months). At the final follow-up, the mean extension-flexion arc of the first carpometacarpal joint was 46° (range, 39° to 52°). The mean thumb abduction was 85° (range, 75° to 93°) and mean pinch and grip strength of the injured hands were 7.2 kg (range, 4.6 kg to 9.3 kg) and 47 kg (range, 32 kg to 52 kg), respectively. The measurements were similar to those on the opposite side. There were no significant differences between two groups regarding the extension-flexion arc of the first carpometacarpal joint and grip strength (p > 0.05). The two groups were similar regarding thumb abduction and pinch strength (p > 0.05).

Conclusions: Open tension band wiring through a small incision is a minimally invasive technique that is reliable and presents another fixation option for the treatment of Bennett fractures.

Keywords:
Bennett fractures; tension band wiring; technique.
Reconstruction of a Nail Unit Using a Free Composite Flap Harvested from the Great Toe with Nerve Repair in 25 patients

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Objectives / Interrogation: Objective: To introduce reconstruction of a nail unit defect in the finger using a free composite flap taken from the great toe, including neurorrhaphy between the dorsal digital nerve of the great toe and the dorsal branch of the proper digital nerve of the injured finger.

Methods: Methods: From May 2015 to May 2017, 25 fingers in 25 patients with traumatic nail unit defects were treated. The mean size of the germinal matrix and sterile matrix defects was 6 mm × 8 mm (range, 4 mm × 6 mm to 7 mm × 10 mm), and the mean size of the nail bed flaps was 7 × 9 mm (range, 5 mm × 7 mm to 8 mm × 11 mm). The mean length of the arteries that the flap based was 2.4 cm (range, 1.9 cm to 3.1 cm). For comparison, we also collected 21 patients without nerve repair from January 2012 to January 2015. Outcomes were rated using the Zook et al.'s method. In the study group, full flap survival was achieved in all patients.

Results and Conclusions: Results: At the mean follow-up period of 28 months (range, 24 to 31 months), there were 15 excellent, 6 very good, 4 good results. In the comparison group without nerve repair, there were 7 excellent, 3 very good, 2 good, 6 fair, and 3 poor results. Donor site morbidities were similar in both groups.

Conclusions: The use of a free composite flap taken from the great toe is a useful technique for reconstructing nail unit defects in the finger, and no obvious donor site morbidity exists with the use of the dorsal branch of the proper digital nerve.

Keywords:
Nail unit; free composite flap; great toe; nerve repair.
Do national randomised controlled trials change international clinical practice?

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Objectives / Interrogation: The Distal Radius Acute Fracture Fixation Trial (DRAFFT) was a randomised controlled trial performed in the United Kingdom (UK). The authors concluded that there was no difference between locking plate versus Kirschner-wire (k-wire) fixation in fractures of the distal radius. This trial had a significant impact on clinical practice in the UK. The number of patients in treated with plate fixation fell from 75% to 48% before and after publication of the trial. The number of patients treated with k-wire fixation rose from 12% to 42%.

Our aim was to assess whether DRAFFT affected clinical practice in Ireland.

Methods: Data was obtained from the Hospital Inpatient Enquiry system (HIPE). It was grouped into annual intervals from 2012 until 2017. All in-patient episodes involving emergency surgery for fractures of the distal radius were included.

Results and Conclusions: In 2012, before publication of DRAFFT, 38% of patients in Ireland were treated with plate fixation versus 49% with k-wire fixation. In 2017, after publication of DRAFFT, the proportion of patients who underwent plate fixation rose to 62% with a concurrent fall in the number who underwent k-wire fixation to 30%.

It appears that surgeons in Ireland do not change their practice in response to randomised controlled trials performed in the UK. National randomised controlled trials performed in the UK have a significant impact on practice in the UK, however they do not appear to influence practice in similar international populations.

Keywords: clinical trial, change in practice, distal radius
The effects of porcine extracellular matrix nerve wrap as an adjunct to primary epineurial repair

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Objectives / Interrogation: The use of nerve wraps has been advocated as a means of protecting and isolating the neurorrhapy site; however, there is a paucity of data to support their use. The most commonly used commercially-available nerve wrap is an extracellular matrix (ECM) membrane derived from porcine small intestine submucosa (AxoGen, Alachua, FL). The purpose of this study is to characterize the effects of using this wrap as an adjunct to primary epineural repair.

Methods: Lewis rats were randomized to undergo median nerve transection and epineural suture repair, either with or without the use of a wrap around the coaptation site (n=10 per group). Animals were sacrificed at five weeks for quantitative histologic analysis of intraneural scar formation and inflammatory cell infiltration at the repair site, as well as distal axonal regeneration and neuromuscular junction reinnervation. These groups were repeated with a 15-week endpoint to allow for weekly assessments of functional recovery with grip strength testing.

Results and Conclusions: The wrapped group demonstrated significantly less intraneural collagen deposition at the coaptation site at five weeks (Figure 1, p=0.01). There were no statistically significant differences for inflammatory-cell density, number of regenerating axons, or percent reinnervation of neuromuscular junctions at either endpoint. Initial functional recovery was observed earlier in the wrapped group than the unwrapped group (5 weeks vs. 6 weeks, p=0.090); at the 15-week endpoint, there was no statistically significant difference between wrapped and unwrapped grip strength (1.29±0.12N vs. 1.06±0.10N, p=0.17). No deleterious effects were observed with use of the wrap.

Figure 1. (A) Intraneurial collagen content; * denotes significances. Representative images of coaptation sites stained with picrosirus red for unwrapped (B) and wrapped (C) repairs.

The use of the porcine ECM nerve wrap as an adjunct to primary epineural repair is safe and effective in reducing the rate of intraneural collagen deposition at the neurorrhapy site. Potential trends towards modest improvement in inflammatory cellular infiltration, motor reinnervation and functional recovery were noted that did not reach statistical significance.

Keywords:
Nerve repair, nerve wrap, neurorrhapy
Sonoelastography in carpal tunnel syndrome diagnosis: A Systematic Review of diagnostic value

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Objectives / Interrogation: Sonoelastogram (SEL) has been widely used in many aspects, including musculoskeletal and vascular application. Its biomechanical properties could somehow reflect the degree the pathophysiology of the breast, liver and musculoskeletal disorder. Sonoelastogram has been used to diagnose the carpal tunnel syndrome (CTS). However, the current criteria for CTS diagnosis was diverse. The authors reviewed the literature and provide extratable of the specific value on diagnosis by using sonoelastogram in CTS patients.

Methods: A literature review was performed using MEDLINE (PubMed), EMBASE, and the Cochrane Collaboration Library for primary research articles on sonoelastogram and carpal tunnel syndrome as the key word. The inclusion criteria were primary journal articles examining CTS by using sonoelastogram based on any modality. Data related to diagnostic value, cross section area and cutoff value were extracted. Bias assessment was performed.

Results and Conclusions: A total of 59 publications were reviewed. Fourteen primary case series were selected for full analysis with 2 diagnose with acoustic radiation force impulse (ARFI) with the cutoff value of 3.25 and 3.0 m/s for diagnosing the CTS. Three diagnose with mean shear modulus (kPa), ranged from 38.25 to 70 kPa. Eight articles with strain ratio (SR) between the median nerve and nearby tissue for CTS diagnosis were reviewed revealed diverse results due to different reference points. The other one diagnostic tool was discussed with pixel value on SEL. Sonoelastogram was a useful tool to diagnose carpal tunnel syndrome. It can itself reflect not only the condition of soft tissue scarring, but also specific diagnostic value for CTS in reflection of median nerve stiffness. From our review, SEL provides a non-invasive and reliable modality for CTS evaluation.

Keywords:
Sonoelastogram; Carpal tunnel syndrome; Diagnosis
Pyrocarbon Interposition with PyroDisk Implant for Trapeziometacarpal Osteoarthritis: A Ten-Year Follow-Up study

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Objectives / Interrogation: The aim of the study was to report outcomes after around 10 years following pyrocarbon interposition (PyroDisk) trapeziometacarpal joint implant with partial trapeziectomy for carpometacarpal osteoarthritis of the thumb in a single center.

Methods: We retrospectively reviewed the longterm clinical and radiological outcomes of 16 patients who had a pyrocarbon interposition implant (PyroDisk; Integra Life Sciences, Plainsboro, NJ) arthroplasty, with partial trapeziectomy. The rate and causes of repeat surgeries, and complications were examined.

Results and Conclusions: Results: The mean follow-up period was 115 months. Patient satisfaction was high. The mobility of the operated thumb was restored to a range of motion comparable to the contralateral thumb. Grip strength was improved. Overall function, according to the Quick DASH and PWRE scores, showed a good improvement. Pain decreased in all cases according to the numerical rating scale. Radiological evaluation revealed no progression of the periprosthetic lucency of the implant after 2 years in 11 of 16 patients. Progression of lucency did not predict implant loosening or failure at 10 years. Scaphotrapeziotrapezoid joint was preserved in all cases. No patient had symptomatic instability that required revision. No dislocations occurred. The 10-year survival of the prosthesis was 100%, but only 8 patients (50%) have forgotten their thumb.

Conclusions: The PyroDisk implant for treating advanced trapeziometacarpal arthritis did not demonstrate superiority over published outcome data of other prosthesis or total trapeziectomy with or without ligament reconstruction and tendon interposition. Indeed, the perceived expectation of these procedures is to be able to achieve the "forgotten thumb". However, in several particular cases, like nickel allergy for example, Pyrodisk can be still proposed.

Keywords:
PyroDisk implant; pyrolytic carbon; trapeziometacarpal arthritis; trapeziometacarpal arthroplasty
Proximal Interphalangeal Joint Adipofascial Flap (PIPJAF) Resurfacing Improves the Active Motion of the Proximal Interphalangeal Joint after Contracture Release

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Objectives / Interrogation: Post-traumatic proximal interphalangeal joint (PIP) contracture of the digit is common and is associated with impaired function of the hand. After surgical release of PIP contractures, relapse often occurs. We performed a novel treatment strategy with a PIPJ adipofascial flap (PIPJAF) to resurface the PIPJ after release. This study examines 2 groups of patients with similar joint contracture release where one group is resurfaced with a flap and the other without.

Methods: During January 2010 to January 2018, 10 patients received single-digit PIPJ flexion contracture release and PIPJAF resurfacing whereas 20 patients received a stepwise release as a control group. A total of 30 joints were compared and the degree of extension lag improvement over time was measured during over an average of 292.4 days.

Results and Conclusions: In the PIPJAF group, greater extension lag improvement was observed compared to control group (37.0±19.2 vs. 21.0±19.5, p=0.055). The ratio of improvement was also significantly higher in the PIPJAF group (0.79±0.26 vs. 0.49±0.46, p=0.049). PIPJAF group appeared to have beneficial effect (p=0.042) while following number of operations, associated fractures and maximum VAS scores one week postoperatively were negatively associated in univariate analysis (p<0.05). From generalized estimating modelling, PIPJAF resurfacing has a significantly positive effect on extensor lag improvement along with time ($###$=2.235, p=0.04). Patients that receive PIPJAF resurfacing following PIPJ contracture release may have a better result in improving extensor lag and maintaining it. Recovery of the PIPJ motion may be quicker as well compared to conventional release alone.

Keywords:
Joint contracture; Capsulotomy; Adipofascial flap; Flexion contracture; Extension lag
IGF-1 Nanoparticles to Ameliorate Effects of Chronic Denervation Following Peripheral Nerve Injury

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Objectives / Interrogation: Insulin-like growth factor 1 (IGF-1) is a potent mitogen with well-described trophic and anti-apoptotic effects on neurons, myocytes, and Schwann cells (SC). Local delivery of IGF-1 is limited by its short-half life. The aims of this study are to (1) encapsulate IGF-1 into biodegradable nanoparticles (NP) that stabilize IGF-1 in its bioactive state and enable sustained release at target tissue sites; and (2) assess the efficacy of locally delivered IGF-1 NPs in augmenting axonal regeneration while also reducing denervation-induced muscle and SC atrophy to thereby improve functional recovery following nerve injury.

Methods: (1) NP Fabrication: IGF-1 was first complexed with dextran sulfate to create hydrophobic ionic paired (HIP) complexes, which were then encapsulated in biodegradable PGLA NPs. Varying ratios of HIP:polymer were evaluated to maximize loading efficiency and release kinetics. In vitro NP release kinetics were evaluated and mitogenic activity of released IGF-1 was compared to native IGF-1. (2) The effects of locally-delivered IGF-1 NPs on denervated muscle and Schwann cells were assessed in a rat median nerve transection-without-repair model. The effects of IGF-1 NPs on axonal regeneration, muscle atrophy and reinnervation, and recovery of forepaw function were assessed in a model in which chronic denervation is induced prior to nerve repair; functional recovery was assessed weekly with stimulated grip strength testing prior to sacrifice at 15 weeks.

Results and Conclusions: (1) Fabrication of uniform NPs with an encapsulation efficiency of 83.2% was achieved. 1:5 PEG5k-PCL40k formulation yielded optimal release of IGF-1. Near-zero-order release of IGF-1 can be achieved for at least 70 days, and released IGF-1 exhibits comparable bioactivity to native IGF-1. (2) IGF-1 treated animals recovered significantly more forceful grip strength compared to negative controls (Fig. 1). IGF-1 NP treatment limits muscle atrophy during periods of denervation compared to negative controls (620 vs. 340um2; p <0.05) and enhances neuromuscular junction reinnervation (41 vs. 27%, p <0.05).

Figure 2: Animals undergoing chronic denervation (CD) with IGF-1 nanoparticle therapy (red) demonstrate more robust recovery of grip strength compared to untreated negative controls (blue). * denotes p<0.05.
Keywords:  
-
FIFTH FINGER COMMINUTED SPIRAL FRACTURE IN HORSE RIDERS RELATED TO REIN HOLD TECHNIQUE

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Objectives / Interrogation: Horse riding is a highly dangerous sport. The athlete's partner is an unpredictable and independent animal over 600 Kg and 2,7 m that can reach 60Km/h. Some studies discuss whether riding horses may be riskier than a motorcycle.

The most common mechanisms of injuries are falling from the horse. From all the injuries, upper limbs seems to be the one with higher prevalence.

The riders usually wear helmet for head protection and boots and specially designed trousers for lower limb protection, while the upper body and limbs remains unprotected. The gloves protect from attritional damage, but they are not useful for rotational finger injury caused by the reins.

The horse riders usually grip the rein in their first and forth interdigital commissural space, leaving the fifth digit out. In the event of twist or a fall, like after a runout, the rider can easily release the rein from the first commissure, but opening up the forth space isn't as easy, and the rein may wrap around the small finger rotating it.

The aim of this study is to report a series of fifth finger fracture in horse riders.

Methods: We retrospective reviewed 204 cases of hand injury in a single center among horse riders from 1994 to 2018. We evaluated epidemiologic data and the pattern of injury.

Results and Conclusions: There was a male: female rate of 18.25, the mean age was 26.3 (S.D 13.4) years old. The non-dominant hand presented most lesions 57.8%.

Of all injuries 73 (35.7%) were fractures and 21 (28.76%) affected the fifth ray. There were 12 metacarpal, 6 proximal phalanx and 3 middle phalanx fractures.

We would like to call attention to this particular injury - fifth finger's comminuted rotational fracture - related to rein holding technique in horse riding

Keywords:
HORSE RIDING, HAND FRACTURE
EXTERNAL FIXATOR WITH DISTRACTOR FOR TREATMENT OF THE RETRACTION IN FLEXION OF FINGERS

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Objectives / Interrogation: Skin retraction at palmar 2 zone level fingers may happen sometimes in case of injury, burn or infection, when it needs surgical treatment for flexion deformity more than 45 grade. There are any methods to treat it, as zetaplasty, skin flat, expansor, skin autograft, Ilizarov method. That our technic, with external distractor, can be used to treatment at various types of finger flexion contracture. As well as first treatment for botoniere deformity and dupuytren contracture. That technic is very easy, may be used with local anesthesia, by day clinic.

Objectives
To describe a serial of patients with retraction in flexion finger, by any reasons, treated by progressive stretch using a mini external fixator as a Hoffa.

Methods: 50 patients were operated from january 2000 to december 2017, 36 male and 14 female, with middle age of 28 years-old, between 15 and 42 years-old. 04 cases in thumb, 16 cases in 2º finger (QD), 08 in 3º QD, 08 in 4º QD and 14 in 5º QD. The patient, after asepsis, receives a local anesthesia for the finger flexioned. So two pins are putting with a Hoffa fixator articulated with distractor. One pin, perpendicularly, in each side of joint. Hangs the screws for block the pins and gives the tool for the patient or parent that will turn, on clockwise, the principal axis to correct the deformity, by progressive strech of 01 mm per day (one complete turn). After the total correction, the patient goes back to the clinic for withdraw the pins and fixator. So the patients were available by total active motion (TAM) and satisfaction.

Results and Conclusions: Results
We had 100% of correction, with TAM recuperated for all patients. About the method, 80% patients are pleased. 10 patients complained about the delay, middle time of 36 days. Had 02 cases with recidive in 5º QD, but retreated with a total correction.

Discussion
That Hoffa fixator is better to use in the thumb, second and fifth finger. In the third and fourth fingers, the interdigital space is more difficult to apply it.
Years ago, an american company produced a model circular very narrow, but they abandoned it, I don't know why. Actually we can use anothers fixators more narrow, as Miniflo.

Conclusions
We conclude that it is a good alternative for treatment of the retraction in flexion of fingers, But to keep the protocol is indispensable, With a attentive and cooperative patient.

Keywords:
RETRACTION, FINGER, EXTERNAL FIXATOR
HAND IN STREET ART AROUND THE WORLD

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Objectives / Interrogation: Since the beginning of human civilization, under the Caveman era, the man had a necessity to represent the human figure, drawing it on the cave, and the hand was always an important part, due to its function as our first tool, for hunting, fighting and daily life activities.

In urban centers, a creative phenomenon is taking place, alongside to buildings and traffic, a personal expression of the modern human condition in the form of works of art on the street (Street Art), is available for everyone to see.

Nowadays, hand keeps present in the art in general; and drawing hand is known to be one of the most difficult forms our body.

In urban centers, a creative phenomenon is taking place, alongside to buildings and traffic, a personal expression of the modern human condition in the form of works of art on the street (Street Art), is available for everyone to see.

Methods: The author, a Hand Surgeon presents photographs of street art, whose theme is hand, around the world, taken by him, with his camera, during bike rides.

Results and Conclusions: We present 50 photographs of street art taken in several cities around the World like Berlin, London, Miami, New York, Paris, Sao Paulo.
The beauty and importance of a hand are expressed in the streets by many artists around the world, sometimes we pass in a hurry, by car and don't notice it. The author passionate by hands wanted to share with other hand surgeons his experience discovering hand in art in our big metropolis.

Keywords:
STREET ART, HAND, PHOTOGRAPHY
Variation Amongst Pediatric Orthopedic Surgeons in the Use of Pre-operative Antibiotics in Percutaneous Pinning Procedures of the Upper Extremity

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Objectives / Interrogation: Pre-operative antibiotics use in percutaneous pinning procedures of the upper extremity is commonly prescribed by many orthopedic surgeons. However, the use of the antibiotics may not be necessary given the low infection rates associated with these procedures. Numerous studies have investigated the need for pre-operative antibiotics in soft-tissue procedures of the upper extremity and found that they did not reduce the overall infection rate. The purpose of this study was to determine the patterns and variation among pediatric orthopedic surgeons in pre-operative antibiotic prescribing practices when performing percutaneous pinning procedures of the upper extremity.

Methods: A survey was sent to all members of the Pediatric Orthopedic Society of North America to assess the current practices and surgeon's thoughts regarding pre-operative antibiotics use for percutaneous pinning procedures of the upper extremity based on location of the procedure. Simple statistics were utilized to analyze the data.

Results and Conclusions: Two hundred ninety-seven surgeons responded to the survey, only 34% reported that their institution had protocols in place to routinely receive pre-operative antibiotics for percutaneous pinning procedures of the upper extremity. Eighty-one percent of surgeons described that they routinely provide antibiotics for all percutaneous pinning procedures of the upper extremity. However, only 60% of surgeons felt that patients undergoing percutaneous pinning procedures of the upper extremity must receive pre-operative antibiotics. When assessing individual joint procedures, 81% of surgeons felt that shoulder procedures required pre-operative antibiotics, 70% of surgeons felt that elbow procedures required pre-operative antibiotics, 66% of surgeons felt that wrist procedures required pre-operative antibiotics, and 62% of surgeons felt that hand/finger procedures required pre-operative antibiotics.

Currently, the majority of institutions do not have protocols for the use of pre-operative antibiotics in percutaneous pinning procedures of the upper extremity. The vast majority of pediatric orthopaedic surgeons (80%) routinely prescribe antibiotics for percutaneous pinning procedures of the upper extremity despite the fact that 40% of surgeons felt that antibiotics were not necessary for all procedures. As the percutaneous pinning procedure is performed more distally on the upper extremity, less surgeons feel pre-operative antibiotics are necessary.

Keywords: pre-operative; antibiotics; percutaneous pinning; pediatrics
Analysis of BSSH UK Hand Registry shows no difference in outcomes between simple trapeziectomy and trapeziectomy plus LRTI

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Objectives / Interrogation: Surgery for thumb base osteoarthritis (TBOA) is common. It is one of the domains recorded by the UK Hand Registry (UKHR). The aim of this study was to analyse the TBOA registry data to assess the impact of surgical procedure type on patient reported outcome measures (PROMs) and EQ5D.

Methods: The UK Hand Registry (UKHR, formerly called the BSSH Audit Database) prospectively collects data from patients undergoing hand surgery as part of an approved national quality assurance process. This study involved secondary analysis of fully anonymised data from inception of the registry. Exemption from ethical approval was confirmed by University of Oxford Clinical Trials and Research Governance prospectively. Prospectively collected data from patients undergoing TBOA surgery were analysed from February 2012 to January 2018 inclusive. Outcomes were evaluated using EQ5D index and Patient Evaluation Measure part 2 (PEM) outcome measures at baseline, three, six and 12 months post-operatively. Regression analyses were conducted with procedure type, age and gender as factors.

Results and Conclusions: A total of 1456 TBOA procedures were added during the study period. Most were simple trapeziectomy (51%) or trapeziectomy plus ligament reconstruction and tendon interposition (LRTI) (45%). Other procedures were excluded from our analysis. There was no statistical difference between the demographics (age, gender) or baseline PROMs (EQ5D; Patient Evaluation Measure, PEM) for the two groups. The mean age was 65 years (SD 9); 78% of the population was female.

There was a significant improvement in EQ5D index and PEM for each postoperative time point up to 12 months for both groups. However, there was no significant difference between the two groups at any time point.

Regression analysis showed gender to be a significant contributing factor to outcome. Male patients had less improvement following surgery at each time point.

This study showed surgery for TBOA significantly improved patient outcomes. Our findings support previous studies suggesting no difference in outcomes between the two most common surgical procedures.

Keywords:
osteoarthritis, thumb, carpometacarpal, trapeziectomy
Distal radius fractures: is rotation an important factor in fixation?

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Objectives / Interrogation: Hypothesis: the distal fracture fragment in distal radius (wrist) fractures very commonly rotates as well as shortens and angulates.
Aim: To assess the frequency and degree of rotation of the distal fracture fragment on CT scans.

Methods: Retrospective radiological assessment of 85 CT scans of the distal radius: 35 following a fracture and 50 normal radii. A simple method for measuring rotation of the distal radius relative to the diaphysis using routine CT scans was developed and applied. Mann-Whitney analysis was used to identify differences in radial rotation between fractures and controls. Intra- and interobserver reliability were analysed using intraclass correlation coefficients and Bland-Altman plots.

Results and Conclusions: The distal fracture fragment could rotate into pronation or supination relative to the diaphysis, both normally and following a fracture. The median radial rotation angle was -1° (pronation, range -15°-4°) in the control group compared to -3° (pronation, range -24°-31°) in the fracture group. The absolute rotation angle was significantly greater in the fracture group (median 10°, range 0-31° vs to 3°, range 0-15°; U = 291.50, Z= -5.21, p < 0.001) and outside the "normal range" of this study in 26 cases indicating that at least 75% had rotated appreciably following injury.
Both intra and interobserver reliability was very good with intraclass correlation coefficients of 0.99 and 0.98 respectively.

Malrotation of the distal radius is common following a distal radius fracture. Malrotation of the distal fracture fragment has been shown to affect DRUJ function. Despite this rotational deformity is often overlooked in clinical practice. The simplified method described in this study is both easy to use in routine clinical practice and reliable. Measuring radial rotation angle using such a method may be an important consideration when planning primary treatment and corrective osteotomy for patients with distal radial malunion.

Keywords: Radius; Fracture; Rotational deformity; Malrotation
RARE TUMOURS IN HAND AND FOREARM: A SERIES OF 18 CASES.

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Objectives / Interrogation: Purpose: To report 18 case of patients with rare tumours in hand and forearm and review the related literature.

Methods: Methodology: The sample consisted of 18 patients, who consulted for mass in hand and forearm who were taken to excresis and the pathology report rare tumours for locating.
The sources of data for the literature review were obtained from Medline, Cochrane and Pubmed.

Results and Conclusions: Results: 18 patients aged 8-74 years old, the tumours were:
- 1 endometrioma,
- 1 squamous cell carcinoma type Keratoacanthoma
- 2 necrotizing synovitis,
- 1 Multiple Osteocondromas,
- 1 Schwannoma with metacarpal intraosseous osteochondroma,
- 3 atypical Schwannoma,
- 1 Nodular fascitis,
- 1 Keratoacanthoma type cutaneous horn,
- 1 cavernous hemangioma,
- 1 villonodular synovitis,
- 1 melanocytic lesions parallel ungual,
- 1 intravascular papillary endothelial hyperplasia,
- 1 aneurysmal bone cyst,
- 1 fibrokeratoma,
- 1 papillary digital adenocarcinoma.

Discussion and Conclusions: Because of rare occurrence of these tumours diagnostic and operative experience is relatively small. There is also a few number of publications regarding strange tumours of hand and forearm. Therefore the aim of the study was present our experience in the surgical treatment of the unusual tumours of the hand and forearm basing on the material of 18 cases treated in the years 1999-2016.
In the literature there is no record of endometrioma in upper extremity, during our literature review we found only one case in lower limb. The present authors have 589 cases of resection tumours in 13 years, and these 18 cases represent 3% of them. Generally these rare tumours are average 2% of report in the literature review without significant experiences have registered.
Unusual tumours pathologies in hand and forearm are part of the differential diagnosis the hand surgeon must be present.

Keywords:
rare tumours in hand and forearm
Treatment of Painful Neuroma by Nerve Capping Using Nerve Conduits in a Rat Model

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Objectives / Interrogation: Although peripheral nerve stump (PNS) capping using nerve conduits for the treatment of painful neuroma has attracted attention, details of the underlying mechanisms of pain relief and appropriate nerve conduit length remain unclear. Thus, we aimed to investigate the effectiveness of nerve capping and to identify the appropriate nerve conduit length in a rat neuroma model.

Methods: In male SD rats (n=45), the sciatic nerve (diameter, 1.5 mm) was sharply transected to create a 15 mm nerve defect (rat neuroma model). In the nerve capping (NC) group, the PNS was inserted to a depth of 2 mm into a 3 mm (n = 15) or 6 mm (n = 15) bioabsorbable nerve conduit (internal diameter, 2 mm), whereas in the no capping group (n = 15), no tube was inserted. Autotomy scores were measured to evaluate neuropathic pain, and the PNS was evaluated grossly and histologically at 12 weeks after the surgery. PNS were stained with HE and Masson's trichrome and immunohistochemically stained using anti-neurofilament protein antibody to evaluate the axons, anti-alpha-smooth muscle actin (α-SMA) antibody to evaluate areas of scarring surrounding the PNS, and anti-sigma-1 receptor (S1R) antibody to examine neuroinflammation. Positive areas were morphometrically analyzed using computer-assisted imaging.

Results and Conclusions: At 12 weeks after surgery, the autotomy scores in the 6 mm NC group was significantly lower than that in the no capping group (p < 0.01). In the gross appearance, PNS was swollen and adhered to the surrounding tissues in the no capping group; meanwhile, the PNS remained wrapped with nerve conduits protectively in NC groups. Histologically, neuroma was formed in the no capping group, and regenerating nerves were exposed from the distal end of the nerve conduit in the 3 mm NC group, whereas they converged within the nerve conduit in the 6 mm NC group. Notable perineural scar tissue was found in the no capping and the 3 mm NC group, whereas minimal perineural scar formation was present around the terminated axonal fibers in the 6 mm NC group. Morphometric analysis revealed that the % area of α-SMA and S1R positive expression in the PNS were significantly lower in NC groups than in the no capping group (p < 0.05).

Nerve capping of the PNS using nerve conduits successfully relieved neuropathic pain in the rat neuroma model. Neuroma was not formed, and the peripheral scar formation around the PNS was suppressed. The appropriate length of the nerve conduit is more than 4 times the diameter of the nerve.

Keywords:
neuroma, nerve conduit, pain, peripheral nerve, capping, autotomy
Pathology and treatment of deviation deformity of thumb after radial polydactyly resection

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Objectives / Interrogation: Radial polydactyly is one of the most common congenital deformity that affect the hand. It has complex anatomic and morphologic features. So the residual thumb deformities usually be seen after radial polydactyly resection. The deviated thumbs are the most common. To the thumb, axis deformity can not be accepted by patients and parents because this kind of deformity seriously affects the function and aesthetics of the hand. We analysis the pathology of deviated thumbs to prevent and treat the axis deformity of the residual thumb.

Methods: A total of 62 deviated thumbs in 58 patients who were treated surgically from 2013 to 2018 were included in this series. The abnormal bone, ligament and tendon were recorded. All patients underwent surgical treatment based on the pathology of deviation. The surgical outcomes were assessed using the Modified Tada score.

Results and Conclusions: Of the 62 deviated thumb cases, 34 (55%) had a abnormal tendon insertion into distal phalanx from flexor pollicis longus, 26 (42%) had no normal insertion of abductor pollicis brevis, and 16 (26%) were triphalangeal thumb. In the evaluation of the surgical outcomes, 51 (82%), 9 (15%) and 2 (3%) were rated as good, fair and poor, respectively. In the thumb that has two phalanges, the main reason contributed to thumb deviation is the abnormal insertion of the thumb muscles. In the children, resetting the insertion of the thumb muscles can avoid the remarkable axis deformity.

Keywords: polydactyly, axis deformity, deviation, pathology, treatment
**Thumie and other Non-Conventional Treatments**

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**Objectives / Interrogation:**
1. Is it possible to achieve good results with certain non conventional treatments for severe hand injuries?
2. Is it possible for serious wounds to heal in presence of bacteria?

**Methods:**
Between Sept 24/14 and Sept 24/18 90 patients consulted of important injuries in the upper limb. Among them were selected 5 with tissue loss, so important that despite complex surgical procedures would be performed it was predictable that there would persist very limiting sequelae. The 5 patients, lucid hand worker males, who averaged 32 y/o (23-41) (2 wounds by circular saw of thumb; 1 blast injury in hand; 1 gunshot on wrist; 1 devascularization of half a phalanx of the thumb by motorcycle chain), were warned about the possibility of not achieving good results by any indicated conventional treatment; the alternative to implementing non-conventional methods which had provided excellent results in previous less severe cases and, in the event of adverse evolution, would not impede the resolution by the same traditional procedure already indicated.

All fractures were stabilized, and tendons and nerves repaired or replaced by convenient grafts. In all cases, the open wounds were covered by a waterproof element that acted as a secretion-preserving chamber, keeping the exposed tissues in a liquid environment. Patients did not receive antibiotics even when they presented purulent secretion, except in cases of deep infection. The wounds were cleaned only when their odor was fouled and the purulent secretions overflowed in outer bandages.

**Results and Conclusions:**
Two patients required intravenous antibiotics for a short time, due to systemic infection. In 4 of the 5 patients was achieved the regeneration of cutaneous tissues in an average of 14 weeks (8-32), despite the contamination with Pseudomonas Aeruginosa and/or Staphillococcus Coagulas Neg. The finger degloved by the blast had to be rescued by a skin-graft. No signs of infection have been detected since then in any patient.

**Conclusions:**
1. It is possible to heal serious wounds in presence of bacteria.
2. Maintaining wounds moist facilitates joints mobility during the healing process.
3. It is possible to achieve the regeneration of some tissues maintaining a humid environment.
4. Bacteria such as Pseudomonas or Staphillococcus does not prevent the healing of hand and wrist wounds.
5. A history of infection does not preclude survival of bone, tendon, or nerve grafts in hand and wrist.
6. Is it possible to achieve good results with certain non conventional treatments.

**Keywords:**
WOUND INFECTION. TISSUE LOSS. NON-CONVENTIONAL
Castleman's Tumor associated brachial plexus, literature review a propos a case

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Objectives / Interrogation: Objective: To report a case of a patient with Castleman's disease associated with brachial plexus injury and review the related literature.

Methods: Methodology: The sample comprised a male patient aged 37, who consulted for feeling mass in left infraclavicular region associated with dysesthesia inner side of forearm and wrist, referred history of blunt trauma to that location.

The sources of data for the literature review were obtained from Medline, Cochrane and the annals of the our Association of Hand Surgery.

Results and Conclusions: Results and Conclusions: In the literature there is no record of these lesions in relation to the brachial plexus. The present authors reported a similar case in a woman in her fourth decade of life, with symptoms of brachial plexus compression.

According to the histological types should be directed treatment, when localized disease is surgical resection definitive management.
Recent findings of cytogenetic alterations in stromal cells of hyaline vascular type and the role of IL-6 and HHV 8 in the pathogenesis suggest that the hyaline vascular and plasma cell may even be considered as separate diseases.

Patients with multicentric disease should undergo extension studies for immune status.

Keywords:
Castleman tumor, brachial plexus injury: lymphoid hyperplasia angiofollicular, angiomatous lymphoid hamartoma, hamartoma nodal lymphoid, benign giant lymphoma tumor brachial plexopathy
Preliminary Study Using A Synthetic Ligament in DRUJ reconstruction

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Objectives / Interrogation: In chronic DRUJ instability, one of the popular methods is utilizing the palmaris longus as a graft in techniques such as the Adams techniques. However we have found that the palmaris longus can be short. We have exchanged the palmaris longus with a synthetic tendon named Orthotape - polyethylene teraphtalate mesh¹.

Methods: A 45-year-old male had a poorly treated comminuted distal end radius fracture and DRUJ instability fixed with a 1/3 tubular plate and K-wires by a private surgeon. Due to the poor fixation physiotherapy was not instituted. After 3 months, he presented to us and we revised the fixation with a locking distal radius system and instituted immediate physiotherapy. His progress went well and 3 months later, his only concern was the DRUJ instability. We opted for the Adams DRUJ reconstruction utilizing a synthetic ligament.

Results and Conclusions: At 6 months post-operatively, his wrist stability had improved and his DASH score has reduced from 39 to 7.5. However radiographically the DRUJ space which immediately post-operatively was obliterated has reopened. Synthetic ligament remains as an alternative in DRUJ reconstruction and can offer good functional outcome to the patient. However a longer follow-up study needs to be done.

Keywords:
synthetic ligament, DRUJ instability, DRUJ reconstruction

References:
1. Shalimar Abdullah, Usage of synthetic tendons in tendon reconstruction, 2015, BMC Proceedings
TREATMENT OF RADIOCUBITAL DISTAL INSTABILITY WITH ENDO BUTTON SYSTEM

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Objectives / Interrogation: Determine the results achieved in the short term with the Álvarez - Hidalgo Technique with the Tight Rope endoboton anchor system of small joints.

Methods: Patients with clinical symptoms and positive signs consistent with IRCD, admitted to the No.1 General Hospital of the Armed Forces (Quito-Ecuador), between January 2013 and December 2015.

Design
Prospective cohort.

Main measurements
Clinical controls performed at 7, 15, 30, 60 and 90 days postoperatively.

Results and Conclusions: Results
We studied 34 patients surgically treated with the Álvarez - Hidalgo Technique with the Tight Rope endoboton anchor system for the stabilization of the distal radio-ulnar joint. The proportion of men was significantly higher than that of women (61.7% vs. 38.2% p <0.001) in the total group, the average age was 38 ± 12.5 years, with a range of 20 to 56 years. The largest number of patients was agglutinated in the age group of 27 to 45 years (48.9%, 95% CI = 40.4% - 57.5%), with significant differences compared to the other age groups.

The location of the IRCD was usually the right hand (n = 102, 73.4%). There were no surgical complications. Six months after the postoperative period, most of the patients who had undergone surgery had achieved a significant clinical improvement in the parameters evaluated; Complete normality was reached in 96.47% of the cases, with respect to pain, 97.05% reported a total decrease, only one patient reported pain on the EVa scale of 2/10. The mobility arcs were recovered within the normal parameter by 94.11%, 5.88% was classified within a degree of medium. Stability (absence of the key sign) was observed in 100% of the patients. The capacity to hold weights-force was established at 91.17%. Total postoperative satisfaction was reported by 100% of the patients. Considering the clinical results classified as excellent and good (Tables 2 and 4), the overall frequency of surgical successes was 97%.

Conclusion
The technique of Alvare - Hidalgo with the Tight Rope endoboton anchor system of small joints used for the IRCD achieves favorable clinical results. The wrist arthroscopic procedure is of the utmost importance, since it allows to visualize complementary lesions of the FCTC and to apply an opportune treatment.

Keywords:
RADOCUBITAL DISTAL INSTABILITY, ENDO BUTTON SYSTEM
Flexor Pollicis Longus Tendon Rupture after Volar Plate Fixation of Distal Radius Fracture.

List of authors:
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Objectives / Interrogation: Flexor pollicis longus (FPL) tendon rupture is known as a complication after volar plate fixation of distal radius fracture caused by volar plate prominence. We experienced some cases of FPL tendon rupture without plate prominence significantly, so we evaluated other risk factors of FPL tendon rupture.

Methods: Patients who had been undergone volar plate fixation for distal radius fracture between 2006 and 2012 were included in this case-control study. Eight patients with FPL tendon rupture (case group) and forty-five patients who were observed for more than two years without hardware removal (control group) were included. All patients were female. We investigated age, body height and weight, range of motion of the operated wrist, medical history of rheumatoid arthritis and diabetes mellitus, history of oral administration of steroids, smoking, and alcohol use in the patients. Post-operative X-rays were used to identify parameters of reduction (volar tilt, radial inclination, and ulnar variance) and of volar plate prominence (Soong’s grade, plate to critical line distance, and plate to volar rim distance).

Univariate analysis with Mann-Whitney U tests or chi-square tests was performed. Factors with a P-value > 0.2 by univariate analysis were introduced to multivariate logistic regression.

Results and Conclusions: In univariate analysis, body height (p=0.014) and plate prominence (Soong’s grade 1, p=0.041) revealed statistically significant differences. In multivariate logistic regression, only the odds ratio (OR) for body height was statistically significant (OR = 1.32 per 1 cm less in body height, p=0.027). We created a receiver operating characteristic curve of FPL tendon rupture and body height, and established a cutoff value of 150 cm, calculated from the national statistical chart of body height of Japanese women (50-80 years old, average 154.36 cm, and the standard deviation of 2.23). As a result, the sensitivity was 75% and the specificity was 58% for using body height as a risk predictor for FPL tendon rupture. In this study, volar plate prominence value of case group (FPL tendon rupture) were not so significantly different from those of control group. It is suggested that the risk of FPL tendon rupture after volar plate fixation is greater not only with plate prominence but also with physically smaller women in this case-control study.

Keywords:
flexor pollicis longus (FPL), distal radius fracture, risk factor, body height
Transfer of contralateral C7 nerve to upper trunk via prespinal route for neuropathic pain after total brachial plexus avulsion: A novel and effective approach to relieving the intractable pain

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Objectives / Interrogation: To report the efficacy of transferring contralateral C7 nerve to the upper trunk via the prespinal route for neuropathic pain after total brachial plexus avulsion, and evaluate the value of this procedure for the intractable pain.

Methods: Between December 2014 and March 2016, 6 patients with refractory pain after total brachial plexus avulsion underwent the procedure of transferring CC7 nerve to the upper trunk via the prespinal route. The curative effects of this procedure for these patients were observed and studied prospectively. The questionnaire of DN-4 was used to determine if the pain in these patients was the neuropathic pain. These patients were followed up regularly, and their pains were evaluated preoperatively and postoperatively using the VAS, pain relief rate, SF-MPQ-2, territory and frequency of the pain, and HADS. The motion and sensation of the affected limb were assessed using the BMRC grading system.

Results and Conclusions: Preoperative scores of DN4 ranged from 5 to 8 in 6 patients who were followed up for a period from 24 to 38 months (average, 29.9 months). There was a descending tendency of the VAS scores over time in the six patients. The VAS scores at the 6 month, 12 month and the last time follow-up postoperatively decreased in order (P<0.05), and were significantly lower than that preoperatively (P<0.05). At the last follow-up, the curative effect of relieving pain was excellent in 4 and good in 2 patients. The total score of the SF-MPQ-2 (32.2±14.1) were significantly lower than that before operation(65288;74.0±9.5)(65289;P<0.05). The territory and frequency of the intractable pain decreased at the last time follow-up. The total score of the HADS was significantly lower at the last time follow-up than before operation (P<0.05).The muscle strengths of both the deltoideus and supraspinatus were grade M3 in five patients, and the mean angle of the shoulder abduction was 27.5°(20°-30°) in six patients. The muscle strengths of the biceps brachii were grade M3 or greater in five patients, and the angle of flexor elbow ranged from 0°to 130°(mean, 81.7°). The sensation in affected upper limb recovered to grade 3 in four patients and grade 2 in two patients.

Transferring CC7 nerve to upper trunk via prespinal route can significantly alleviate neuropathic pain after total brachial plexus avulsion, and this procedure is a novel and effective approach. Meanwhile, it has the advantage of recovery in both motions and muscle strengths of the affected shoulder and elbow.

Keywords:
Brachial plexus; C7 nerve root; Avulsion; Nerve transfer; Neuropathic pain
Forearm diaphyseal bone strength recovers three months after plate removal

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Objectives / Interrogation: Forearm diaphysis fractures are usually treated by open reduction internal fixation with plates. Long after surgery, some patients present with bone atrophy adjacent to the plate, occasionally leading to refracture. Because we have an incomplete understanding of when bone strength recovers, the aim of this study was to investigate changes in forearm bone strength after plate removal using a computed tomography (CT) based, specimen-specific finite element model (FEM).

Methods: We included 13 forearm fractures from 7 patients treated with locking plates. CT imaging of both forearms was performed before plate removal, and at 1, 3, and 6 months after plate removal to assess local bone mineral density and predict bone strength. We created a 3-dimensional FEM with Mechanical Finder software, using a previously-reported CT data.

Results and Conclusions: Mean patient age at plate remove was 33.5 years. The mean period of plate fixation was 33.2 months. The mean bone strength of the healthy contralateral side was 7910.2N. The mean strengths of the injured side before plate removal, and 1, 3, and 5 months after plate remove were 4093.1N, 4178.3, 6139.7, and 7220.7N, respectively. The injury-healthy ratios were 49.0% (baseline), 62.7% (1 month), 88.0% (3 months), and 95.2% (5/6 months). Compared with the healthy side, bone strength was significantly decreased after removal. By 3 months after plate removal, bone strength was significantly recovered.

In conclusion, bone strength decreases after plate fixation, often recovering by 3 months after plate removal. It may be necessary for patients to restrict potentially injurious activities for approximately 3 months or until bone strength recovers.

Keywords: forearm diaphysis fracture, plate remove, bone atrophy
Reversed Dorsal Metacarpal Adipofascial Flap Resurfacing the Metacarpophalangeal Joint Capsule after Dorsal Capsulotomy in Posttraumatic Contractures

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Objectives / Interrogation: After dorsal capsulotomy or capsulectomy for the extension contracture of the metacarpophalangeal joint (MCPJ), the divided capsules were left for secondary healing. Despite vigorous rehabilitation postoperatively, reemergent fibrotic capsule restricting the motion was inevitable. In this study, the reversed dorsal metacarpal adipofascial flap was used to resurface the MCPJ capsule in the cases with posttraumatic contracture.

Methods: Dorsal approach with a curvilinear Incision was performed. Tenolysis of the extensor tendon was undergone from zone 4 to zone 6. The proximal sagittal slings could be divided to expose the MCPJ. Capsulotomy and division of dorsal collateral ligaments was continued to ensure least resistance with passive flexion of the joint. The reversed dorsal metacarpal adipofascial (RDMA) flap was dissected superficial to the extensor tendon. The longitudinal axis of the flap locates in the center between two metacarpi, and the pivot point is the midpoint between the two metacarpal necks. The flap was turned and inset to the joint capsule with passive flexion of the MCPJ.

Results and Conclusions: Results
The technique was performed in 4 cases, including one 3rd MCPJ and three 5th MCPJs. All contracture were resulted from previous metacarpal fracture. Pre-operative active motion of the involved MCPJ was from 0 to 35 degrees. The patients were followed for 6 to 17 months. The final active motion was from 55 to 82 degrees. The improvement of active motion was from 40 to 70 degrees.

Conclusions
The RDMA flap resurfacing the divided MCPJ capsule provides primary healing of the defect and a better gliding surface for the extensor tendon on the dorsal MCPJ. All the patients got improvement without relapse of extension contracture.

Keywords:
Reversed dorsal metacarpal adipofascial flap, Capsulotomy, Metacarpophalangeal joint
**WALANT Surgery, Advanced techniques in wrist surgery**

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**Objectives / Interrogation:** Wide Wake Local Anesthesia No Tourniquet Surgery recently changed the way hand procedures are done and contributed definitely to improve our functional results in some of the hand conditions. Recently, the technique for distal radius fracture treatment by WALANT were described.
We asked if the same principles and rationale of WALANT could be applied to wrist surgical techniques and what would be the advantages of Wrist Surgery done by WALANT.

**Methods:** We developed a technique of local anesthesia technique to apply the principles of WALANT Surgery in Wrist Surgery. 6 Patients were selected and included in the study. All patients gave their informal consent.
Carpal row carpectomy, four corner fusion, scaphocapitate arthrodesis and perilunate dislocation were the procedures done by technique.
We had no complications from using WALANT techniques for these more advanced wrist procedures.
Dynamic motion allowed additional procedures and adjustments made peroperatively based on intraoperative findings.

**Results and Conclusions:** We operated 6 patients with no formal complications of the local anesthetic technique.
In 3 patients additional procedures decisions were done by direct visualization of their need dynamically.
Motion could be very reliably anticipated by intra-op motion by the patient.
WALANT is possible in more advanced Wrist surgery and can permit several important technical decisions during surgery regarding additional and concomitant procedures, this could improve surgical functional results and patient satisfaction.
This study adjoin new possible procedures that can be done with Walant technique, expanding the armamentarium of surgeries already described.
We present our anesthetic technique and surgical results.

**Keywords:**
WALANT, WRIST SURGERY, wide awake
Comparison of open surgical release versus ultrasound-guided percutaneous release using new instrument for trigger finger

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Objectives / Interrogation: We used new ultrasound-guided instrument for percutaneous release with 18-gauge needle for trigger finger. This instrument was developed to avoid the complications of incomplete release and flexor tendon, digital nerve, and digital artery damage under ultrasound-guided. (Double guide-type tendon sheath incision instrument, Nara Seiko INC®, Japan).
We compared open surgical release (Group A) with ultrasound-guided percutaneous release with this instrument (Group B) for trigger finger.

Methods: 18 fingers were treated with open surgery (Group A) and 16 fingers were treated with ultrasound-guided percutaneous release with this instrument (Group B). Functional and clinical outcomes of the both groups were evaluated at 1.5, 3, and 6 month postoperatively and were compared between the patients with the Group A and B.
Group A patients allowed wetting hands after the stitches have been removed. Group B patients allowed soaking hands the second postoperative day.

Results and Conclusions: The groups were similar at base line in terms of sex, age. There are no postoperative complication and secondary operation procedures. At 1.5 months postoperatively, the average VAS score was 32 mm in the Group A, and 15mm in the Group B, respectively. There was a significant difference between the two groups (p<0.05). The average extension of PIP joint at 3 months postoperatively was -10 degree in the group A, and -3 degree in the group B, respectively. There was a significant difference between the two groups (p<0.05). At 6 months postoperatively, there was no significant difference between the two groups regarding the pain level on a visual analogue scale, the Quick DASH, range of motion of PIP. Our data indicate that both procedures are highly effective for treatment of trigger finger without postoperative complication. While, release with new ultrasound-guided instrument yielded better results compared to the open technique in the early postoperative period, in respect of improvement of VAS and extension of PIP joint. Besides, after 6 months, this study shows the functional outcomes are comparable between two groups.
The ultrasound-guided percutaneous release with this instrument may make sure to complete release and provide earlier recovery of the finger function in the early postoperative period.

Keywords:
trigger finger, ultrasound-guided release, new instrument
10 Questions About Scaphoid Fractures - Revisited: A case based discussion

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Objectives / Interrogation: The 1992 article “Twenty questions about scaphoid fractures” by Nicholas Barton was a seminal work in wrist surgery. Twenty-five years of progress in the treatment of this common wrist injury have made the revisiting of this work with current methods, materials, and analyses an important endeavor. [1]

Methods: An international panel of experts will discuss the following 10 questions:

1. What is the diagnostic algorithm for a painful wrist injury?
2. What characteristics of scaphoid fractures lead to a poor prognosis?
3. What is the current treatment algorithm for scaphoid fractures?
4. What techniques are currently used to treat scaphoid fractures?
5. How is delayed union of scaphoid fractures diagnosed and treated?
6. What is the best treatment for scaphoid nonunion?
7. What is the role of vascularized bone grafts in scaphoid nonunion?
8. What is the role of free microvascular grafting in scaphoid nonunion?
9. What is SNAC wrist?
10. How is SNAC wrist best treated?

Results and Conclusions: Each question will be discussed by an expert surgeon, using currently available diagnostic tools, treatment methods and techniques, and discussing published data related to outcomes of treatment.

The panel will then present cases in a discussion format to illustrate the current state-of-the-art in the treatment of scaphoid fractures, including acute fractures, non-unions, and SNAC wrist.

Keywords:
scaphoid, fracture, wrist, nonunion, SNAC

References:
Analysis of the risk factors that determine composite graft survival for fingertip amputation

List of authors:
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Objectives / Interrogation: The composite graft is the only surgical method that is able to maintain digital length and provide soft tissue coverage without donor site morbidities in microsurgically non-replantable fingertip amputations. This study aimed to explore the risk factors that determine the survival of composite grafts.

Methods: Clinical characteristics associated with graft survival were retrospectively analysed by a comparison between the graft survival and failure groups.

Results and Conclusions: Of 94 patients who underwent a composite graft for fingertip amputation, the graft survived in 84 (89%). Surviving grafts showed reperfusion within 1 week. Multivariate analysis revealed that graft failure was independently associated with a crushing injury. Based on the risk factors from the comparison analyses and a review of previously published studies, a cutting injury, grafting the injured finger within 5 hours of injury, and being a non-smoker are associated with good results.

In these circumstances, excellent outcomes with a high success rate can be achieved by composite graft in most adult patients as an alternative treatment to microsurgical replantation.

- This paper is in the process of publication on the J Hand Surg Eur Vol. -

Keywords:
Fingertip amputation, composite graft, risk factors
Midterm outcome of costo-osteochondral graft reconstruction of proximal pole of scaphoid fractures

List of authors:
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Objectives / Interrogation: We present the midterm outcome of patients that were treated for an irreparable proximal pole fracture of the scaphoid with a costo-osteochondral graft (rib graft). The surgical technique itself as well as our rational for the use of this technique are outlined.

Methods: A prospective non-randomised series of 30 consecutive patients with irreparable proximal pole of scaphoid fractures were treated with a rib graft reconstruction. The average follow-up was 25 months. All patients were male with an average age of 25 years.

Subjective outcome measures are Patient Rated Wrist Evaluate (PRWE) and Disability ARM Shoulder Hand (DASH) scores, objective outcomes include clinical range of motion and grip strength.

Post operative x rays were assessed for union and carpal alignment.
Complications are reported.

Results and Conclusions: We noted a statistically significant and clinically relevant improvement of the PRWE from 42 to 23 and of the DASH score from 33 to 16.

The grip strength, measured as percentage of strength of the uninjured arm, improved significantly from 63 to 84%. The average postoperative range of motion arc for flexion/extension was 114 degrees.

Radiologically we noted union of the graft in all but one patient. The scapholunate gap, created by the chondral portion of the graft was maintained in all patients. The capitolunate angle, as marker for carpal alignment, was 82 degrees (range 75-90).

There were no donor site complications noted, i.e. no pneumothorax after rib harvest. One patient needed revision to a four corner fusion for persistent pain due to poor graft quality.

In conclusion we found the cost-osteochondral graft reconstruction a reliable solution for an otherwise difficult problem. Standard salvage procedures remain an option for the patients in the future.

Keywords:
Proximal pole scaphoid fracture, rib graft, costo-osteochondral graft
OPEN CARPAL TUNNEL RELEASE WITH LOCAL ANESTHESIA: ISQUEMIA VS WALANT COMPARATIVE STUDY

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Objectives / Interrogation: To evaluate the effectiveness and acceptability of the use of adrenaline as a mean to achieve hemostasis in open release of median nerve compared to the use of tourniquet in the arm.

Methods: Prospective, experimental, controlled, randomized study was made up of 50 participants; divided into two groups of 25 each. Group 1 operated with application of local anesthesia under transverse carpal ligament and with tourniquet (WT) and 25 with WALANT technique. In the WT, 2% lidocaine 10ml was injected, and in the WALANT 2% lidocaine plus epinephrine was injected at a concentration of 1: 200,000 in total of 10ml, below the dermis. Pain was measured at the time of anesthesia with the analogous visual scale, surgical time, amount of bleeding, heart rate, blood pressure and pulse oximetry, pre, trans and postoperative.

Results and Conclusions: RESULTS: The analysis of association by groups between the 2 kind of treatments showed significant differences in the heart rate (HR) pre, trans and postsurgical (p: 0.045, 0.001, 0.001, respectively), the other variables studied did not show significant p values , when associating the quantity of bleeding with the used methods, patients with WALANT obtained significantly higher values with respect to WT, when performing the correlation analysis in groups the relationship of bleeding with WALANT was lost, while patients wearing a tourniquet maintained a P < 0.05, showing a relative benefit. CONCLUSION: WALANT is a good alternative of anesthetic technique for the release of the median nerve, since it presents fewer complications, absence of pain by the tourniquet, without the need of an operating room for the procedure, support from a single assistant, short hospital stays, the patient stays awake during the surgery without pain, as well as, decrease in costs and increase in the benefits for the patient and the surgeon, being a simple, safe and effective anesthetic technique to achieve haemostasis in the surgical site.

Keywords: wide awake, hand surgery, local anesthesia, epinephrine, no tourniquet, carpal release
Role of arterial supply and venous drainage of fasciocutaneous pedicle in saphenous artery perforator-plus fasciocutaneous flap in rabbit

List of authors:
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Objectives / Interrogation: Based on the models of saphenous artery septocutaneous perforator pedicled (SPP) flap and perforator-plus fasciocutaneous (SPF) flap in rabbit, the purpose of the present study is to illuminate the role of the fasciocutaneous pedicle in arterial blood supply and venous drainage of the perforator-plus fasciocutaneous flap, and provide experimental evidences for optimal application of both flaps during operation.

Methods: The flaps harvested in twenty legs of 10 New Zealand rabbits were randomly divided into 2 groups: the perforator group including saphenous artery perforator flap (n=10), and the perforator-plus group including saphenous artery perforator-plus fasciocutaneous flap (n=10). The blood perfusions in five zone of both flaps were measured using Laser Doppler flowmeter before operation, and 1h, 6h, 1d, 3d, 5d, 7d and 10d postoperatively. The survival rates of both flaps was measured at 7 days postoperatively. The flaps harvested in 50 legs of 25 rabbits were randomly divided into 5 groups: group A consisting of the SAP flap (n=10), group B consisting of the SAPPE flap (n=10), group C consisting of fasciocutaneous flap without the perforator (n=10), group D consisting of the fasciocutaneous flap with perforator artery but without the perforator vein (n=10), and group E consisting of the fasciocutaneous flap with perforator vein but without the perforator artery (n=10). The survival rates of these flaps was measured at 7 days postoperatively.

Results and Conclusions: The blood perfusions in five zones of the flaps were not statistically significant at every time point between perforator group and perforator-plus group (P>0.05). The survival rates of the SAP flap and the SAPPE flap were 94.0%±11.8% and 96.7%±6.9%, respectively (P>0.05). The survival rates of groups A, B, C, D and E were 86.5%±18.2%, 97.7%±4.6%, 32.8%±26.8%, 60.8%±38.4% and 51.2%±31.3%, respectively (P<0.05). The survival rate was higher in group A than in group C, in group B than in group C and group E, and these differences were not statistically significant (P>0.05). There is no statistically significant difference between other two groups (P>0.05).

Converting the SAP flap into SPF flap can not significantly improve both the survival rate and blood perfusion of the SAP flap. The perforator plays a key role in the survival of the SAPPE flap, and the fasciocutaneous pedicle plays a minor role. The fasciocutaneous pedicle is an approach for venous drainage in the SAPPE flap.

Keywords:
perforator flap; surgical flap; rabbit; saphenous artery; Laser Doppler flowmeter
The clinical results of Kirschner wire fixation after closed reduction for Gertland type II and III supracondylar humerus fractures in children

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Objectives / Interrogation: Supracondylar humerus fracture is the most common fracture around elbow in children. Closed reduction and percutaneous Kirschner wire fixation is a standard method of managing displaced extension type (Gartland Type II and Type III) supracondylar humerus fractures. In our hospital, we perform these operations as much as possible on the day of injury. We hypothesized that emergency operation for this fracture might bring more feasible results.

Methods: Twenty male and five female children injured with supracondylar humerus fracture were included in this retrospective study. The patients' age was averaged 6 (ranged 3-10) and the follow up period was averaged 20 months (ranged 3-56). 10 patients were distributed as Gartland type II and 15 patients were Type III. Percutaneous Kirschner wire fixation after closed reduction under general anesthesia was performed on the day of injury for 21 patients (emergency group) and on the following day for 4 patients (control group). Operations were performed in the spine position for 8 patients (group S) and in the lateral recumbent position using with the reduction bar for 17 patients (group L). We evaluated for the difference of operation time, carrying angle, forward tilting angle and Flynn's criteria at the time of final follow up between each groups.

Results and Conclusions: In previous reports, performing operation on the day of injury with supracondylar humerus fracture in children reduced complications such as compartment syndrome and facilitated the reduction. But there were no significant differences of these outcomes between emergency group and control group. There was a tendency that the average of operation time of group S was slight longer than that of group L. Forward tilting angle of group S was smaller than that of group L (p<0.05: statistically significant). Regarding to the Flynn's criteria, 22 patients were excellent, one patient in the control group was good and the other patients with neurological symptoms at the first visit were fair. We thought that there were some difficulties of the bending reduction for the fracture in the lateral recumbent position. Reduction bar would inhibit the bending reduction and this incomplete reduction might become the result of small tilting angle. An operation in the spine position is desirable if we aim at the more feasible flection. But the results of Flynn's criteria in the group L were almost excellent because the average of forward tilting angle was within the acceptable range.

Keywords:
pediatric, elbow, supracondylar humerus fracture, Closed reduction and percutaneous Kirschner wire fixation
Reconstruction of the Extensor Tendon of the Proximal Interphalangeal Joint (PIPJ) using a distally based slip of Flexor Digitorum Superficialis (FDS)

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Objectives / Interrogation: Objective
In 1971, H Graham Stack described a case report using a slip of FDS as a distally based tendon transfer to reconstruct the central slip of the extensor mechanism of the PIPJ. Essentially overlooked since then, this technique provides an excellent option for uncomplicated central slip reconstruction but can also be used, with more limited outcome, in more complex cases with extensor tendon or intrinsic muscle loss. We present a small prospective series of 6 patients who underwent this procedure.

Methods: Method
Six patients, identified as suitable for extensor tendon reconstruction with this technique were entered into the study.

The surgical technique was a modification of that originally described by H Graham Stack. Only one distally based slip of FDS was used; this being passed via a drill hole at the base of the middle phalanx to its dorsum, at the site of the original insertion of the central slip. The FDS slip was then woven (Pulvertaft weave) under appropriate tension, into the extensor mechanism over the proximal phalanx. A very strong repair was obtained allowing immediate protected mobilization

The six patients were prospectively reviewed.

Results and Conclusions: Results/Conclusions
Follow up averaged 18 months (3-48)

There were 4 patients who had central slip injuries of which one patient had multiple operations before his reconstruction procedure and one other had a simultaneous PIPJ release. Their mean gain in active extension was 73 degrees with a mean loss of 15.5 degrees of flexion.

In the 2 patients with major trauma, improvement was less; the active PIPJ extension gained was 28 and 21 degrees respectively with both patients each loosing 15 degrees of flexion; while seemingly a small net gain the improvement in arc of movement in these very injured fingers was thought to be, from the patient’s perspective, worthwhile.

In conclusion; this surgical technique provides a strong reconstruction suitable for early mobilization, with satisfactory early results. Better in simple central slip defects, the technique is robust enough to use in severe injuries, even those with loss of intrinsic function, but a more modest outcome should be expected

Keywords:
extensor tendon, central slip, Stack reconstruction
Smoking as risk factor for carpal tunnel syndrome: a birth cohort study

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2 University of Oulu (Oulun yliopisto)

Objectives / Interrogation: The aim of this study was to determine whether smoking is associated with carpal tunnel syndrome (CTS) from two perspectives: if maternal smoking and offspring's own smoking affect the offspring's risk for CTS.

Methods: The study sample consisted of the Northern Finland Birth Cohort 1966 (N=8703). Prenatal data collected from mothers at 24 to 28 weeks of gestation and 31-year follow-up data were used, combined with data for hospitalization due CTS from the Finnish Care Register for Health Care during follow-up from 1997 to 2016. Hazard ratio (HR) with 95% confidence intervals (CI) and population attributable risk (PAR) for smoking was calculated and adjusted for body mass index and socio-economic status.

Results and Conclusions: During the follow-up between 1997 and 2016, altogether 308 participants were diagnosed with CTS.

<table>
<thead>
<tr>
<th>Carpal tunnel syndrome, n (%)</th>
<th>Men, n=4156</th>
<th>Women, n=4547</th>
<th>Missing, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal smoking after second month of pregnancy, n (%)</td>
<td>345 (4.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>585 (14.5)</td>
<td>628 (14.4)</td>
<td></td>
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<tr>
<td>No</td>
<td>3405 (85.3)</td>
<td>3740 (85.6)</td>
<td></td>
</tr>
<tr>
<td>History of regular smoking, pack years</td>
<td>1248 (14.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (sd)</td>
<td>5.30 (7.37)</td>
<td>2.41 (4.55)</td>
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</tr>
<tr>
<td>No, n (%)</td>
<td>1756 (49.3)</td>
<td>2452 (63.0)</td>
<td></td>
</tr>
<tr>
<td>Ten or less, n (%)</td>
<td>960 (27.0)</td>
<td>1118 (28.7)</td>
<td></td>
</tr>
<tr>
<td>Over ten, n (%)</td>
<td>846 (23.7)</td>
<td>323 (8.3)</td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>316 (3.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (sd)</td>
<td>25.27 (3.60)</td>
<td>23.92 (4.47)</td>
<td></td>
</tr>
<tr>
<td>Normal, n (%)</td>
<td>2053 (51.0)</td>
<td>3060 (70.1)</td>
<td></td>
</tr>
<tr>
<td>Overweight/Obese, n(%)</td>
<td>1969 (49.0)</td>
<td>1305 (29.9)</td>
<td></td>
</tr>
<tr>
<td>Socio-economic status, n (%)</td>
<td>515 (5.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clerical workers, entrepreneurs</td>
<td>1801 (45.5)</td>
<td>2796 (66.0)</td>
<td></td>
</tr>
<tr>
<td>Students, retired, unemployed</td>
<td>526 (13.3)</td>
<td>675 (15.9)</td>
<td></td>
</tr>
<tr>
<td>Manual workers, farmers</td>
<td>1626 (41.1)</td>
<td>764 (18.0)</td>
<td></td>
</tr>
</tbody>
</table>

Basic demographic features of the study population stratified by gender.

Maternal smoking was not associated with increased risk of CTS in offspring. Offspring's own smoking was associated with elevated risk for CTS, especially in women. Before the age of 31 years, regular smoking of ten or less pack years (HR=1.51, 95% CI=1.09-2.10) and over ten pack years (HR=1.82, 95% CI=1.15-2.89) among women and over ten pack years (HR=1.93, 95% CI=1.16-3.21) among men was associated with increased risk for CTS compared to non-smokers. PAR for smoking was 13.9% for men and 20.9% for women.
In this birth cohort study, we found that maternal smoking was not, but offspring's own smoking was, associated with elevated risk for CTS.

**Keywords:**
carpal tunnel syndrome, smoking, tobacco, epidemiology, birth cohort
Ulnar neuropathy at the elbow in 413 Japanese patients: an assessment of pathological elbow lesions and neurological severity

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² Department of Orthopaedic Surgery, Faculty of Medicine, University of Yamanashi (Chuo, Yamanashi)
³ Department of Orthopaedic Surgery, Shinshu University School of Medicine (Matsumoto, Nagano)
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⁵ Department of Orthopaedic Surgery, Yokohama City Minato Red Cross Hospital (Yokohama, Kanagawa)
⁶ Department of Orthopaedic Surgery, Graduate School of Medical and Dental Sciences, Tokyo Medical and Dental University (Tokyo)
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⁸ Department of Orthopaedic Surgery, Sapporo City General Hospital (Sapporo, Hokkaido)

Objectives / Interrogation: Pathological lesions of the elbow are often complicated by ulnar neuropathy at the elbow (UNE); however, detailed pathological and neurological features of these lesions remain unidentified. We investigated the elbow pathology and neurological severity of UNE in Japanese patients.

Methods: We retrospectively examined the medical records of 457 patients aged 15 years or more who were diagnosed with UNE and surgically treated by certified hand surgeons between 2000 and 2012 at six participating institutions. UNE of eligible patients were diagnosed by physical findings and nerve conduction studies. Elbows were analyzed for age, gender, occupation, elbow pathology, entrapment site of the ulnar nerve, and severity of nerve palsy.

Results and Conclusions: A total of 413 UNE elbows in 398 patients with a median age of 63 years (range: 15-87) were included. UNE elbows were predominantly male (69%). Of 310 elbows, 75% had 1 or more lesions: single lesion, 238 elbows (77%); 2 or more lesions, 72 elbows (23%). Common lesions were as follows: primary elbow osteoarthritis (EOA), 55% of elbows; medial elbow ganglion, 9%; cubitus valgus, 7%; dislocation of the ulnar nerve, 6%; prior elbow trauma, 3%; cubitus varus, 2%. Medial elbow ganglion and cubitus valgus or varus were generally associated with EOA (91% and 67%, respectively). UNE with primary EOA exhibited older age, higher prevalence of manual laborers and severe ulnar nerve palsy, and longer symptom duration compared to those with no lesion. Common entrapment sites were: cubital tunnel, 86%; medial epicondyle, 5%; deep flexor pronator aponeurosis, 4%; medial intermuscular septum, 2%. Incidences of primary or secondary EOA and severe motor weakness (McGowan grade III) were 62.2% and 47.2% in this study, respectively; in contrast, 9.5 to 19.7% and 15.0 to 26.4% have been previously reported for the Caucasian population, respectively.

Conclusions: This study showed that 75% of UNE had isolated or combined pathological lesions, and 85 to 90 % of UNE had an entrapment site at the cubital tunnel regardless of the lesion. In Japanese patients, EOA was highly associated with UNE, and clinical features of UNE with EOA differed from UNE with no lesion. In contrast to Caucasians, the UAE of Japanese patients showed high incidences of EOA and severe ulnar nerve palsy.

Keywords:
Ulnar neuropathy, elbow, pathological lesion, ulnar nerve, elbow osteoarthritis, ganglion
Radioscapholunate Fusion following Resection of Giant Cell Tumours of the Distal Radius

Objectives / Interrogation:
The objective of this study was to review the oncologic and functional outcomes of patients who underwent en bloc resection of distal radius giant cell tumours followed by radioscapholunate fusion with either a vascularised or non-vascularised bone graft.

Methods:
A retrospective review of patients with tumours of the hand and upper extremity that were treated at our institution from 2010 to 2018 was conducted. Patients with giant cell tumours of the distal radius that had undergone en bloc resection of the distal radius, and had reconstruction with either vascularised fibular graft or non-vascularised iliac crest bone graft and radioscapholunate fusion were selected for this study. The oncologic outcomes that were assessed were the presence of local and distant recurrence. Functional outcomes were assessed after patient's function had stabilised (more than one year after surgery) using the Musculoskeletal Tumor Society (MSTS) rating score of limb salvage and Short Form (SF)-36 scores.

Results and Conclusions:
5 patients were identified (1 male, 4 female). 3 presented with primary tumours, while 2 presented with recurrent tumours. Median age at the time of presentation to our centre was 35 years (range, 23 to 47 years). The 3 patients with primary disease had Campanacci Grade 3 disease. None had distant metastases at the time of surgery.

After a median follow up of 4 years (range, 4 months to 5 years), none of the patient had developed local or distant recurrence. One patient developed a peri-implant fracture requiring repeat fixation, while another developed complex regional pain syndrome that resolved with medication and aggressive hand occupational therapy. MSTS and SF-36 scores were available for the 3 patients that were more than 1 year post-op. The mean MSTS score was found to be excellent at 91.3% (range 86.7% to 96.7%) and the mean SF-36 score was 70.3% (range 59.5% to 78.5%). Assessment of range of motion of the affected wrist at mid-carpal joint revealed an average of 34.3 degrees (range 0° to 60°) of palmar flexion, 41.7° (range 40° to 45°) of dorsiflexion, 81.7° (range 65° to 90°) of supination and 78.3° (range 60° to 90°) of pronation.

Conclusion
En bloc resection and radioscapholunate fusion is a viable treatment option for patients with large and / or recurrent giant cell tumours of the distal radius.

Keywords:
giant cell tumour, radioscapholunate fusion
**WALANT in tendon transfers in the forearm and hand. Our experience**

**List of authors:**
Constantinos Kritiotis\(^1\), Lindsay Muir\(^1\), Zaf Naqui\(^1\), Adrian Pearce\(^1\)

\(^1\) Manchester Hand Centre (Manchester)

**Objectives / Interrogation:** To present our experience with the use of WALANT (Wide Awake Local Anaesthesia No Tourniquet) for tendon transfers.

**Methods:** We present nine cases operated during 2018 in three Hospitals.

<table>
<thead>
<tr>
<th>A/A</th>
<th>HOSPITAL NUMBER</th>
<th>LOCATION</th>
<th>DATE OF SURGERY</th>
<th>DOB</th>
<th>AGE</th>
<th>PROCEDURE</th>
<th>CAUSE OF PALSY</th>
<th>COMPLICATIONS</th>
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<tbody>
<tr>
<td>1</td>
<td>1561637</td>
<td>UK</td>
<td>17/01/2018</td>
<td>30/11/1959</td>
<td>58</td>
<td>FCR TO EDC TRANSFER LEFT HAND</td>
<td>CERVICAL RADICULOPATHY</td>
<td>INFECTION/WOUND BREAKDOWN</td>
</tr>
<tr>
<td>2</td>
<td>2461218</td>
<td>UK</td>
<td>31/01/2018</td>
<td>18/01/59</td>
<td>59</td>
<td>FCR TO EDC TRANSFER LEFT HAND</td>
<td>PROLONGED/NEGLECTED PIN COMPRESSION</td>
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</tr>
<tr>
<td>3</td>
<td>2470921</td>
<td>UK</td>
<td>28/02/2018</td>
<td>05/10/1964</td>
<td>53</td>
<td>FCR TO EDC TRANSFER RIGHT HAND USING PL GRAFT</td>
<td>RUPTURE OF EDC DUE TO GOUT</td>
<td>NIL</td>
</tr>
<tr>
<td>4</td>
<td>919126</td>
<td>UK</td>
<td>27/06/2018</td>
<td>07/11/1965</td>
<td>52</td>
<td>LEFT FCR TO EDC AND PL TO EPL TRANSFER</td>
<td>CERVICAL RADICULOPATHY</td>
<td>NIL</td>
</tr>
<tr>
<td>5</td>
<td>2444583</td>
<td>UK</td>
<td>27/06/2018</td>
<td>23/04/1947</td>
<td>71</td>
<td>LEFT ECRB TO ADDUCTOR POLLICIS USING PL GRAFT</td>
<td>NEGLECTED CUBITAL TUNNEL</td>
<td>RUPTURE OF TRANSFER 11/52 POST-OP</td>
</tr>
<tr>
<td>6</td>
<td>2369635</td>
<td>UK</td>
<td>19/07/2018</td>
<td>27/09/1994</td>
<td>23</td>
<td>EXPLORATION OF PREVIOUS TENDON TRANSFERS, TENOLYSIS OF EXTENSORS AND RELOCATION OF PL TO EPL TRANSFER IN 1ST EXTENSOR COMPARTMENT</td>
<td>RADIAL NERVE INJURY FOLLOWING RUPTURE OF HUMERUS</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>3964345</td>
<td>UK</td>
<td>26/03/2018</td>
<td>19/06/1944</td>
<td>74</td>
<td>EXCISION OF ULNAR HEAD AND EIP TO EDC IV-V TENDON TRANSFER</td>
<td>DRUJ ARTHRITIS/ATTRITIONAL RUPTURE</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>2834870</td>
<td>UK</td>
<td>22/06/2018</td>
<td>06/10/38</td>
<td>79</td>
<td>LEFT HAND</td>
<td>NEGLECTED</td>
<td></td>
</tr>
</tbody>
</table>
Patient that had tendon transfers under WALANT

Author (1) was the lead surgeon for all cases. We present our injection method for each of these procedures.

All transfers were performed with 2.0 or 3.0 braided non absorbable suture using the side to side tendon weave as per Jan Friden. A temporary stay suture was placed for each transfer and passive tenodesis was used to check the tension. The patient was then asked to use the transfer muscle in order to check the tension. In a number cases, although the passive tenodesis tension appeared satisfactory the tension needed to be readjusted after assessment of active motion as tenodesis may not always be accurate for setting the tension.[1]

All patients were referred for early protected active mobilization. We present our outcomes based on patient satisfaction (questionnaire) and complications.

Results and Conclusions: One of our patients developed a wound breakdown due to postoperative infection that required surgical debridement. However his transfer was not compromised and his wound eventually healed. Another patient suffered a rupture of the transfer (ECRB to Adductor pollicis using PL graft) 11 weeks post surgery. All patients were very happy to see the outcome of their procedure on the table and this reassured them about their outcome. Also, rehabilitation was started on the table as patients were taught how to fire the transfers during surgery. No patient required sedation during surgery.

From a surgeon's perspective, the ability to witness the tension of the transfer during active range of motion was invaluable, making WALANT our preferred method of anaesthesia for carrying out tendon transfers. Conclusion: WALANT is a safe method of anaesthesia for tendon transfer surgery and if a surgeon is proficient in administering it, then the benefits of active motion can lead to good outcomes and increased patient reassurance and satisfaction.

Keywords:
WALANT, tendon transfer, hand, forearm

References:
Mutational spectrum and targeted therapy for isolated macrodactyly

List of authors:
Hengqing Cui*, Gang Han¹, Bin Wang¹
¹ Shanghai 9th People's Hospital, Shanghai jiaotong University (Shanghai)

Objectives / Interrogation: Macrodactyly is a congenital condition characterized by continuous overgrowth of fingers or toes. It is a symptom of PIK3CA-related overgrowth spectrum (PROS), which is caused by mosaic somatic mutation of PIK3CA gene. This study aimed to reveal the mutational spectrum and the targeted drug sensitivity of isolated macrodactyly.

Methods: We included 52 patients diagnosed with isolated macrodactyly from June 2014 to August 2018 in our hospital. Genomic DNA were prepared from different tissues including adipose, skin, bone, nerve, tendon, and vessel of surgically debulked or amputated macrodactylous digits. All exons of PIK3CA were PCR-amplified and sequenced by Sanger sequencing. Clinical manifestations of the patients were recorded. Adipose-derived stem cells from 9 patients with macrodactyly and 3 patients with polydactyly were isolated and cultured. The half maximal inhibitory concentration (IC 50) of rapamycin and BYL719 for these cells were determined.

Results and Conclusions: PIK3CA mutations were detected in 90.4% (47 in 52) of the patients in our cohort of isolated macrodactyly. These mutations clustered into three hotspots, p.His1047Arg (46.2%, 24/52), p.Glu542Lys (17.3%, 9/52), and p.His1047Leu (9.6%, 5/52), which differed from that was found in PROS. Mutations were detected in all tissue types including adipose, skin, bone, nerve, tendon and vessel, irrespective of the overgrown phenotype. Interestingly, the PIK3CA inhibitor BYL719, but not the mTOR inhibitor rapamycin, displayed lower IC50 for macrodactylous adipose-derived stem cells than normal adipose-derived stem cells, indicating selective inhibition of macrodactylous cells. In conclusion, through investigation of the largest cohort of isolated macrodactyly up to date, we revealed a unique mutational spectrum of this condition that differed from other PROS. Moreover, all tissue types in macrodactylous digit could serve as a DNA source for mutation detection. Finally, BYL719 was a potential selective drug for suppression of the overgrowth of the macrodactylous digit. This study will shed light on genetic diagnosis and targeted therapy for isolated macrodactyly.

Keywords:
macrodactyly, isolated, mutational spectrum, targeted therapy
Concurrent endoscopic carpal tunnel release and volar locking plate osteosynthesis for distal radius fractures

List of authors:
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¹ Yamagata University (Yamagata-city)
² Izumi Orthopaedic Hospital., Center for Hand, Elbow and Sports Medicine (Sendai-city)

Objectives / Interrogation: Carpal tunnel syndrome (CTS) is a common complication associated with distal radius fractures (DRFx). We performed a median nerve electrodiagnostic study before surgery. In addition, we have undergone endoscopic carpal tunnel release (ECTR) in the same setting as open reduction and internal fixation (ORIF) of the radius fractures, on the following cases who is developing CTS or is potentially present CTS. The purpose of this study was to report the outcome of ECTR concurrent with osteosynthesis for DRFx.

Methods: We retrospectively reviewed 10 (mean age, 65 years; 80% women) patients treated with DRFx between 2011 and 2015. Radiographs showed the following distribution in the AO/OTA classification system: one case of type A3, one case of C1, four cases of C2, and four cases of C3. The case of type A3 was an open fracture. We performed ECTR in the same setting as ORIF using a volar locking plate for DRFx. The clinical examination served to collect data on presence of numbness, preoperative abductor pollicis brevis-distal latency (APB-DL), range of motion at the final examination, radiographic evaluation, and complications. Average follow-up period was 7.7 months (range, 3-24 months).

Results and Conclusions: Eight of the 10 patients preoperatively complained the numbness of the affected hand. The preoperative APB-DL of the affected side was 5.1 (3.5 to 7.1) msec. We preoperatively diagnosed Four patients were preoperatively diagnosed to have CTS before the injury, four patients as acute onset CTS, and two patients as asymptomatic CTS on the basis of delayed APB-DL > 6.0 msec. Mean range of motion at the final follow-up was as follows: forearm 79° pronation/77° supination, and wrist 57° palmar flexion/62° dorsal flexion. The final radiographic measurements averaged 14 degrees of volar tilt, 24.7 degrees of radial inclination, and 1.3 mm of ulnar-positive variance. We confirmed 4 trigger digits as a complication. However, there were no numbness recurrence, CTS onset, or other complications. Concurrent ECTR in distal radius ORIF using a volar locking plate was efficacious and safe.

Keywords:
Endoscopic carpal tunnel release, distal radius fracture, carpal tunnel syndrome
Volar Plating of Distal Radius Fractures: Comparison of the Functional Outcomes of the Pronator Quadratus Muscle Repair, Non-repair, and Preserving Techniques

List of authors:
Ja Hea Gu¹, Jong-Pil Kim¹*, Jae-Uk Jung¹
¹ Dankook University (Cheonan)

Objectives / Interrogation: To demonstrate how the pronator quadratus(PQ) muscle function is affected in terms of forearm pronation after volar plating of distal radius fracture with PQ preservation and whether clinical outcomes would be affected by any pronation strength decrease compared to conventional technique.

Methods: A randomized controlled prospective study was performed by gathering data from all sixty-six patients treated with volar locking plate fixation for distal radius fractures divided into three groups: Group 1 with PQ preserving, Group 2 with PQ repair after splitting, and Group 3 with PQ non-repair after splitting. Clinical outcome measurement included the visual analogue scale(VAS), the disability of the arm, shoulder and hand(DASH) score, the patient-rated wrist evaluation(PRWE) score, range of wrist motion, grip strength at 12, 24, 48 weeks after surgery, and the isokinetic force of forearm pronation strength at 48 weeks after surgery. Radial height, radial inclination, ulnar variance, and palmar tilt were measured on wrist radiographs which takes immediately after surgery and at last follow-up for the radiologic outcomes.

Results and Conclusions: At 12 weeks after surgery, the average grip strength was 34.5±18.43N in group 1, 45.5±21.57N in group 2, and 31.91±15.4N in group 3.(P=0.043) At 24 weeks after surgery, the average extension was 71.32±11.94º in group 1, 79.91±6.49º in group 2, 73.05±12.56º in group 3.(P=0.031) Radial deviation was 19.55±4.21º in group 1, 22.91±6.49º in group 2, 17.95±5.46º in group 3.(P=0.012) Ulnar deviation was 26.55±6.1º in group 1, 31.14±4.86 in group 2, 27.36±6.97 in group 3.(P=0.033) The average grip strength was 42.23±21.62N in group 1, 60.23±23.68 in group 2, 47.45±21.97 in group 3.(P=0.029) At 48 weeks follow up, the average PRWE score was 16.82±23.06 in group 1, 11.68±14.90 in group 2, 31.77±30.49 in group 3.(P=0.018) Radiologic parameters were no statistically difference among the three groups. There were no complications such as complex regional pain syndrome(CRPS), post-traumatic arthritis, malunion, nonunion, delayed union, and reduction loss. PQ preservation with volar plating in distal radius fracture does not have benefit of forearm pronation strength, clinical and radiologic outcomes. Instead of preservation, pronator quadratus muscle repair is suggested when volar plate fixation is done in distal radius fractures.

Keywords:
Distal radius fractures, Volar plate fixation, Pronator quadratus muscle, Preservation
THE CHIMERIC SUPERFICIAL CIRCUMFLEX ILIAC ARTERY PERFORATOR FLAP IS AN EFFECTIVE OPTION FOR RECONSTRUCTION OF OSTEOCUTANEOUS DEFECTS OF THE HAND OR FOOT

List of authors:
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Objectives / Interrogation: Osteocutaneous defects of the hand or foot often necessitate multiple donor sites to address soft tissue and bony defects. We believe that a single chimeric perforator flap based on the superficial circumflex iliac artery (SCIA) is a reliable option for effective reconstruction of osteocutaneous defects of the hand and foot.

Methods: A retrospective review of all patients with osteocutaneous defects of the hand or foot reconstructed with a chimeric SCIA perforator (cSCIP) flap were included in this study. The SCIA is the common pedicle in the cSCIP flap which contains a perforator to skin and another vascular branch to the iliac crest. Demographic information, soft tissue defect size and location, bony defect size, chimeric flap size, and post-operative complications were collected. Success of soft tissue coverage and bony union were the primary outcome measures.

Results and Conclusions: A total of 15 patients were reviewed with a mean follow of 14 months (8-21 months). Average skin defect size was 27.8cm² (4.8-91.0 cm²) and average bony defect length was 3.35 cm (1.5-6.2 cm). In the cSCIP flap, average bone length was 3.40 cm (2.0-6.5 cm) and average skin area was 34.7 cm² (6.4-105.0 cm²). Bony union was successful in 13/15 of the cases at an average of 11.5 weeks (8-16 weeks) with the remaining two patients requiring second stage non-vascularized ICBG. 14/15 patients had complete flap survival. The remaining patient required a secondary skin graft for partial superficial necrosis. Donor site morbidity for the cSCIP flap is minimal and similar to that of non-vascularized ICBG harvest and groin flap. With a single stage procedure, the cSCIP flap provided successful soft tissue coverage and bony union in 93.3% and 86.7%

Keywords:
perforator flap; osteocutaneous defect; superficial circumflex iliac artery
Reconstruction both of hand and donor foot with a variety of wrap around flaps and free perforator flaps respectively

List of authors:
Xin Wang*, Jiadong Pan¹, Yaopeng Huang¹, Weiwen Zhang¹, Hong Chen¹
¹ Ningbo sixth Hospital (Ningbo)

Objectives / Interrogation: Objective To explore the surgical indications, techniques and curative effects of both hand and donor foot reconstruction with different types of big toe wrap-around flap and free perforator flap.

Methods: From February 2012 to October 2017, 102 fingers in 65 cases were reconstructed. A variety of wrap around flaps and perforator flaps were designed and transferred to reconstruct the hands and donor feet respectively. Single thumb reconstruction: I degree (11 fingers in 11 cases), II degree (25 fingers in 24 cases), III degree (5 fingers in 5 cases). Fingers reconstruction including thumb: two fingers (12 fingers in 5 cases), three fingers (12 fingers in 4 cases), four fingers (8 fingers in 2 cases). Fingers reconstruction except thumb: single finger (5 fingers in 5 cases), two fingers (6 fingers in 3 cases), three fingers (18 fingers in 6 cases). Secondary foot skin or bone defect: repaired with perforator flap (49 cases) or chimeric superficial circumflex iliac artery perforator flap (16 cases).

Results and Conclusions: Result All reconstructed fingers survived at last. Most of flaps for foot repair survived except partial necrosis in 3 cases and complete necrosis in 1 case. The follow-up ranged from 5 to 28 months. According to evaluation criteria from Chinese Medicine Association for hand surgery: excellent in 47 cases, good in 18 cases. According to the Maryland foot function score standard: excellent in 52 cases, good in 13 cases. Conclusion These described procedures can not only get the excellent outcome of reconstructed fingers based on minimal morbidity in the donor site but also provide a new treatment option for degloving hand that need multiple fingers reconstruction.

Keywords:
Toe to finger transfer; Perforator flap; Free tissue transfer; Composite transplantation; Degloving hand
Short to mid-term result of Pyrocarbon implant in the TMC 1 joint for osteoarthritis

List of authors:
Allan Ibsen Sorensen\textsuperscript{1}, Anders Nilsson\textsuperscript{1}
\textsuperscript{1} Sahlgrenska University Hospital (Gothenburg)

Objectives / Interrogation: The aim of the study is to present short to mid-term results of a Pyrocarbon implant (Pyrocardan) in the trapeziometacarpal joint (TMC).

Methods: A pyro-disc was used as a spacer in the TMC joint between first metacarpal bone and trapezium bone to treat osteoarthritis. Minimal resections performed of the base of first metacarpal and trapezium bone. A cast was used for 4 weeks, and then unloaded rehabilitation of exercises in 3 weeks followed by 3 weeks with gradually loading. Heavy load was allowed 12 weeks postop.

All patients were evaluated preop, 6, 12 and 26 weeks postoperatively and then yearly with ROM, grip strength, pinch, key-pinch, VAS scores for pain, Quick-DASH and patients satisfaction. X-Ray performed preop, 3 months postop and thereafter yearly.

Thirty-six patients were operated 18 men and 18 women. Median age 59 years (45-79). Four additional operations of IP and or MP1 joint and seven on wrist or hand. One patient operated later with arthrodesis in MP1 joint in same thumb. Mean values are used.

Results and Conclusions: Follow-up was 21 months (range 3-52). Radial abduction/palmar abduction was preop 38/39 degrees and at follow-up 40/40. Thumb opposition was .5 cm (0-3.0) versus .7 (0-6.0) Last follow-up (LFU) (P=NS). Grip strength in KgF preop was 22 (range 1-76) and at LFU 24 (7-69) (P=NS). Pinch/key-pinck (Kg) preop were 4.3/3.4 and at LFU 4.5/5.1 (P=NS). VAS pain (mm) was preop at rest/activity: 47/78 and at LFU: 20/35 (P<.01). Quick DASH preop; 52 (16-86) and at LFU; 33 (0-86) (p<0.01). Satisfaction (mm of 100) preop: 17 (0-94) was improved at LFU: 71 (0-100) (p<0.01). Radiographic migration occurred in two implant but it was not dislocated.

No infection. Four implants were revised, two to tendon interposition arthroplasty and two to change of the size of the implant and MiniTightRope joint stabilization. One MiniTightRope joint stabilization were performed due to instability.

Short to mid-term results with a pyrocarbon implant in the TMC joint concerning pain, Quick-DASH and patient satisfaction are favorable. Change of other outcome data were non-significant. Longer follow-up and a larger series of patients operated on with this implant is needed.

Keywords:
TMC1, Pyrocarbon Implant, Pyrocardan, Osteoarthritis, CMC1
Vascularized Thumb Metacarpal Periosteal Flap for Scaphoid Nonunion in Adolescents: An Anatomical Study and Prospective Cohort Study of 16 Patients

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2 ICATME; Hospital Quirón-Dexeus (Barcelona)
3 Universitat Autònoma Barcelona (UAB) (Barcelona)
4 ICATME; Hospital Quirón-Dexeus, Universitat Autònoma Barcelona (UAB) (Barcelona)
5 Hospital Sant Joan de Deu (Barcelona)
6 Governador Celso Ramos Hospital, University of the South of Santa Catarina (Florianópolis, Santa Catarina)

Objectives / Interrogation: Through an anatomical review, the primary aim of this study was to delineate the dorsal thumb metacarpal (TM) periosteal branches of the radial artery (RA). In addition, we report here the clinical and radiological outcomes of a vascularized TM periosteal pedicled flap (VTMPF), supplied by the first dorsal metacarpal artery (FDMA), in a cohort of scaphoid nonunion in an adolescent.

Methods: Ten latex-colored upper limbs from fresh human cadavers were used. Branches of the RA were dissected, noting the periosteal, muscular, and cutaneous branches arising from the FDMA and the radial branch (RB) of the first dorsal intermetacarpal artery (FDIA).

Sixteen patients under age 18 years with scaphoid nonunion, who underwent a VTMPF procedure without bone grafting, were included for this prospective cohort study at a mean follow-up of 10.9 months. Patients were operated on by three different hand surgeons at three hand surgery institutions. All patients received a VTMVF, but with different scaphoid internal fixation modalities, in 14 cases using one or two retrograde 2mm headless compression screws and in 2 cases were not required stabilization.

Results and Conclusions: The FDMA provided a mean 12 periosteal branches (range 9 to 15), and the RB of the FDIA provided a mean five periosteal branches to the dorsal aspect of the TM (range 4-7).

In 13 boys and 3 girls, the mean age was 16.2 years. There were two type D1 nonunions (Herbert classification), six type D2, five type D3, and three type D4. Seven patients previously had undergone an unsuccessful surgical attempt to treat their nonunion. The mean anterior bone defect was 3 mm in length. The patients experienced no postoperative complications. Successful consolidation was achieved in all cases, with 82% cross sectional trabecular bridging at 12 weeks. Pain subsided after surgery and patients experienced improvements in both their QuickDASH and MMWS scores. Overall 34% and 40% gains in strength and wrist motion, relative to the contralateral normal side, were observed. At final follow-up, there were differences between the preoperative versus postoperative hand in wrist range of motion, or either grip or pinch strength.

Conclusions: In this study, the use of VTMPF for scaphoid nonunion in children and adolescents is associated with general good outcomes.

Keywords:
Vascularized Thumb Metacarpal Periosteal Pedicled Flap; Thumb Metacarpal Periosteal Flap; Periosteal Flap; Scaphoid Non-union; Non-union
Clinical studying on the reconstruction of extremity skin defect by free ilio groin skin flap

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Objectives / Interrogation: To investigate the clinical effect of free iliogroin flap in repairing soft tissue of extremities and combining bone defect.

Methods: From January 2010 to June 2017 75 cases performed with free iliogroin flap to repair skin and soft tissue defect of extremities, including 42 cases of superficial circumflex iliac artery flap (13 with ilium superficial circumflex iliac artery flap, superficial 18 were epi gastric artery flap, 15 cases of superficial circumflex iliac artery and the superficial epigastric artery combined the flap (lobulated flap in 7 cases). 49 cases of hand and skin soft tissue defects were repaired, 26 cases of skin and soft tissue defects were repaired, 18 cases were toe reconstruction, and the smallest area was 5.0 cm *7.0 cm, the largest was 11.0 cm * 23.0 cm. All repair superficial circumflex iliac vein or superficial circumflex iliac vein (21 cases of repair and a concomitant vein). The donor site is directly sutured through flexion and hip flexion. The occurrence of arteriovenous crisis and the principle of treatment were observed within 1 weeks after the operation. After 3 weeks, 1.5 months, 3 months, 6 months, 1 years and 2 years follow-up, we observed the healing of the donor site and the appearance and sensory recovery of the skin flap, and summarized the clinical application characteristics and experience of the flap.

Results and Conclusions: In 75 cases of skin flap, 72 cases survived smoothly, 1 cases had arterial crisis, 2 case had venous crisis, and skin necrosis occurred after conservative treatment. After two stage eschar, subcutaneous soft tissue survived and skin graft survived. A flap cut was removed after a week straight walk for area after two incision dehiscence and suture after healing, healed more than. After 0.5 - 1.5 years of follow-up, the skin was soft, mild and bloated, and the sensation recovered S2-S3, and the line scars in the abdominal donor area were small. The use of free iliac inguinal flap transplantation to repair skin and soft tissue defects of extremities is an axial skin flap. It has a constant blood vessel and easy cutting. It does not damage main vessels. The operation time is short, the flap is large, the donor area can be directly sutured, and the scar is small and hidden. It is one of the better methods to repair the soft tissue defects of the extremities.

Keywords:
free;groin flap;perforator flap; limb defects
The clinical application of type I venous flap of volar forearm in complicated replantation of fingers

To evaluate the clinical curative effect of the type I venous flap transplantation of volar forearm for complicated digital replantation.

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Objectives / Interrogation: To evaluate the clinical curative effect of the type I venous flap transplantation of volar forearm for complicated digital replantation.

Methods: From May 2009 to June 2016, 8 cases with 12 fingers who underwent digital replantation using type I venous flap of volar forearm for flow-through dorsal veins of finger and covering soft tissue defects, 5 cases were male, 3 female; age 22 to 58 years (mean age 34.3 years) of follow-up observation, observing the postoperative changes of blood supply of the venous flaps and digital replantation. The process of flap survival and contracture of survived flaps.

Results and Conclusions: 8 cases with 12 fingers of replantation were survived without venous crisis, but 2 cases with 3 fingers had arterial crisis. The color of the all venous flaps were reddish with capillary reflux slowly in 1 day after operation. Then superficial skin exfoliating and formatting blisters. Eventually the wound of flaps healing and the flaps survived completely with an average of 28.5 days after surgery (18-36 d). No venous reflux disorder, swelling and congestion of the flaps during the healing procedure. Flap survived without obvious contracture and did not affect the joint flexion.

The type I venous flap of volar forearm can simultaneously flow-through the dorsal veins of fingers and repair the wound. It is suitable for finger replantation with soft tissue defect of the dorsum of fingers and hand.

Keywords:
Digital replantation; Venous flow-through flaps; Venous flaps; Hand and digital soft tissue defects
Salvaging the Congestion or Stasis Compromised Free Perforator Flaps based on a new classification

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Objectives / Interrogation: To investigate the causes and classification of the congestion or stasis free perforator flap.

Methods: 187 compromised flaps were found in 1236 patients receiving the free perforator flap transfer, and divided into four types based on the size, the characteristics and the progress of ecchymosis which showing on the surface: Type 1 had no ecchymosis. Type 2 had slowly enlarged ecchymosis in a small area. Low perfusion was type 3. Type 4 had a high flap tension with larger ecchymosis size and deeper color in a short time. According to this classification, there were 37 cases in type 1, 68 in type 2, 39 in type 3, 43 in type 4. The conservative treatments such as dressing change, removal of stitches, bleeding with small incisions, local flap massage and thrombolysis were applied to 109 cases including 37 in type 1, 68 in type 2, 4 in type 3. The other 78 cases underwent surgical revision including 35 in type 3 and 43 in type 4. After exploration, 35 in type 4 (44.9%, 35/78) were venous obstruction, 29 (37.2%, 29/78) in type 3 due to artery occlusion, and 14 (17.9%, 14/78) consisting of 8 in type 4 and 6 in type 3 were both of arterial and venous obstruction.

Results and Conclusions: After conservative treatment, 94 (86.2%, 94/109) flaps survived, 13 (12%, 13/109) were partial necrosis, and 2 (1.8%, 2/109) complete necrosis. After surgical revision, 29 cases (82.9%, 29/35) were venous obstruction, 17 (58.6%, 17/29) were arterial cause and 8 (57.1%, 8/14) because of both vessel problem survived finally. Partial necrosis were 4 (11.4%, 4/35), 3 (10.4%, 3/29) and 4 (28.6%, 4/14) respectively. Complete necrosis were 2 (5.7% 2/35), 9 (31%, 9/29) and 2 (14.3%, 2/14). 132 patients (70.6%, 132/187) were followed up from 3 to 21 months. The texture and color of the fully salvaged flap is similar to the non-crisis flap, but it looks like tougher and darker in the partial salvaged flap. Conclusion The stasis and congestion of venous blood in the flap always led to flap necrosis, which may result from either low artery perfusion or poor venous backflow. The clinical classification is objective and easy to observe, which contribute to an early accurate diagnosis and treatment for the compromised flap. The conservative methods are mainly used to save the crisis flap in type 1 or 2, and for the cases in type 3 or 4, the surgical revision is a preferred choice.

Keywords:
lims; trauma; perforator flap; free flap; vascular crisis
Transplanting the posterior interosseous artery perforator lobulated flap to repair soft tissue defect on fingers

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Objectives / Interrogation: To explore the surgical method of applying the lobulated flap designed on the polyfoliate posterior interosseous artery perforator (PIAP) to repair the soft tissue defect on fingers and report the clinical outcome.

Methods: From Aug 2011 to Feb 2015, there were 12 patients suffered with soft tissue defect on fingers, repaired with PIAP flaps through anastomosing one group vessel with perforator. All wounds of donor site were closed primarily.

Results and Conclusions: All flaps of 12 cases survived. The clinical results were satisfactory after 3-15 months of following-up. The TAM was 150°-265° (contralateral, 255°-270°).

The use of applying the PIAP lobulated flap to repair the soft tissue defect on fingers is a functional, feasible and effective treatment method.

Keywords:
posterior interosseous artery, lobulated, perforator flap, soft tissue defect
The application of Freestyle concept in anterolateral thigh flap with oblique branch

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Objectives / Interrogation: To explore the feasibility and clinical effect of freestyle concept in the anterolateral thigh flap with oblique branch repairing the soft tissue defect of extremities.

Methods: Twelve patients with soft tissue defects in extremities were repaired using anterolateral thigh flaps with oblique branch from January 2015 to December 2017. The distance of perforator through the muscle was greater than 8.0 cm. The flaps were harvested based on freestyle concept. End-to-side anastomosis or end-to-end anastomosis was performed, posterior tibial artery end-to-side anastomosis in 3 cases, posterior tibial artery branch end-to-end anastomosis in 2 cases, anterior tibial artery end-to-side anastomosis in one case, anterior tibial artery branch end-to-end anastomosis in one case, radial artery end-to-side anastomosis in 3 cases, and radial artery branch end-to-end anastomosis in 2 cases. The flap size ranged from 10 cm × 6 cm to 18 cm × 9 cm. The donor sites were closed directly for 9 cases and skin grafting for 3 cases.

Results and Conclusions: 11 cases survived uneventfully, one case suffered from arterial congestion, which was solved by reoperation. All of the patients were followed-up 1 to 12 months, average of 5 months. All flaps showed good texture matches and contour. When patients are repaired using anterolateral thigh flaps with oblique branch, the distance of perforator through the muscle is longer, the flaps can be harvested based on freestyle concept and end-to-side anastomosis or end-to-end anastomosis can be performed, good clinical effect can also be achieved.

Keywords:
Anterolateral thigh flap; Perforator flap; Oblique branch; Freestyle
Early internal fixation combined with free flaps for the treatment of Gustilo type IIIB forearm open fractures with soft tissue defects

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Objectives / Interrogation: To investigate the clinical therapy of early internal fixation combined with free flaps for Gustilo type IIIB forearm open fractures.

Methods: A retrospective study was conducted of the 15 patients with Gustilo type IIIB forearm open fracture who had been treated from July 2014 to July 2017 at our department. They were 10 men and 5 women, aged from 22 to 68 years (average, 45.5 years). AO classification: type A 4 cases, type B 9 cases, type C 2 cases. Primary internal fixation and second-stage perforator flaps transfer 11 cases, second-stage internal fixation and flaps transfer 4 cases; all the 15 patients received free flap transplantation, site of the defect: 4 cm×8 cm~8 cm×33 cm. The period between injury to second-stage flap transplantation was 4~28 days (average, 10.2 days). There were all anterolateral thigh perforator flaps.

Results and Conclusions: All the 15 cases of free flaps were survived with no deep infection and osteomyelitis. 4 cases had superficial infection at wound. Partial necrosis happened at the distal end of 2 cases and healed with skin grafts. 1 anterolateral thigh perforator flap encountered vascular complication which survived with 3 cm-in-width skin necrosis at the distal end of the flap after successful surgical exploration. All the patients were follow-up for 12~36 months (average, 18.5 months). All the flap texture was soft, with varying degrees of pigmentation. The sensory recovery of flap was S2 in 2 cases, S3 in 10 cases, S4 in 3 cases. Bone union time ranged from 4 to 14 months (average, 8.6 months), 2 cases of nonunion were treated with autologous iliac bone grafting 8 months after operation. The curative effect was evaluated by Anderson standard: 10 cases were excellent, 3 cases good, 1 cases better and 1 cases poor. Conclusion It is an effective strategy to treat the Gustilo type IIIB forearm open fractures with soft tissue defects by early internal fixation combined with free flaps transfer, which has advantages of shorten the treatment period, recovering exercise early, decrease complications, and satisfactory function.

Keywords:
forearm; open fracture; internal fixation; free flaps; repair and reconstruct
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Objectives / Interrogation: Objective To introduce indications of palm replantation with degloved or avulsed skin and recovery of hand function

Methods: from June 2011 to January 2015, 10 patients with severed palm with degloved or avulsed skin were treated by replantation. All patients were followed up 8 to 36 months with an average of 14.5 months. In all patients with rigid internal fixation and exquisite soft tissue repair, the functional exercise were performed in early stage after operation.

Results and Conclusions: 10 patients with severed palm were all survived without any postoperative infection. All fractures healed after follow-up of 6–10 weeks with an average of 8 weeks. 8 patients took plate removal and Myotenolysis. According to evaluation standard of upper limb replantation function posposed by Chinese Medical Association, 5 cases got excellent results, 4 good and 1 poor and good rate is 90 percent.

Keywords: degloved skin; avulsed skin; severed palm
Improving Functional and Aesthetical Result of Radial Forearm Flap

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Objectives / Interrogation: The radial forearm flap is one of the most reliable conventional type of flaps. This is due to its thinness, pliability, good vascularization, relative hairlessness and good sensation. The disadvantages lies in radial artery sacrifice and donor-site morbidity. The increasing understanding of the local anatomy has allowed for the identification of perforating branches of the radial artery that allow for the subdivision of the radial flap into two or three components.

![Anatomical drawing](image)

Rotation of each small component can reach up 180 degree. This modification allows contouring of the flap to a wide range of recipient sites, while permitting the primary donor side closure [1].

Methods: From 2014 to 2016, 5 patients (4 males and 1 female) were treated by "a modified radial artery perforator flap". Free flaps from the contralateral limb were used in 2 cases and pedicled flaps were used in 3 cases. The age of the patients ranged from 7 to 52 years. The reconstructed areas involved the hand in 4 cases and the elbow in one case, all of which were traumatic in nature. Outcomes included flap survival, complications and donor site morbidity.

<table>
<thead>
<tr>
<th>Age</th>
<th>Sex</th>
<th>Defect</th>
<th>Flap</th>
<th>Donor site closure</th>
<th>Flap's segment</th>
</tr>
</thead>
<tbody>
<tr>
<td>36</td>
<td>M</td>
<td>Hand</td>
<td>Pedicled</td>
<td>Direct</td>
<td>2</td>
</tr>
<tr>
<td>57</td>
<td>M</td>
<td>Hand</td>
<td>Free</td>
<td>Dermal substitute</td>
<td>2</td>
</tr>
<tr>
<td>52</td>
<td>F</td>
<td>Elbow</td>
<td>Pedicled</td>
<td>Direct</td>
<td>3</td>
</tr>
<tr>
<td>7**</td>
<td>M</td>
<td>Hand</td>
<td>Free</td>
<td>Dermal Substitute</td>
<td>2</td>
</tr>
<tr>
<td>26</td>
<td>M</td>
<td>Hand</td>
<td>Pedicled</td>
<td>Direct</td>
<td>2</td>
</tr>
</tbody>
</table>

Results and Conclusions: All flaps survived without signs of necrosis. The donor site was closed primarily in three cases. In the remaining cases, the donor site was initially covered with a dermal regeneration template followed by skin grafting three weeks later. There were no cases of impaired blood circulation of the hand or cold intolerance after sacrifice of the radial artery. The flap may be considered an alternative method to other reconstructive techniques especially when reconstruction has to match the concept of "like to like".
Keywords:
upper limb reconstruction, radial flap,

References:
1. MATEEV M., Shape Modified Radial Artery Perforator Flap Method: Analysis of 112 cases, PRS, 2009, 1533-1543, 123(5), PRS
Intraoperative Technique for Evaluation of the Interosseous Ligament of the Forearm

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Objectives / Interrogation: To introduce a technique for the diagnosis of interosseous ligament (IOL) disruption based on lateral displacement of the radius after radial head resection and to determine the cutoff value of the lateral displacement for the diagnosis of disruption, the best elbow position for testing, and the diagnostic performance of the technique in different positions.

Methods: We used 10 fresh-frozen cadavers. After resection of the radial head, a Steinman pin was placed into the radius medullary canal and used to mark the pin location on the capitellum. We applied 1 kg force to pull the proximal radius laterally and measured the displacement in full supination, neutral, and full pronation of the forearm with the elbow in extension and then in 90 flexion. All measurements were performed once with the IOL intact and again with it cut. To assess diagnostic efficacy, receiver operating characteristics curves were constructed. To determine the quality of the technique, we measured the area under the receiver operating characteristics curve for each position. We also determined the cutoff value to obtain the highest sensitivity and specificity.

Results and Conclusions: Results: The area under the curve of the test in extension-supination and flexion-supination showed that these positions were excellent for the diagnosis of IOL disruption. The cutoff value of 5.5 mm lateral displacement in extension-supination had 100% sensitivity and 90% specificity. In flexion-supination, the cutoff value of 9 mm had 100% sensitivity and 90% specificity for the diagnosis of IOL disruption.

Conclusions: This maneuver was reliable and accurate in cadavers with complete IOL disruption. It is likely that in an intraoperative setting, these results will be reproducible.

Keywords:
Interosseous ligament, interosseous membrane, lateral pull
NUMBER OF WEAVES IS AN IMPORTANT FACTOR IN THE TENSILE STRENGTH OF THE PROXIMAL WEAVE IN TENDON GRAFTING

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Objectives / Interrogation: Current literature supports the idea of joining tendons or tendon grafts by multiple interdigitating weaves, known as the 'Pulvertaft weaves' in proximal reconstruction of tendon grafts to increase the tensile strength. While a greater number of weaves contribute to greater strength of the reconstruction, additional weaves would add to the bulk which inhibits optimal tendon gliding and postoperative rehabilitation. The aim of this study is to investigate the optimal number of weaves on the tensile strength of tendon reconstruction.

Methods: 36 fresh frozen flexor tendons were harvested and divided into 3 groups with 6 specimens each (G1 - 1 weave; G2 - 2 weaves; G3 - 3 weaves). Longitudinal slits were made on the receiving tendon at 90 degrees perpendicular to the previous slit. The tendon graft was delivered through the slits to form the interdigitating weaves. The tendons were reconstructed using 8 anchoring sutures (Ethilon 3/0) placed at regular intervals.

The tensile load of the repaired tendon was measured by a mechanical tester (Instron Model 3343). Firstly, the repairs clamped at each ends and pre-loaded with 5 consecutive cycles of 2.0 N. The specimen was then pulled to failure at a constant strain rate of 20 mm/min. Variables measured were: maximum load, tensile extension at maximum load, ultimate load and time to failure. One-way ANOVA was used to determine the statistical difference between the groups. A high-speed camera was used to record the mechanism of failure.

Results and Conclusions: The mean maximum load for G1 was 75.18N; G2 90.60N, and G3 89.41N; G2 and G3 showed very similar results but these were not statistically significant. The mean tensile extension at maximum load (G2 14.59mm vs G3 15.80mm, p 0.010); ultimate load (G2 50.46mm vs G3 57.72mm, p 0.049); and time to failure (G2 149.9sec vs G3 173.52 sec, p 0.042) were found to be statistically significant. The modes of failure for all the 18 specimens were suture pull out resulting in gradual failure. One specimen from G2 and G3 demonstrated suture breakage, these were found to have precipitated earlier time to failure.

This study demonstrated that 2-weave tendon grafts were comparable in tensile strength with the 3-weave construct. This suggested that a 2-weave construct could afford sufficient stability for finger and hand rehabilitation following tendon reconstruction. The 2-weave construct is less bulky, which reduces the tendency for tendon adhesion and resistance in gliding.

Keywords:
pulvertaft, tendon weaves, proximal weaves, tensile strength
The diagnosis and treatment for 7 carpal tunnel syndrome cases caused by NTM infection

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Objectives / Interrogation: Retrospectively analyze 7 patients diagnosed with CTS caused by NTM infection and explore the clinical character, differential diagnosis and corresponding treatment.

Methods: From June 2015 to June 2017, we collected 7 cases diagnosed with CTS, which during operation, we found granulomas inflammation and send for culture with NTM positive. We then retrospectively analyzed their etiology, clinical character, differential diagnosis, culture results, treatment and prognosis.

Results and Conclusions: 3 of 7 cases had a history of sea creature injury, while 4 cases had not. Clinical presented with numbness and pain, 5 cases had experience acute pain. 4 patients manifested with infectious redness and edema in the fingers while the other 3 patients had no infection signs. The culture showed mycobacterial marinum in 6 cases, in 1 case. EMG showed median nerve moderately compressed for 5 cases, severe for 2 cases. 4 patients took antimycobacterial medication before operation, we did CTR and thorough debridement for 4 patients, and CTR and limit debridement. All the patients get pain relief and numbness improved. All the patients were prescribed with antimycobacterial medication for an average of 2.5 months. 6 of them recovered uneventfully with satisfied function, 1 patient who underwent limited debridement reoccurred in 2 months after surgery who need another thorough debridement and recovered with mild dysfunction.

NTM infection can present with CTS which is difficult to differentiate. Acute and continued pain indicate the present of infection. The main treatment is antimycobacterial medication. Debridement and CTR surgery is for those with obvious nerve compression syndrome while can not relief after conservative treatment.

Keywords:
non tuberculous mycobacteria; carpal tunnel syndrome; treatment
reparing skin defect of the finger with the free flap which with tendon pedicled on the palmar branch of the suracarpal palmar perforator of ulnar artery

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Objectives / Interrogation: To study the clinical effect of free graft of the compound flap of wrist perforator branch of ulnar artery with partial flexor carpi ulnaris tendon and / or medial forearm cutaneous nerve for the repair of flexor tendon and / or finger nerve defect in dorsalis digitalis skin and soft tissue.

Methods: From June 2010 to June 2017, 35 patients with 36 fingers dorsal skin and soft tissue with extensor tendon defect and 21 patients with metacarpal skin soft tissue with flexor and / or deep flexor tendon were treated clinically. A patient with a defect of the inherent nerve of the finger. The tendons and (or) nerve defects were transplanted with the ulnar flexor wrist tendon and / or the ulnar artery superior palmar perforating branch flap of the medial forearm cutaneous nerve. The length of ulnar flexor tendon was about 2.0 – 5.5 cm with superficial thickness of 0.5 cm. 35 cases (36 fingers with extensor tendon defect) were transplanted to repair the extensor tendon to cover the skin defect. 21 patients with deep flexor tendon and / or finger nerve defect were transplanted to repair. The occurrence of arteriovenous crisis and the principles of management were followed up after operation.

Results and Conclusions: In 56 cases of 57 fingers, 54 fingers flaps survived successfully, and 1 finger appeared arterial crisis, which was relieved after conservative treatment, and later appeared partial necrosis of the distal skin, and scar healed after dressing change. Blisters and purples appeared in 2 fingers, in which 1 finger was partially necrosed, and 1 finger was completely necrosed after dressing change. Skin grafting was performed in the second stage. The flap was followed up for 6 to 24 months; and was similar in color, had no obvious bloated appearance. In the patients with tendon repair, the flexion of the fingers returned to normal or near normal, and the sensory recovery of the nerve repair was s3 / s3 +. The wrist joint movement and flexor muscle strength were not changed.

The ulnar artery has constant cutaneous perforating branches on the palmar side of the wrist, which meets the design requirements, and the skin of this part is similar to the skin texture of the dorsal palm of the finger. It is a good choice to repair the compound tissue defect of the dorsal metacarpal tissue with the free tendon and nerve flap of the ulnar artery.

Keywords:
suracarpal palmar perforator, branch of ulnar artery flap, tendon,free
Repairing donor site of foot after improved Toe-to-thumb reconstruction utilizing superficial circumflex iliac artery perforator chimeric flap

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Objectives / Interrogation: To evaluate the clinical outcome of the method of repairing donor site of foot after improved Toe-to-thumb reconstruction utilizing superficial circumflex iliac artery perforator (SCIAP) chimeric flap.

Methods: Fourteen cases of thumb defect were recruited in our hospital from April 2012 to January 2016. According to Gu Yudong's classification 5 cases met the criterion of type I, 4 cases met the criterion of type II, and 5 cases met the criterion of type III. For type I, the thumb was reconstructed with the great toe wrap-around flap. For type II and III, the thumb was reconstructed by the combined tissue with mutual artery (great toe wrap-around flap, and the bone-tendon tissue of the second toe). All the donor sites of foot were repaired utilizing SCIAP chimeric flap.

Results and Conclusions: All the reconstructed thumbs survived. Among 14 free flaps of donor site, 1 case suffered venous crisis and survived after exploration and rescue surgery. Dorsal skin necrosis of the second toe was found in 1 case, which was healed by local skin flap transposition. All patients were followed-up ranged from 3 months to 30 months (average time was 16 months). In spite of slightly bloated, all the flaps' color and texture was satisfied, and the average healing time of the bone in the donor sites was 2.5 months. All the patients did not feel painful and had no adverse effect when walking and running. Three months after the operation, 5 slightly bloated flaps in the donor sites under went flap plastic and achieved better appearance. On the part of iliaca, there was only one inconspicuous linear scar without any discomfort.

Repairing donor site of foot after improved Toe-to-thumb reconstruction utilizing SCIAP chimeric flap was an ideal method. Using this method, the reconstructed thumb can achieve good appearance and function, all the toes of donor site were reserved, and the disability of the donor site was minimized.

Keywords:
Superficial circumflex iliac artery; chimeric flap; perforator flap; Tissue transplantation; Thumb reconstruction; Donor site; Microsurgical technique
Long-term results after total wrist fusion using the AO-plate

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Objectives / Interrogation: Arthrodesis of the wrist is a salvage procedure for advanced arthritis with painful destruction of the radiocarpal and midcarpal joint after failure of all conservative treatment and motion-preserving procedures. Fusion is performed to eliminate pain and therefore increase function of the hand. The main purpose of this study was to determine long term functional result despite the loss of motion and define possible reasons for remaining pain.

Methods: Inclusion criteria for our retrospectiv study were total wrist fusion with an AO-plate and follow up of more than 10 years. Exclusion criteria were rheumatoid arthritis, congenital malformations and brachial plexus palsy. Between 2002 and 2007 214 patients underwent a total wrist fusion in our clinic, of which 71 patients were available for clinical follow-up examination, x-ray and functional self assesment using the DASH-questionnaire, the patient-rated wrist evaluation score (PRWE-G) and the short form 36 (SF 36) questionnaire. The modified Mayo wrist score was used to assess the clinical outcome. The mean follow-up of the 60 men and 11 women with an average age of 60.8 years was 11.2 years.

Results and Conclusions: Results
The various scores averaged: DASH-score = 30 points, PRWE-G = 31 points modified Mayo wrist score (Krimmer score) 59 points. 70 of the 71 wrists fused primarily. In 23 cases the plate was removed. 18 x-ray demonstrated broken screws. Only 15 patients were complete pain free and the majority complained about pain during stress with a mean of 4/10. In most patients the pain wasn't reproducible during the examination.
The grip strength averaged 92% compared to the other wrist. Despite the remaining pain 98% of the patients were satisfied and 93% would undergo the operation again. Influence of various radiological and clinical factors on the functional result will further be statistically investigated.

Conclusions
Despite loss of wrist motion patients are highly satisfied with the long term result although most patients complain about remaining pain during strong activity that could not further been defined on clinical or radiological examinations. The long term functional result with a mean of 30 points measured with the DASH score appears to be more favorable than the reported midterm results in other studies and is similar to the long term results of partial wrist fusion.

Keywords:
total wrist fusion, AO-Plate, salvage procedure osteoarthritis
Active Wrist Mobilization after operatively treated distal radius fractures by volar locking plate - a prospective randomized trial

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Objectives / Interrogation: Distal radius fractures (DRFs) are very common and surgical treatment by volar locking plates became standard therapy in the last decade. In addition, incidence of DRF will increase until 2030 because of an increased life expectancy. Due to this, surgical treatment and rehabilitation are of great interest. Main aim of this study was to compare an early postoperative mobilization after DRF with a cast immobilization of 5 weeks. Null hypothesis was that an early mobilization results in an equal outcome in range of motion (ROM) and functional outcome scores than an immobilization of 5 weeks.

Methods: One hundred patients with an isolated distal radius fracture treated by open reduction and internal fixation with volar locking plate were prospectively randomized in two groups. One group ("Mobilization group"; Mo) received a removable thermoplastic splint for 1 week and was allowed to move the wrist from the first day after surgery. The other group ("immobilization group"; IM) received a nonremovable forearm cast for 5 weeks. Both groups underwent physiotherapy 2 times a week. At 6 weeks, 9 weeks, 3 months, 6 months, and 1-year postsurgery, ROM, grip strength, and radiographs had been evaluated. Additionally, Quick Disability of the Arm, Shoulder and Hand (QuickDASH) questionnaire, Patient-rated Wrist Evaluation (PRWE), modified Green O'Brien (Mayo) score, and pain according to the visual analog scale (VAS) score was analyzed.

Results and Conclusions: Patients in the EM group showed a significantly better QuickDASH score, ROM in extension/flexion and grip strength at the one year checkup. Radial/ulnar deviation and pain according to the VAS differed significantly up to 9 weeks while supination/pronation and PRWE score was significantly better at 6 months evaluation. Additionally, sick leave and physiotherapy were also significantly shorter in the EM group. There were no significant differences in respect of radiological loss of reduction and complications between the groups.

Conclusions: Early mobilization of the wrist after operatively treated DRFs using volar angular stable locking plates is safe, and results in a significantly better functional outcome up to one year, with shorter duration of sick leave and physiotherapy compared to an immobilization for 5 weeks.

Keywords: distal radius fracture, rehabilitation, volar locking plate, outcome
Patient and Carer Satisfaction Post Wrist Arthrodesis in Cerebral Palsy

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Objectives / Interrogation: Cerebral palsy is characterised by static brain injury with progressive musculoskeletal manifestations. This includes spasticity with wrist deformity in a hyperflexed and ulna deviated position. Treatment of severe deformity requires bony correction to restore neutral position, which is usually achieved by a wrist fusion. Our aim was to assess patient and carers post-operative satisfaction following wrist arthrodesis to determine what benefits were being gained from this procedure.

Methods: This is a retrospective case series assessing patients with cerebral palsy who underwent wrist arthrodesis at our institution by a single surgeon with a minimum of 1-year follow-up. We developed a visual analogue scale questionnaire of eight questions in which patients and carers rated the satisfaction of their wrist fusion with regards to pain, function, hygiene, appearance, daily care and overall satisfaction. For each question, a scale from -10 to +10 was given: +10 being the best outcome, 0 being no change, and -10 being the worst outcome. Surveys were anonymous and sent to patients via post. Results of the surveys were our our primary outcomes. Secondary outcomes were complications documented in patient records and radiographic outcome measures from routine post-operative follow-up.

Results and Conclusions: We identified 13 patients who underwent wrist arthrodesis. Four patients had bilateral procedures, giving a total of 17 wrists. Of these 13 patients, eight were quadriplegic and five hemiplegic. Age at arthrodesis ranged from 15-22 years. Pre-operative joint contracture ranged from 60-90 degrees. There were two deaths not related to the procedure. A total of 11 surveys were sent and eight returned (73% response rate). Results from the survey showed the greatest improvements were made in appearance with a mean rating of +6.6, ease of daily cares (+4.9), hygiene (+3.2), and hand function (+2.7). There was a slightly negative change in pain levels (-0.7). Overall, there was a positive satisfaction rating (+5.0).

Complications from the procedure included one non-union, one superficial wound breakdown, one removal of metalware for prominence and one pain syndrome.

Wrist fusion appears to be a beneficial procedure for cerebral palsy patients with severe wrist deformity. Greatest improvements are in daily cares, hygiene and cosmetic appearance. However, it does not significantly improve patient function or pain levels. Patients and carers should be counselled about the limitations of this operation.

Keywords: wrist arthrodesis, cerebral palsy
Complications after distal radius fractures stabilized by volar locking plate in 392 patients

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Objectives / Interrogation: Distal radius fractures (DRF) are the most common occurring fractures in the upper extremities and the incidence is worldwide on the increase due to a growing population in the industrial countries. In the last decade there was significant change in stabilisation away from k-wires and external fixation to open reduction and locking plate fixation. Due to the increased number of DRFs, stabilization methods and complications are of interest in the literature. Many studies reported up to 39% complication rates in volar stabilized DRF. Typical complications included: changes in sensibility, tendon irritation and rupture, hardware malfunction, infection, complex regional pain syndrome (CRPS), and post-traumatical osteoarthritis.

Methods: All patients with DRF that were stabilized between 2013 to 2016, using volar angular stable locking plate and minimum follow-up of 3 months were included. 392 patients medical records (259 female/133 male) with a mean follow-up interval of 11 months (range 3 to 52 months) were analyzed. All recorded complications were documented. Range of motion (ROM) in extension, flexion, supination, pronation, radial- and ulnar deviation of the last follow-up was noted. Age was divided into younger than 65 years and equal or older than 65 years. The primary, postoperative and final checkup radiographs were analyzed for alignment and intra-articular step-off.

Results and Conclusions: A total of 51 (13%) early and 17 late (4%) complications were recorded patients. The most common complications included carpal tunnel syndrome (3%), complex regional pain syndrome (3%) and loss of reduction (2%). Of the 68 complications, only 23 (6%) were directly related to the plate and 73% of all complications occurred in AO type C fractures. Patients without complications showed a significantly better ROM in extension, flexion, pronation and supination than patients with complications. No significant differences in incidence of complications, ROM or loss of reduction could be found between patients over and under 65 years of age.

Conclusion:
Treatment of DRF by volar angular stable locking plate is a safe and results in the majority of the cases a good clinical and radiological outcome with no complications. Age over 65 years is not associated with an increased risk for complications or restricted ROM.

Keywords:
Distal Radius Fracture, volar locking plate, complications, outcome, elderly
Prevalence of Flexor Carpi Radialis Brevis in Chinese Patients with Volar Wrist Plating Performed for Distal Radius Fracture

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Objectives / Interrogation: To evaluate the prevalence of flexor carpi radialis brevis (FCRB) in patients with volar wrist plating done for fracture distal radius in Chinese population

Methods: This is a retrospective single-centre study. In a 3.5-year period from March 2015 to August 2018, 133 patients who suffered from distal radius fracture requiring volar locking plate fixation were recruited. Patients younger than 18 years old were excluded. Non-Chinese patients were excluded.

All data were retrieved from electronic clinical data analysis and reporting system in our hospital. Descriptions in operation records were collected.

All operations were carried out by or supervised by hand specialists. A direct flexor carpi radialis (FCR) approach was used. FCR tendon sheath was incised. FCR and flexor pollicis longus were retracted ulnarly. Pronator quadratus was subperiosteally elevated with an L-shaped incision to expose the underlying distal radius.

All subjects were followed-up in out-patient clinic for at least 3 months. Any complications were recorded.

Results and Conclusions: 133 patients with volar wrist plating performed were identified. 9 patients with FCRB variant were identified (6.8%). 7 were female patients and 2 were male patients. All cases were asymptomatic before the occurrence of the fracture. During surgical dissection, the FCRB were noted to be originated from the volar aspect of the distal third of the radius, occupying part of the radial border of pronator quadratus. The pronator quadratus were hypoplastic. The insertion of FCRB were beyond the surgical exposure of distal radius fracture fixation. No complications were noted during follow up at 3 months.

Literatures on the prevalence of FCRB were scarce. Studies from Japan, Singapore and Brazil reported the prevalence to be 1.6-8.7%. Our series was the first study showing 6.8% prevalence of FCRB in Chinese population with volar locking plate surgery performed.

Although most patients with FCRB variant were asymptomatic, symptomatic cases such as tendinopathy, partial tear, painful forearm mass and intersection syndrome were reported.

In conclusion, in Chinese population with volar locking plate done for distal radius fracture, the prevalence of FCRB was 6.8%.

As volar locked plating is a common way of treating distal radius fracture, knowledge of distal forearm anatomy and the possible variant is important. Surgeons should be aware of such possibility to avoid neurovascular injury in these patients.

Keywords:
Flexor carpi radialis brevis, volar locking plate, distal radius fracture
High reoperation rate in 13 total wrist arthroplasties after 4 years

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Objectives / Interrogation: Wrist arthroplasty surgery is increasingly performed as an alternative to wrist arthrodesis. In our institution all patients with destroyed radiocarpal joints are offered wrist arthroplasty. The patients are included in a prospective follow-up study. The results in non-inflammatory wrist patients are presented.

Methods: 13 (8 women, 9 dominant wrists) patients 68 (44-85) years of age with destroyed radiocarpal joints due to SLAC (8), SNAC (3) and lunate malaci (2) had a ReMotion (Stryker, Michigan, USA) wrist arthroplasty implanted. 5 patients had 6 prior wrist surgeries. 7/8 SLAC wrists had bilateral wrist degeneration. Radiographs were taken and active range of motion, grip- and key pinch strength was measured. The patients completed QDASH, PRWHE and VAS pain score preoperatively and at yearly follow-ups.

Results and Conclusions: During the follow-up period 3 arthroplasties were revised to a new arthroplasty due to distal loosening and osteolysis (2) or massive osteolysis (1). Additional bone removal on the radial side were done in one patient due to impingement. Removal of the two distal screws due to pain in the cmc joints were done in another. Arthrolysis, removal of ectopic bone in the joint, and a Darrachs procedure were done in one patient, and finally one had a CRPS resolving after 2 years. At final follow-up 4 (2-6) years after surgery the clinical results were satisfactory in the non-revised patients, demonstrating significant reduced PRWHE (63 to 31) and VAS pain at activity (69 to 39). QDASH was reduced (49 to 34) and grip strength increased (11 to 15 kgs) but the two latter did not reach statistical significance. The radiographic analysis demonstrated loosening in 2/10 arthroplasties (not revised) and major osteolysis in 2/10. None of the patients regretted choosing arthroplasty as compared to arthrodesis.

Conclusion: Published results on the Remotion wrist arthroplasty has mainly been in inflammatory wrist patients rendering satisfactory results. In our series of non-inflammatory wrist patients we found satisfactory clinical results but a relatively high complication and revision rate after 4 years. Patients prefer arthroplasty to arthrodesis, but they must expect complications, and should be informed about the expected outcomes including additional surgeries, osteolysis and fixation problems.

Keywords:
Wrist arthroplasty, non-inflammatory, osteoarthritis
Treatment of scaphoid nonunion by one, two headless compression screws or plate with or without Extracorporeal Shock Wave Therapy

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Objectives / Interrogation: Non-union of the scaphoid is even today a challenge for the treating hand surgeon and does if occurs, present notable consequences in hand function. Several methods for treating scaphoid nonunions are available, like sole bone graft in the technique according to Matti - Russe, with or without additional stabilization by a headless compression screw (HCS) or plate.

In the last decades, Extracorporeal Shockwave Therapy (ESWT) has become an established procedure for nonunion treatment. However, the mechanism of shockwave therapy is poorly understood, but it’s considered verified, that it leads to an angio- and vasculogenesis in the treated tissue, which causes a persisting increase of blood supply.

Main aim of this study was to investigate union rate and clinical outcome of a combined treatment of scaphoid nonunion by surgery and ESWT and to compare union rates after stabilization by one HCS, two HCS or plate.

Methods: 42 patients with a scaphoid nonunion treated by non-vascularized bone graft from the iliac crest and a interval between injury and surgery of at least 6 months were investigated. 26 patients were treated with an additional ESWT within two weeks after surgery and 16 without. A scaphoid plate was used in 20 patients, a double HCS in 12 patients, and one HCS in 10 patients. Age, gender, range of motion (ROM), date of surgery, the last follow-up examination were included in the statistical analysis. DASH scores, PRWE, the Green 0&Brien Score, and the Michigan Hand Questionnaire score were determined for all patients. A CT was performed in each patient to analyze union and signs of osteoarthritis.

Results and Conclusions: In total 74% (31/42) of the scaphoid nonunions showed bone healing at the follow-up investigation. Patients in the ESWT group showed in 21/26 (81%) and in the group without ESWT 12/16 (75%) bony healing. No significant differences could be found between the groups in ROM, grip strength, DASH score, PRWE score or MHQ. Patients stabilized by one HCS showed in 6/10 (60 %), by two HCS 10/12 (83 %) and by scaphoid plate 17/20 (85 %) union. No significant differences could be found between the groups in respect of VAS, ROM, grip strength, PRWE Score, DASH Score and MHQ.

Conclusion:
The results of this study suggest that a combination of ESWT and surgery is reasonable in treating scaphoid nonunions and a stabilization by two HCS or scaphoid plate provide higher union rates than a stabilization by one HCS.

Keywords:
headless compression screw, extracorporeal shockwave therapy, non-union, scaphoid, shockwave therapy, surgery, plate
Factors associated with operative treatment of enthesopathy of the extensor carpi radialis brevis origin

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Objectives / Interrogation: This study investigated the factors associated with variation in the rate of surgery for enthesopathy of the extensor carpi radialis brevis (eECRB).

Methods: We used a large database from 3 academic hospitals including 5964 patients with the diagnosis of eECRB from 2001 to 2007. Of those, 244 patients (4%) had surgery for eECRB. We used the date of the first encounter as the date of diagnosis. We also recorded the date of the first cortisone injection and surgery for eECRB. We used Cox multivariable regression analysis to find factors associated with surgery. We considered the following explanatory factors: age, sex, race, diabetes, a diagnosis of major depression, a diagnosis of an anxiety disorder, hospital, provider (surgeon vs. nonsurgeon), corticosteroid injection, and the time from diagnosis to the first cortisone injection.

Results and Conclusions: Results: The hazard ratio of having surgery was 12-times greater if the initial provider was an orthopedic surgeon rather a nonsurgeon and 1.7-times greater at 1 of the 2 hospitals. The rate of surgery varied substantially, ranging from 0% to 22%. Corticosteroid injection delayed the time to surgery but was ultimately associated with a higher rate of surgery. The majority (86%) of surgeries were done within 1 year of the first documented office visit.

Conclusions: It seems likely that an emphasis on the preferences and values of the patient rather than the surgeon would decrease the variation in surgery rates for eECRB observed in this study. Methods for optimizing the influence of patient preferences and values on decision making (eg, decision aids) merit additional study.

Keywords:
Extensor carpi radialis brevis; enthesopathy; lateral epicondylitis; tennis elbow; variation; corticosteroid injections
Functional outcome following headless compression screw fixation for hamate fractures

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Objectives / Interrogation: Most hamate fractures are treated non-operatively, with percutaneous K-wire fixation, or with excision of a fractured hook of the hamate. Screw fixation is less popular due to the risk of iatrogenic ulnar nerve injury. The aim of this study was to present the functional results of patients with hamate fractures treated with headless compression screws (HCS).

Methods: In this retrospective cohort series, all consecutive adult patients with a hamate fracture, treated with HCS by the same hand-surgeon between August 2012 and November 2017 were screened for inclusion. The primary outcome was the Michigan Hand Outcome Questionnaire (MHOQ) after at least four months follow-up. Secondary outcomes were complications and whether or not patients were able to continue their profession following surgical treatment.

Results and Conclusions: Nine patients were included in this retrospective cohort study. A median MHOQ total score of 67% was reported (IQR 44-76). No ulnar nerve injuries were found. Also, no other complications were found during follow-up. All patients returned to their previous profession or a different profession in the same field. HCS fixation is a safe alternative to treat hamate fractures with good functional outcome.

Keywords:
hamate fracture, osteosynthesis, headless compression screws, functional outcome
Midterm results of scaphoid reconstruction using a free vascularised osteochondral medial femoral condyle flap

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Objectives / Interrogation: Reconstruction of a destructed proximal pole in scaphoid non-union using a free vascularised medial femoral condyle flap is a sophisticated operation with promising early results published. As there is a lack of midterm results in the literature we analysed our midterm results of this procedure.

Methods: Between 2011 and 2016 76 patients were operated in our hospital using a free vascularised medial femoral condyle flap to replace a proximal scaphoid pole in non-unions. In a retrospective study 44 of these patients (41 men/ 3 women) with a mean age of 31 (20 - 53) years were reexamined with a mean follow-up time of 44 (13-77) months. The examination included the patients history, a clinical examination, establishment of DASH-score and Krimmer-score and standard x-rays of the wrist. 31 out of 44 patients had a history of at least one scaphoid reconstruction before.

Results and Conclusions: Bony consolidation was found in 35 out of 44 patients (80%), partial consolidation in 2 (5%) and persisting non-union in 7 (15%). 5 (11%) patients had had a salvage procedure in the meantime: 4 four corner fusions and 1 proximal row carpectomy. In 12 out of 44 cases the shape of the reconstructed scaphoid was not sufficient especially in complex situations with large bony defects and fixed scaphoid deformity. Osteoarthritic changes of varying degrees were found in 17 patients.
Clinically the patients without salvage procedures had good results with a mean Krimmer-score of 80(38-100), a mean range of motion of 90°, a mean grip strength of 81% of the contralateral side and a mean DASH-score of 15 (0-56), whereas the 5 patients with salvage procedures had worse results with a mean Krimmer-score of 52 (25-70), a mean range of motion of 47°, a mean grip strength of 58% and a mean DASH-score of 19 (8-27). 39 out of 44 patients would choose the same operation once again.
Scaphoid reconstruction using a free vascularised medial femoral condyle flap yields good clinical and radiological midterm results in the majority of these complex cases, but usually not a complete functional recovery. Furthermore our results demonstrate a considerable number of complications which in some cases require salvage procedures with not satisfying results. These aspects have to be discussed with future patients to enable them to have realistic and not enthusiastic expectations.

Keywords:
free vascularised osteochondral medial femoral condyle flap - scaphoid non-union
Articular complications after modern wrist arthroplasty surgery

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Objectives / Interrogation: We present 3 complications attributed to wear in a ball-and-socket metal-on-metal (MOM) or metal-on-polyetheretherketone (MOPEEK) wrist arthroplasty (Motec).

Methods: 3 patients/2 men age 51, 52 and 74 years had a Motec wrist implanted for radiocarpal degeneration due to radius fracture (2) or SLAC (1). Two had MOM articulation, one had a MOPEEK articulation. All three had 1, 2 and 5 prior wrist surgeries.

Results and Conclusions: Patient 1 had initial good pain relief and very good range of motion after Darrahcs and arthroplasty insertion. After 9 months she had increasing radial sided pain and an unstable distal ulna. During ulna shortening and additional bone removal the radiocarpal joint exhibited black particles and the PEEK cup was eroded about 20% of the circumference due to impingement dorsally between the cup and the ball neck. It was revised a MOM articulation. Patient 2 had initial good result but developed a dorsal lump after 4-5 months. Infection was excluded (punctured). MR and ultrasound suggested a pseudotumour. No metallosis was seen and the articulation occurred without any macroscopic changes on exploration. Histology revealed granulomatous tissue and chronic inflammation. The articulation was changed to MOPEEK. Patient 3 had multiple procedures prior to wrist arthroplasty surgery. He developed a fixed extension position of the wrist and reduced finger function. He had 2 extensor tenolysis procedures. He developed an extension position of the wrist again, increased pain, reduced finger function and symptoms CTS. Ultrasound exhibited massive flexor tendon synovitis from the distal forearm to the CMC joints. The extended position gave fretting dorsally between the distal screw and the cup (short head articulation). A complete tenolysis and arthrolysis was performed as well as shortening of the radius (removing the integrated radius implant and inserting a new implant more proximally) and changing the articulation to MOPEEK. Histology revealed foreign body giant cells and chronic inflammation. The patients had normal blood chrome and cobalt levels.

Conclusion: modern wrist arthroplasties has performed well in many patients. We found unexpected side effects in three patients. On the articulation side the technology is still immature. Concepts which has proven its endurance in hip arthroplasties (highly crosslinked polyethylene and ceramics) has not been implemented in small joint arthroplasties, reducing the performance and survival of modern small joint arthroplasties.

Keywords: wrist arthroplasty, non-inflammatory, osteoarthritis, complications, wear
In Vivo Changes of Subchondral Bone and Cartilage in First Carpometacarpal Joint Osteoarthritis Across Severity Stages

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Objectives / Interrogation: In osteoarthritis (OA), the site of disease initiation and sequence of degenerative process in subchondral bone and cartilage is not known. Changes of the subchondral bone as degeneration progresses have not been characterized. We hypothesized that in the first carpometacarpal joint (CMCJ), subchondral trabecular bone change could be an early structural feature leading to cartilage loss. Our aim was to determine the in vivo changes of subchondral microarchitecture compared with cartilage volume from early to advanced OA.

Methods: A cross-sectional study on bone and cartilage morphology in patients with different severities of CMCJ OA was performed. 33 patients consecutively seen by a hand surgeon in our orthopaedic unit from August 2017 to June 2018 were recruited. Normal asymptomatic contralateral CMCJs of the patients were used as controls. A total of 57 CMCJs were included of which there were 8 in stage 1, 10 in stage 2, 28 in stage 3, 4 in stage 4, and 7 were normal controls. Severity was staged according to the Eaton and Glickel 1987 radiographic staging.

Subchondral trabecular microarchitecture and cartilage volume were measured by high resolution peripheral quantitative computed tomography (HR-pqCT, voxel size 82µm³) and 3T MRI with hand coil array respectively. A 4mm³ cube of subchondral trabecular bone was extracted at the center of the trapezium articular surface for Individual Trabecula Segmentation. Plate-like and rod-like trabeculae were analyzed. Parameters including volume, thickness, number and density of total, plate-like, and rod-like trabeculae were calculated. Plate-to-rod ratio was obtained.

Cartilage volume was obtained from segmentation with an in-house program.

Results and Conclusions: Osteoarthritic trapezia had decreased subchondral bone density vs controls (590.7 versus 631.3mgHA/mm³, p=0.036) and decreased cartilage volume (8.76 vs 26.78 p<0.001) that correlated with disease staging. There was a significant decrease in rod thickness across the stages starting from stage 1 (p=0.01), and a significant increase in plate-to-rod ratio from stage 2 (p=0.049).

This is the first in vivo study of subchondral bone microarchitecture in osteoarthritis using high-resolution CT, and demonstrated trabecular changes early osteoarthritis. Increase in P-R ratio starting at stage 2 is in agreement with other studies that transformation of rod-like to plate-like trabeculae occurs in advanced OA, which causes change in load-bearing properties, and ultimately cartilage damage.

Keywords: first carpometacarpal osteoarthritis, subchondral bone, individual trabeculae segmentation, subchondral trabeculae, HRpqCT
Displaced scaphoid type B2 waist fractures stabilized by one or two headless compression screws

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Objectives / Interrogation: Scaphoid fractures are rare and account only 2 - 3 % of all fractures and 10 % of all hand fractures. Displaced scaphoid fractures are treated typically with headless bone screws, but a treatment with one screw will not lead to absolute stability. Due to the complex and multidirectional movements of the scaphoid one screw is, specially against rotational forces, insufficient. Therefore, some authors started to use temporary anti-rotational K-wires. The aim of this study was to compare radiological and clinical outcome of unstable scaphoid fractures, stabilized using one or two headless compression screws (HCS).

Methods: A total of 52 patients were included in this study with a mean follow up interval of 43 months. 22 patients were treated using one HCS and 30 with two HCS. Clinical assessment included range of motion (ROM), pain according to the visual analogue scale (VAS), grip strength, the Disability of the Arm, Shoulder and Hand Score (DASH), the Patient Rated Wrist Evaluation (PRWE) Score, the Michigan Hand Outcomes Questionnaire (MHQ) and the modified Green O'Brien (Mayo) Wrist Score. All complications were documented. The follow-up study on each patient included a CT-Scan of the wrist which was analysed for union, osteoarthritis, Dorsiflexed Intercalated Segment Instability and humpback deformity.

Results and Conclusions: Totally 49/52 (94%) of the scaphoid B2 type fractures showed union, 30/30 (100%) in the two HCS group and 19/22 (86%) in the one HCS group. Mean ROM in extension/flexion was 170° (range 80°-179°), in pronation/supination 178° (range 170°-180°) and radial/ulnar deviation 57° (range 30-60). Grip strength of 43 kg (92% of the uninjured hand). No significant differences could be found in respect to ROM, grip strength, VAS and Scores between the groups. Conclusions: The unstable B2 type fractures of the scaphoid, when treated with two HCS and no bone grafting is a safe method, shows a higher union rate and equal clinical outcome compared to stabilization using only one HCS.

Keywords:
scaphoid fractures, displaced, headless compression screw, unstable
Treatment of fingertip injuries with the semi-occlusive dressing

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Objectives / Interrogation: Injuries to the fingertips are very commonly encountered in the emergency department. V-Y plasty according to Tranquilli-Leali is a widely accepted approach for coverage of these defects in patients with an exposed distal phalanx. The occlusive dressing was first reported on by De Boer and Collinson in 1981; finger stalls consisting of silver sulfadiazine and ointment were used at this time. The occlusive dressing has been developed further in the last 20 years. Mennen and Wiese were the first to use Opsite® foils in 1993. Briefer periods of incapacity for work and nearly complete restoration of sensitivity have been reported in studies. 1997 Vogt et al. observed markedly increased levels of growth factors and immunological factors in the wound exudate.

Methods: 114 fingertip injuries were treated with occlusive dressings between 2008 and 2011. All fingertip injuries (purely soft tissue injuries and amputations with bone involvement) of the distal phalanx were debrided, cleaned with antiseptic, and an occlusive dressing made of Opsite® foil was placed. Bone shortening was not required in any patient. The foils were placed fully on the flexor and the extensor side. After placement of the dressing the patients received a finger wrap-over dressing. The primary occlusive dressing was left in place as long as possible. It was sealed if necessary, and removed only after the wound had healed. Photographs were taken in two planes at weekly intervals until complete healing had been achieved. After the treatment had been concluded. The size of the defect was classified according to Allen. In each patient a Semmes-Weinstein test was performed.

Results and Conclusions: 114 patients were treated with an occlusive dressing. The patients' mean age was 39 years, the mean duration of treatment with an occlusive dressing 20 days. 33 women (29%) and 81 men (71%) were included in the study. Sufficient soft tissue coverage was achieved in all patients and nearly complete regeneration of the fingertip and excellent cosmetic results were achieved in all patients. Complete restoration of sensitivity was observed on the Semmes-Weinstein test in all patients. No patient developed a soft tissue infection, neuroma, or osteitis, and no patient required a secondary flap plasty.

Conclusion: The semi-occlusive dressing is a good treatment option for all kind of fingertip injuries, regardless of the amputation level. Even if the bone is exposed up to the wound level, satisfactory soft tissue cover can be achieved.

Keywords: fingertip injury, semi-occlusive dressing, local skin flap, amputation, conservative treatment
Establishing National Diagnostic Reference Levels for Mini C-arm Use, St John’s Hospital Livingston

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Objectives / Interrogation: There is a lack of data regarding the relative amount of patient radiation exposure during mini C-arm procedures. It is critical that diagnostic reference levels (DRL's) are put in place to ensure patient safety. This study aims to be the first to audit large quantities of mini C-arm data, and use the results to generate national DRL’s for mini C-arm use. Furthermore the difference between open and closed surgical procedures and anatomical location of procedure will be analysed.

Methods: Data from procedures using mini C-arms over 5 years has been collected and analysed. Screening times and Dose Area Product (DAP) were recorded for 2033 procedures. 3rd Quartile values for screening time and DAP were calculated for the different groups being analysed. The impact that anatomical location of procedure (digits and hand compared to wrist and forearm) was statistically analysed using ANOVA analysis.

Results and Conclusions: The majority of procedures fall within the 3rd quartile screening time for their given population. The 3rd quartile screening time for all procedures was 23s and 1.6126 cGycm2 for DAP. The 3rd quartile DAP and screening is significantly shorter for closed surgical procedures compared to open procedures. Furthermore, there is significant variation in the screening time and DAP of procedures based on anatomical location. Not only can these results be used to generate new DRL’s for mini C-arm use in the upper limb, but they provide a platform for further training and identification of areas where there were significant outliers during procedures.

Keywords:
Mini C-arm, Diagnostic Reference Level, Radiation, Upper Limb
Zaidenberg's pedicled vascularized bone-grafting for reconstruction of scaphoid-nonunions - effects and functional outcome in a series of 49 cases

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Objectives / Interrogation: Nonunions of the Scaphoid can result after proximal fractures, failed surgical reconstruction and avascular fragment necrosis. Vascularized bone grafts in various techniques have been proven to be an effective treatment. They can be harvested as pedicled grafts from the direct vicinity of the wrist or as free transplants from other regions. A well-known pedicled vascularized bone graft for reconstruction of the scaphoid was described by C. Zaidenberg in 1991.

Methods: Between 2008 and 2016 a cohort of 49 consecutive patients underwent vascularized bone-grafting, pedicled on the 1,2 intercompartimental, supraretinacular artery in a modified technique based on Zaidenbergs description.

The indication for pedicled grafting, the operative procedure, aftercare and diagnostics to validate consolidation after treatment were prospectively standardized.

We present radiologic outcome / consolidation rates, characteristics of the group and follow-up data over 2 years including functional scores and quality-of-life data until the year 2018.

Results and Conclusions: Impaired perfusion of scaphoid fragments in preoperative contrast-enhanced MRIs indicated for the use of pedicled grafting in this study on the above described cohort. Consolidation could be shown in 37 of 49 cases in CT scans performed after 6 month. Treatment failure correlated with the severity of changes in preoperative MRI. Functional outcomes showed a frequent loss in range of motion of the affected wrist even after successful treatment / consolidation.

Keywords:
Scaphoid nonunion - vascularized bone-grafting - pedicled bone-grafting - intercompartimental supraretinacular artery
Triple nerve transfers for the C5/6 Brachial Plexus injury

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**Objectives / Interrogation:** Assess the functional results of triple nerve transfers for the C5/6 Brachial Plexus injury as a single stage procedure from the dorsal approach to decrease the recovery time post nerve transfers.

**Methods:** All adult patients who presented to our institution in four two years with loss of C5 and C6 after the Brachial plexus Avulsion injury and where primary repair was not possible underwent the Nerve transfers to reconstruct the shoulder abduction, external rotation and elbow flexion as a single stage procedure. Dorsal approach to the spinal accessory nerve was used for neurotization to the SSN, Radial nerve branch to the long head of triceps was used to restore the axillary nerve function and single fascicle of ulnar nerve to the wrist flexor was utilized to target the MCN nerve to the biceps muscle. The patients were follow-up at 6 weeks, 3 months, 6 months, 1 year and 2 years. The muscle charting was done with MRC grading.

**Results and Conclusions:** We currently have done 21 patients with C5/6 Brachial plexus injury which received triple nerve transfers and early results shows the return of biceps function an average of 5 months, the shoulder abduction and external rotation functional recovery is incomplete but functional at 6 months and improved up to 18 months post-operatively.

**Conclusions**
Loss of shoulder abduction, external rotation can be reconstructed as a single stage procedure from the dorsal approach to the spinal accessory & radial nerve, and Oberlin transfer for elbow flexion from volar approach, this has decreased the recovery time as nerve transfers are possible near the target muscles.

**Keywords:**
Nerve transfers for C5./6 nerve root injury
CMC thumb replacement with Touch implant, a comparative case series with CMC excision arthroplasty

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Objectives / Interrogation: Assess the functional and radiological results of thumb CMC joint replacement done at Tygerberg Hospital

Methods: Patients who had one side of CMC joint surgery done at our institution 1-2 years back and now presented with CMC arthritis (Eaton Stage III disease) to the other hand and booked for thumb CMC joint excision arthroplasty were enrolled in this case series.
CMC thumb replacement was done with the same approach as the tightrope procedure, dorsolateral approach between APL and EPB, capsular release was also kept the same way for later repair. Joint replacement was done with un-cemented stem to the metacarpal after preparation of the trapezium the cup was inserted and bipolar head was used for articulation. Capsular repair was performed and thumb spica back slab was applied for two weeks. At follow-up short splint was given for two weeks and mobilization was started.

The patients were follow up at 6 weeks, 3 months, 6 months and one year. The radiological parameters like implant position and height was checked and compared cmc tightrope group as well as the functional outcomes by means of DASH score.

Results and Conclusions: We currently have done 10 patients with CMC implant arthroplasty and at six months post-surgery radiological results shows good position of components with no dislocations.
Functional results of CMC arthroplasty group at six months are the same as in CMC tightrope group with better pinch grip strength.

Conclusion:
CMC implant arthroplasty is less painful as compared to the resection arthroplasty, has earlier return to function, better range of movements and pinch strength almost double the CMC excision arthroplasty site at six months.

Keywords:
CMC thumb arthroplasty
Arthroscopic Lunocapitate Fusion with Scaphoid Excision for Treatment of SLAC or SNAC wrists

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Objectives / Interrogation: Lunocapitate fusion (LCF) with scaphoid excision is an alternative method of four-corner fusion to treat advanced osteoarthritis of scapholunate advanced collapse (SLAC) or scaphoid nonunion advanced collapse (SNAC) wrists with an advantage of less dissection of carpal ligaments and joint capsule. As a minimally invasive procedure, arthroscopic LCF is expected to have same benefits of open LCF as well as additional merits of fast recovery and cosmetic satisfaction to the patients. We retrospectively reviewed 8 cases of arthroscopic LCF for evaluating clinical and radiological outcomes of this procedure.

Methods: From Jan 2013 to Dec 2016, all patients with SLAC (stage II or III) or SNAC (stage II or III) wrist, who underwent arthroscopic LCF with scaphoidectomy were enrolled in this retrospective study. Union was determined by CT taken 8 to 10 weeks after operation with bridging trabecular at arthrodesis site. These clinical outcomes were assessed preoperatively and last follow-up: visual analogue scale (VAS) pain score, grip strength, active range of motion (ROM), Mayo wrist score (MWS), and Disabilities of Arm, Shoulder and Hand (DASH) score. For radiologic outcomes, carpal height ratio (CHR), lunate coverage index (LCI), and radiocarpal joint narrowing were measured. Any operation-related complications were also evaluated.

Results and Conclusions: The mean follow-up period was 24.9 (12 to 36) months. The union rate was 75% (6 of 8), but it was increased to 100% (4 of 4) when considering cases using 2 screws for fixation. The 2 cases of nonunion had undergone revisional arthroscopic LCF for increasing rate of union.

Keywords:
arthroscopic lunocapitate fusion, SNAC, SLAC
Volar locking plate fixation for distal radius fractures assisted by intraoperative computed tomographic navigation

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Objectives / Interrogation: Unstable distal radius intra-articular fractures require restoration of alignment, and exact fixation of intra-articular fragments is essential. Here, we employed intraoperative computed tomographic (CT) navigation to accurately insert screws in the intra-articular dorsal fragments during treatment with a volar locking plate for distal radius intra-articular fractures. We evaluated the accuracy of this procedure through preoperative, intraoperative, and post-bone union CT findings as well as the clinical outcomes.

Methods: This study included 18 patients with distal radius fractures, who were treated with a volar locking plate (HYBRIX, Mizuho, Tokyo, Japan) using intraoperative CT (SOMATOM Definition AS, Siemens, Erlangen, Germany) navigation (Kolibri, Brainlab, Feldkirchen, Germany) with a minimum follow-up duration of 12 months. The mean patient age was 60.8 years and the mean follow-up duration was 16.2 months. Based on the AO comprehensive classification of distal radius fractures, 3 cases were classified as C1, 7 as C2, and 8 as C3. We examined the articular displacement and position of the inserted distal screws on CT images. The gap and step off were calculated as the indices of articular displacement. The mean minimum distance between the screw and articular surface and between the tip of the screw and the dorsal cortex were calculated. The three distal ulnar screw positions that influence the stability of the ulnodorsal articular fragment were evaluated. The Mayo wrist score and DASH score were also clinically evaluated.

Results and Conclusions: The mean gap and step off were 3.1 and 1.6 mm preoperatively, 0.9 and 0.3 mm intraoperatively, and 0.3 and 0.3 mm post-bone union, respectively. The mean distances between the screw and articular surface were 1.2, 1.7, and 1.7 mm from the ulnar side intraoperatively and 0.9, 1.3, and 1.4 mm from the ulnar side post-bone union. The mean distances between the tip of the screw and the dorsal cortex were 1.1, 0.5, and 0.9 mm from the ulnar side intraoperatively and 0.9, 0.2, and 0.6 mm from the ulnar side post-bone union. At the final follow-up, the mean Mayo wrist score was 91.7 and the mean DASH score was 6.5.

CT evaluation revealed that the screws were precisely inserted for articular fragments and bone union was achieved, thereby maintaining good intra-articular alignment. The findings demonstrate the accuracy of volar locking plate fixation assisted by intraoperative CT navigation and the good clinical outcomes of this procedure.

Keywords:
distal radius fracture, computed tomographic navigation, volar locking plate fixation
The Neurophysiology of Peripheral Nerve Transfers

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Objectives / Interrogation: Surgical nerve transfers provide the nerve surgeon with the ability to convert proximal into distal nerve lesions and thereby bypass slow nerve regeneration. Many nerve transfer procedures have been described and are successfully used in the reconstruction of brachial plexus and peripheral nerve injury. Despite their success, little is known about the neurophysiological effects of peripheral nerve transfers, especially regarding the motor unit rewiring that results thereby. In this work, we review the neurophysiological effects of nerve transfers in regard to refining surgical procedures and external aspects such as age on outcomes.

Methods: We review the literature investigating peripheral nerve transfers and their effects on the motor unit. Additional information is drawn from classic cross-innervation studies that present a similar surgical nerve transfer procedure and have been well-investigated. Specifically highlighted are the effects of donor nerve quality (agonist or antagonist) and axon quantity (donor-to-recipient ratio) on functional outcomes. Additionally, the poor results of nerve transfers in the lower extremity compared to their success in the upper extremity are discussed.

Results and Conclusions: Few publications, yet with growing tendency, specifically investigate the neurophysiological effects of nerve transfers, as applied in modern nerve surgery. Many conclusions can be drawn from cross-innervation studies. In general, agonist donor nerves provide a higher success rate and less-complicated motor re-education. Donor nerves with similar motor axon numbers as their recipient nerve provide better functional outcomes, likely the result of more functional motor units. This has been specifically shown for brachial plexus reconstruction. Experimentally, hyper-reinnervation, e.g. providing a surplus of axons, provides the best functional outcomes regarding muscle force. High patient age, the need for nerve grafts between donor and recipient, or the use of antagonist donor nerves have been reported to result in inferior results but are no contradiction for the use of nerve transfers in the upper extremity. Understanding the neurophysiological effects of nerve transfers has helped to refine surgical techniques. Future studies will provide additional information on motor unit effects and functional outcomes (muscle force).

Keywords:
Nerve transfer, physiology, upper extremity
Arthroscopic Scaphoid Excision and 4-corner Fusion of Scaphoid Nonunion Advanced Collapse or Scapho-lunate Advanced Collapse Wrist

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Objectives / Interrogation: Arthroscopic scaphoid excision and 4-corner fusion is a minimally invasive procedure that can be expected to achieve rapid bone union and recovery. The purpose of this study is to report the results of arthroscopic scaphoid excision and 4-corner fusion.

Methods: A total of 14 patients with arthroscopic scaphoid excision and 4-corner fusion from 2011 to 2016 were reviewed retrospectively. The patients with scaphoid nonunion advanced collapse (SNAC) or scapho-lunate advanced collapse (SLAC) stage 2 or higher were included. Scaphoid excision and decortication for 4-corner fusion were performed with arthroscopic assistance. After arthroscopic procedure, dorsal intercalated segment instability (DISI) deformity was corrected and headless auto-compressive screws were inserted through capitate-lunate and triquetrum-hamate-capitate by percutaneous method. Bone union and DISI deformity were evaluated by radiographs. Preoperative and postoperative pain Visual Analogue Scale (pVAS), range of motion (ROM), grip strength, the Modified Mayo Wrist Score (MMWS), and the Disabilities of the Arm, Shoulder and Hand (DASH) score were analyzed.

Results and Conclusions: There were 11 male and 3 female patients, with an average age of 58 years (range, 32-77 years). There were 12 SNAC patients and 2 SLAC patients. The mean follow-up period was 26.0 months (range, 24-34 months). Bone union was observed in 13 patients after mean 8.3 weeks (range, 5-12 weeks). One patient did not show a bony union, but was maintained without symptoms. It was thought to be a stable fibrous union and was observed without additional treatment. There were no other major complications related to surgery. The capitate-lunate angle was significantly reduced from 13.7° preoperatively to 4.1° postoperatively (p<0.001). The flexion-extension arc showed no significant change from 83° preoperatively to 76° postoperatively. The grip strength showed no significant change from 53 lb preoperatively to 56 lb postoperatively. The pVAS, MMWS, and DASH score were significantly improved from 5.1, 56, and 43.3 to 1.3, 69, and 16.1, respectively (p<0.001). Arthroscopic scaphoid excision and 4-corner fusion showed rapid bone union and good clinical outcomes without major complications.

Keywords:
arthroscopy, wrist arthritis, scaphoid excision, 4-corner fusion
**Anatomic Rationale and Clinical Results for Relative Motion Flexion Management of Acute and Chronic Boutonniere Deformity, Permitting Immediate Active Motion and Functional Use**

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**Objectives / Interrogation:** We introduced the relative motion splint concept at the 1995 IFSSH meeting in Finland, permitting active motion and functional use following long extensor tendon repair using relative motion extensor (RME) orthoses. Its use is now well established. We now present rationale and results using relative motion flexion (RMF) orthoses for acute boutonniere deformity, allowing use during healing, and the nonsurgical management of chronic deformity.

**Methods:** Cadaver and anatomic study show that placing the injured digit MP joint in 15-20 degrees' greater flexion than adjacent digits can transition a supple boutonniere deformity to full PIP extension by the quadriga effect, transmitting the increased EDC tension to full IP extension by the EDC lateral slips to the lateral bands, with simultaneous relaxation of the lumbrical volar pull by relaxed tension of the attached flexor profundus tendon. Acute injuries were splinted 6 weeks encouraging hand use and avoiding later therapy. Chronic boutonniere cases had serial casting of fixed PIP deformity to maximum extension (none worse than -20 degrees) maintained by 3 months of RMF orthosis use, with full flexion recovered.

**Results and Conclusions:** Since 2003, 8 acute (3 open) and 15 chronic cases are reviewed. Acute cases had supple PIP deformity and maintained full range of motion (minus 15 to 20 degrees MP extension) throughout 6 weeks of splinting without additional therapy. Chronic boutonniere patients treated an average of 40 months after injury had serial PIP casting to extension of 0 to -20 degrees, averaging -3 degrees. This required an average 2.5 weeks of casting. Thereafter therapy recovered full flexion, maintaining PIP extension in the splint for 3 months. Therapy visits averaged 7.5, with the most frequent complication broken orthoses from functional use. Initial joint contracture averaged -29 degrees, and the average improved PIP range of motion was 35.9 degrees, because several chronic boutonniere patients improved PIP flexion as well as extension. RMF splinting safely permits early active motion and hand use after boutonniere injury during 6 weeks of healing, obviating need for additional therapy. Serial PIP casting and use of RMForthoses for 3 months obviated need for surgery in chronic boutonniere deformity, allowing functional use and minimal hand therapy once full flexion was recovered, other than to replace broken orthoses. These patients achieved an "excellent" Strickland classification for boutonniere deformity.

**Keywords:**
relative motion splinting, relative motion orthosis, relative motion flexion orthosis, long extensor, long extensor tendon repair
Modified dorsal rotational advancement flap for reconstruction of congenital spade hand combined with one-stage opponensplasty

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Objectives / Interrogation: To introduce surgical treatment techniques of congenital spade hand, and focus on the modified dorsal rotational advancement flap to reconstruct the thum web space and one-stage osteotomy transposition of radial finger so as to reconstruct thumb opponensplast.

Methods: Between Jan 2015 to April 2017, using modified dorsal rotational advancement flap, totally six children undergoing congenital spade hand reconstructed thum web space. With 90° rotation, one-stage radial finger osteotomy was used to reconstruct the opponensplast and the alignment was maintained by Kirschner wires. Besides, skin graft repair was used to dorsal thumb and radial side of index finger. Four weeks later, the K-wires were removed and rehabilitation was started. Postoperatively, clinical results were evaluated.

Results and Conclusions: Results: The male-to-female ratio in the 6 patients was 1:1, and the median age was 15.5 months (range, 13-20). 4 of them had spade hand deformity in the left, while 2 in the right, and the patients were followed up for at least 12 months after surgery (range, 12-20). No distinct difference in the skin color between thumb web space and the healthy side was observed in all patients at the final follow-up, the thumb web distance in the affected hands ranged from 3.5cm to 5cm (average, 4.2cm), the depth and dilation extent of thumb web were close to those in the healthy side, and favorable functional recovery was achieved in the thumb opponensplast. 2 affected children had mild scar hyperplasia in the lateral incision, which was mitigated 6 months after wearing the pressure gloves, and no other complication was observed.

Conclusions: Modified dorsal rotational advancement flap combined with one-stage metacarpal osteotomy is an alternative surgical method for treating congenital spade hand deformity. One-stage thumb opponensplast reconstruction is conducive to the early use of the thumb to learning and exercising. In the meanwhile, one-stage surgery dissects neurovascular bundle, which can avoid the separation within scars and reduce surgical risk compared with the two-stage transposition thumb.

Keywords:
congenital#65292;spade hand ,flap, thumb
Fragment-Specific Fixation versus Volar Locking Plates in non-reducible or redisplaced distal radius fractures. A long-term follow-up of a prospective and randomized study in 50 patients

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Objectives / Interrogation: To compare the long-term outcome of two types of internal fixation for distal radius fractures, the Volar Locking Plate (VLP) and the Fragment-Specific Fixation (FSF) were compared regarding objective, subjective, radiographic outcome, complications and secondary surgery at 6 to 8 years after surgery.

Methods: 50 patients with distal radius fractures were included in the previously reported original study between December 2010 and December 2012¹. All patients in the previously reported 12-month follow-up were invited. Six patients declined to participate. 44 patients (mean age 64 (27-75) years, 35 women) participated in the present study. Grip strength was determined as primary outcome. Range of motion, patient reported outcome using the short version of Disabilities of the Arm, Shoulder, and Hand (QuickDASH), radiographic outcome, complications, and secondary surgery were considered as secondary outcomes.

Results and Conclusions: Results
We found no difference between the VLP and FSF groups regarding grip strength (92% and 98% of contralateral), median QuickDASH (5 and 3) or range of motion, nor radiographic parameters. The complication rates were similar in both groups, as was the rate of secondary surgery 20% (5/25) in the VLP group and 25% (4/25) in the FSF group.

Conclusions
Surgical treatment of distal radius fractures with VLP and FSF both achieve good and similar results 6-8 years after primary surgery. We found no differences in outcome. We speculate that the differences in subjective and objective outcome between two modern methods of internal fixation are too small to be captured in smaller randomized series using present outcome measures.
Fragment-specific fixation 7 years after primary surgery
14th IFSSH Congress  
Abstract no.: IFSSH19-1011

Volar locking plate 7 years after primary surgery

[1]

Keywords:  
Distal radius fracture, open reduction internal fixation, volar locking plate, fragment-specific fixation, randomized trial, long-term follow-up

References:
Treatment of artificial dermal template to release congenital syndactyly without skin graft

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Objectives / Interrogation: Congenital syndactyly is one of the most common upper extremity deformities treated by hand surgeons. The aim of this study was to release congenital syndactyly without skin grafts through treatment of artificial dermis.

Methods: From June 2015 to Jan 2017, the skin defects after syndactyly release were covered with artificial dermis in 22 webs of 14 patients. The wounds were healed in one-stage without skin grafts. Average follow-up was 28 months (range, 18 to 38 months). The post-operative results were assessed with the Vancouver Scar Scale (VSS), the Patient and Observer Scar Assessment Scales (PSAS, OSAS), and visual analog scale (VAS).

Results and Conclusions: All wounds were healed within 6 weeks in average. The Vancouver Scar Scale scores averaged 0.8 (range, 0-2), grade of web creep averaged 1.2 (range, 0-3) for the affected digits. All patients gained satisfactory results in aesthetics and functionality. Thereby, we may conclude that the new procedure is simple and effective for syndactyly reconstruction with less invasion.

Keywords:
syndactyly, web reconstruction, artificial dermal template, without skin graft
Comparisons of MRI and Arthroscopic Findings of Elbow Synovial Plica

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Objectives / Interrogation: MRI findings with clinical symptoms and physical examinations are important to diagnose elbow plica syndrome, but there are no criteria in MRI diagnosis. We compared MRI findings with arthroscopic findings and analyzed the correlation between MRI and arthroscopic findings.

Methods: We studied the patients undergoing arthroscopic surgery of elbow and performed MRI (3.0T, Philips medical systems) at our department from 2010 to 2016. 38 cases were reviewed consisting of 11 men and 27 women in their median age of 49 (16 to 63 years). Among the surgeries conducted for 38 cases, 30 cases were for lateral epicondylitis, 7 cases were for plica syndrome, and 1 case was for loose body.

MRI was observed in the proton density with fat suppression sequences and the length was measured from the joint capsule to the most extruded area. The anterior plica was measured in the sagittal plane and the posterior plica was measured in the sagittal and coronal plane.

The length of the anterior and posterior plica observed on arthroscopy was measured and compared with MRI. The paired t-test was performed with an equivalence test of ± 1 mm for the equivalence limit. The Pearson correlation analysis was used to analyze the correlation between the MRI and the arthroscopic plica findings.

Results and Conclusions: The median value of the anterior plica measured on MRI was 1.5 mm (0-6.8 mm) and the median value of the anterior plica measured on arthroscopy was 1.8 mm (0-7.1 mm). The two measures were statistically equivalent and the correlation coefficient was 0.718, indicating a statistically significant correlation. (p< 0.001)

The median value of the posterior plica measured on MRI was 3.6 mm (0-6.8 mm) in coronal plane and 5.7 mm (1.9-11.1 mm) in sagittal plane. The median value of the posterior plica measured on arthroscopy was 5.6 mm (1.6-9.7 mm).

The two measures in sagittal MRI and arthroscopy were statistically equivalent, but correlation coefficient was 0.22, indicating no statistically significant correlation (p >0.05). There was a statistically significant difference between the measures in coronal MRI and arthroscopy and the correlation coefficient was -0.05, indicating no statistically significant correlation (p>0.05).

The anterior plica measured by MRI has diagnostic value because it reflect the size observed in the arthroscopy. Relatively, the case of posterior plica is considered to have low diagnostic value due to its low correlation with the arthroscopy.

Keywords:
elbow plica, elbow synovial plica, MRI, arthroscopy
Volar locking fixation for distal radius fracture in patients with concurrent hip fractures: A matched pair analysis of elderly patients

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Objectives / Interrogation: To describe the outcomes of operative treatment with volar locking plates in patients with distal radius fractures with concurrent hip fractures and to identify differences in these patients in comparison to a matched control group of patients with isolated distal radius fractures.

Methods: From January 2010 to December 2016, twenty-eight patients who met the criteria of both hip and distal radius fractures were retrospectively reviewed for analysis. Twenty-eight matched patients during the same period were recruited from a cohort of patients who underwent volar locking plate fixation for isolated distal radius fractures. To perform the matched-paired analysis, patients were matched for age, sex, body mass index, fracture type, and bone mineral density (BMD). Radiological assessment including radial inclination, radial length, and volar tilt was performed to evaluate loss of reduction. We also examined range of motion, grip strength, visual analog scale (VAS) and quick Disabilities of the Arm, Shoulder and Hand (DASH) score.

Results and Conclusions: In all patients, the distal radius fractures were ipsilateral to the hip fractures. According to radiological assessment, there were no significant differences between the groups at an immediate post-operative time. At the time of final follow-up, however, there were significant differences in radial length and radial inclination, and all radiological parameters were better in the control group in comparison to the study group. Wrist range of motion was not significantly different between the groups. Furthermore, no difference in pain scores and functional status were detected between the groups based on the VAS and quick DASH scores, respectively. However, grip strength was better in the control group compared with study group. In conclusion, while volar locking plating provides greater stabilization for distal radius fractures, loss of reduction can occur in patients who have sustained simultaneous hip and distal radius fractures although it was not associated with functional outcomes.

Keywords:
distal radius fracture, hip fracture, volar locking plate, osteoporosis
Assessment in Upper Extremity

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**Objectives / Interrogation:** Introduction: The dorsal ganglions cysts are the most common benign tumors in the wrist. The length of the surgical incision can cause inconformity for the patient, for that reason it is proposed a controlled emptying technique to achieve resection of the mass with a decrease in the size of the injury during the surgery, without modification of the risk of recurrence. We studied the demographic data and the clinical and intraoperative characteristics of these lesions in our population, and determined the recurrence rate with this technique in a population that underwent surgical resection of the ganglion during the period of January 2016 to January 2018.

**Methods:** Methodology: A retrospective descriptive study, case series, was performed in patients diagnosed with a dorsal ganglion cyst from 2016 to 2018, who underwent total resection with a minimally invasive technique with assisted drainage.

**Results and Conclusions:** Surgical technique: The patient is under anesthesia, according to its location, is performed. A 0.6 - 1 cm transverse incision is made on the mass in accordance with the skin folds at that level, then it is dissected by planes. The mass is partially drained with a scalpel, by small dotted incision, maintaining minimal content to avoid losing its visualization and delimitation. The small incision is closed with a mosquito clamp leaving a fusiform sac and keeping some tension. The procedure continues by dissecting and exposing the mass and its pedicle; with the drained content it will be easier to visualize the capsule and perform the resection of the ganglion cyst, from the original pedicle.

Results: 6 patients were found to have met the inclusion criteria for management with assisted voiding technique, the average age was 43 years, the female to male ratio was 1:1, the size of the ganglions cysts was 4 - 2 cm and histological confirmation and resection of the pedicule, capsule and ganglion were performed. There were no recurrences in the patients at the 6-month follow-up. There were no complications. The patients were satisfied with the size of the surgical wound and with the result obtained.

Conclusions: The technique of controlled intraoperative emptying of the dorsal ganglion cyst by minimum incision to improve visualization and complete resection of the lesion does not show an increase in the recurrence rate and is a safe and easy technique to perform. Patients have a small aesthetic wound that meets the patient's expectations without modifying the rate of recurrence.

**Keywords:**
ganglion cyst, minimum incision, assisted drainage
Surgical management of complex hand's contractures with blended use of mini-invasive procedures and wide awake surgery: case series

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Objectives / Interrogation: Complex contractures of the hand following traumatic injuries may involve several joints in the same segment, adhesions of both extensor and flexors tendons. Several surgical procedures may be required in different times: dorsal teno-arthrolysis, flexors tenolysis, treatment of associated complications (fracture's malunions or cartilage loss). The ideal surgical procedure should allows to treat all issues in one surgical step, with surgical approaches more mini-invasive as possible and allows to evaluate the effectiveness of procedure during surgery.

Methods: We report our experience on nine patients affected of complex contracture of fingers who underwent, in one surgical step to dorsal teno-arthrolysis through mini-invasive approaches with small incisions; tenolysis of flexor tendons through minimal exposure using Allis forceps; release of collateral ligament at MP joint to correct rotation instead of osteotomy. Surgery was performed in wide awake. Contracture was following proximal phalanx 's fractures (4 cases), PIP joint fractures(2), sub-amputations( 2) and burns (1). Two patients showed fracture's malunion with rotation and 2 patients cartilage loss of PIP joint. They underwent interposition arthroplasty. All patients started rehabilitation after 48 hours.

Results and Conclusions: Average follow up was 14 months. The mean value of TAM increased from 141,5° before surgery, to 195,23° after surgery; PIP joint active flexion increased from a mean pre-operative value of 38° to 78°, DIP joint active flexion from 10° to 43°; lag of extension was shown after DIP joint arthrolysis (mean 25°). Mean PRWHE score improved from 20.8 to 4.7; grip strength from 18.9 kg to 29.7 kg. Even if lateral ligament release didn't allow the complete correction of rotation, function was improved, patients were very satisfied.

The use of wide awake surgery allows to improve effectiveness of mini-invasive incision performing subcutaneous dissection, without wide exposures; reduces post operative bleeding and swelling, avoids excess of release and following instability. Showing to the patient the immediate result improves his motivation. The flexor tenolysis with Allis forceps could seem a very aggressive procedure, but it is very useful to treat tendons adhesions following fractures or immobilization without adding trauma and scar to the tendon canal. It's not indicated for release of flexor's tendons adhesions following tendons suture because the risk of tendons rupture is higher.

Keywords:
contracture, wide awake, mini-invasive, Allis forceps, tenolysis
On-Top-Plasty combined Modified Bilhaut-Cloquet Procedure for Complicated Radial Polydactyly

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Objectives / Interrogation: Some radial polydactyly are difficult to classify into Wassel classification. Some features are important in decision of management but are not considered in the Wassel classification. We report our management of complicated Wassel VI or VII Radial Polydactyly with significant hypoplastic metacarpal and both of digits were hypoplastic. Usually the radial digit was functional, while the ulnar digit was motionless. We reviewed the results of our procedures of On-Top-Plasty combined Modified Bilhaut-Cloquet Procedure for the treatment complicated radial of polydactyly of the thumb.

Methods: We reviewed five patients with six radial polydactyly, who underwent this On-Top-Plasty combined Modified Bilhaut-Cloquet Procedure from 2015-2017. The average follow up was eight months. The range of motion and the size of the thumb were measured. Parent's satisfaction was measure by a visual analog scale of 0-10.

Results and Conclusions: All parents were satisfied with the cosmetic and functional results. Compared with the preoperative thumb size and appearance and motion, the average girth of the reconstructed thumb relative to the contralateral thumb was 105%. The width of the thumb nail was similar to the contralateral thumb and was significantly increased as compared to pre-operation.

Conclusions: Our On-Top-Plasty combined Modified Bilhaut-Cloquet Procedure for treatment Complicated Radial Polydactyly is effective in preserving metacarpophalangeal joint motion, minimizing nail deformity.

Keywords:
On-Top-Plasty#65292;Modified Bilhaut-Cloquet#65292;Modified Bilhaut-Cloquet
Application of vascular grafting in syndactyly release of Poland syndrome

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Objectives / Interrogation: Poland syndrome includes the deformity of brachysyndactyly. The etiology of Poland syndrome may be related to the development of the subclavian artery of the fetus at the sixth week of pregnancy. Some patients with Poland syndrome have higher position of palmar digital arteries bifurcation points. In the separation of fingers, the side finger artery is often ligated to obtain the deep web shape and hand function. The purpose of this study was to investigate the effect of superficial dorsal palmar vein grafting on lengthening the unilateral digital artery and deepening the finger web.

Methods: 1. age <3 years old. 2. Poland syndrome hand deformity manifested as 2-5 fingers brachysyndactyly. 3. higher position of palmar digital arteries bifurcation points were found during the separation. From June 2014 to December 2017, a total of 5 patients were treated with palmaro-dorsal superficial vein transplantation to extend the lateral digital artery and deepen the digital webbed. Postoperative follow-up was conducted to observe the depth and morphology of the fingers web.

Results and Conclusions: The operation was successfully completed, all the flap and skin grafting were completely alive, and there were no early complications such as infection and skin necrosis. All patients were followed up for 7-27 months, with an average of 14.3 months. All patients had a reconstruction depth of digital webbed at nearly 1/3 of the proximal phalanx, 5-7 mm deeper than the position of palmar digital arteries bifurcation points, with an average of 6.12 mm. Both the appearance and function were satisfactory without conspicuous scar. The depth, width and slope of the webbed are normal without conspicuous scar.

Conclusion: Using palmaro-dorsal superficial vein transplantation to extend the lateral digital artery and deepen the digital web can not only retain the two digital arteries but also have no additional incisions. The operation of vascular transplantation is simple and the clinical learning cycle is short, so it is suitable for clinical promotion.

Keywords: surgical flap; Hand deformity, congenital; vascular grafting; Finger web reconstruction
Preliminary report for capitolunate arthrodesis for SNAC wrists: radial approach and robot-assist screw insertion

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Objectives / Interrogation: The aim of the study was to evaluate short-term results of capitolunate arthrodesis by radial approach and robot-assist screw fixation for the treatment of scaphoid non-union (SNAC) wrists.

Methods: A capitolunate arthrodesis was performed on 6 patients, one woman and 5 men, of 33 years old on average (18-45). All patients were in the 3rd stage of scaphoid non-union degenerative change at time of surgery. The styloidectomy, scaphoidectomy and capitate-lunate arthrodesis was performed by radial approach instead of dorsal approach. Fixations of the arthrodesis with double Acumed cannulated screws were assisted by navigation robot system during insertion stage.

Results and Conclusions: The average follow-up time was 8.7 months (6-12 months). Follow-up evaluation included radiographs, wrist range of motion (flexion-extension, radial-ulnar deviation, and pronation-supination); grip strength; visual analog scale (VAS); and Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire. The average pain on visual analog scale (VAS) was 1.5. The flexion/extension arc was increased of 15° and strength of 8kg compared to preoperative values on average. All patients returned to their previous working activities. No secondary procedure or complication was observed in all patients.
These results were comparable to or better than the results of previously published techniques in terms of alleviation of pain, grip strength, range of motion and DASH score. The technique has the theoretical advantages of strong compression between capitate and lunate articular cartilage and preserving the dorsal capsular ligament of the wrist joint.

Keywords:
Capitolunate fusion; Limited wrist fusion; Scaphoid nonunion advanced collapse; Wrist arthritis
"The role of Magnetic Resonance Imaging (MRI) and Ultrasound (US) in the diagnosis of the thumb Stener lesion"

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Objectives / Interrogation: The interposition of the fascia of the adductor pollicis muscle in the ulnar metacarpophalangeal (MCP) ligament injury of the thumb (Stener lesion), is a pathology that requires surgical treatment. The ability to accurately diagnose Stener lesion has proven to be difficult and unreliable; the most common imaging methods used to diagnose this injury are US and MRI, however, their utility is not clearly established.

The purpose of this study is to evaluate the diagnostic accuracy of US and MRI for the Stener lesion.

Methods: A descriptive study was carried out in 14 adult patients, operated on suspicion of a Stener lesion of the thumb, with joint instability (more than 30°) after an acute trauma (less than 10 days). Patients with open injuries and fractures were excluded.

After the surgery was indicated, an ultrasound study (evaluated by one observer) and an MRI (evaluated by four observers) were performed, with emphasis on the presence of a Stener lesion. Both exams were blind to the surgeon, patient and observers.

Results and Conclusions: All patients presented complete rupture of the ulnar collateral ligament in the surgery, but only eight of them (57.1%) had the Stener lesion.

For the identification of Stener, the MRI presented a sensitivity of 87.5%, specificity of 66.6%, PPV 77.7% and NPV of 80%. The US had a sensitivity of 100%, specificity of 50%, PPV 72% and NPV of 100%. Moderate to considerable values were obtained in interobserver and intraobserver concordance for MRI.

CONCLUSIONS: In the suspicion of a Stener lesion, US and MRI are complementary studies that would help improve the diagnosis. However, the values of specificity and negative predictive value are insufficient to confirm the Stener lesion and reduce the false positive diagnosis, so their use would not yet fully resolve this situation.

Keywords: Stener Lesion
The flexion-pronation provocation test. A new test for distal biceps tendon pathology

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Objectives / Interrogation: Background: Partial biceps tendon ruptures are often missed; therefore a reliable clinical test is needed. Hypothesis: Partial distal biceps tendon ruptures and bursitis can be reliably diagnosed with the pronation-flexion provocation test.

Methods: Methods: The pronation-flexion provocation test was performed by a single surgeon in a cohort of 30 patients with a confirmed partial distal biceps tendon rupture and a cohort of 30 patients with other elbow pathology. To perform the flexion pronation provocation test the patient is asked to actively flex the elbow from a pronated position of the forearm with the elbow tucked in to the patient's side and with the elbow in ninety degrees of flexion. The examiner's hands are placed on the patient's forearm and the patient's flexion is resisted. Care is taken not to place the hands on the hand or wrist as resisted wrist flexion might elicit pain in other elbow pathologies. The test is positive when the patient indicates pain when active flexion is resisted.

Results and Conclusions: Results: The flexion-pronation provocation test was positive in all patients with distal biceps tendon pathology. The VAS score averaged at seven out of ten (range 4-9). The VAS score for the supination-flexion resistance test averaged at one out of ten (range 0-5). In the control group the VAS score for the flexion-pronation provocation test averaged at zero out of ten (range 0-1) while the VAS score for the supination-flexion resistance test averaged at 1 (range 0-2). Conclusions: The pronation-flexion provocation test is highly reliable and accurate in the clinical diagnosis of partial biceps tendon ruptures.

Keywords:
test, elbow, distal, biceps, tendon, partial, rupture
Minimally invasive corrective osteotomy of the proximal phalanx: A biomechanical study

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Objectives / Interrogation: Background:
Malunions of phalangeal fractures of the hand form a real challenge to the treating surgeon. Corrective osteotomies of the proximal phalanx need stable fixation to allow immediate active finger motion to prevent postoperative tendon adhesions. Typically this is achieved with plate/screw osteosynthesis. Despite rigorous postoperative mobilization, results are often disappointing due to stiffness. Intramedullary fixation of phalangeal fractures has been popularized recently. These offer a strong and reliable fixation allowing early mobilization. This technique can be performed with minimal disturbance of the soft tissue envelope of the finger. The stability of this type of fixation after open wedge osteotomy has not been tested.

Methods: Methods:
24 paired fresh frozen proximal phalanges were divided into two groups. In twelve phalanges, an apex volar osteotomy was created. In the other half, an apex medial osteotomy was created. In each group, 6 phalanges were stabilized with a dorsal 1.3 mm angular stable plate. The contralateral, paired phalanx was stabilized with a 2.4 mm intramedullary screw. The phalanges were tested in a custom mount in a 3 point bending, load-to-failure protocol. The load was transmitted onto the volar side of the phalanx as this mimics the physiological load of the tendons on the phalanx. A paired t test was used for statistical comparison of the 2 groups.

Results and Conclusions: Results and Conclusions:
Results: The load to failure in the apex medial osteotomy group was 178.5N and 143.8N for the plate and screw and intramedullary screw group, respectively (p=0.3). Stiffness was 63.33N/mm and 55.83N/mm (p=0.22). For the apex volar osteotomy group, these numbers were 263.7N and 160N (p=0.0072) and 220N/mm versus 60N/mm (p=0.0012).

Conclusions: For fixation of an apex medial osteotomy, there is no statistically significant difference in load to failure between an intramedullary screw and an angular stable plate/screw construct. However, after apex volar osteotomy, plate/screw fixation is stronger.

Based on the available evidence, the rigidity provided by an intramedullary screw is probably sufficient to allow immediate active motion after both types of osteotomies. Combined with the advantage of minimal soft tissue disturbance, it seems to be a valid alternative for fixation of these osteotomies. Further clinical investigation in regards to feasibility is needed however.

Keywords: corrective, osteotomy, phalanx, screw, intramedullary
A Novel Procedure for Chronic Sagittal Band Rupture, Permitting Immediate Active Motion and Hand Use During Recovery

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Objectives / Interrogation: Chronic sagittal band ruptures have characteristically been treated by surgical techniques that repair or reinforce the ruptured side to ipsilateral structures, then immobilize in extension 6-10 weeks, followed by an intense course of therapy. Cause of deformity can be traumatic or due to connective tissue weakness, as in Ehlers-Danlos syndrome (EDS) or connective tissue disease. This report supports use of a strong tendon graft centralization and relative motion extension (RME) splinting to preserve motion and function during healing, obviating the need for additional therapy.

Methods: 23 years ago we encountered a rheumatoid arthritis patient who after repeated steroid injections subluxed on both sides of her MP joint. The EDC tendon was centralized by a tendon graft passed through the metacarpal head, then RME utilized for 6 weeks to protect the repair and permit active motion. The result encouraged us to similarly manage the following 22 patients reported, most of whom had traumatic rupture, one with EDS and 3 with rheumatoid arthritis. Tendon grafts have been used from juncturae tendinum, extensor retinaculum, half of the EIP, have of the EFR and most recently the palmaris longus tendon.

Results and Conclusions: These patients were encouraged to resume normal hand function in the splint, and recovered full range of motion without need for additional therapy. The only failure was in a rheumatoid patient with ulnar deviation of her 4th and 5th digits that remained uncorrected by centralization. This surgical technique obviates the need for careful tension adjustment to centralize the tendon, and provides a strong pulley to support patients whose connective tissue strength may be questionable. The use of safe, active motion in an RME orthosis preserves function and avoids need for a prolonged therapy program.

Keywords: sagittal band rupture, sagittal band repair, tendon grafts, relative motion extension splint, relative motion extension orthosis
A Modern Adaptation to the Ten Test for the assessment of Digital Nerves

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Objectives / Interrogation: Digital nerve injuries are common injuries of the hand with variable sensory recovery. These injuries have a significant burden of care and to the wider economy due to delayed return to work. Early, accurate diagnosis of nerve injury allows appropriate planning for surgery and informs the patient early of likely prognosis. There are several methods to assess a digital nerve injury. However, there is yet to be a method that can correctly predict nerve division and is easy to use. The aim of this study was to review the assessment of nerve injury and in particular the use of the Ten Test, and evaluate these in our own patient cohort.

Methods: Our study included patients who had a sensory deficit along the distribution of the digital nerves. We assessed 744 nerves in 370 patients during screening in an investigator led trial for nerve repair (Conduit Nerve approximation versus Neurorrhaphy Evaluation of Clinical outcome Trial). Data was collected prospectively and included the mode of injury, sensory score from 0-10, and operative findings. Patients were excluded if they did not have the Ten Test Score on assessment or if they did not have an operation which confirmed the diagnosis of nerve injury. Statistical modelling was applied to our data.

Results and Conclusions: Results: 159 patients had a complete nerve injury, 484 patients did not have any nerve injury, 46 patients had a bruised or contused nerve and 55 patients had a partial nerve injury. The mean Ten Test score of a patient with a complete nerve injury was 3.13 with a standard deviation (SD) of 0.181. Statistical analysis showed a significant difference in the Ten Test scores between complete digital nerve injury and partial, intact or bruised nerves. Scores of 5 or more showed a negative predictive value of 81.1%. An interesting relationship was noted between the mode of injury and the reliability of the Ten Test score in predicting the severity of the injury which has led to our adaptation of the Ten Test.

Conclusion: The Ten Test can be considered a reliable examination tool in the assessment of digital nerve injuries. Accuracy in nerve injury assessment can be improved when combined with the mode of injury. Further data is required to ascertain whether the Ten Test can be used to rule out nerve injuries in a pre-operative setting.

Keywords:
diagnosis, ten-test, nerve, digital nerve, prospective study, nerve repair
The diagnosis and treatment for extra-pulmonary tuberculosis in the wrist and hand

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Objectives / Interrogation: Analysis the status and regional distribution of tuberculosis in China. Introduce our experiences on the diagnosis and treatment of extra-pulmonary tuberculosis in wrist and hand.

Methods: Tuberculosis is an old and infectious disease. According to the 2018 global tuberculosis report of WHO, the number of new cases was 889,000 and the incidence rate of TB was 63/100,000 in China in 2017. Though the global incidence rate in China has decreased, but a lot of cases of extra-pulmonary tuberculosis in the wrist and hand still could be seen in the northwest China. From 2012 to 2018, 25 patients were diagnosed extra-pulmonary tuberculosis in the wrist and hand in our department and debridement of focal lesion and/or proximal row carpectomy and external fixation were conducted for the treatments according to the degree of lesion. Chemotherapy was recommended for patients including rifampicin, isoniazid, pyrazinamide and ethambutol for three months and rifampicin together with isoniazid for another nine months. First of all, we focused on the relapse of TB in wrist and hand. Then we evaluated the motion of the wrist and joints of hand. And we also measured the VAS score of wrist and hand for assessment the degree of pain.

Results and Conclusions: 25 patients were all followed up. All of patients finished the chemotherapy. The incisions of all cases were primary healing. 3 cases relapsed after 3 months for the first operation. Then they were cured after second debridement for distal row carpectomy. The histopathological examination of tissue showed chronic inflammatory cells with evidence of granuloma with giant cells and central caseation. The range of motion of wrist was obviously limited owing to joint fusion or scar adhesion in the patients with severe erosion in their wrists. The average VAS score of wrist pain decreased from 8.3 to 1.7. Completely debridement of the lesion synovial tissues and bones eroded by mycobacterium tuberculosis combined with early, united, regular, moderate and whole course chemotherapy could be an option for the treatment for the severe extra-pulmonary tuberculosis in wrist and hand.

Keywords: tuberculosis wrist hand pain infection China
A Mendelian randomisation analysis suggests that skeletal growth is causal in the aetiology of Carpal Tunnel Syndrome

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Objectives / Interrogation: We recently performed the first ever genome-wide association study (GWAS) of Carpal Tunnel Syndrome (CTS), and discovered that several of the putative genes that predispose to CTS are important in skeletal growth. We also found that individuals with CTS are on average >2cm shorter than controls. The aim of this study was to establish whether there is a causal relationship between shorter stature and increased risk of developing CTS.

Methods: Mendelian randomisation (MR) is an analytical method that provides evidence about causal relationships between a risk factor and a disease. It is less susceptible to reverse causation and confounding than conventional observational studies, because inherited genetic variation is randomly allocated at conception.

We performed a two-sample MR analysis using height as the exposure and CTS status as the outcome. We selected 601 single nucleotide polymorphisms (SNPs) for use as instrumental variables for height, taken from a large meta-analysis of adult height GWAS[1]. The genetic effect estimates for these SNPs with CTS risk were obtained from our own GWAS of CTS using data from UK Biobank. The analyses were performed using the MendelianRandomization package for R.

Results and Conclusions: Using the inverse variance-weighted (IVW) MR method on the 601 SNPs identified that a 1 standard deviation (equivalent to 9.24cm) increase in height was associated with an odds ratio (OR) of 0.76 (95% CI: 0.70-0.82, p=2.24x10^{-15}) for development of CTS. The MR-Egger analysis gave an OR of 0.68 (95% CI: 0.52-0.83, p=2.87x10^{-5}) and no evidence to support the presence of confounding arising from the same genetic variants affecting both height and CTS status through different biological pathways (horizontal pleiotropy): intercept=0.0029; 95%CI: -0.0016, 0.0073, p=0.21. These associations persisted in various sensitivity analyses.

This study strongly supports the hypothesis that height is inversely causal in the aetiology of CTS, and, by extension, that altered anthropometric measures (of which height is a proxy) contributes to CTS predisposition. We therefore provide compelling genetic epidemiological evidence that is consistent with previously reported observations that altered hand anthropometric measurements and wrist dimensions correlate with CTS risk. We suggest that a significant proportion of the genetic contribution to CTS risk arises as a result of variants affecting genes that control skeletal growth.

Keywords:
Carpal Tunnel Syndrome, Nerve compression, Genetics

References:
**Prevalence of neuropathic pain in patients who underwent Carpal Tunnel Release (CTR) and outcomes of surgery on neuropathic pain**

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**Objectives / Interrogation:** Carpal tunnel syndrome (CTS) is the most common compressive neuropathy and has been reported to affect up to 10% of the general population. Few papers have reported the prevalence of neuropathic pain in CTS as well as the outcomes of surgery on NP. The aim of this study is to determine the prevalence and risk factors of neuropathic pain (NP) in patients who underwent carpal tunnel release as well as the outcomes of surgery on NP.

**Methods:** Patients who underwent Carpal tunnel release from January to December 2017 at Singapore Hospital were enrolled in this study. Neuropathic Pain (NP) was determined by the Douleur Neuropathique en 4 Questions (DN4) with pre and post surgery scores recorded. Data including diabetes, use of gabapentin and pre-operative corticosteroids will be collected. Functional outcome was measured using the (Disabilities of the Arm, Shoulder and Hand) DASH score as well as patient reported satisfaction.

**Results and Conclusions:** A total of 53 patients were identified. There were 37 females and 15 males with an average age of 52 years. 58% of patients were Chinese, 30% Malay and 8% Indian. Results on the prevalence and risk factors for neuropathic pain in patients undergoing carpal tunnel release will be presented. Outcomes of surgery on neuropathic pain will also be discussed.

**Keywords:**
Carpal Tunnel Syndrome, Neuropathic pain, Surgical Outcomes
Outcomes of De Quervain's release from a patient's perspective

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Objectives / Interrogation: De Quervain disease is the second commonest entrapment tendinitis of the hand and wrist following trigger finger. Patients are often treated conservatively with analgesia, splints and steroid injections. De Quervain’s release has been the treatment of choice for many patients who have failed conservative management. The aim of this study is to evaluate the surgical outcomes of Dequervain Release including patient reported experience.

Methods: This is a retrospective study. Patients who underwent DQ release from 2014 to 2017 at a Singapore Hospital were identified and interviewed over the phone in this study. A 28 part questionnaire including demographic data, patient's occupational history, subjective symptoms and patient reported satisfaction will be used.

Results and Conclusions: 99 involved wrists from 95 patients who had surgery were identified. The average age of patient was 46 and 61% of the surgeries were performed on the right wrist. The average follow up period was 28 months. Outcomes of surgery and patient's reported satisfaction will be presented and discussed subsequently.

Keywords:
De Quervain's release, Outcomes, Patient perspective
An ultrasonic diagnostic method by multiple plane scanning and side-to-side comparing for unilateral peripheral nerve entrapment disease.

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Objectives / Interrogation: To discuss ultrasonic inspection methods and diagnostic indicators by multiple plane scanning and side-to-side comparing for unilateral peripheral nerve entrapment disease.

Methods: Unilateral carpal tunnel syndrome (CTS), cubital tunnel syndrome (CuTS) and radial nerve compression (RNC) patients have been selected as object in this study. The numbers of patients were separately 15, 34 and 13. First, CSASR (cross section area swelling rate) in multiple level was calculated by comparing cross section area of affected side and normal side. Second, the diagnose cut-off value of CSASR was used to diagnose CTS, CuTS, and RNC meanwhile therapy cut-off value to select therapy method. When the maximum value of CSASR was greater than therapy cut-off value, surgical treatment was selected for patients. When the maximum value of CSASR was between the two cut-off values, conservative treatment was selected for patients. At last, the most serious position was determined based on the location where the maximum CSASR value was calculated. The extent of disease was defined by the segment where the CSASR value was greater than diagnose cut-off value.

Results and Conclusions: Diagnose cut-off values of CTS, CuTS and RNC were separately 1.22, 1.51 and 1.50. Therapy cut-off values were separately 1.48, 1.67 and 3.04. The ultrasonic diagnostic method realized localization diagnosis and defined the extent of disease by multiple plane scanning simultaneously, further decreased individual difference, intraneural difference, and interneural difference by side-to-side comparing. The accuracy and objectivity of ultrasonic diagnosis was greatly improved.

Keywords:
Ultrasonography; peripheral nerve; entrapment neuropathy; electrophysiology
**Development of a Mobile App Based on the Oberg Manske Tonkin (OMT) classification to increase its utilization in clinical practice**

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**Objectives / Interrogation:** The Oberg Manske Tonkin (OMT) classification for congenital hand differences (CHD) was introduced in 2013 and subsequently recommended by the IFSSH to replace the pre-existing Swanson's classification. Based on evidence from developmental biology, genetics and clinical features, the OMT eliminated the ambiguities of the Swanson's classification, allowing a robust categorisation of each condition. However, uptake of the OMT remains slow, with surgeons citing difficulties in understanding embryology and other practicalities within a busy clinical practice. Using the OMT to improve communication between different sub-specialties remains difficult. This study examined if a mobile OMT App for smartphone devices would increase its utilisation in clinical practice.

**Methods:** App development was done using the React Native Framework, and distributed for testing using the Apple TestFlight Platform. The App allows search of a condition using traditional CHD nomenclature, as well as keywords such as 'short' or 'fused' fingers to help users unfamiliar with CHD nomenclature. The OMT classification is displayed for each condition, as well as an image/radiograph where possible, plus a short description. Genetic information for syndromes were also included, if known. The Beta version of the App was trialled among 10 participants of various disciplines including congenital hand surgeons, trainees, developmental biologists, geneticists and neonatologists. Each was surveyed on the usefulness of the App as compared to a paper version in the following areas: accessibility, ease of classifying a condition, improved knowledge about the condition and improved communication with other specialties.

**Results and Conclusions:** 83.33% of participants agreed that the OMT itself is useful for clinical use, to improve embryological knowledge (66.67%) and to improve genetic knowledge (33.33%). 100% found it easier to access the OMT using the App as compared to the paper version (40%). 83.3% strongly agreed that ease of access would increase their likelihood of using the OMT. All participants found it easier and quicker when using the App as compared to paper version; 66.7% felt that they could learn more about a condition using the App. Crucially, 66.7% felt that using the App would allow them to communicate better with other specialties.

The OMT App presents a potentially useful platform for the classification of CHD, improved knowledge of embryology among clinicians and communication between different sub-specialties.

**Keywords:**
OMT, App
Thumb strength and manual ability in radial polydactyly at the interphalangeal and metacarpophalangeal joint level

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Objectives / Interrogation: The aims of this study were to quantify strength impairment in radial polydactyly at the interphalangeal and metacarpophalangeal joint level (i.e., Wassel types II and IV), to assess which factors affect thumbs strength in radial polydactyly, and to evaluate the impact of thumb strength impairment on manual ability in radial polydactyly patients.

Methods: Postoperative thumb strength was measured in patients with unilateral radial polydactyly type II and IV using a pinch gauge dynamometer and the Rotterdam Intrinsic Hand Myometer (‘RIHM’). Strength of the unaffected contralateral side was used as the reference. Radial polydactyly type, hand dominance, thenar hypoplasia, number of surgeries, sex, age at follow-up, duration of follow-up, instability, and thumb size were evaluated as potential determinants of thumb strength. Self-reported manual ability was measured using the ABILHAND-kids questionnaire.

Results and Conclusions: Eighty patients were included in this study, with a mean follow-up of 9.4 years. Thumb strength was 86% - 94% of the unaffected contralateral thumb in all measurements. Strength impairment was influenced by hand dominance, thumb size, and number of surgeries. Thumbs of radial polydactyly patients with an affected dominant hand were 10% - 29% stronger on average, compared to patients with an affected non-dominant hand, with exception of metacarpophalangeal flexion strength. Increased thumb size was positively correlated with pinch strengths, whereas increased number of surgeries showed a negative correlation. Forty-three (54%) patients attained the maximum score in the ABILHAND-kids questionnaire. While there was no correlation between relative thumb strength and manual ability, age at follow-up and duration of follow-up were positively correlated to manual ability.

The relatively small but statistically significant strength impairment of radial polydactyly patients does not impair their perceived manual ability. Strength is better in radial polydactyly cases with an affected dominant hand and in cases with relatively larger thumbs. An increase in number of revision surgeries is associated with greater strength impairment.

Keywords:
Radial Polydactyly, Strength, Manual Ability, Outcome
Treatement of dorsal synovial ganglion of the wrist with percutaneous sclerotheraphy using hypertonic glucose

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**Objectives / Interrogation:** Synovial ganglion is a benign soft tissue tumor most commonly found in the dorsal region of the wrist. There are numerous forms of treatment described in the literature, among them, observational, aspiration of ganglion fluid and infiltration of corticosteroids or sclerosing agents and surgical resection. Conservative treatment with aspiration with or without infiltration has a low resolution rate (20-30%) compared to surgical treatment (up to 100%), however the surgery is more invasive and has a higher rate of complications. Few sclerosing agents have been studied for this purpose. There are reports of polidocanol and hypertonic serum, however no work using 75% hypertonic glucose.

Hypertonic glucose is considered one of the safest sclerosing agents. Our study was performed with dorsal synovial ganglion aspiration and hypertonic glucose infiltration 75%

**Methods:** Case series, prospective interventional with 45 patients, totaling 47 dorsal synovial ganglion of the wrist, confirmed by ultrasound examination, without previous treatment.

Local anesthesia was performed with 1% lidocaine subcutaneous injection; puncture of the cyst with needle and aspiration of synovial fluid; infiltration of solution containing 3 ml of 75% hypertonic glucose and associated with 0.5 ml of 1% Lidocaine; band Aid. If there was no complete cure or permanence of the cyst within 4 weeks, another puncture and infiltration was performed.

The cure index, the pain intensity by the visual analog pain scale (VAS), the scores of the Quick DASH and Brief Michigan functional questionnaires, the presence of the side effects, range of motion of the wrist and grip strength were evaluated.

**Results and Conclusions:** Of the 45 patients, 30 were female and 15 were male. The mean age was 36.4 years. Of the 47 evaluated ganglion, 24 were on the left side and 23 on the right side, 57.4% evolved to cure, 12.8% presented ganglion without elevation but present palpation and 29.8% were present.

The functional questionnaires and the applied EVA show significant improvement. Side effects were edema and hyperemia for 2 days and skin necrosis in 1 patient treated with dressings. There were no differences in grip strength and range of motion.

It is concluded that the treatment of dorsal synovial ganglion of the wrist with aspiration and infiltration of Hypertonic Glucose 75%, is another new tool for conservative treatment of the ganglion, with a cure rate of 57.4% at 6 months after the procedure.

**Keywords:**
Synovial ganglion, sclerotheraphy, hypertonic glucose
Anatomical study of dorsal hand vascular network and clinical application of a new multiple intermetacarpal perforators flap.

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Objectives / Interrogation: The reconstruction of deep defects of dorsal long fingers continue to remain a challenge for the hand surgeon. We investigated the anatomical basis of dorsal hand vascular network to perform a new wide turnover flap.

Methods: In ten fresh frozen upper limbs, injected with acrylic resin, the dorsal surface of hand was dissected. The intermetacarpal spaces and long fingers were evaluated for the characteristic (number, site, interval of origin and course) of dorso-palmar perforators. Wide perforator flap, based on multiple intermetacarpal distal perforators, was used in five patients for the soft tissue reconstruction of multiple dorsal long fingers.

Results and Conclusions: The mean number of perforator vessels of intermetacarpal space was 3.5, mainly septal-type. Proximally to juncturae tendinorum, the vessels were less numerous. The average distance between the more distal intermetacarpal perforator called Quaba perforator and the metacarpophalangeal joint was 1.15 cm (DS 0.58), between Quaba’s and the commissural artery was 1.61 cm (DS 0.66). Proximally to Quaba, constant perforators have been encountered at a mean distance of 28 mm, 37.84 mm, 46.42 mm, 45.5 mm. In long fingers, the mean number of branches for the dorsal cutaneous network was 9 (range 5-15) arising from the proper digital artery. There were not symmetry between radial-ulnar sides, or opposite side of an interdigital-space. In 5 patients a multi-perforator flap, based on distal perforator vessels, has been used to cover the dorsal surface of multiple long fingers. A good aesthetic and clinical result has been achieved at 6 months of follow-up. The perforator arteries network arising from intermetacarpal arteries, allow us to perform a distally based 4 multi-perforator flaps of entire subcutaneous surface of the dorsum to obviate to a microsurgical flap reconstruction. This new flap was then mobilized as a turn-over flap to cover the long fingers and then skin grafted. This autologous-functional reconstruction of all involved fingers allows an early and intense rehabilitation to achieve a better recovery. Subcutaneous surface guarantees tendons and joints gliding, with minimal donor site morbidity. Anatomical knowledge achieved, showed a reliable vascular network, able to support this wide adipofascial flap.

Keywords:
multi-perforator flap, intermetacarpal artery, adipo-fascial flap, hand microsurgery
The reconstruction of lateral nail fold in radial polydactyly with a common nail

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Objectives / Interrogation: In this study, we developed a new surgical technique to reconstruct the lateral nail fold of radial polydactyly.

Methods: From December 2012 to October 2015, sixteen cases had a common nail and were treated with a flap from finger pulp. Unilateral inverting suture was performed between the flap and nail bed to reconstruct the lateral nail fold and nail groove.

Results and Conclusions: The follow-up period ranged from 10-45 months. The reconstructed nails had even curvature with a natural-looking of the lunula, and the nail width was about 80%-100% of their normal sides. Four cases had a right angle between the nail epithelium and lateral nail fold, and two had acute angle. The reconstructed nails were asymmetrical in these thumbs. One patients showed a hypertrophy in the lateral nail fold. The reconstructed nails were evaluated by Wang-Gao scoring system (total 12): 10 in two cases, 11 in four and 12 in ten. All the nails had excellent results.

The nail width usually is more than 80% of the normal sides in the radial polydactyly with a common nail. Thus, there is no indication of Bilhaut-Cloquet procedure. Our surgical technique can reconstruct the lateral nail fold and nail groove, and avoid the nail deformity caused by the Bilhaut-Cloquet procedure.

Keywords:
Radical polydactyly; nail deformity; nail reconstruction; nail plasty.
Outcomes after Long Nerve Gap Reconstructions in the Upper Extremity with Processed Nerve Allograft

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Objectives / Interrogation: Long segmental nerve defects after traumatic injuries pose a significant surgical challenge. Current treatment modalities include nerve autograft, nerve transfers, and most recently processed nerve allograft. Recovery outcomes in these repairs however are often limited due to the challenges of this study population. Data was queried from an on-going nerve repair registry for subjects reporting long term follow-up after reconstruction in the upper extremity with processed nerve allograft. Here we report on the recovery outcomes of long gap nerve injuries reconstructed with processed nerve allografts in the upper extremity.

Methods: The RANGER® Study is a multi-center IRB/Ethics approved registry designed to collect data on the use and outcomes of processed nerve allografts (Avance® Nerve Graft, AxoGen). The registry database was queried for upper extremity nerve repairs 30mm or greater with a minimum of 12 months of follow-up data. The cohort was further stratified into sensory and mixed/motor nerve subgroups. Outcomes data were incorporated into the MRC scale for sensory and motor function. Meaningful recovery was defined as = S3/M3 on the MRC scale with higher thresholds defined at S3+/M4 or greater.

Results and Conclusions: The long gap cohort consisted of 91 injuries (58 sensory and 33 mixed/motor nerves). The mean age was 41±18 (18-76) years. The median time to repair was 6 days after injury. Mean gap length was 39±11 (30-70)mm. The mean follow up time was 21 months. Overall meaningful recovery was reported in 81% of repairs with 43% reaching higher thresholds. Meaningful recovery was reported in 81% of sensory nerve repairs. Return of sensory or motor function was reported in 73% and 63% respectively in the mixed/motor subgroup. These outcomes were comparable to historical literature of long gap reconstructions with nerve autograft. No related adverse events were reported.

Processed nerve allograft can successfully be used in long gap nerve reconstructions. Meaningful recovery was reported in 81% of repairs with outcomes as expected across subgroups. No adverse events were reported. These outcomes compare favorably to historical data in the literature for nerve autograft. Limitations of this study include the challenges of obtaining long term follow-up, observational study design, and lack of an active control. The registry continues to collect outcomes data on the use of processed nerve allografts.

Keywords:
Nerve Repair, Processed Nerve Allograft, Nerve Gap
The classification and treatment of the polysyndactyly of middle finger

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Objectives / Interrogation: The polysyndactyly of the middle finger usually manifests as the polydactyly of middle finger and at least one of the duplicated middle fingers fused to adjacent fingers. Most cases are distinctly different from the polysyndactyly of the ring finger and haven't appropriate classification to guide surgery. Here we proposed a classification system and discuss the treatment.

Methods: Classified the osseous syndactyly as complex type, cutaneous syndactyly as simple type and classified the polydactyly of middle finger from type I to VIII based on the level of bifid or duplicated skeleton. 19 cases was classified into: Type I 1 cases, Type III 2 cases, Type V 5 cases, Type VI 7 cases, Type VII 4 cases and 3 cases belonged to complex syndactyly. The surgical procedures were performed based on the characteristics of different types. Usually the hypoplastic finger was removed, and the preserved finger was separated from fused adjacent finger by zigzag incisions and using consecutive gull wing flap to construct the two webs at the same time. The final shape and function of affected fingers were followed-up.

Results and Conclusions: All cases were operated successfully. The adjacent fingers in simple type cases were nearly normal. However, all the preserved middle fingers were still suffering from different degree of hypoplasia and abnormality of joints. 4 cases accepted a latter surgery to correct the shape and to improve the function.
We proposed the classification of the central polydactyly, which is similar to the Wassel classification of thumb polydactyly. It will be easily acceptable by most clinicians and be more convenient for academic exchange. There are different characteristic in different types and Type V and VI were more common. Type V usually manifested as bifid proximal phalanxes with both hypoplasia middle fingers but usually minimal lateral deviation. Type VI usually manifested as duplication of proximal phalanxes, usually associates convergence of both middle fingers, similar to the Wassel IV-D type polydactyly of thumb. To select which finger to remove, one should consider to the characteristics of the above different types. The deformity of the preserved finger should be corrected as possible. But in most cases, the residual deformity of the middle finger may still need a second-stage surgery. Skin graft may not be needed in some cases by using consecutive gull wing flap to construct the two webs and transferring the remaining flap from the excised duplication.

Keywords:
polysyndactyly; classification & treatment
Ulnar shortening osteotomy as treatment for ulnar impaction syndrome. An 8-year follow-up.

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Objectives / Interrogation: The ulnar impaction syndrome is a source of ulnar wrist pain. The diagnosis includes physical examination and radiological signs of ulnar impaction, although not all cases of radiographic impactions are symptomatic.

The objective of the study is to evaluate the results of ulnar shortening osteotomy fixed with a compression plate on the volar face of ulna for primary ulnar impaction syndrome, 8 years of follow up.

Methods: Retrospective review of 10 patients with primary ulnar impaction syndrome intervened in 2009 and 2010, mean follow up of 8,7 years.

The following data observed genre, age, range of motion (pronation, supination and Kapandji scale), grip strength, pinch strength, VAS and DASH.

A P-A and lateral x-ray of forearm were made for assessment changes on distal radio-ulnar joint ant carpal-ulnar joint.

Results and Conclusions: 10 patients (6 women, 4 men), mean age 44.4 years (26-62 years). 3 were intervened on the left hand. All patients had right dominance. Intervention was made with Acumed Osteotomy System (Acumed®) with mean shortening of 2,3 cm.

The osteotomy consolidation was achieved between 2-10 months (mean 6.3). 4 patients were intervened for extraction of the material due to discomfort. The extraction was made between 1 and 7 years (mean 3 years). Just one x-ray showed a distal radius osteophyte.

Results were analyse using Wilcoxon test. Mean values of grip strength was 26,8 kg and pinch mean strength was 7,4 kg, we did not found statistical difference compared to contralateral (grip strength p = 0,345, pinch strength p = 0,35).

Mean values of pronation was 90º, supination was 83,5º, Kapandji 9,6. There was no difference on the range of motion between both extremities (pronation p = 0, supination p = 0,109, Kapandji p = 0,317).

There was no difference on the VAS scale, mean value of 0.9 points (p = 0,317). The DASH score mean results were 12,72 points.

A correlation was found using Spearman test between the DASH scale and both the grip strength (p < 0,05) and the pinch strength (p < 0,05). There was no difference between VAS scale results and grip (p = 0,059) or punch strengths (p = 0,127).

We concluded that ulnar shortening provides excellent long-time results, with no difference on either motion values (pronation, supination, Kapandji scale, grip strength and punch strength), VAS or DASH between the intervened extremity and the collateral at 8 years after the procedure.

It also suggest that DASH may have better correlation with surgical results in terms of strength than VAS.

Keywords: Ulnar shortening, Ulnar impaction syndrome
Surgical Management of Thoracic Outlet Syndrome: A Single-Centre Review

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Objectives / Interrogation: Thoracic outlet syndrome (TOS) results from compression of one or more of the brachial plexus, subclavian vein, or subclavian artery as they pass from the neck into the axilla. Presenting signs and symptoms, location of compression, and responsible structures can vary. We sought to review the indications, operative findings, treatment, and outcomes for all patients treated at our centre.

Methods: A retrospective review of all thoracic outlet syndrome patients treated surgically by a single operator was performed. Patients were identified by theatre logbooks. Data was extracted via review of medical records, theatre records, and investigations.

Results and Conclusions: 32 primary procedures (7 bilateral, 7 right-sided, 11 left-sided) were performed in 25 patients (18 female) from October 2010 to September 2018. Surgical indications included one or more of sensory change (24/32), weakness (23/32), or neurogenic pain (20/32) in 31 out of 32 cases.

One case was abandoned intra-operatively due to respiratory compromise. All other patients were treated with surgical exploration, release/excision of compressive soft tissues, neurolysis, and rib resection if indicated. Compressive structures included scalene musculature, fibrotic tissues, first rib, and anomalous structures including cervical rib, with multiple involved structures documented in 29 of 31 cases.

Complications were common (19/31), with cervical plexus pain/paraesthesia occurring most frequently (12 cases, 1 refractory). Major complications (1 haemothorax, 1 pneumothorax) occurred in 2 cases. Satisfactory symptom resolution was reported by 84% of patients (26/31). 1 patient underwent surgical re-exploration for recurrent symptoms.

The operative findings demonstrate varied and multiple structures contributing to thoracic outlet syndrome. Surgical decompression is individualized according to the pathology encountered. Despite a high rate of minor complications, surgical exploration and decompression effectively treats TOS symptoms in the majority of patients.

Keywords:
thoracic outlet syndrome, thoracic outlet decompression, peripheral nerve
Abstract no.: IFSSH19-1045

**Oral presentation or poster presentation: Tendon**

**Injection into both compartments is more effective than an extensor pollicis brevis compartment alone in de Quervain disease?**

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**Objectives / Interrogation:** In de Quervain’s disease (dQD), it has been described in many previous studies that failure to inject of steroid into the first compartment could result in persistent symptom. Therefore, recent studies have been focused on ultrasound (US) guided accurate intra-synovial injection into the abductor pollicis longus (APL) and extensor pollicis brevis (EPB) tendons for enabling the steroid to reach both tendon sheath in patients with complete septation. We hypothesize that accurate injection of steroid into an EPB compartment alone is as effective as injection into both compartments in dQD.

**Methods:** A prospective, randomized controlled study was performed at a single center between 2017 and 2018 using patient who presented with dQD. The patients were divided into two groups: Group 1, in which we injected into the compartments of APL and EPB tendon, respectively and Group 2, in which we injected only into the EPB compartments. All injections were performed by single orthopedic surgeon under US-guided. Pain and functional outcome was assessed by visual analogue score (VAS), quick Disabilities of the Arm, Shoulder, and Hand (DASH) scores and subjective response of patients.

**Results and Conclusions:** A total of 27 US-guided injections have been performed in 27 patients after clinical and ultrasound examination. 14 patients were classified into group 1 and 13 patients were into group 2. Pain on the 100 mm VAS for the group 1 was 82.8 and group 2 was 72.7 at baseline. At 2 weeks after steroid injection, pain and clinical scores improved in both groups. However, there was no significant differences in pain and clinical scores at 2, 6 weeks and final follow-up. Furthermore, no significant differences were seen in subjective response and the ratio of surgeries/total in each group. In conclusion, Our findings suggest US-guided injection targeting the EPB alone is as effective as targeting both compartments in dQD patients with complete septation.

**Keywords:**
De Quervain’s disease, abductor pollicis longus, extensor pollicis brevis
Radioscapholunate (RSL) fusion for posttraumatic osteoarthritis (PTRO) or type II scapholunate advanced collapse (SLAC). Functional results for both etiologies.

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Objectives / Interrogation: Background
Despite a high complication rate when looking at long term follow-up, RSL fusion is a therapeutic option for arthritis affecting the radioscaphoid and radiolunate joints. However, its role in management of SLAC wrist remains poorly defined and RSL fusion for the SLAC type II wrists is not an option commonly discussed. Indeed, the mainstays of treatment for this condition remain proximal row carpectomy (PRC) or four corner fusion.

Objectives and interrogation
The objective of this study was to determine if there were differences in outcome for RSL fusion when performed for SLAC II wrist as compared to that performed for post traumatic radiocarpal OA (PTRO).

Methods: Patients who had undergone RSL fusion for either SLAC II wrist or PTRO joint were identified from surgeons' records. Data collected included patient demographics, co morbidities, operative data and postoperative complications. Participants were asked to complete DASH and PRWE questionnaires. They were also asked to rate level of pain on a VAS as well as satisfaction score. Objective functional outcomes were measured in terms of range of motion at the wrist and grip strength. Follow-up x-rays were also performed.

Results and Conclusions: Flexion-extension arc was better in the SLAC group and radio-ulnar deviation better in the PTRO group though none reached statistical significance (p>0.05). Grip strength (both as an absolute value and as percentage of uninjured side) was better in the SLAC group and came to statistical significance. Functional measures of DASH and PRWE were also better in the SLAC group.
There was no significant difference in Pain VAS score or satisfaction in either group. Both groups scored low for pain and high for patient satisfaction. Analysis of the follow up x-rays indicated that all those which had not gone onto complete wrist fusion demonstrated successful bony union.

Conclusions
RSL fusion when performed for PTRO can be a very effective procedure in terms of range of motion, functional outcome assessment and patient satisfaction. When SLAC is the indication for surgery the results would suggest that FCF is superior. Indeed, when we compare our results to published series and that performing RSL fusion in a SLAC wrist is more technically demanding, FCF would seem to remain the better option for SLAC wrist.

Keywords:
Topographical analysis of Pacinian corpuscle in the pulp of human cadaver finger tip pulp: A pilot cadaver study

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Objectives / Interrogation: The human hand is an organ specialized for fine motion and sensation, hence the relatively large representation of it on brain homunculus. The pathway of sensation starts from information sent by mechanoreceptors in the hand. This study reports the topography of Pacinian corpuscle in the fingertips of human, as the critical apparatus.

Methods: Ten fingers from both hands of one fresh frozen cadaver were examined. Glabrous skin distal to the distal interphalangeal joint was harvested deep to the periosteum, including its fat and subcutaneous tissue. The fingertips were divided into 10 specimens, consisting of 5 distal parts and 5 proximal parts. Modified gold chloride stain was performed. Sectioned specimens were observed under light microscopy and the volume was measured. The density of the corpuscle in the radial and the ulnar sides of the fingers, in the proximal and the distal sides, and in the right and the left hand were compared.

Results and Conclusions: Results: The Pacinian corpuscles were only observed in the subcutaneous tissue. There was no significant difference in terms of density between distal to proximal sides and right to left hand. Ulnar and radial sides showed statistically significant difference in the fingers except for the thumb.

Conclusion: The Pacinian corpuscle is present with different density depending on its locations on the human finger tips' pulp.

Keywords: -
Costochondral interposition arthroplasty in treatment of basal thumb arthritis

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Objectives / Interrogation: Trapeziectomy remains gold standard in treatment of basal thumb arthritis. This presentation handles the technique of costal cartilage interposition arthroplasty with special attention to the additional arthritis of the scaphotrapezoidal joint.

Methods: The main agenda of the presentation is to primarily focus on 26 patients afflicted by the disease who, according to Eaton-Littler classification, were categorized as stage IV, and who from 2015 on were treated with trapeziectomy, costochondral autograft and ligament reconstruction. Surgery was performed with additional interposition arthroplasty of the scaphotrapezoidal joint with a cartilage chip. Thumb and wrist were immobilized postoperatively for 4 weeks in a spika type cast/orthosis. The results were assessed by Buck-Gramco scale after 14-36 months.

Results and Conclusions: In total we could assess well or very well 20 patients. Radiologically there was no migration of thumb metacarpal in any of the patients. The vitality of costal cartilage was evidenced in MRI performed on random patients, which further more demonstrated the correct position of the cartilage chip.

Since 1995 interposition arthroplasty with costal cartilage in basal thumb arthritis has been performed with generally very good results.

The special attention to the scaphotrapezoidal joint seems to be reasonable and the interposition of a cartilage chip appears to be a suitable solution.

Keywords:
Basal thumb arthritis
AN UNUSUAL LUMP IN THE HAND: DESMOPLASTIC FIBROBLASTOMA

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Objectives / Interrogation: Soft tissue tumours of the hand are common and usually benign. Enlargement of tumours within the confined spaces of the hand can cause pain and stiffness. We report the case of a desmoplastic fibroblastoma (collagenous fibroma): a rare histological finding in the hand. Only a small number of sporadic cases and series have previously been documented.

Methods: A 41 year old right hand dominant male presented with worsening wrist pain and decreased range of movement. Eight years earlier he had sustained a scaphoid fracture which was successfully managed with six weeks of immobilization. He had plain film X-rays of his wrist requested in primary care, which were unremarkable. He subsequently developed a visible dorsal wrist soft tissue swelling and was referred to the hand clinic of a University Teaching hospital

Results and Conclusions: Magnetic Resonance Imaging (MRI), showed an abnormal mass arising dorsal to the capitate and extending through the gap between the second and fourth extensor compartment to lie immediately beneath the skin, measuring 15 mm thick by 27 mm wide and over 40 mm longitudinally. His management was discussed in a sarcoma-multi-disciplinary clinic: he was offered an excision biopsy.
Surgery was performed under general anaesthetic with tourniquet control. A marginal excision was performed: histology of the excised specimen showed well demarcated lobules comprising dense fibrous stroma and scattered spindle cells.
Immunohistochemistry showed minimal expression of Actin, Desmin and other diagnostic surgical pathology protein markers such as S100, CD34 or Epithelial membrane antigen (EMA). These histopathological and immunohistochemistry findings supported the diagnosis of a desmoplastic fibroblastoma.
After 4 weeks he returned to work as a security guard, his pain was reduced, his wrist mobility and hand strength returned to within 90% of his contralateral limb within 8 weeks.

Prior to surgery the most likely diagnosis seemed to be a Giant Cell Tumour: definitive diagnosis required histological assessment.

Reporting the behaviour and appearance of rare soft tissue tumours should help future hand surgeons to consider a more comprehensive list of possible causes for a lump, and allow more confident decision making

Keywords: -
Reconstruction of fingertip amputations in children with composite autograft and semi-occlusive dressing: CASOD, new technique

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Objectives / Interrogation: The reconstruction of fingertip amputations in children is challenging. There are many procedures described to treat this injury, none of which present optimal results. Repositioning of the amputated segment as an autograft or with microsurgical techniques seems to offer the best outcome. It allows to preserve otherwise irreplaceable structures, such as the nail bed and the hyponychium, enabling children to maintain an anatomically and functionally normal fingertip. We present a series of three pediatric patients treated with this proposed method, which combines composite autograft and semi-occlusive dressing (CASOD technique).

Methods: Patients were admitted to the operating room. Under anesthesia, surgical irrigation and debridement, with excision of part of the adipose tissue of the fingertip was performed, followed by suture of the amputated segment. In cases of bone involvement, a hypodermic needle was placed as fixation method. A semi-occlusive wound dressing (Tegaderm \textsuperscript{®}) was placed for 6 weeks. Patients were evaluated weekly to ensure the dressing maintained its sealing properties.

Results and Conclusions: Results: 3 patients were included in this study, with ages between 18 months-10 years. The amputation level, according to the modified Ishikawa classification was 1a (1 patient) and 1b (2 patients). Patients were followed-up for 13 months. In all three cases, the fingertip was preserved without necrosis or any other complication. The anatomy and aesthetic aspect of the fingertip was maintained.

Conclusions: this technique -"CASOD"- provides a new, simple and reproducible approach that offers good results. For this technique, preserving the wound's inflammatory exudate is fundamental, since it supplies the environmental conditions for regeneration without scar tissue formation. A wider number of patients needs to be recruited to this study in order to validate the technique.

Keywords:
Fingertip amputation, children
Neurovascular Island Flap for Thumb Duplication Reconstruction- a Novel Treatment with Long Term Outcomes

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Objectives / Interrogation: Pulp and nail asymmetry is commonly seen in thumb duplication. In hypoplasia of both digits, conventional reconstruction or Bilhaut-Cloquet procedure and its modifications may not be possible or may lead to poor cosmetic outcome. To improve aesthetic and functional results, a novel reconstruction technique with neurovascular island flap with long-term outcome was developed.

Methods: 14 patients with thumb duplication aged 8 to 18 months were operated between 2002 and 2013 in our center. All patients had significant hypoplasia and asymmetry of the pulp and nail of the planned retained digit. A dorsal-based neurovascular island flap including part of the pulp tissue, nail bed, with or without the associated phalangeal bone was raised from the planned ablated digit basing on its single neurovascular bundle. On combining the flap to the proper digit, meticulous repair of the nail bed, nail fold and pulp tissue using fine sutures under magnification. All patients were followed up to monitor the aesthetic, functional and radiological outcome, using the Tada and JSSH scores. A novel aesthetic scoring system was proposed which assessed size, shape, scar, smoothness of nail, and symmetricity. Parents, an occupational therapist and a hand surgeon participated in assessment.

Results and Conclusions: The mean follow up period was 7 years 11 months. 13 patients underwent the flap procedure and all flaps survived. In 1 patient, flap procedure was not proceeded as the pedicle was not well developed. Nail width and pulp circumference were restored compared with the normal thumb.

Pre-op (left) and post-op (right) after neurovascular pulp island flap procedure

The mean Tada and JSSH scores were 4 (3-5) and 17.5 (16-19) respectively. Suture size, the use of microscope, or combination of bone did not affect outcome. The proposed aesthetic scoring system was able to assess and highlight the cosmetic aspect of
the outcome, and correlated well with the parents' satisfaction (p=0.049).

In selected cases of thumb duplication with significant pulp hypoplasia and nail asymmetry, the neurovascular pulp and nail island flap is a safe and effective means to restore symmetry for improvement of aesthetics.

Keywords:
Thumb duplication, neurovascular pulp island flap, extra thumb reconstruction
Role of the interosseous membrane and TFCC in distal radioulnar joint instability in Galeazzi fracture: Anatomical and biomechanical study

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Objectives / Interrogation: Most Galeazzi fractures can be treated adequately with ORIF of the radius alone, but some will remain unstable at the DRUJ and require repair of the TFCC. The purpose of this study was to define and measure DRUJ dislocation and instability associated with the sequential sectioning of the different bands in the interosseous membrane (IOM) and TFCC in a simulation of a Galeazzi fracture.

Methods: Methods: Twelve fresh-frozen cadaver forearms were dissected and the different parts of the IOM were measured. Their were 6 men and 6 women with a mean age 74 years-old. We examine the anatomy and function of the forearm IOM and define the importance of anatomic divisions within IOM. Each forearm was them mounted into a wrist and forearm biomechanical device (Mecmesin AFG/AFTI Multitest-d ®, Virginia, USA). We simulated a radius fracture in all the specimens. A force of 25 N, 50 N and 75 N was applied. The load data (N) were correlated with the displacement data (cm). We sequential sectioning: 1) Central Band (CB); 2) CB plus Distal Oblique Bundle (DOB); and 3) CB plus DOB plus TFCC. The degree of displacement (cm) in DRUJ were measured in the three groups with the different loads. We evaluated differences in variables using Student’s t-test and ANOVA for groups. We considered 2-tailed p values less than 0.05 to be statistically significant.

Results and Conclusions: Results. In the specimens the average radial length was 23.38 cm and the average ulnar length was 25.5 cm. The average length of the radial origin was 13 cm and the ulnar origin was 5.7 cm. The CB has an average width of 2.5 cm. The CB of the IOM contributes 70% to the mechanical stiffness of the forearm, while the TFCC contributes 20% and the DOB contributes 10%. In-group 1 applying progressive loads (25/50/75 N) the average DRUJ displacement (cm) was 4.3, 5.9, and 7.9 cm respectively. In-group 2 was 5.2, 5.7, and 6.9 cm respectively. In-group 3 was 6.2, 8.1, and 9.9 cm respectively. Our study showed a correlation between the increase in applied load to the same injury and the degree of displacement (P=0.001). In-group 3 the degree of DRUJ displacement was statistically significant (p= 0.04).

Conclusions: CB is the crucial region within the IOM in restraining proximal migration. The TFCC also acts to resist proximal radial migration. Migration of the radius under loads implies disruption of both the CB and the TFCC. The DOB does not seem to have a relevant role in the displacement and in the transverse instability in forearm.

Keywords:
TFCC; DRUJ dislocation; Galeazzi fracture; Radial shaft fracture
Treatment for PIP joint flexion contracture in stenosing tendovaginitis using resection of the flexor digitorum superficialis.

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Objectives / Interrogation: Generally, PIP flexion contracture associated with finger stenosing tendovaginitis is resolved by incision of A1 pulley which is a major obstruction site. In spite of the favorable result of A1 pulley release, sometimes certain degree of contracture did not go away due to remaining sliding disorder at other sites except A1. We reviewed whether excision of total or half slip of the flexor digitorum superficialis (FDS) tendon was practicable for primary or revision cases with refractory flexion contracture.

Methods: We identified 12 fingers in 12 patients who underwent FDS resection. The average age was 76 years old (62-91). 2 fingers had one prior A1 pulley release and 1 had 2 previous surgeries. Diabetes were involved in 4. The long finger was affected in 11 and index finger in one. The intraoperative findings on tendons were recorded. Clinical outcome was reviewed including ROM, grip strength, Visual analogue score (VAS).

Results and Conclusions: The mean preoperative PIP contracture was 28 degrees. The ulnar half slip of the FDS was excised in 4, both slips in 8 fingers. Intraoperative full extension was achieved in 11 cases, and no other soft tissue release like capsule and volar plate was conducted. All FDS tendons had longitudinal internal lesions and enlargement. The postoperative PIP contracture was 7 degrees, full extension was achieved in 7 fingers at a mean of 18 months postoperative. No case of swanneck deformity was recognized. VAS was 14 points, and grip strength was 86% against contralateral side. Total active arc motion was 241 degrees. Between half slip and total resection, total arc was significantly different with 219 / 252 degrees, as opposed to insignificance among the other variables.

Resection of hemi or total slip of FDS is an effective method for treatment of residual PIP contracture. In consideration of total arc motion in our cases at final follow up, total resection might provide wider space for flexor digitorum profundus to glide than half slip.

Keywords: Trigger finger & FDS & Pulley
Open wedge phalanx osteotomy for correction of Wassel type IV-D thumb duplication with zigzag deformity

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Objectives / Interrogation: Wassel type IV duplications angulated inversely is the most complicated and common subtype associated with Wassel type IV polydactyly. The objective of this study is to align the IP joint by use of open wedge proximal phalanx osteotomy to obtain better outcome for reconstruction of zigzag deformity.

Methods: Between 2015 and 2017, 14 patients were treated for thumb duplication with zigzag deformity by use of open wedge osteotomy at the proximal phalanx to correct deviation at the interphalangeal joint from the central axis. The mean age of patients at the time of surgery was 11 months (range, 6-15 months). Preoperative and postoperative X-ray were obtained in all cases to provide information about the zigzag pattern of bone involvement and monitor growth changes over time. Patients were followed for a mean of 26 months (range, 16-36 months).

Results and Conclusions: The results were evaluated according to form for thumb polydactyly of the Japanese Society for Surgery of the Hand. By the end of follow-up, 12 cases were rated good, 2 cases fair. Therefore, this approach may be considered as a good alternative for reconstructing Wassel type IV polydactyly with zigzag deformity.

Keywords: thumb duplication, Wassel type IV, zigzag deformity, open wedge osteotomy
Computer navigated reduction of scaphoid non-unions and displaced scaphoid fractures- a cadaveric study

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Objectives / Interrogation: Scaphoid non-union results in humpback deformity, pronation of the distal fragment, and a bone defect in the non-union site with shortening. To improve accuracy of scaphoid fracture fixation or non-union reconstruction with bone grafting, we hypothesize that pre-operative planning and computer navigated reduction is feasible and results in good correction of alignment. We propose a method of anatomical reconstruction in scaphoid non-union by computer-assisted preoperative planning combined with intraoperative computer navigation, which can be performed in conjunction with arthroscopic bone grafting technique.

Methods: The first model consisted of a scaphoid bone with a simulated fracture, a forearm model, and an attached patient tracker was used. 'Pre-operative' CT scan was done. The proximal scaphoid fragment was attached to the model. 2 titanium K-wires were inserted into the distal scaphoid fragment. 3D images were acquired (3D Iso-C, Siemens) and matched to those from the computed tomography (CT) scan. In an image processing software, the non-union was reduced and pin tracts were projected into the proximal fragment. The K-wires were driven into the proximal fragment under computer navigation. Reduction was assessed by direct measurement.

These steps were repeated in 2 cadaveric upper limbs. A scaphoid fracture was created and a patient tracker was inserted into the radial shaft. Simulated reduction and planning of pin tracts into the proximal fragment was done as in the first model. Using these planned tracts, the K-wires were driven into the proximal fragment under computer navigation. Direct visual assessment of reduction was done and post-fixation CT was obtained to assess reduction.

Results and Conclusions: In both models, articular stepping was less than 1mm, and scaphoid length was restored with less than 1mm discrepancy. Part analysis of the CT showed good matching with mean root mean square analysis of 0.5mm.
This is the first report on the use of computer navigation on reduction of malalignment in the wrist. Further study in real patients is warranted to demonstrate clinical benefit.

**Keywords:**
scaphoid non-union, computer navigation, scaphoid bone grafting
Polyaxial locking plate fixation for volar-displaced distal radius fractures including marginal fractures

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Objectives / Interrogation: The volar-displaced distal radius fractures was considered to be easy to treat before. Harness reported that there were 7 cases of palmar subluxation after volar plating for distal radius fractures. He described all cases were B3 type of AO-classification and it was important to fix the fragment of volar lunate facet fragment (VLF fragment). We also reported 20 cases of palmar subluxation, and 17 cases of them were Smith's or volar Barton's fractures. From our data, the average of longitudinal distance of VLF fragment was under 10 mm, and only 34% of VLF fragment was supported with the plate. As our strategy for volar-displaced distal radius fractures, we place Polyaxial Locking Plate (PLP) as distally and ulnar as possible. This time, we report the treatment result of volar-displaced distal radius fractures including marginal fractures.

Methods: The number of cases that had been operated for distal radius fractures in Showa University after 2015 were 131 hands of dorsal-displaced type and 35 hands of volar-displaced type. Among the latter, 33 hands, which are followed up more than six months, were subjected to this study. The mean age was 60.3 years old, male: female was 11:22 cases, and the mean follow-up period was 9.5 months. For CT in pre-operation, there were 9 hands (27.3%) of double fracture-line in VLF fragment and 7 hands (21.2%) of palmar subluxation. Monoaxial Locking Plate (MLP) were used for 4 hands and PLP for 29 hands. As the mean followed up period was 9.5 months. As for an additional procedure, spring wire fixation by Moore were used for 5 hands, plate with mini-plate was used for 1 hand, and artificial bone was used for 8 hands. We investigated the clinical evaluation, the radiological evaluation and complications of these cases.

Results and Conclusions: [Results]
For the all cases, fractures were united. The correction loss of various parameters was slight (UV: VT: RI was 0.9 mm: 0.2 degrees: 0.8 degrees). The mean of the modified Mayo score was 86.2 points. As the complications, palmar subluxation were 2 cases, carpal tunnel syndrome was 1 case, ulnar abutment syndrome was 1 case and CRPS was 1 case.

[Conclusion]
The results of our treatment for volar-displaced distal radius fractures were almost good, but there were two cases of palmar subluxation after volar plating. For prevention of palmar subluxation, it is important to support the VLF fragment perfectly. We should select rim plates or some additional procedures for the cases under 10 mm of longitudinal VLF fragment.

Keywords:
volar-displaced distal radius fractures, Polyaxial locking plate, Palmar subluxation after volar plating
Functional Outcome for Arthroscopic Treatment of Septic Arthritis of the Wrist

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Objectives / Interrogation: Septic arthritis is a potentially joint destructing condition if not treated properly, and septic arthritis of the wrist accounts for an estimated 5% of septic arthritis of all joints.
Arthroscopic lavage is a well established treatment for septic arthritis of the knee, hip or shoulder. However, previous studies on treatment of wrist arthroscopy were limited to case reports or retrospective studies focusing on open treatment. There is also insufficient data on functional outcome following treatment. Our study aims to establish the effectiveness of arthroscopic treatment and to investigate the functional outcome.

Methods: This is a retrospective study reviewing all cases of septic arthritis of the wrist treated by arthroscopic lavage over a period of 10 years from 2007 to 2016. Clinical data collected included age, gender, history of prior injury, duration of symptoms, culture of joint aspirate, and radiological findings.

An arthroscopic technique and any additional procedures performed are described. Intraoperative findings, duration and type of antibiotics used, number of operations performed, and length of hospital stay were reviewed.
Functional outcomes included range of motion and subjective evaluation with QuickDASH (Disabilities of the Arm, Shoulder, and Hand) score questionnaire.

Results and Conclusions: From 2007-2016, 14 patients (10 males and 4 females) with 15 septic wrists underwent arthroscopic surgery. One patient had both wrists involved. The average age at time of operation was 63.9 years old and the average duration of symptoms before admission was 6.08 days. Average follow up time was 10 months.
The most notable risk factors were diabetes mellitus and immunosuppression conditions which were present in 8 patients. All except 2 patients (83.3%) responded well to single arthroscopic treatment. Two required subsequent operations for concomitant tenosynovitis. There were no complications. The most common isolated organism was staphylococcus aureus. At an average follow up of 10 months, one case (8.3%) had signs of severe joint erosion on subsequent X-Ray. The average QuickDASH score was 19.7 out of 100. Duration of symptoms of 5 days or more prior to presentation was associated with a poorer QuickDASH score.

With a low re-operation rate and good functional outcome which is comparable to open treatment from previous studies, arthroscopic treatment is a safe and effective alternative to open procedure as a first-line treatment for septic arthritis of the wrist.

Keywords:
septic arthritis of wrist, wrist arthroscopy, arthroscopic synovectomy, functional outcome
Evaluation of Nerve Reconstruction in the Hand by Gap Length with Processed Nerve Allograft

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Objectives / Interrogation: Nerve gap injuries associated with hand trauma are very common. Current reconstruction methods for addressing nerve gaps include nerve autograft, processed nerve allograft, and synthetic conduits. Data were queried from the on-going international registry for nerve reconstructions with processed nerve allograft to determine effect of gap to outcomes. We report on the return of meaningful sensation by gap length after nerve repairs in the hand.

Methods: This multicenter IRB/Ethics approved international registry is designed to collect data associated with processed nerve allografts (Avance® Nerve Graft, AxoGen). The registry database was queried for nerve repairs in the hand with a minimum of six months of quantitative follow-up. Demographics, nerve injury/repair, assessments, and safety were evaluated. Data included static/moving 2-point discrimination, Semmes-Weinstein Monofilaments, and tens score. The cohort was stratified into three gap groups: Small (< 15mm), Mid (15-29mm), and Long (≥30mm). Meaningful recovery was defined as S3 or greater on the MRC scale. Higher thresholds of recovery were evaluated in repairs with at least 1-year follow-up.

Results and Conclusions: The cohort consisted of 325 nerve injuries. The mean patient age was 42±16 years; patients were predominantly male. The mean time-to-repair was 1 (0-2579) days. Mean gap length was 20±13mm. The mean follow-up time was 11.6 months. Overall meaningful recovery was reported in 87% of repairs with 70% reaching higher thresholds. Return of sensation was consistent across gap subgroups: Small (91%), n=104; Mid (87%), n=137; and Long (83%); n=83. Outcomes by mechanism of injury were significantly different (p=0.03) with lacerations and complex injuries (gunshots/blast, amputations, avulsions) reporting 91%, n=206 and 80%, n=95 recovery respectively. No related adverse events were reported.

Processed nerve allograft can be used successfully with consistent outcomes in both short and long gap reconstructions. Overall meaningful recovery was reported in 87% of repairs. Limitations of this study include the observational study design and lack of active control. These outcomes compare favorably to historical data in the literature for nerve autograft and exceed those for conduit.

Keywords:
nerve repair, nerve reconstruction, processed nerve allograft
Investigation into the Complex and Co-ordinated Anatomy of Preaxial Polydactyly

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Objectives / Interrogation: Radial or preaxial polydactyly (PPD) is a common congenital hand difference of varying severity, popularly classified as according to Wassel's classification (1969) depending on the level of skeletal duplication. Much of the focus, therefore, has been on the bony architecture in PPD, rather than the soft tissues. Embryologically, PPD is classified as a malformation in the radial-ulnar axis under the Oberg Manske Tonkin (OMT) classification, with the underlying pathology thought to be due to abnormal Sonic hedgehog (SHH) expression in the limb bud. Other than digit number and identity, the SHH-axis controls musculature, tendon and vascular patterning. The aim of this study is to investigate the relationship between the bony architecture and the associated soft tissues, including anatomical variations in musculature and innervation in an animal model of induced polydactyly.

Methods: We induced PPD in a chicken limb model using beads soaked in either SHH protein or retinoic acid (SHH agonist) implanted into the anterior early limb bud (20HH/3.5 days of development, equivalent to Carnegie stage 130). Manipulated embryos were examined at seven days of development after cartilage pattern of digits has been established. In addition to skeletal anatomy, secondary changes in limb patterning affecting the soft tissues were also studied using wholemount RNA in situ hybridisation in combination with histology. Muscle was labelled with MyoD, nerves with Schwann cells marker, tendons with Scleraxis and cartilage was stained with Alcian Green.

Results and Conclusions: Polydactyly was reliably induced both in models using retinoic acid or SHH protein beads. As predicted, soft tissue anatomy was also altered in polydactylous limbs. The changes were categorised and compared to control limbs (without manipulations). Results will be discussed.

We present an early model which can be utilised in the future to assist prediction of not just skeletal duplications, but also deviations in soft tissue anatomy in polydactylous digits.

Keywords:
Preaxial polydactyly, SHH, retinoic acid, anatomy, soft tissue
WALANT or Bier Block? A Prospective Cohort Study for Patients’ Perspective on Anesthesia Type for Carpal Tunnel Surgery

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Objectives / Interrogation: Regional intravenous anesthesia (Bier block) has been used for carpal tunnel surgery (CTS). Recently, wide awake local anesthesia no tourniquet (WALANT) has been increasing its popularity for many hand surgery procedures. We aimed to compare patients’ CTS experience with two different anesthesia methods.

Methods: Patients’ CTS were performed either with WALANT (epinephrine 1:100.000, lidocaine 1%, bicarbonate %8.4) or with Bier block (lidocaine 1%, bicarbonate %8.4) anesthesia methods. Patients were requested to fill patients’ satisfaction form after the surgery. In the form, patients’ were appealed to quantify their pain levels on visual analog scale (VAS), asked to compare the operation with dental procedures and their expectations, and questioned for their desires about re-operation with the same anesthesia method. The results were compared for two anesthesia methods.

Results and Conclusions: There were 54 cases operated with WALANT and 34 cases operated with Bier block anesthesia methods (72 patients, 16 bilateral). There were no significant differences between mean ages (WALANT 50.9, Bier block 52.4) and median VAS (during local anesthesia injection, during surgery, and during the postoperative first day) of the two groups. Bier block patients reported moderate (median VAS score 5) tourniquet pain. When compared with dental procedures; 90.7% (49/54) of WALANT patients, and 42.4% (14/33, one patient reported to have no dental experience) of Bier block patients reported the CTS to be an easier procedure (p<0.0001). When compared with patients’ expectations; none 94.4% (51/54) of WALANT patients, and 52.9% (18/34) of Bier block patients reported the CTS to be an easier procedure than they expected (p<0.0001). For the re-operation when needed; 96.3% (52/54) of WALANT patients, and 41.2% (14/34) of Bier block patients reported their desire for the same anesthesia method (p<0.0001). Thirteen patients who were operated bilaterally (one side with WALANT, and the contralateral side with Bier block) were asked for their anesthesia choice; 11 preferred WALANT, one preferred RIVA, and one reported no difference. Three patients were operated bilaterally with WALANT for their both hands because they did not accept operation with RIVA.

WALANT anesthesia method offers a better patients’ satisfaction for CTS than Bier block. This is mostly related to tourniquet pain of Bier block patients. Nowadays, many surgeons prefer WALANT anesthesia for a wide variety of hand surgery procedures.

Keywords: carpal tunnel, WALANT, Bier block
Brachial Plexus Birth Injury: An Epidemiological State Level Analysis of Trends and Risk Factors

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Objectives / Interrogation: Brachial plexus birth injury is a condition in which the brachial plexus is thought to be damaged during the birth process. Studies have cited a varying incidence rate ranging from 0.5 to 4.0/1000 live births. The purpose of this study is to evaluate birth claims data in the state of Colorado over a 15 year period to identify risk and protective factors for brachial plexus birth injury (BPBI).

Methods: A data request was made to the Colorado Hospital Association for birth claims data. We requested all birth claims from the years 2000 to 2014. ICD9 codes for variables of interest included: brachial plexus birth injury, shoulder dystocia, heavy-for-dates, macrosomia, breech delivery, instrumented birth, birth hypoxia, and gestational diabetes. Descriptive statistics and univariate analysis was performed on birth claims. A multivariable logistic regression model quantified both risk and protective factors as odds ratios (OR) with 95% confidence intervals (CI).

Results and Conclusions: There were 966,906 birth records received from state hospital association. The brachial plexus birth injury rate was 0.63/1000 live births averaged over all years. The mean birthweight was 3187 grams for the total population and 3807 grams for the BPBI births. Each year after the year 2000 reduced the chance of BPBI by 4% (OR 0.96, 95%CI: 0.94, 0.97, p<0.001). Asian, black, or Hispanic were more likely to have a BPBI than white births. Births impacted by shoulder dystocia (OR 49.77, 95%CI: 39.23, 62.77, p<0.001), instrumented forceps births (OR 21.29, 95%CI: 11.90, 35.47, p<0.001), breech delivery (OR 17.75, 95%CI: 5.73, 42.33, p<0.001), and gestational diabetes (OR 5.69, 95%CI: 4.16, 7.66, p<0.001) were at higher risk of BPBI. Cesarean Delivery (OR 0.27, 95%CI: 0.20, 0.36, p<0.001) was protective of BPBI but multiple gestation (OR, 4.86 (95%CI: 2.55, 8.43, p<0.001) was not. Colorado births experienced a decreased risk of BPBI from 0.82/1000 live births in 2000 vs. the US rate of 1.6/1000 (p<0.001) to 0.56/1000 in 2012 vs. the US rate of 0.9/1000 (p=0.003). Brachial plexus birth injury rate decreased between 2000 and 2014. Historically Colorado has had a lower BPBI rate than the United States. Shoulder dystocia, instrumented forceps birth, gestational diabetes, and breech delivery are significant predictors for BPBI. Increased awareness of shoulder dystocia and instrumented birth have been hypothesized to have reduced these rates. Non-white patients also appear to be at higher risk for BPBI.

Keywords:
brachial plexus birth injury; pediatrics; birth trauma; shoulder dystocia; epidemiology
Correlation of Tinel sign and site of ulnar nerve compression in cubital tunnel syndrome

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Objectives / Interrogation: Cubital tunnel decompression is usually performed to address symptoms of ulnar nerve compression at the elbow. Nerve conduction studies (NCS) are commonly obtained to confirm compression neuropathy prior to scheduling surgery; in a small percentage of cases, surgery is performed despite normal NCS results based on clinical symptoms and signs. Percussion irritability of the nerve, referred to as Tinel's sign, is a common physical finding taken to confirm nerve irritability at a particular site. The aim of this study was to evaluate the presence and site of this sign for the ulnar nerve preoperatively, and to correlate this with the intraoperative site of compression.

Methods: The notes and NCS results of patients undergoing cubital tunnel decompression with or without anterior subcutaneous nerve transposition were reviewed pre-operatively and compared to the surgical findings recorded by an independent observer, masked to the pre-operative results; the surgical site of compression was then correlated with the site of a Tinel sign, if this was present, and NCS findings. Patients who had nerve decompression as part of a bigger reconstructive procedure were excluded.

Results and Conclusions: Thirty-eight cases were identified between June 2017 and September 2018. 92% of patients had a Tinel sign. This was distal to the medial epicondyle in 17 cases, with intra-operative nerve compression noted beneath the humeroulnar aponeurotic arcade between the tendinous attachment of the two heads of flexor carpi ulnaris. The Tinel sign was posterior/proximal to the medial epicondyle in the remaining 21 cases, with intra-operative nerve compression in the retroepicondylar groove in 12 cases, and evidence of compression at both these sites in the other 9 cases. In cases were no Tinel sign was present, compression was identified in the retroepicondylar groove. Hour glass deformity and change in nerve texture with visible and palpable nerve thickening was not present in the absence of a Tinel sign. There were no cases of more proximal nerve compression.

The Tinel sign is a useful adjunct to NCS that can be used to plan surgical approaches as it correlates with the site of nerve compression when this is caused by a defined structure. In cases where nerve compression occurs over longer segments or at multiple sites, this sign is only present consistently at the more proximal site of compression. Therefore, in patients who have this sign distal to the epicondyle, a more limited approach can be safely considered.

Keywords:
ulnar nerve compression, Tinel sign
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**Oral presentation or poster presentation**
**Avascular Necrosis**

**14th IFSSH Congress**

**Vascularized bone graft (VBG) from distal radius in the treatment of scaphoid nonunions associated to proximal pole osteonecrosis**

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**Objectives / Interrogation:** The aim of the study was to investigate the effectiveness of the use of a vascularized pedicle bone graft of distal radius for scaphoid nonunions with osteonecrosis and its validity in correcting bone deformity too, even if the quality of the donor bone is not macroscopically so high as that used in free bone graft flaps.

**Methods:** We treated 12 patients, suffering of established scaphoid nonunion, with a VBG of the distal radius. All presented a scaphoid nonunion associated with proximal pole osteonecrosis; 8 of them presented a carpal collapse too.

An interposition palmar-based wedge graft was used in 8 cases and an inlay graft in 4 cases.

Functional outcome was assessed with DASH questionnaire, PWRE score, modified Mayo Wrist Score. Mean outcome measures of pain, range of motion and grip strength were evaluated. Time to return to daily activity was also recorded.

Radiological assessment was performed at the last follow-up visit with conventional X-rays and Computer Tomography scans, evaluating bone union and presence of osteoarthritis, measuring revised carpal height ratio, lateral intrascaphoid and radio-lunate angles.

**Results and Conclusions:** At an average follow-up of 7 years mean DASH score was 5, mean PRWE score was 16,4, mean MWS was 80,5. Mean VAS pain score was 2,7. Flexion-extension arc of the wrist averaged 73,7 % of the uninjured side; radial-ulnar inclination arc averaged 83 % of the uninjured side. Grip strength averaged 89,6 % of the unaffected hand. Return to previous activity averaged 6 months.

At the radiological evaluation bone union was obtained in 100% of cases, with a mean union time of 5 months. Ectopic ossification was present in 2 cases. Mean carpal height ratio was 1,55, mean lateral intrascaphoid angle was 21°, mean radio-lunate angle was 6,09°. There were signs of degenerative changes at the radio-scaphoid joint, confined to the radial styloid region, in only 2 cases; both benefited from a radial stiloidectomy. No sign of arthritic progression was detected at final follow-up.

We consider VBG a good method to increase the proportion of healed fractures in higher risk patients. We demonstrated that this technique is also valid in correcting bone deformity.

The advantages of these procedures are their relative technical ease compared with other methods of vascularised bone transfer (free flaps), the ability to limit dissection to a single surgical incision, the possibility to obtain additional nonvascularized cancellous graft, if needed, from the same harvest site.

**Keywords:**
scaphoid nonunion, avascular necrosis, vascularised bone graft
**Mallet Finger Splinting - No Skin Irritation, No PIP Stiffness**

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**Objectives / Interrogation:** Conservative treatment of mallet finger injury was reported to fail in some patients due to discontinuation of splinting especially because of skin complications within the splint. We thought that the complication rates would decrease with an appropriate patient education about splint use. Therefore, the aim of this study was to assess the complication rate and clinical results of conservative treatment of mallet finger with detailed instructions of splint use.

**Methods:** Fifty consecutive patients with mallet finger deformity were enrolled. They were instructed to wear the splint 24/7 for the first six weeks and advised to take it off once a day for 10 minutes for their skin to vent. They were strictly told to support the distal interphalangeal (DIP) joint during wear on and off. Besides, free proximal interphalangeal joint (PIP) movement was emphasized within the splint. Following six weeks 24/7 regime, night splinting continued for two more weeks. Patients were called for last follow-up and assessed for "Outcome Measures for Mallet Finger Injury" including pain, stiffness, range of motion (ROM), functional impairments and satisfaction.

**Results and Conclusions:** Thirty patients admitted for follow-up and the mean age was 37.1. Average follow-up duration was 6.4 (3-14) months. None of the patients gave up wearing the splint during the treatment period as no skin irritation was seen and PIP joints’ ROM were not affected. Nine patients were injured on their 5th finger, 13 were on 4th and 8 were on 3rd finger. Ten of the patients had bony mallet injury. According to the applied criteria, 20 of the patients achieved at least three criteria. Extensor lag was less than 20° in 19 patients and flexion arc was more than 50° in almost all patients (n: 28). Most patients (n: 20) reported noticeable pain or stiffness in their finger and 14 patients had difficulty during heavy activities. Satisfaction level was at least 9/10 in 17 patients.

Detailed education about the splint use to prevent the patients' complaints resulted in satisfactory clinical results. It also improved the compliance with the splinting regime with no skin irritation or excessive stiffness of the finger. Therefore, the clinicians should spare some more time for patient education for its potential benefits like the decrease in the need for surgery after a well-applied splinting treatment.

**Keywords:**
mallet finger, splint, skin irritation, PIP stiffness
Bone Grafting for the Correction of Nonunion or Malunion of Long Bones in the Upper Extremity: A Systematic Review

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Objectives / Interrogation: Autologous iliac crest has long been considered the best graft option as an adjuvant modality in the fixation of bone nonunions or malunions as a result of its osteoinductive, osteoconductive, and osteogenic properties. However, the clinical benefit from autologous bone graft in general and iliac crest specifically has not consistently demonstrated. Additionally, the use of iliac crest bone increases the risk of complications and leads to longer recovery and/or higher patient morbidity. The aim of this systematic review was to collect and summarize the current literature comparing different forms of bone graft used in the surgical correction of nonunions and malunions of the humerus, radius, and ulna. In this way, we sought to challenge the belief that autologous iliac crest provides superior clinical outcomes to other forms of graft.

Methods: A comprehensive systematic review was performed of PubMed, Embase, Scopus, SPORTDiscus, and the Cochrane Library for all relevant articles. A total of 4,043 publications were reviewed. Inclusion criteria: 1. Studies comparing at least 2 different forms of bone graft or one form of bone graft versus no graft in treatment of malunions or nonunions in upper extremity long bones, 2. Participants 18 years or older, 3. At least 5 participants in each arm. A total of 20 articles met our inclusion criteria and were used in this review.

Results and Conclusions: Iliac crest autograft provided superior results in union rates and time to union compared to synthetic graft, such as bone metalloproteinase-7 and platelet-rich plasma. Calcium phosphate cement was an exception, demonstrating similar union rates. The combination of synthetic bone graft and autograft improved the healing rate. Allograft demonstrated comparable union rates and time to union to autograft, but had significantly shorter surgical time and hospital stay. There was a significantly shorter interval from surgery to union when allograft was combined with autologous bone marrow stem cells. Multiple articles call into question the utility of bone graft after demonstrating that surgical fixation of upper extremity nonunions and malunions without bone graft provides acceptable results. Bone graft, even autologous iliac crest bone, may not be necessary as an adjuvant in the correction of every upper extremity long bone nonunion or malunion. However when graft is used the current literature supports composite grafts over the use of autograft alone.

Keywords: Malunion, nonunion, upper extremity, long bones, autograft, allograft, synthetic graft, graft
Tetraplegia Hand Surgery. The Cypriot Perspective

List of authors:
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\textsuperscript{3} Swiss Paraplegic Centre (Nottwil)

Objectives / Interrogation: We present the creation of the Cypriot Tetraplegia Hand Surgery Service, the acceptance in the SCI patients community as well as our results thus far.

Methods: All tetraplegic patients who express an interest for reconstructive procedures are referred and evaluated by authors (1) and (2). Procedures are carried out twice per year, every March and October. More complex cases are referred to the Centre where Author (3) works. The International Classification for Surgery of the Hand In Tetraplegia is used to evaluate patients and identify surgical candidates. Surgical candidates are evaluated preoperatively with the Canadian Occupational Performance Measure (COPM) and also captured on video performing certain tasks (eating with utensils, holding a bottle etc). Patients who receive a triceps reconstruction are evaluated with the Motor Research Council Grade, before and after the procedure.

The two major procedures that we perform is the posterior deltoid to triceps transfer using a tendon graft for triceps reconstruction and the ALPHABET procedure for grip reconstruction. \cite{1}

Patients following surgery start their rehabilitation immediately with protected active motion. The patients are evaluated at six months post op again with the COPM and the difference is calculated to record the patient reported outcome.

Results and Conclusions: So far, seven procedures have been carried out on six patients with another two scheduled for October 2018 and two for March 2018.

<table>
<thead>
<tr>
<th>Patient and date of procedure</th>
<th>Age</th>
<th>ICSHT grade</th>
<th>Procedure</th>
<th>Improvement achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) 03/2016 49 X (-)</td>
<td>49</td>
<td>X (-)</td>
<td>Left posterior deltoid to triceps transfer</td>
<td>MRC from 0 improved to 4</td>
</tr>
<tr>
<td>(2) 03/2017 34 3 (-)</td>
<td>34</td>
<td>3 (-)</td>
<td>Left posterior deltoid to triceps transfer</td>
<td>MRC from 0 improved to 4</td>
</tr>
<tr>
<td>(2) 10/2017 34 3 (-)</td>
<td>34</td>
<td>3 (-)</td>
<td>Left grip and key pinch reconstruction</td>
<td>COPM (average) from 1 improved to 6.5</td>
</tr>
<tr>
<td>(3) 10/2017 63 4(+)</td>
<td>63</td>
<td>4(+)</td>
<td>Left grip and key pinch reconstruction</td>
<td>COPM (average) from 2 improved to 8</td>
</tr>
<tr>
<td>(4) 03/2018 21 2(-)</td>
<td>21</td>
<td>2(-)</td>
<td>Left posterior deltoid to triceps</td>
<td>MRC from 0 improved to 4</td>
</tr>
<tr>
<td>(5) 03/2018 32 X (monoplegic patient, C5C6 injury)</td>
<td>32</td>
<td>X (monoplegic patient, C5C6 injury)</td>
<td>BR to ECRL, ECU to ECRB, release of volar wrist capsule, 1st web space deepening and adductor release</td>
<td>COPM from 2 improved to 9</td>
</tr>
<tr>
<td>(6) 06/2018 49 6(+)</td>
<td>49</td>
<td>6(+)</td>
<td>ALPHABET right hand and EDM to APB transfer</td>
<td>COPM from 3 improved to 8</td>
</tr>
<tr>
<td>(3) 10/2018 63 6(+)</td>
<td>63</td>
<td>6(+)</td>
<td>Right ALPHABET with EDM to APB transfer</td>
<td>Procedure scheduled 10/2018</td>
</tr>
<tr>
<td>(7) 10/2018 21 0 (-)</td>
<td>21</td>
<td>0 (-)</td>
<td>Left posterior deltoid to triceps transfer</td>
<td>Procedure scheduled 10/2018</td>
</tr>
</tbody>
</table>

Patients who received the procedures

Of the 21 patients who were seen by our service, 12 were candidates for surgical procedures and 7 either received or are scheduled to receive the procedures.

Patients who received a posterior deltoid to triceps transfer had a significant increase in triceps strength resulting in better wheelchair propulsion.

COPM increase in patients who received a grip reconstruction was on average 6.175.

Conclusion: Tetraplegia Hand Surgery can produce life changing results and should be routinely offered to all tetraplegic patients.
International collaborations can enhance patient trust and lead to better outcomes.

**Keywords:**
tetraplegia, tetrahand, tendon transfer, ALPHABET, posterior deltoid, triceps, spinal cord,

**References:**
1. J.Friden, A. Gohritz, Tetraplegia Management Update, Elsevier, 2015, JHS (A)
FUNCTIONAL RESULT OF WRIST ARTHRODESIS IN SEVERE INJURIES OF BRAQUIAL TRAUMATIC PLEXUS. INITIAL EXPERIENCE

List of authors:
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Objectives / Interrogation: Report the functional result of wrist arthrodesis in 3 patients, treated at our university hospital.

Methods: This is a descriptive, cohort study that reports the result in 3 male patients diagnosed with a complete traumatic right brachial plexus injury. All of them present a postoperative follow-up of 12 months. For the selection of these patients, it was previously confirmed that they presented stability of shoulder and elbow flexion of 110 degrees with adequate function of trapezius, serratus anterior and pectoralis major and minor. The presence of neuropathic pain, the presence of radiographic consolidation of the arthrodesis and functional capacity were evaluated using the modified quick DASH scale before and after the surgical intervention and throughout the follow-up. This allowed us to determine concisely the improvement of the overall function of the upper limb.

All our patients were included in the same rehabilitation protocol, carried out by our kinesiologist, always making decisions in conjunction with the surgical team.

Results and Conclusions: The patient achieves work reinsertion, clinically and visually arthrodesis allows him to perform load work (3 kg) achieving good press with arthroded hand, in this way he is partially incorporated into the external environment, improving their living conditions; both professionally and psycho-socially. We consider that the reconstruction of the function of the member in stages could be a viable option, the wrist arthrodesis would be the last link of this reconstruction, and would represent the clasp of the scapular waist. We believe fundamental the management of these patients by an interdisciplinary team made up of kinesiologists, neurosurgeons and traumatologists for the evaluation of the lost functions to recover. We acknowledge that the sample size is small and that a greater number of cases could grant these conclusions, however we can cautiously say that this would be the first functional recovery report at 12 months after wrist arthrodesis.

Keywords:
traumatic brachial paralysis, wrist arthrodesis
Scaphoid Skyline View (SSV): A Useful Method to Detect Intrarticular Screws at the Proximal Pole of the Scaphoid During Retrograde Fixation

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Objectives / Interrogation: Screws protruding the proximal pole of the scaphoid during retrograde scaphoid fixation with cannulated screws may lead to unfavorable outcomes. Conventional intraoperative radiographic views have limitations to detect this complication.
We propose a modification of the Skyline view of the distal radius (Joseph et al 2011, Riddick et al. 2012) to assess the proximal pole of the scaphoid tangentially.
The aim of this study was to evaluate the ability of a new radiographic view, tangential to the proximal pole of the scaphoid, the Scaphoid Skyline View (SSV), to detect intrarticular screws during retrograde fixation of the scaphoid.

Methods: 9 fresh frozen adult cadaveric wrists without degenerative radiographic signs were used. A retrograde screw was inserted with a volar percutaneous retrograde technique.
Radiographic views studied were: posteroanterior (PA), PA with ulnar deviation (PAUD), lateral (L), oblique pronated (OP), PA with extension and ulnar deviation (PAEUD) and the SSV.
SSV is obtained with aligning the forearm at 30º respect to the Xray beam and maximum wrist flexion.
Baseline X rays were recorded with screw flush to the proximal pole, visualized directly through a limited dorsal capsulotomy. The screw tip was advanced sequentially 0.5 mm measured with a digital caliper through the dorsal approach. After every screw advance all views were repeated until screw prominence a was noticed in all images.
The mean articular protrusion (mm) required to detect intrarticular screws was compared between different radiographic views using oneway ANOVA.
Accuracy of the different radiographic view was studied with ROC curve analysis. Statistically significant differences were considered with p<0.05.

Results and Conclusions: The mean (SD) protruding length (in mm) required to detect articular screws with different radiographic views was:
PA 1.9 (1), PAUD 1.8 (1.1), OP 1.4(0.9), L 1.1(0.7), PAEUD 1.2 (0.7), SSV 0.8 (0.3). Statistically significant differences were found between groups (oneway ANOVA, p=0.014, F=3.756). SSV had the highest accuracy with an area under curve of 0.92 (95% Confidence interval: 0.831-1).

Conclusions
SSV was able to detect intrarticular screws with less than 1mm, being the most accurate view.
Other radiographic views showed similar ability to detect protruding screws as described in literature¹.
This radiographic view could avoid complications when used during retrograde fixation of the scaphoid with cannulated screws.

Keywords:
scaphoid fracture, percutaneous scaphoid, skyline view, retrograde fixation

References:
MICROSURGICAL FLAPS IN GENERAL ORTHOPAEDIC SURGERY: INDICATIONS AND RESULTS

List of authors:
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1 University of Sao Paulo (SAO PAULO)

Objectives / Interrogation: The advances of reconstructive microsurgery in orthopaedic surgery provided better functional and aesthetic results and prevented many indications of amputations. The indications of free flaps for the treatment of traumatized extremity is increasing, including, open wounds, long bone defects, muscle impairment after brachial plexus injuries, reconstruction of pinch with toe to hand transfer, among others. The combination of treatment are described as orthoplastic and early transference for centres for combined treatment is recommended in literature. We describe an orthopaedic microsurgery group with residency performing free flaps for orthopaedic injuries with indications and evaluating predictors factors influencing free flaps outcomes in musculoskeletal system.

Methods: From July 2014 to July 2018, patients undergoing microsurgical free flaps were consecutively included in this cross-sectional study. Data regarding personal medical history, intraoperative microsurgical procedure and laboratory tests were collected. Complications and free flap results were observed during follow-up.

Results and Conclusions: A total of 128 flaps in 126 patients were evaluated. The mean age was 34.8 years with 103 male patients. The most frequent cause of the musculoskeletal defect was traumatic in 79 patients (61.7%), followed by brachial plexus injury in 34 patients. Complications of type III Clavien-Dindo Classification were observed in 42 microsurgical flaps. Seven cases (5.5%) had partial loss of the flap. Twelve cases progressed to total loss of the flap (9.4%). The overall success rate of the microsurgical flaps was 90.6%. In the multivariate analysis, the risk factors for complications were: ischemia time greater than or equal to 2 hours (p = 0.037), end-to-side arterial anastomosis (p = 0.021) and obesity (p=0.012). The indication of take-back flap to operative room was associated with a higher incidence of total loss (p <0.001). In the multivariate analysis, the independant risk factor for partial flap loss was the presence of thrombocytosis (p=0.004).The main indication of microsurgical flaps in orthopaedic surgery was trauma with complex wounds, followed by free functional muscle flap for brachial plexus injury and limb reconstruction after tumor resection We observed a statistically significant increase in complications in patients with ischemia time greater than 2 hours, obesity and end-to-side arterial anastomosis.

Keywords:
Free flaps; Trauma. Microsurgery; Orthopedic Surgery; Free Tissue Flap; Tissue Transplantation
Development and biomechanical analysis of a new 4-strand suture for transosseous flexor tendon repairs in zone 1

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2 Department of Hand, Plastic and Reconstructive Surgery, Kantonsspital St. Gallen (St. Gallen)

Objectives / Interrogation: Development of a transosseous suture for zone 1 repairs that can withstand immediate controlled active motion rehabilitation.

Methods: 30 deep flexor tendons and distal phalanges were harvested from pigs feet. Tendons were cut perpendicular at the joint line. Tendons were randomly assigned to one of three groups: (1) A hole was drilled through the base of the distal phalanx in a coronar plane. A 18G hypodermic needle was passed through the drill hole. Two additional needles were passed from the tendon insertion to the lateral ends of the drill canal. A 3-0 PDS suture is passed through the needles with successive removal of the needles. An unarmed needle is placed at the free end of the suture. The tendon is sutured to the bone in a Krackow-like technique. (2) like (1) but two additional epitendinous figure-of-eight stitches with 5-0 PDS are placed, (3) Only the needle through the drill hole is used. The end of a 4-0 Supramid loop is passed through the needle and the needle is removed. A second supramid loop is threaded through the already placed loop, linking them. The needles at both ends are passed to the tendon insertion. The tendon is first sutured to the bone in a Zechner-like technique and the knot is pulled tight. Two additional Krackow-like locking loops are performed at each side of the repair. Placement of an epitendinous suture like in (2). Completed repairs were fixed in a biomechanical testing machine, a 1N preload was applied followed by distraction at a rate of 1cm/min. During distraction, photos in two planes were recorded together with distraction and applied force. For statistical analysis force at a 2mm gap in the repair (2GF) and ultimate failure load (UFL) were recorded. Tamhane's T2-test was used for group comparisons during statistical analysis.

Results and Conclusions: Results:
Mean 2GF was 6.4N for group 1, 23.2N for group 2 and 52.8N for group 3. Differences were significant at p<0.001 between all groups. Mean UFL was 55.6N for group 1, 53.2N for group 2 and 63.3N for group 3. No statistically significant differences were detected. No suture pull-outs occurred. No common suture breaking point was noted at UFL.

Conclusion:
Addition of two epitendinous stitches significantly improves 2GF in zone 1 repairs. Furthermore, the presented 4-strand technique can withstand enough force to allow for immediate controlled active motion rehabilitation.

Keywords:
Management of Scaphoid Fractures at a Tertiary Center in the UK: The University Hospital North Midlands Experience

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Objectives / Interrogation: Carpal bone fractures encompass approximately 18% of all hand fractures; with scaphoid fractures being the most common of these fractures. Up to 40% of scaphoid fractures are missed at initial presentation as plain radiographs lack adequate sensitivity to detect a fracture immediately after injury and so many cases are managed non-operatively initially. In the United Kingdom, The National Institute of Clinical Excellence (NICE) issued guidance on non-complex fractures in February 2016 and have recommended that MRI should be considered as first-line imaging for suspected scaphoid fractures. We report on a select group of patients in which operative management of scaphoid fractures was necessary before and after introduction of this guideline.

Methods: A retrospective chart review of patients with scaphoid fractures who required operative fixation was undertaken between January 2015 and August 2018 was undertaken. We evaluated many aspects including implementation of the nice guideline in these cases, time to presentation to the orthopedic team, time to decision to operate and complications.

Results and Conclusions: 31 cases were reviewed and tabulated. Operative cases ranged from percutaneous screw fixation, headless compression screws and open reduction internal fixation +/- bone graft. We report on the outcomes of these patients and identify key trends and lessons that we have learnt over this time period.

Keywords:
Clinical Audit; Scaphoid Fractures; Quality Improvement
FREE FLAPS RECONSTRUCTION IN PEDIATRIC PATIENTS FOR LIMB DEFECTS

List of authors: Raquel Bernardelli Iamaguchi*, Gustavo Bersani da Silva, Alvaro Baik Cho, Teng Hsiang Wei, Marcelo Rosa de Rezende, Rames Mattar Jr
1 University of Sao Paulo (SAO PAULO)

Objectives / Interrogation: Free flaps in the pediatric population are less common and when indicated the expectations to avoid amputation is high. The objective of this study is to describe indications and results of free flaps for limb reconstruction in pediatric patients.

Methods: From July 2014 to January 2018, patients undergoing microsurgical free flaps in an Orthopedic Hospital were consecutively included in this cross-sectional study. Data regarding personal medical history, intraoperative microsurgical procedure and laboratory tests were collected. Complications and free flap results were observed during follow-up.

Results and Conclusions: 19 free flaps in 19 patients were studied. The most common indications were skin or bone defects caused by trauma (7 patients), tumor (5 patients) and congenital pseudarthrosis of the tibia (3 patients). The most indicated flap was vascularized fibular flap in 8 patients, followed by anterolateral thigh flap in 4 patients. Complications were observed in 4 patients and were: one dehiscence, one re-exploration of anastomosis with resolution of thrombosis and two cases of thrombosis of microanastomosis with avascular fibular flap. Of these two cases, one fibula was maintained avascular and the second case was submitted to trans-femoral amputation. 18 patients could preserve their limbs and in one case a toe-to-hand transfer was successfully performed.

Conclusion: Free flaps in children are safe and indications are restricted to precise indications of providing alternative to amputations and improving the function of patients.

Keywords: Pediatric reconstruction; Microsurgery; Orthopedic Surgery; Free Tissue Flap; Tissue Transplantation
**Abstract no.: IFSSH19-1087**

**Oral presentation or poster presentation**

Diagnostic Value

**IFSSH19-1087**

**Do we need electrophysiological measurements for the diagnostics of carpal tunnel syndrome**

**List of authors:**
Balazs Lenkei*, Adrienn Lakatos¹, Zsolt Szabo¹
¹ Miskolc Hand Surgery Center (Miskolc)

**Objectives / Interrogation:**
In our practice electroneurography (ENG) was an obligatory examination procedure in cases suspicious for carpal tunnel syndrome. Nowadays it seems to have less importance. The aim of our study was to analyze the necessity of electrophysiological measurements before carpal tunnel release.

**Methods:**
Method: We run a prospective data collection of all operated carpal tunnel patients in our unit. For this study we included the patients operated for carpal tunnel syndrome in the last 4 years. The patient with incomplete datasheets were excluded from the study. Daytime and nighttime numbness, pain levels and subjective satisfaction of the patient were registered by a Visual Analogue Scale preoperatively and 1 week, 6 weeks, and 12 weeks postoperatively. Significance was evaluated using Z-test (p=0.05).

**Results and Conclusions:**
Results: 168 patients were operated without ENG, and 284 patients had positive ENG previous the operation. In the preoperative data, the ratio of patients with symptoms for less than 3 months was 7 % in the group without ENG and 20% in the group with ENG. The patients with ENG had a longer anamnestic period. The average of the VAS points for night pain was 6.99 VAS for those without ENG, compared to the with 6.47 ENG group. No other significant differences were found between the two groups. The subjective satisfaction level after 3 months was 8.31 VAS point without ENG and 8.61 with ENG.

Conclusion: Both groups had a good healing tendency. It seems that in the hand of experts, to diagnose and for treatment of carpal tunnel syndrome does not mandatory to have ENG examination. In our view ENG examination should be reserved to those patients with controversial symptoms.

**Keywords:**
Carpal Tunnel Syndrome, Diagnostics, Electrophysiologi, symptomes
THERAPEUTIC APPROACH FOR ULNAR NERVE ENTRAPMENT IN PERFORMING MUSICIANS

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Objectives / Interrogation: There are some instrumentalist musicians who present risk factors that increase the incidence of ulnar nerve entrapment, such as valgus and forced elbow flexion, during their performance. The aim of this study is to report incidence and therapeutic approach of ulnar nerve entrapment at the elbow in performing musicians treated in our center. We propose the surgical technique of Osborne ligament reconstruction in patients with risk of dislocation of the ulnar nerve due to a vicious postures during their instrument execution.

Methods: We performed a retrospective, descriptive study between 2001 and 2018. We included 2387 instrumentalist musicians treated at our center. There were 71 patients with related symptoms of ulnar nerve entrapment and confirmed diagnosis with electrophysiological and image studies, always performed by the same professional. Of the total population, 15 were violinists, 27 guitarists, 5 double bass players, 7 bandoneonist, 9 pianists and 8 cellists. All of them presented epitrochlear pain and sensitive symptoms during their performance. Risk factors were identified as posture execution in flexion and forced elbow valgus, with scapular dyskinesia. The initial therapeutic approach was the treatment of these risk factors associated with physiotherapy and music counseling. Most of them responded to conservative treatment by improving their execution posture, but 8 required surgical intervention. The surgical technique consisted of internal elbow approach, with complete liberation of the ulnar nerve according to conventional technique and the additional Osborne ligament reconstruction with triceps fascial flap.

Results and Conclusions: A total of 71 patients with ulnar nerve entrapment were included. 63 had resolution of their symptoms, by improving scapular dyskinesia, vicious postures and forced elbow valgus during their instrument performance. 8 patients continued with symptoms, and were treated by surgical intervention consisting of ulnar nerve release associated with Osborne ligament reconstruction to avoid dislocation of the ulnar nerve due to the forced elbow valgus remnant. In performing musicians population with ulnar nerve entrapment, the initial approach is aimed to correct vicious postures like forced elbow valgus and the improvement of scapular dyskinesia. In cases of failure in conservative treatment, surgical intervention is proposed, and must include, in addition to the nerve release, a mechanism of nerve containment, due to the risk of dislocation.

Keywords:
ulnar nerve entrapment, performing musicians disease, Osborne ligament reconstruction
Injection of a concentrated bone marrow punctate into denervated muscles can improve the results of their reinnervation. Our first clinical experience.

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Objectives / Interrogation: Determine the effectiveness of concentrated punctate bone marrow injection into muscle after their denervation.

Methods: During 2016-2018, to 56 patients (35 men, 21 women) with peripheral nerves injury (brachial plexus - 43; axillary nerve - 3; radial nerve - 6; median nerve - 3; ulnar nerve - 1) concentrated bone marrow punctate injection into the denervated muscle was performed after nerve surgery. Scheme: 1 week prior to surgery - PRP injection, during surgery - injection of a concentrated bone marrow punctate into the target muscle, and then PRP injection in 2 weeks postop. Subsequently, injection of concentrated bone marrow punctate was repeated 1 time every three months until the moment of effective reinvention. The control of hypotrophy and reinnervation of the muscle was performed using sonography and ENMG.

Results and Conclusions: Control sonographic examinations have shown that the injection of a concentrated bone marrow punctate into the denervated muscle significantly slows the process of hypotrophy. In the ENMG of target muscles - large motor units was detected (which significantly exceeded those that could be recorded in the muscles which did not administer the injection of a concentrated bone marrow punctate). According to the authors, this suggests the stimulation of terminal collateral sprouting.

Injection of concentrated bone marrow punctate into the denervated muscles - significantly improves the process of their reinnervation due to the slowdown of hypotrophy, and stimulation of terminal collateral sprouting.

Keywords:
bone marrow, muscle reinnervation, regenerative medicine, denervated muscle
Does A1 Pulley Release for Trigger Finger Have an Effect on Grip and Pinch Strengths?

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Objectives / Interrogation: A frequently performed operation, release of A1 pulley for triggering fingers and thumbs usually results in high patient satisfaction. In this study we aimed to assess its effect on grip and pinch strengths.

Methods: This prospective cohort study was performed in 26 patients who were operated between March 2016 and May 2018. There were 17 women and 9 men. The mean age of the patients was 53 (min=17, max=71). A total of 30 A1 pulley releases were performed (in 9 thumb, 1 index, 12 middle and 8 ring fingers). All of the operations were performed under local anesthesia using transverse skin incisions. Grip and tip-to-tip pinch strengths were recorded both pre-operatively and 3 months after the surgery. To compare pre and postoperative strengths, Wilcoxon and paired samples t-tests were used for grasp and pinch values, respectively.

Results and Conclusions: Both grip and pinch strengths showed statistically significant (p<0.05) increases postoperatively. Regarding details, grip strength increased in 23 hands while in 2 hands decreased and in one hand remained the same. Pinch strength increased in 28 fingers of 24 patients while decreased in one and remained the same in another patient. When we planned the study, we had hypothesized that A1 pulley release might lead to loss of grip and/or pinch forces by an increase in bowstring effect of flexor tendons. Verifying the part of our hypothesis about the increase in bowstring, Park et al in their recently published article state that ultrasonography shows significant bowstring of flexor tendons at 12th week postoperatively. Due to our results, the probable increase in bowstring of flexor tendons have no adverse effect on pinch and grip strengths at 3rd postoperative month. We think that the main reason of significant increase in grip and pinch strengths which we found in our patient group after release of triggering fingers might be due to recovery from the painful condition.

Keywords:
trigger finger, A1 pulley release, grip strength, pinch strength
How does thenar atrophy influence the outcome of carpal tunnel release?

List of authors:
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1 Hand Surgery Center, Miskolc (Miskolc)

Objectives / Interrogation: Visible thenar atrophy is described as the more severe stage of carpal tunnel syndrome. Our hypothesis was that patients operated presenting thenar atrophy have worse outcome.

Methods: Our self-made prospective database was used to evaluate the preoperative and postoperative data. The question form was filled preoperatively then postoperatively at 1 week, at 6 weeks and at 3 months. The patients were distributed into two groups: with and without thenar atrophy. Subjective data as daytime numbness, nighttime numbness, nighttime pain, disturbance in everyday work and satisfaction were recorded and evaluated on Visual Analogue Scale 1-10 (VAS). Grip and pinch strengths were measured using hand dynamometer grip gauge and pinch gauge. Significance was evaluated using Z-test (p=0,05).

Results and Conclusions: 467 patients with carpal tunnel syndrome were operated in our center from 01.01.2014. to 31.08.2018. 10 patients had to be excluded due to lack of data. 182 had visible thenar atrophy prior the operation while 275 patients had no thenar atrophy. In both groups the average age was 61 and 65 years respectively. 75% of the patients were women.

We found no significant difference between the average values of the two groups neither preoperatively, nor postoperatively. 12 weeks after the operation the daytime numbness decreased by 3,41 VAS points in the group with thenar atrophy and by 3,63 VAS points in the group without thenar atrophy. The level of nighttime numbness dropped by 5,98 points if there was thenar atrophy and by 6,18 points if there was not. By this time both groups reached the preoperative strength values and the group with atrophy even increased the grip strength by 0,4 kg and the pinch strength by 0,8 kg. Throughout the postoperative period the level of satisfaction was high in both groups (8,8 VAS points).

Conclusion: Based on our results we can conclude that our hypothesis was wrong thus thenar atrophy does not influence the outcome of carpal tunnel release.

Keywords:
carpal tunnel syndrome, thenar atrophy, symptomes
TRIQUETRUM CONTROVERSIES IN LIMITED CARPAL FUSIONS

List of authors:
Essam ElKaref*, Walid Metwaly
1 Alexandria University (Alexandria)

Objectives / Interrogation:
To demonstrate the pros and cons of triquetrum excision in management of limited degenerative wrist arthritis.

Methods: A prospective single-center study of twenty-two patients (21 male and one female) presented with painful wrist arthritis due to stages 2 or 3 scapholunate advanced collapse or scaphoid non-union advanced collapse wrists. All were treated by three corner fusion (fusion of lunate, capitate and hamate with excision of both scaphoid and triquetrum). Subjective and objective outcome measures were evaluated pre and post-operatively using wrist function scoring system. This study raises the question “should we excise the triquetrum or keep it in place?” The final clinical and radiological outcomes were judged against our previous triquetrum sparing procedures, and also were compared with the studies in the literature concerning lunocapitate fusion with or without excision of triquetrum.

Results and Conclusions: The debatable factors affecting the short and long term results were studied and applied to or cases (with excision or with sparing of the triquetrum). Relative data in the literature also analyzed and compared to our findings. The results were in favor of its excision.

Triquetrum preservation or excision in limited carpal fusions did considerably affect rate of union, time to union as well as the other functional parameters.

Keywords:
Wrist osteoarthritis; Three-corner fusion; Arthrodesis.
Long term results of dynamic tenodesis for management of camptodactyly as an intrinsic minus deformity.

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Objectives / Interrogation: An imbalance between finger flexors and extensors would seem like the primary cause of camptodactyly. It is probably because of deficient intrinsics’ function. The long term (more than 10 years) results of management of such problem is presented.

Methods: Isolated (non syndromic) symptomatic camptodactyly affecting 56 fingers of 32 children were comprised. An abnormal lumbrical muscle of the affected finger was reported in all cases; being absent, rudimentary or abnormally attached. Surgical treatment using dynamic tenodesis (Lasso procedure), that aims at metacarpophalangeal joint stabilization and a better extensor-flexor forces balance, so enhancing proximal interphalangeal joint extension, was used. All tight soft tissue structures were also released.

Results and Conclusions: After a mean follow-up period of 12.4 years, 49 fingers were rated as good or excellent results according to modified Siegert et al. (1990) grading system. The mean final proximal interphalangeal joint flexion deformity was 12o with a mean gain in motion of 75o. Joint subluxation, lack of full flexion and stiffness occurred in seven fingers. Three were subjected to further surgery and another four had improved with exercises.

The used procedure is rather simple. The outcome of management of camptodactyly, with the use of this method, is encouraging and no longer unpredictable.

Keywords:
Camptodactyly - Tendon transfer - Lasso procedure
Palmar and complex distal flap in macrodactyly surgery

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Objectives / Interrogation: Operative treatment of macrodactyly is one of the most complex surgery. Operative technique requires the observance of a narrow "corridor" between the maximum possible resection of excess soft tissues, the shortening of the ray segments and at the same time the preservation of the blood supply of the finger.

Methods: 18 patients with macrodactyly were treated in the St. Petersburg University Clinic last 2 years. The selection criteria for this group were the enlargement of bone and soft tissues; size of affected rays were smaller or equal parent's; angulation deformity or hyperextension in DIP joints were presented. The design of the surgery included performing the palmar flap on the digital artery from one of the side of finger and distal flap on the artery from the other side. Shortening/ angular correction/ arthrodesis was used with combination of debulking. During debulking procedure distal part and free border of the palmar flap were resected.

Results and Conclusions: The presented method allowed simultaneously shortened the finger and perform circular debulking of the affected ray in all patients. Marginal necroses of the palmar flap, not exceeding 6 mm2 in area, were detected only in two patients.

Conclusions: The presented design of the surgery in macrodactyly allows to perform in one step shortening of the affected ray with circular debulking. This design is characterized by a low frequency and severity of complications associated with blood supply (11.1%)

Keywords:
Macrodactyly Surgery
Treatment of dorsal defect finger with modified fibular free flap of great toe

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Objectives / Interrogation: To evaluate the outcome of the procedure of using the free flap vascularized by the fibular side of the great toe to treat finger dorsal skin defect

Methods: From June 2013 to August 2016, 18 patients with finger skin defects were repaired by modified fibular side pulp flap of great toe. The portable Doppler was used to detect and identify the artery perforator from the fibular side skin of great toe before the operation. The design area of the modified fibular side pulp flap of great toe is between the traditional dorsal flap of foot and the fibular side pulp of the toe. The area of the flaps ranged from 3.2 cm × 2.4 cm to 7.6 cm × 2.8 cm.

Results and Conclusions: RESULTS: All of the 18 flaps survived at the last office visit, and the wounds in the donor and recipient areas healed well. In 18 patients in this group, 4 cases of skin flaps appeared vesicles within 1 to 2 days after operation. The epidermis of vesicles was dislocated after 1 month. There was no obvious different appearance between graft skin flap and normal skin tissue at last. The follow-up period ranged from 7 to 16 months. There was no pigmentation on the surface of the flap. The texture, shape and function of the finger were satisfactory. Two points of flaps discrimination restored 4 to 6 mm, sensory function of flaps restored S3 to S4. The donor site of the flap was covert, and the function of the foot was unaffected.

Conclusion: The tissue structure of the modified fibular side pulp flap of great toe is similar to the dorsal skin of finger. This free flap is satisfied in the shape, easy to harvested and the blood supply was constant in its location. The appearance and function of finger were recovered well after repairing. It is avoids secondary injury of the injured finger with adopting local pedicled skin flap for repairing. It is an ideal repair method for large area dorsal skin defect of the finger.

Keywords:
fibular side pulp flap of great toe; finger; transplantation; microsurgery
Carpal Tunnel Syndrome - Should we treat it mini-open or endoscopic?

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Objectives / Interrogation: CTS affects an important part of active population, and leads to impairment in hand function, leading to surgical treatment when conservative measures fail.
There is still controversy regarding which technique would be more appropriate to treat this pathology.
In this study we evaluate and compare results of a single-approach endoscopic technique (Agee) and a mini-open procedure, to help the surgeon to decide which technique is more effective.

Methods: In a one year period, a single surgeon treated 43 patients with carpal tunnel syndrome in an out-patient basis with two different methods:
Group A (Mini-open, n=16), were treated with mini-open approach over the retinaculum.
Group B, (endoscopic, n= 27) were treated endoscopically, with Agee single approach technique.
Post-operatively patients were examined at 2 days, 1 and 2 weeks and 1, 3 and 6 months if needed. All the patients were analyzed at the final follow-up using the Modified Mayo Hand score and Visual Analogue Scale.

Results and Conclusions: Average age, male-female ratio, and dominant - non-dominant ratio of both groups were similar.
Three initial endoscopic approaches were converted to mini-open due to incomplete visualization of retinaculum, and were excluded. Two patients of endoscopic group were revised with an open procedure, after maintaining the symptoms post-operatively, and in both cases we found an incomplete distal resection of the retinaculum.
Complication rate was 3/16 (22%) in group A, and 16/27 (53%) in group B. The main complaint of endoscopic group were transient paresthesias of the 2nd and 3rd fingers, lasting between 3 to 6 months post-operatively. No major complications were seen in this series. No significant difference were found in operative time between procedures
Endoscopic group have an early return to work (14 days vs 21 days in open group).
Cost evaluation show a lower cost in mini-open of 200 euros comparatively with endoscopic technique.
Average final Mayo score at 6 months were similar in both groups.
Conclusion:
Endoscopic treatment of CTS provide shorter post-operative period but a longer period of residual paresthesias in about half of the patients.
Open treatment presents longer post-operative period, but better early functional outcome, without residual paresthesias or further surgical treatment.
In overall the mini-open procedure is more cost-effective than the endoscopic procedure, and should be preferred for the treatment of carpal tunnel syndrome.

Keywords:
Physical and Occupational Hand Therapy for Musicians - A Retrospective Study of Patient-Perceived Outcome and Comparison to Symptomatic Treatment

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Objectives / Interrogation: There are no standard methods of treatment for musicians with hand and wrist problems interfering with their ability to play. Many are treated conservatively, either symptomatically or with physical/occupational hand therapy. As there is little scientific data on the subject, it was the authors' aim to retrospectively analyze and compare the patient-perceived impact of these therapies.

Methods: 58 patients (31 female, 27 male, mean age 46 years) who visited the music-medical outpatient clinic between 01/15 and 02/18 were surveyed, using a previously developed questionnaire on pain and impairment (on a numeric rating scale (NRS) of 0 to 10), plus epidemiological data. Exclusion criteria were surgery, a history of specific hand trauma and failure to contact by the third try. The primary outcome was defined as an improvement of at least 3 points on the NRS. 35 patients were professional musicians, 9 university music students, 7 retired, 6 amateurs and 1 high-school student preparing for university auditions. 27 played string instruments, 15 piano, 2 woodwinds, 5 plucked, 1 percussion and 8 two or more instruments. Playing time per day averaged at 2.9 hours. 33 received physical/occupational hand therapy, 25 were treated symptomatically (e.g. rest and pain medication), based on individually evaluated, patient-specific criteria such as severity and duration of symptoms, plus expected compliance and time of recovery.

Results and Conclusions: Of 33 patients who followed at least 6 sessions of hand therapy, 24 reported an improvement in pain and 25 in impairment. For the 25 patients treated symptomatically, it were 15 (pain), respectively 13 (impairment). 29 patients changed their playing and practicing habits after hand therapy, 13 after symptomatic treatment. Alterations included longer and more frequent breaks, warming-up and cooling-down periods, use of relaxation techniques, increase of awareness to the physical limitations of practicing, and changes to position, playing technique and literature.

This is one of the largest numbers of musicians ever surveyed after following hand therapy and the only perceived-outcome comparison of hand therapy and symptomatic treatment. The response to hand therapy was good and the self-perceived impact positive. In contrast, patients treated symptomatically reported a less favorable outcome.

This analysis will build a base for future research, such as a specific hand therapy regime for musicians with hand or wrist problems interfering with their ability to play.

Keywords: musician’s hand, occupational therapy, hand therapy, physical therapy

References:
Use of reverse end-to-side suture to create a supercharge in spinal accessory nerve transfer to suprascapular nerve

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Objectives / Interrogation: Nerve transfer has clearly shown to be a great technique to restore some nerve palsies. Spinal accessory to suprascapular is probably one of the most popular nerve transfers to restore shoulder function. The use of intraoperative nerve recording to measure the amount of nerve action potential (NAP) transferred has added an important value to expect a successful results. In addition, in cases where some residual nerve conduction in the receptor nerve is detected, the use of reverse end-to-side suture (RETS) can be useful in order to do a supercharge. In those situations when donor nerve is not long enough to connect directly with the receptor nerve, a RETS with allograft is indicated to fill in this gap.

Methods: Three men between 2015 and 2016 has been treated with a partial suprascapular function after brachial plexus lesion. Age ranges from 27 to 48 yo. When under brachial plexus revision, some residual function in suprascapular nerve is present, a RETS with spinal accessory nerve is indicated. In situations without suprascapular nerve transection from the upper trunk, a nerve gap is left, which we fill in with an allograft. Spinal accessory is transected when 150 mv level of NAP is identified. Termino-terminal suture with allograft is performed at that proximal level and end-to-side suture distally, to suprascapular nerve. Evaluation is done with clinical function regarding shoulder abduction and external rotation and improvement in amplitude of suprascapular nerve conduction in postoperative nerve conduction studies.

Results and Conclusions: Spinal accessory nerve is recorded and transected when 150 mv are still present, when in suprascapular nerve at least 60 mV or some activity in CMAP is found, a RETS as a supercharge is indicated. The mean gap left was 3cm and was covered by allograft. The mean range of motion improved from 40 degree FA to 120°, and strength and update amplitude value went from 0.3 mV to 3.5 mV after 3 moths postop explained by reinnervation along allograft. In conclusion, transfer enough NAP from donor nerve is crucial for successful results in nerve transfers, so we believe more proximal neurotomy with a high NAP and allograft interposition is preferable than an end-to-end suture with low NAP conduction in donor nerve.

Keywords:
nerve transfer, suprascapular nerve, accessory spinal nerve, intraoperative nerve recording, supercharge
BIOLOGICAL THERAPY IN DELAYED DISTAL RADIUS FRACTURE HEALING. CASE REPORT.

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Objectives / Interrogation: Currently, the study of cellular and molecular biology has allowed to restore or improve organs and tissues function injured by certain diseases or traumatisms. Recent studies indicate that bone marrow concentrate with its mesenchymal and hematopoietic stem cells population, along with growth factors, shows anti-inflammatory, immunomodulatory, chondrogenic, osteogenic and osteoinductive qualities. Platelet-rich plasma is a derivative of autologous peripheral blood, a concentration of platelets in a small amount of plasma, which has a very important role in inflammatory modulation and specially in regulation and stimulation of regenerative processes of different tissues. The aim of our study is to demonstrate the effectiveness of this type of biological therapy in delayed fracture healing, presenting a clinical case.

Methods: A 41-year-old patient who works as a legal assistant, suffered a motorcycle accident and presented a distal radius fracture of his right wrist, treated with open reduction and internal fixation with distal radius blocked plate. He arrives to our medical control after 7 months without radiographic or tomographic consolidation signs, mild pain during forced pronation or supination. With diagnosis of delayed fracture healing, we offered the biological therapy contribution: percutaneous application of bone marrow concentrate (from his iliac crest) + peripheral blood PRP.

Results and Conclusions: After the serial radiological and tomographic controls, changes in the consolidation process began to be seen at the 6th week and was completed after 6 months of the biological therapy, without pain in the fracture focus and complete mobility of the wrist.

We conclude that percutaneous application of autologous biological supply: bone marrow concentrate + platelet-rich plasma is a minimally invasive, effective, safe, economical and viable technique for the treatment of delayed fracture healing.

Keywords:
biological therapy, delayed fracture healing, bone marrow concentrate, PRP
**Helical tendon repair: description of a new technique and comparative biomechanical analysis with two standard techniques**

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**Objectives / Interrogation:** Describe a new tendon repair technique for the management of hand flexor tendon injuries and compare their biomechanical characteristics with two conventional techniques of 4-strand cruciate repair, in an ex vivo experimental animal model with porcine tendons.

**Methods:** We describe a technique that consists in a 6-strand cruciate repair that crosses the tendon in an helical form.

This is a comparative experimental biomechanical study in ex vivo animal models. We harvested 66 porcine flexor tendons, a transverse cut at the middle of the tendons was made and these was repaired according a random assignment in six groups: Helical tendon repair made by experienced surgeon, Helical tendon repair made by surgeon in training, Adelaide tendon repair made by experienced surgeon, Adelaide tendon repair made by surgeon in training, modified Kessler tendon repair made by experienced surgeon and modified Kessler tendon repair made by surgeon in training. All the repair were made with 4-0 vascular prolene. The repaired tendons were pulled until failure using an universal test machine. The measuring and registering were made in a blinded manner, recording the ultimate tensile strength, load to 2-mm gap force, stiffness, and mechanism of failure.

**Results and Conclusions:** The Helical tendon repair (65 N) had greater ultimate tensile strength than the Adelaide tendon repair (46 N) and modified Kessler tendon repair (36 N). This is an easy and reproducible technique that can be performed by any surgeon. It resists the forces required for an early active hand mobilization. The repair biomechanic has a greater stability due to its configuration that involving the entire tendon cross-sectional area.

**Keywords:**
Tendon, Tendon repair, Tendon injury, Hand, Suture Technique, mechanics, material resistance
Oberlin technique assisted with intraoperative nerve recording

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Objectives / Interrogation: Fascicles identification to optimize nerve transfer is usually an issue during surgery. Anatomic fascicular variability is frequent. Potential of each fascicle is of at most importance to decide which one must be transferred. Intraoperative nerve recording (NAP) and CMAP evaluation guide us to choose the best option for nerve transfer surgeries.

Methods: Oberlin procedure has been performed under intraoperative nerve recording to evaluate which is the best fascicle to be harvested and CMAP in intrinsic and extrinsic muscle obtained. From 2007 to 2013, 36 patients (34 male, 2 female), ages ranges from 17 to 55 have been treated using this method.

Adequate stimulator, recorder, intramuscular needles and settings for multiple channel electromiograph is necessary. Careful intraneural dissection to split fascicles of ulnar nerve and low stimulus intensity is crucial to apply this technique properly. CMAP technique on FCU, hypothenar and first dorsal interosseous muscle were done to record proper fascicle donor. At the same time, we identified and measured NAP of the selected fascicle to optimize results of Oberlin nerve transfer. Activity in the biceps branch was also recorded to decide end-to-side (ETS) or reverse end-to-side (RETS) suture.

Results and Conclusions: Although is described motor fascicles for FCU must be elevated from anteroexternal area of ulnar nerve, we have found just 58% motor nerves are coming from this area, 25% from posteroexternal and 16% from anteroexternal. Reinnervation appears between 3 and 8 months, 91% ETS sutures were performed and 9% RETS sutures in cases we detected some nerve conduction in the biceps motor branch.

We consider CMAP above 500mV in FCU and NAP fascicle greater than 100 mV is necessary to obtain good results. NAP lower than 50 mV get poor results.

Final muscular strength range from 3/5 to 4+/5. We have no failure in any case in terms of EMG reinnervation, however, the amount of NAP transferred is related to clinical results.

So, we can conclude that not all proper fascicles are in the anteroexternal axial section of ulnar nerve and intraoperative nerve recording give us relevant information to localize it, such as measurement of the amount of axonal charge transferred which is correlated with clinical results.

Keywords:
Oberlin technique, ulnar nerve, musculocutaneous nerve, nerve transfer, intraoperative nerve recording
Squamous cell Carcinoma - “The most common Hand malignancy”

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Objectives / Interrogation: According to literature squamous cell carcinoma is the most frequent malignant tumor of the hand with 58-90%. In particular organ transplant patients have a 65 to 200 times greater risk of developing squamous cell carcinoma with more aggressive progression compared with the general population.

Methods: On the basis of our patients between 2013-2017 we want to work up squamous cell carcinoma in the hand, provide a literature review and give treatment guidelines.

Results and Conclusions: At the University Hospital for Plastic, Reconstructive and Aesthetic Surgery Innsbruck 24 squamous cell carcinoma out of 32 malignant/semimalignant skin tumors (melanoma n=6, basal-cell carcinoma n=2) were presented between 2013 and 2017. The average age at diagnosis was 72, with a 1:1 male to female ratio. In 75% the tumor was localized on the dorsum of the hand. In 3 Patients who underwent immunusuppression after organ transplantation, squamous cell carcinoma was characterized by rapid growth, multiple lesions and a high rate of local recurrence.

As stated in literature squamous cell carcinoma was the most common hand malignancy in our patients. Especially in organ transplant recipients squamous cell carcinoma was more aggressive than in nonimmunocompromised patients and therefore these patients should be routinely screened at regular intervals for skin lesions. As hand surgeons, it is important to know about the risk of squamous cell carcinoma (SCC) in the upper extremity.

Keywords:
cancer, carcinoma, hand, skin, squamous
NERVE TRANSFER TO RESTORE THENAR MUSCLE IN LOW MEDIAN NERVE PALSY

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Objectives / Interrogation: Nerve transfer has changed peripheral nerve and brachial plexus expectations to restore function of damaged nerves. Several transfers have been described for multiple lack of function and each patient must be studied carefully in order to offer the best plan to recover function.
Anterior Interosseous Nerve (NIA) has been described to restore ulnar motor function in patients with ulnar nerve palsy, severe compression or low brachial plexus injuries. We decided to use NIA as a motor nerve to restore thenar muscle function in a selected group of patients with no motor thenar function and viability of NIA after partial brachial plexus injury. Accurate nerve conduction studies (NCS) are crucial to indicate this nerve transfer.

Methods: According to this principles, 3 patients have been treated during 2014-2015, age ranges from 28 to 57 yo, 2 females and one male. Preoperative diagnosis supported by precise NCS is crucial to be sure pronator quadratus function is normal, as well it was uninjured or successful reinnervated.
Surgical technique was assisted by intraoperative nerve recording (INR) to identify any residual nerve action potential (NAP) in the motor branch of the median nerve or compound motor action potential in the thenar muscles (CMAP). This way, intraneural dissection is avoided in cases with some or no activity, nerve dissection was performed from distal to proximal to identify fascicular group track to thenar muscle. Reverse end-to-side suture was performed in cases with some NAP recorded and end-to-end when NAP was absent.
Reinnervation was measured by NCS.

Results and Conclusions: Improve in CMAP at thenar muscle was achieved in all three cases. Initial reinnervation was detected at 4 months and improvement of thenar CMAP was measured with a mean rate of 2.4 mV. Clinically, patients recover some abduction function and atrophy of thenar muscles.
So, we can conclude that although indications for this nerve transfer are restricted, clinical results are successful to restore thenar abduction with no morbidity of tendon transfer. Nerve conduction studies also demonstrated improvement. Reverse end-to-side suture also reveals effectiveness of this method.

Keywords:
anterior interosseous nerve, thenar branch, median nerve, nerve transfer, intraoperative nerve recording
USE OF BIOLOGICAL THERAPY IN POST-SURGICAL SCAR ADHERENCES IN PERFORMING MUSICIANS

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Objectives / Interrogation: We propose, through a retrospective study, the possibility of improving functionality linked to the performance of instrumentalist musicians who had adhesions of their post-surgical scars that affected the correct execution of their instrument.

Methods: We describe 4 musician patients: one with a history of olecranon osteosynthesis, with elbow scar adhesion that limited flexion-extension, another with a history of TFC plastic reconstruction, with scar adherence on the ulnar side of the wrist with pain and limitation of pronosupination and ulnar deviation. Another patient with a history of multiple interventions for scapholunate lesion with extensive incisions and scar adherence on the dorsolateral border of the wrist with regional pain due to neuritis of the radial nerve sensory branches and finally a patient with a history of EPL tenorrhaphy with scar adherence and limitation of the mobility of the thumb.

Three of the cases were treated by percutaneous rigotomy and injection of platelet-rich plasma (PRP) + stem cells derived from autologous adipose tissue and the fourth, only rigotomy with autologous PRP.

Results and Conclusions: In all cases, the range of regional joint mobility, pain according to VAS and improvement in instrument performance were evaluated objectively, as well as, subjectively with the DASH method, finding in all cases, symptomatic and functional improvement.

We believe that biological therapy is an alternative for hypertrophic or adherent scars in performing musicians who are limited in the proper execution of their instrument.

Keywords:
bio logical therapy, scars adherence, performing musicians diseases
A new minimally invasive technique of the bone marrow concentrate injections improves hand function and reduces pain in the selected scaphoid nonunions

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Objectives / Interrogation: The scaphoid fractures are the most common carpal bone fractures. Often misdiagnosed can lead to a nonunion. The scaphoid nonunion changes carpal biomechanics and leads to wrist arthrosis. The aim of the study was to evaluate the administration of the autologous bone marrow stem cells in the selected scaphoid nonunions as a new minimally invasive alternative treatment.

Methods: A consecutive series of 28 patients (25 men and 3 women, 17-58 years old, average 30.7 years) with scaphoid nonunions was analysed. The criterion for inclusion were fibrous nonunions with minimal sclerosis changes (up to 1 mm) - grades 2 and 3 in the Slade classification confirmed in a computed tomography scan (Slade 2 - 64.3% (18), Slade 3 - 35.71% (10).

The patients were examined prior and after the treatment using the Visual Analog Pain Scale (VAS) and the Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire supplemented with an assessment of the active range of motion (AROM) and the grip strength. An X-ray evaluation was compared with the preoperative findings.

Scaphoid nonunion was identified under a fluoroscopy. Later 2-3 needles were inserted to the scaphoid and nonunion with arthroscopic guidance.

In the second stage of the procedure, 60 ml of bone marrow were aspirated from the anterior iliac crests, later injected into a Harvest BMAC system, centrifuged and concentrated in a cell separator. Two to three ml were injected into the scaphoid bone through previously inserted needles. A splint was applied for 5 weeks.

Results and Conclusions: After the treatment there was an improvement in all measured features: decrease in DASH: \( p < 0.0001 \), decrease in VAS: \( p < 0.0001 \), increase in grip strength: \( p = 0.001 \) and increase in AROM: \( p = 0.2099 \).

The highest percentage of patients with positive changes was observed in the reduction of pain (96.4%) and in the DASH score (85.7%). Both in grip strength and in AROM most of the patients presented positive changes. The results were not correlated with patients' age, therefore the outcome was better the older the patients were. There were 2 cases without a bone union, nevertheless with an improvement in DASH and VAS.

There was no significant impact of the initial status on the level of the improvement.

In conclusion, our new minimally invasive technique can be an attractive treatment option for scaphoid nonunions with minimal sclerosis with a significant impact on patients' hand function and pain reduction, improving the quality of life.

Keywords: scaphoid non-union, bone marrow stem cells, arthroscopy, minimally invasive surgery
A new combined treatment for Kienböck's disease: bone leveling procedure with bone marrow mesenchymal stem cell administration

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Objectives / Interrogation: Avascular necrosis of the lunate bone (Kienböck's disease) is a rare entity that leads to a significant hand dysfunction. Treatment algorithms are variable up to radical salvage procedures. The aim of this study was to analyse the results of a treatment combining surgical bone leveling intervention with autologous stem cell administration.

Methods: Nine consecutive patients with advanced Kienbock disease underwent treatment with surgical osteotomies and direct injections of bone marrow concentrate to the lunate bone. Individually regarding anatomical prerequisites certain surgical techniques were applied, as radial shortening in the ulnar positive variance and capitate shortening in the ulnar neutral variance. The patients were examined prior and after surgery using the Visual Analog Pain Scale (VAS) and the Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire supplemented with an assessment of the active range of motion (AROM) and the grip strength. An X-ray evaluation was compared with the preoperative findings.

Results and Conclusions: Preoperative hand function was impaired in all of the patients (median DASH: 27, with 56% of grip strength and 60% of AROM compared to the unaffected side). The preoperative pain was extensive (median VAS: 7). Following the presented combined interventions, a significant decrease in DASH score (median: 12, p = 0.0077), a reduction of pain (median VAS: 2, p = 0.0076) and an increase in grip strength (median: 61%, p = 0.007) were observed.

The study provides a protocol for combining bone leveling procedures with a direct administration of bone marrow cells in the treatment of avascular necrosis of the lunate bone that could be easily implemented in surgical practice. The combined treatment method has promising results as the improvement of hand function and the decrease in pain. The suggested technique can protect patients with Kienbock disease from salvage procedures with a restricted range of motion of the wrist.

Keywords:
bone avascular necrosis, Kienbock disease, mesenchymal stem cells, bone marrow cells,
5 to 7 years results using a mini-TightRope (Arthrex) alone to suspend the thumb metacarpal after a trapeziectomy in the treatment of thumb carpometacarpal osteoarthritis: proving the 5-year successful outcomes of this method.

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Objectives / Interrogation: On review of the current literature, the most common procedure for painful carpometacarpal joint of the thumb (CMC-I) osteoarthritis remains trapeziectomy with or without tendon suspension and interposition. We were encouraged by excellent 2-year results using the mini-TightRope (mTR) to suspend the thumb metacarpal, replacing the need for tendon suspension and interposition. The aim of this prospective study is to report minimum 5 years (to 7 years) results of 67 patients operated from 2010 to 2013 using the mTR alone for suspension following trapeziectomy in advanced CMC-I osteoarthritis.

Methods: 67 Patients (72 thumbs) (F: 64 M: 3), mean age 60 (44-76) years, with painful CMC-I osteoarthritis, treated conservatively longer than 1 year, were studied. The surgical technique included open trapeziectomy with suspension of the thumb metacarpal to the 2nd metacarpal using a mini-TightRope. Patients were immobilised for 10 to 14 days and range of motion exercises started. Pain was recorded on a visual analogue scale (VAS) before surgery and after 6, 12 and 60+ months. Thumb function was also recorded, measuring quick DASH, key pinch grip strength, first webspace angulation and range of motion (Kapandji method). Radiographic measurements included the trapezial space ratio. Any complications were documented.

Results and Conclusions: 67 patients (F: 64 M: 3) (72 thumbs) were reviewed after 5 years, mean follow-up of 6 years. Their mean age was 60 (44-76) years. There was no intraoperative complication nor need for device removal. The average VAS pain improved from 7.66 preop to 0.07 postoperatively. The average quickDASH improved from 60 to 5.5. The first webspace angulation improved from 33.6° to 38.1°. The range of motion improved from average 7.8 (Kapandji score) preop to 9.3 postop. The average key pinch grip of the operated thumb was 3.36 kg preop and improved to 3.74 kg postoperatively, 94% of the nonsurgical side. The trapezial space ratio averaged 0.2 with minimal metacarpal subsidence. Use of the mTR to suspend the thumb metacarpal following trapeziectomy is a simple procedure allowing for early mobilisation of the thumb postoperatively. It provides significant improvement in pain (VAS) and function (qDASH), improves range of motion, webspace, and pinch strength. There have been no complications related to the mTR. We conclude, based on 5-year results, that using a mini-TightRope is a safe and effective method to suspend the thumb metacarpal after trapeziectomy, without need for immobilisation nor tendon harvest.

Keywords: CMC-I; Trapeziectomy; metacarpal suspension; miniTightRope
TRANSFER OF THE EXTENSOR INDICIS TO EXTENSOR POLLICIS LONGUS IN CASES OF INJURY OF THE EXTENSOR TENDON, SEQUEL OF FRICTION WITH SCREW OF VOLAR PLATE OF DISTAL RADIO.

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Objectives / Interrogation: INTRODUCTION.
The first finger is fundamental for the correct operation of the hand, allows one of the main functions that is the realization of clamp. Extensor Pollicis Longus tendon rupture can be spontaneous, traumatic, secondary to rheumatoid arthritis, secondary to the use of corticosteroids or as a sequel of friction with a screw of a volar plate used for the treatment of fractures of distal radius. The direct sutures of the injured ends of the Extensor Pollicis Longus under the extensor retinaculum have a high failure rate. Transposition of the Extensor Indicis is a surgical technique to be considered for the repair of this type of injuries. The objective of this work is to demonstrate the surgical technique that we use after a rupture of the EPL tendon by friction of screws placed in a DVR plate with favorable functional results.

Methods: A 42-year-old female patient who, after falling from her own height with a left wrist in extension, presented a fracture of the distal radius Fernandez III, AO 2R3A2.2. Surgical treatment, open reduction plus internal fixation with a volar plate for distal radius (DVR) is performed. Two years after the surgery the patient presented an inability to extend the distal phalanx of the thumb, with apparent loss of strength, which is why an ultrasound study was performed that reported empty space in the third extensor compartment, absence of Extensor Pollicis Longus tendon, in addition to surgical material (screw), that crosses the dorsal cortex and is evidenced in the third compartment. The tendon ends are located at 2.3 cm. Tendinous transfer of the Extensor Indicis tendon to the Extensor Pollicis Longus tendon is performed, with adequate functional recovery.

SURGICAL TECHNIQUE
Identification of the Extensor Indicis tendon at the level of the wrist and distal tenotomy at the metacarpophalangeal level. The extraction of the Extensor Indicis tendon and the distal end of the Extensor Pollicis Longus is performed, both ends are faced, and a terminal term repair is carried out using the pulvertaft technique.

Results and Conclusions: The rupture of the Extensor Pollicis Longus secondary to friction by a volar plate screw of distal radius is a rare complication, however, it causes serious functional limitations. Direct repairs of injured extremities, under the extensor retinaculum, are associated with a high failure rate, so the transfer of the Extensor Indicis to the Extensor Pollicis Longus is a relatively simple technique to perform, with good functional results.

Keywords:
Total wrist arthroplasty in rheumatoid and post traumatic wrist: long term follow-up.

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Objectives / Interrogation: To report the long-term follow-up outcomes of 43 total wrist arthroplasty (TWA) in rheumatoid and post traumatic wrists.

Methods: From 2003 to 2018 8 men and 35 women, aged 32 to 74 (mean 62) years underwent 43 total wrist arthroplasties for rheumatoid arthritis (n=29) and post-traumatic arthritis (n=14) using the Universal 2 wrist prosthesis in 24 Patients, Integra Freedom Wrist System in 6 Patients, ReMotion in 11 Patients and Emi-Prosthesis in 2 cases. The mean follow-up was 82.3 months (range: 2-12 years). Pre and post-operative Visual Analogue Scale (VAS), Quick Disabilities of the Arm, Shoulder and Hand (DASH) score and the Patient-Rated Wrist Evaluation (PRWE) score were performed. The Authors also evaluated: Range of motion, neurovascular and tendon status, stability, dislocation rate. The X-Ray views was performed to evaluated implant and screws alignment and fit and loosening.

Results and Conclusions: All patients had good or complete pain relief, the mean visual analogue scale pain score was 1.0 (pre-op 9.0). The mean grip strength improved and postoperatively was 11kg (Jamar). The mean total active motion (AROM) of flexion-extension was 73.4°; radial-ulnar deviation 25.7°. The mean QuickDASH score was 32 and PRWE was 40.3. Revision surgical procedures were performed in 7 cases (18,6%): 6 carpal components were revised (polyethylene inserts wear and/or carpal ulnar screw loosening secondary to intra-operative malalignment) and 1 radial component, in 4 cases total implant failed, Swanson's silicone spacer was applied (n=3) or wrist joint fusion (n=1).

Long term results in TWA suggest a pain relief and improves function both in rheumatoid and post traumatic arthritis. Nowadays the wrist arthroplasty can be considered as a predictable functional option to managing wrist joint arthritis in selected cases and patients.

Keywords:
Total wrist Arthroplasty, Rheumatoid and post traumatic wrist
Combined Total Wrist Arthroplasty with Ulna Head Prosthesis in a Rheumatoid Patient with gross Distal Radio-Ulnar Joint instability using Interosseous Membrane Reconstruction with Brachioradialis tendon graft

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**Objectives / Interrogation:** Background
We report a patient with Rheumatoid Arthritis, submitted to Total Wrist Arthroplasty (TWA) and Ulna Head Prosthesis (UHP), addressing a previous gross instability of Distal Radio-ulnar Joint (DRUJ) by ligament reconstruction of the distal part of interosseous membrane using brachioradialis (BR) tendon graft. The surgical technique is described as well the follow-up after 6 years from the surgery showing a good outcome.

Potential benefit of combining TWA with UHP is a more balanced load distribution on the wrist, compared to Darrach. The technique of BR tendon reconstruction of IOM for DRUJ instability was largely used by the authors with reliable results, on post traumatic injuries.

**Methods:** Case Description
The patient was a 38-year-old woman presented with wrist degenerative deformity by RA in his right, dominant wrist. Wrist radiographs and CT scan demonstrates signs of advanced arthritis, affecting radio-carpal, midcarpal and DRUJ, with dorsal dislocation of the ulnar Head. The patient was directed by other hand surgeons to undergo total wrist arthrodesis associated with the Darrach procedure, an indication not accepted by her. Twenty-four months later, the patient complained of persistent wrist pain and radiographs signs worsened.

On pre operative physical examination, there was a painful limited mobility on the wrist. Wrist flexion was limited to 30°; extension was limited to 10°. Pronation was 70° and supination 45°. The patient's Disabilities of the Arm, Shoulder and Hand (DASH) score of was 54, and the visual analog scale (VAS) pain score was 7. Grip strength was 38% of that achieved by the wrist on the unaffected side.

Since the patient expectation was a functional motion on her dominant wrist, we decided for entire Wrist Replacement using a TWA technique with Radio-carpal prosthesis and ulna head replacement addressing the DRUJ instability by reconstruction of the distal part of interosseous membrane using BR tendon.

**Results and Conclusions:** On follow-up 6 years after surgery, the patient exhibited good wrist, forearm, and elbow range of motion, with 70° flexion, 60° extension, 20° radial deviation, 30° ulnar deviation, 85° pronation, and 90° supination. The patient had normal movement of all digits, a DASH score of 5, VAS of 0, and grip strength of 92% the unaffected wrist. Wrist radiographs shown articular congruency of DRUJ and radio carpal joint and good bone attachment to the implants.

**Keywords:**
Arthroplasty, rheumatoid wrist, total wrist arthroplasty, interosseous membrane reconstruction
Differential Effectiveness for Trigger Thumb and Finger Injections

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Objectives / Interrogation: Literature examining the effectiveness of corticosteroid injection as a treatment method for trigger finger has typically grouped all of the digits together, with no distinction made between the thumb and lesser fingers. In this study, we use the novel ICD-10 coding to determine if the effectiveness of corticosteroid injections in the thumb and lesser fingers differs according to affected digit.

Methods: We queried a national insurance database from 2007 to 2017 to identify all patients who were treated for a trigger digit with 6-month follow-up. We categorized trigger digits by laterality and by digit (thumb, index, long, ring and small fingers). We reviewed all tendon-sheath injections and trigger digit releases (TDR) during the observation period. The time in days from trigger digit diagnosis to TDR was recorded and compared between thumb and all other fingers. Kaplan-Meier survival curves were calculated to analyze the effectiveness of tendon sheath injection and conversion to TDR.

Results and Conclusions: The study population included 38,268 patients with the diagnosis of a trigger digit (TD) and 6-month follow-up. Long and ring fingers were treated most commonly, accounting for 32.2% and 27.2% of all digits, respectively. Trigger thumbs accounted for 22.3% of the study population. While the lesser fingers converted to release in an average of 170 days (SD 114.5 days) after injection, thumbs converted to release on an average of 130 days (SD 94.2 days)
Among digits that went on to surgical release, trigger thumbs on average progressed to surgical release 40 days more quickly than lesser fingers. Notably, our analysis revealed that the overall survival wasn’t affected in the same way, as the number of days from trigger digit diagnosis to release in the thumb and fingers were very similar. Taken together, these data suggest that corticosteroid injection is less effective in alleviating symptoms in thumbs than in fingers and that trigger thumb may be more recalcitrant to non-operative treatment than trigger finger.

**Keywords:**
Trigger Finger, Thumb, Corticosteroid
Incidence of peripheral nerve trauma in England between 2006-2016 - time to increase resources for peripheral nerve trauma of the hands and upper limb?

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Objectives / Interrogation: To establish the common patterns of peripheral nerve injury in England between 2006-2016

Methods: This is a retrospective observational study using cross-sectional data collected by Hospital Episode Statistics (HES) between 2006-2016 in England. Data included all primary diagnoses coded using ICD-10 codes within the study period for all hospital attendance episodes. All peripheral nerve injury codes were included and subclassified by anatomical region, age and gender.

Results and Conclusions: A total of 65,163 peripheral nerve injuries were coded over the study period. The commonest site of injury was consistently the upper limb with a median of 94.8% over 10 years (range 93.8%-95.2%, Interquartile range 0.5%), followed by lower limb at 3.0% (2.8-2.4%, 0.3%), head and neck at 2.0% (1.5%-2.7%, 0.2%) and trunk at 0.3% (0.2-0.5%, 0.2%).

Within the upper limb peripheral nerves group the majority of injuries occurred to nerves distal to the wrist (median 84.4%, range 81.5%-86.7%, Interquartile range 1.5%) followed by nerve injuries between the wrist and elbow (8.5%, 6.9-11.3%, 1.3%) and then injuries proximal to the elbow (7.2%, 6.0-8.1%, 0.6%). Of note, finger and thumb nerve injuries represented 55.4% (52.0-61.5%, 4.2%) of all injuries of the upper limb.

Nerve injuries distal to the wrist were commoner in males (70.6%, 68.8%-71.5%, 1.3%). The commonest age range to sustain injuries were patients in their third decade (27.2%, 26.0-27.9%, 0.9%), followed by the fourth (18.9%, 18.3-19.7%, 0.8%), the fifth (17.5%, 16.9-18.2%, 0.8%), the sixth and second decade (12.2%, 11.8-13.0%, 0.3% and 12.1%, 11.8-13.1%, 0.72%). The first decade and beyond the seventh decade complete the rest of the age profiles with diminishing numbers towards the extremes of life.

Conclusion
The upper limb and hands are consistently the most common regions that sustain peripheral nerve injury. The patient group most likely to present with peripheral nerve injuries are males in their third decade with finger nerve injuries. Future research into nerve surgery and allocation of resources should take these data into account. In addition, research identifying other risk factors for injury is needed.

Keywords:
Peripheral nerve injury, nerve injury,
Reconstruction of Blauth type IIIb hypoplastic thumb with half 2nd metacarpal and tendon transfer

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Objectives / Interrogation: Parents usually want a five-digit-hand for the child with Type IIIb hypoplastic thumb, though pollicization has excellent function results but 4-digit hand. Most parents concern more about the number of digit than the function of the hand. We reported our technique with half 2nd metacarpal transfer to reconstruct the 1st CMC joint and followed by tendon transfer to reconstruct the main function of the thumb.

Methods: We reported 14 thumbs of 12 children with IIIb hypoplastic thumb. The average age of surgery was 1.5 years (one year two months to two years one month). The surgery was performed in two stages. The first stage was to reconstruct the proximal part of the 1st metacarpal with half of the proximal 2nd metacarpal. Half year later, the second stage was performed with tendon transfer. Thumb extension was reconstructed with EDI tendon and thumb opposition with FDS from ring finger, MP joint was stabilized by tendon transfer in the meantime. All the children were followed up. The growth and the function of the reconstructed thumb were recorded and compared with contralateral thumb.

Results and Conclusions: The complete union of the bone transfer was seen in 10 of 12 children, and the other two with non-union was fixed with K-were during the second stage of surgery. The growth to reconstructed thumb still slower than the contralateral thumb, the grip and pinch power was less than the contralateral one, however, the parents were satisfied with five-digit thumb and the function.

In conclusion, the reconstruction of the Blauth type IIIb hypoplastic thumb with half second metacarpal and tendon transfer is an acceptable alternative to those who can not accept the procedure of pollicization.

Keywords:
Hypoplastic thumb, reconstruction
HOW TO IMPROVE AND DIRECT THE NEURONAL GROWTH PROCESS. THE FUTURE FOR PERIPHERAL NERVE REGENERATION

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Objectives / Interrogation: Peripheral nerves injuries are common lesions than cause loss of function and poor outcome. In case of severe nerve gap (>50mm), the gold standard remains the autologous graft. The limits are: functional damage at the donor site, double surgical access and the lack of large amounts of grafts. In response to injury, Schwann cells (SC), take advantage to extracellular matrix (ECM) connection, proliferates in organized structures than guiding axons during regeneration.

Methods: Researchers focused two main areas of investigation: the role of the interaction between cells with the extracellular membrane (ECM) and the forces acting during axonal elongation.

Results and Conclusions: Regarding the contact between cells (nervous and glial) and physical stimuli arising from the ECM, the tissue engineering build artificial surfaces than reproduce the topographical signals of the ECM (Micro and Nano size spur). The influence of micro and nano-topography on cells behaviour is explored both in vitro and in vivo. SC quit on the anisotropic substrate aligning preferably along the axis of the topographical signal, while cells cultured on flat surfaces show a random orientation. In reference to the forces acting during axonal elongation in 1984 Bray demonstrated in vitro that the application of a mechanical tension by micro-needles of glass inserted in the growing cones, helped the axon's elongation, without reducing the diameter. Riggio et all proposed to use, in vitro, nervous Rat PC12 Cells cultured with magnetisable nanoparticles (MNPs) (1-100mgml-1), "assimilated" by cells by endocytosis. Subsequently, an external magnetic field was applied. The association of the nanoparticles and an external magnetic field, generating a tension force in order of pN, virtually able to guiding axonal growing and orienting cells along the direction of the magnetic force(4). The Author investigated the early step of in vivo application of this technique and used an experimental model of the median nerve injury in rats. The data show that did not hinder with the nerve regeneration (one week after injury, it is evident the presence of Schwann cells migrated from the proximal to the distal stump). The MNPs were endocited by Schwann cells, but also within the same nerve fibres. Finally, in case of severe nerve gap the gold standard remain the autologous nerve graft, however the technique could be overcome in the future by different and alternatives solutions.

Keywords: Nanosurfaces scaffold, magnetic nanoparticles, peripheral nerve regeneration.
Wide Awake surgery, team work between surgeon, anesthetist and patient.

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Objectives / Interrogation: One of the most significant advance in knowledge about hand anesthesia is based on the safety of local infiltration of epinephrine. It promotes vasoconstriction and combined with lidocaine or ropivacaine eliminates the need for sedation, brachial plexus blocks and general anesthesia for frequent hand surgeries.

The wide-awake anesthetic-surgical technique traditionally described in the literature consists of local administration of lidocaine and epinephrine by the orthopaedic surgeon. We adapted this technique to our surgical practice, in a teamwork between orthopaedics and anesthesia. Several hand surgical procedures were performed with this protocol. In this paper we describe the procedures and results of 9 patients whose follow up was documented.

Methods: We describe 9 procedures that were evaluated and documented: 5 surgeries of arthrolysis and tenolysis, 3 tendinous section repair and a metacarpal desrotative osteotomy with arthrolysis and tenolysis. In all cases, the anesthetist performed a distal peripheral block at the level of the radial, ulnar and median nerve, according with the required territory (2-3 mL of ropivacaine at 3.75 mg/mL). 20 minutes after, epinephrine is locally infiltrated in doses up to 15 mL in the palmar region, 2 mL on the 1st and 2nd phalanges and 1 mL on the 3rd phalanx. Surgery starts in 30 minutes. No tourniquet was used. Patients were fully aware throughout the procedure, moving the concerned segment when requested, allowing tendon tension and excursion assessment, suture strength, release efficacy and movement correction.

Results and Conclusions: Distal block with ropivacaine, in the referred doses, makes an effective sensory blockage for a 12 hours average period, maintaining the motor capacity that allows active mobilization by the patient during the surgical procedure demonstrating the effectiveness of the surgical procedure. Ropivacaine and epinephrine were effective in pain and hemorrhage control, removing the need for sedation and tourniquet. Positive results were obtained in hand fractures surgeries, repair and tendon transpositions. It enables the patient to collaborate during the surgery by actively performing the movement that needs to be tested. Reduces complications of rupture, incomplete tenolysis or joint stiffness by allowing motion monitoring intra-op and early rehabilitation post-op. Allows a more effective pain control than the traditionally one, since the effect is longer with ropivacaine.

Keywords:
Wide awake surgery, epinephrine, ropivacaine, distal peripheral block
Modified proximal capitate osteotomy in a chronic isolated lunate dislocation - a new perspective in treatment of Kienbock disease?

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Objectives / Interrogation: Isolated lunate dislocation is one of the most severe carpal instability lesion. Despite devastating changes in wrist anatomy it can be misdiagnosed. We present a case of an isolated lunate dislocation diagnosed 14 weeks after injury with avascular necrosis (AVN) of the lunate.

Methods: A 37-years-old male, a manual worker injured his right (dominant) wrist during a fall. He was initially diagnosed as a wrist sprain. One month later due to a persistent pain, an X-ray was performed with no recognition of wrist pathology. The patient came with a stiff wrist to an outpatient clinic 14 weeks later. His pain was 8 in the Visual Analogue Scale (VAS). The wrist was swollen with no active range of motion (AROM). Grip strength was 12% of the opposite hand, Mayo Wrist Score-5, and Disabilities of the Arm, Shoulder and Hand (DASH)-76.2. The symptoms of the median nerve dysfunction were present. The radiograms were reevaluated with a diagnosis of a lunate dislocation.

The patient was qualified for surgery. Preoperatively, computed tomography confirmed the isolated lunate dislocation with an injury of proximal capitate cartilage.

From volar and dorsal approaches a severe damage to the cartilage of the capitate and a fibrosis of the lunate were identified. The lunate was necrotic with loss of the cartilage and was excised. Due to a chondromalacia of the capitate, a proximal row carpectomy was excluded. We chose a proximal osteotomy of the capitate and a free cortical graft to remodel the shape of the capitate. A graft from the iliac crest was harvested to preserve its convex shape covered with soft tissue to be positioned as the new articular surface facing radiocarpal joint. The graft and remaining capitate were stabilized with a cage plate. The scaphoid and the capitate were fixed with a cannulated screw.

A bone union was achieved after 8 weeks. In a 6 months follow-up the pain was 0-1 in VAS, Mayo Wrist Score (80), DASH (10.9) and AROM and grip strength - 70 % of the opposite hand. The patient has returned to his previous occupation.

Results and Conclusions: This is the first report of a modified proximal capitate osteotomy with a free bone graft in the lunate dislocation with the AVN of the lunate with a coexisting chondromalacia of the capitate. Our method reduces the potential risk of double non-union and capitate head necrosis observed in the Graner's procedure as there is only one bone-union necessary. We assume that our modification could be an attractive option for the advanced Kienbock disease.

Keywords:
lunate dislocation, capitate osteotomy, Graner's procedure, Kienbock disease
ARTROSCOPIC EVALUATION OF LIGAMENT INJURIES ASSOCIATED TO INTRAARTICULAR DISTAL RADIUS FRACTURES

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¹ Clinica Indisa (santiago)

Objectives / Interrogation: Our objective is to describe associated ligament injuries in intraarticular distal radius fractures using arthroscopic assistance. Additionally, to characterize these findings according to stability and need for treatment (either arthroscopic or open).

Methods: Retrospective study including 85 distal radius fractures treated surgically with open reduction and internal fixation and arthroscopic assistance between January 2017 and July 2018. Inclusion criteria were intraarticular fractures with indication of surgical treatment, in high demand patients. Low demand patients, as well as extraarticular and non operated fractures were excluded. All wrist fractures in this study were treated with open reduction and internal fixation using locking volar plate, and wrist arthroscopy to assess articular surface and associated ligament injuries. Findings related to Triangular Fibrocartilage Complex, Scapholunate Ligament and Lunotriquetral Ligament were recorded and classified according to Palmer and EWAS Classification, respectively. Finally, arthroscopic findings were classified as "stable" and "unstable" according to they need to undergo additional procedures for stabilization. No functional results were evaluated.

Results and Conclusions: From a total of 85 fractures, 49 (57.6%) presented at least one ligament injury during arthroscopic evaluation. 31 (36.5%) fractures were associated to Triangular Fibrocartilage Complex lesions. When evaluating intrinsic ligament injuries, 27 (31.8%) cases had Scapholunate Ligament and 12 (14.1%) Lunotriquetral Ligament injuries. Of the total number of ligament injuries, 12 (14.1%) Triangular Fibrocartilage Complex, 15 (17.6%) Scapholunate Ligament and 9 (10.6%) Lunotriquetral Ligament tears needed some additional surgical procedure for stabilization. In conclusion, the total number of ligament injuries found in association to intraarticular distal radius fractures is similar to other publications. Moreover, proper characterization of these lesions allow us to have a more accurate idea of which will need further treatment.

Keywords:
wrist fracture arthroscopy intrinsic ligaments
Histologic Analysis of the Nail Apparatus in Regard to Subungual Melanoma: Anatomical Study in 21 Cadavers

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Objectives / Interrogation: Breslow thickness is the most important factor that determines treatment plans and the prognosis of the melanoma. However, this cannot be directly applied to the subungual melanoma considering the unique anatomy of the nail unit. The aim of the present study is to analyze the anatomy of the nail unit in order to get information for the functional surgery of the subungual melanoma.

Methods: Twenty-one cadavers were enrolled in this study. Bilateral thumbs and big toes were obtained, and midline longitudinal cross-section slides were made with a thickness of 10 micrometers. The distances from the nail bed to the underlying bone were measured at multiple points including the nail matrix and the hyponychium.

Results and Conclusions: The distance between the nail bed and the underlying bone was the shortest at the nail matrix and the longest at the hyponychium. At the nail matrix, the distance showed $1.10 \pm 0.43$ mm in the thumbs and $1.12 \pm 0.39$ mm in the big toes, respectively. At the hyponychium, the distance was $2.86 \pm 0.82$ mm in the thumbs and $2.71 \pm 0.80$ mm in the big toes, respectively.
This is the first study that measured the distance between nail bed and bone at multiple points in Korean. Nail bed showed the shortest distance to the underlying bone at the nail matrix. The results of this study will help to build up a new staging system and surgical methods of subungual melanoma in the future.

**Keywords:**
Melanoma, Breslow's thickness, Nail matrix, Subungual melanoma

<table>
<thead>
<tr>
<th></th>
<th>Thumb</th>
<th>Big toe</th>
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</thead>
<tbody>
<tr>
<td>S1-S2</td>
<td>9.80±1.54</td>
<td>9.02±1.47</td>
</tr>
<tr>
<td>B1-B2</td>
<td>4.01±1.38</td>
<td>3.25±0.92</td>
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<tr>
<td>M-B2</td>
<td>1.10±0.43</td>
<td>1.12±0.39</td>
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<tr>
<td>S3-B3</td>
<td>1.98±0.43</td>
<td>2.54±0.69</td>
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<tr>
<td>S4-B4</td>
<td>1.17±0.51</td>
<td>1.37±0.61</td>
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<tr>
<td>S5-B5</td>
<td>2.86±0.82</td>
<td>2.71±0.85</td>
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FATGRAFTING IN DUPUYTREN DISEASE

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Objectives / Interrogation: Several pathogenetic hypothesis were described for fascia proliferation in Dupuytren's disease. The surgical approach aim to treat the macroscopic manifestation of finger retraction in the most advanced recurrent disease. It became necessary to investigate the cellular Dupuytren develop to find out new therapeutic approach to permit a more sparing surgery and to treat all severe cases. In fact, some clinical studies assess as, in addition to fascia, palmar skin and fat-derived cells may be a potential source of cells causing the Dupuytren disease. Based on this observation, the introduction of the fat graft palmar replacement by lipofilling technique joint to traditional aponeurectomy have shown promising long term good result.

Methods: A retrospective study was performed on patients treated for Dupuytren recurrence by selective aponeurectomy and fat graft. 44 patients, with five years of follow, were treated for recurrent Dupuytren disease (30 patients previously undergoing aponeurectomy and 14 patients undergoing infiltration with collagenase). An aponeurectomy was performed in all cases with complete removal of affected fascia. At the end of procedure all the surgical site and neighboring rays were filled by fat graft from the abdomen (mean 12cc). Primary endpoint was skin texture, quality of scar, tendon gliding, pain and complications. Secondary endpoint was to observe the recurrence of the disease by echography evaluation.

Results and Conclusions: The patients were evaluated after 3 years from surgery to verify effects. Good results emerged from many patients concerning: the degree of flexion and extension of the operated fingers, the degrees of active and passive mobility of the MCF and IF joint, pain, sensitivity, flexion strength and scars. Only three patients presented a relapse. All patients underwent ultrasound evaluations six months and on1 and 3 year after surgery, documenting the persistence of adipose tissue in rays involved. Fat grafting is a common procedure in reconstructive and aesthetic surgery, colled as "lipofilling''. For the presence of adipose derived stem cell (ADSC) and cytokines it is employed in several clinical procedures as severe Dupuytren especially for its possible role in modulating the fibroproliferative diathesis.

The morphological, functional results and limited incidence of recurrences in treated patients would seem to confirm that aponeurectomy and lipofilling may represent a new weapon in cases of aggressive disease.

Keywords:
Dupuytren, lipofilling, aponeurectomy
CLASSIFICATION OF DISTAL FINGER TUMOURS

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Objectives / Interrogation: This study aims to define a new classification system by dividing the distal finger into zones according to their anatomical formations and natural boundaries, to determine the histopathologic diagnosis of the finger tumours presenting in these regions and examine the tumour distribution according to these zones.

Methods: Between January 1995 and February 2016, 61 patients with distal finger tumours and tumour-like lesions were retrospectively evaluated. Patients' gender, age, clinical features, radiological findings, tumour localisations and histopathologic features were evaluated. The distal finger was divided into two zones (zone 1 and 2) according to their anatomical characteristics; zone 1, the interphalangeal joint of the thumb, distal interphalangeal joint of the other fingers and the surrounding soft tissue; zone 2a, nail and surrounding structures; zone 2b, distal phalanx zone and zone 2c, finger pulp.

Results and Conclusions: Lesions originating from soft tissue and bone comprised 91.8% (n = 56) and 8.2% (n = 5) of the tumour and tumour-like lesion population, respectively. According to our distal finger tumour classification, majority tumours and tumour-like lesions were located in zone 2a (nail complex; 44%), followed by zone 1 (joint and surrounding soft tissue; 30%). The most common tumour lesion according to the identified zones was GCTTS in zone 1 and zone 2c, glomus tumour in zone 2a and enchondroma in zone 2b.

The widespread use of this classification system could provide an idea of the possible pathologies when encountering a patient with a distal finger mass, thereby enabling more accurate surgical planning.

Keywords:
Soft tissue tumours, bone tumours, finger, classification, tumour-like lesions.
A successful use of collagenase injection multiple fingers contractures in a child in the course of a generalized collagenopathy and Arnold Chiari Malformation Type I

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Objectives / Interrogation: Dupuytren disease is extremely rare among the pediatric population. We present an extremely rare case bilateral multiple finger contractures of a yet unknown collagenopathy in a child treated with collagenase injection.

Methods: A 17-year-old girl presented in a Pediatric Hand Surgery ambulatory with advanced contractures of II-V fingers in both hands. The left hand (4th finger) had been already operated in another centre as a Dupuytren disease with postoperative complications and severe progression of the contracture. History taking and a detailed clinical examination drew hand surgeons attention to contractures of both feet, complains of recurrent headaches, nystagmus and an unusual forced position of the head - intensifying the progeria of the mandibula. A neurosurgical reevaluation of the past head scans confirmed the Arnold Chiari Malformation Type I with a severe inclination of the cerebellum tonsils into the foramen magnum and dens axis compression of the pons. The girl was qualified for an urgent neurosurgical intervention.

The girl underwent craniocervical decompression with a posterior occipital stabilisation with no complication. In an 8-month follow-up, there was a significant clinical improvement with

The patient was qualified to following hand procedures: first collagenase injection into the overgrown aponeurosis in the II-IV fingers of the right hand. Later under the general anaesthesia contractures of the right-hand were stretched reaching the full range of motion. At the same time, an open fasciectomy with a tendon reconstruction was performed to the III and IV fingers of the left hand. The wound healing was uncomplicated and the patient continued rehabilitation improving significantly everyday activities.

A wide genetic testing confirmed multiple mutations linked with the rare disease also including collagenopathies, but no clear diagnosis was stated.

Results and Conclusions: The collagenase injection was a successful treatment option in this rare case. What's more the unknown course of the disease favour the minimally invasive methods.

In conclusion, the treatment option for finger contractures has to be adjusted individually. A team approach in the Pediatric Hand Surgery can be an example of a holistic treatment to a young patient that can benefit from the most up-to-date methods of treatment.

Keywords: Dupuytren disease, Xiapex, Child, Arnold Chiari Malformation type I
Iatrogenic Injuries of Motor or Mixed Motor/Sensory Nerves

List of authors:
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Objectives / Interrogation: To report patterns of iatrogenic nerve palsies referred to a tertiary peripheral nerve injury service.

Methods: This was a retrospective review of patients who presented with new-onset nerve palsy involving a motor or mixed motor/sensory nerve following an operation. Cutaneous neuromas alone were excluded.

Results and Conclusions: Between 2013 and 2018, 70 patients were referred to our unit with new-onset postoperative nerve palsies. There were 31 males and 39 females, with a mean age of 54 years (range 7-85). Apart from one case who was referred intraoperatively, the median duration from the index surgery to the date of referral was 6 months (range 7 days - 7 years). 24 (34%) referrals were made over 12 months postoperatively. The longest delay was seen in the spinal accessory nerve group with a mean delay of 2 years.

The nerves involved in the order of frequency were 14 radial, 10 axillary, 9 sciatic, 9 spinal accessory, 5 ulnar, 4 musculocutaneous, 3 posterior interosseous, 3 medial cord, 3 tibial, 5 median, 2 long thoracic, 1 C5 root, 1 common peroneal and 1 lateral cord.

The commonest index surgery was 26 (37%) arthroplasty, followed by 14 plating, 10 soft tissue excision, 4 wiring, 3 entrapment release, 3 removal of metalwork, 3 tenodesis, 2 arthroscopy, 2 nailing, 1 fusion, 1 manipulation and 1 thoracotomy.

9 patients (13%) showed signs of spontaneous recovery under review and were managed nonoperatively. 61 patients (87%) proceeded with secondary surgery, including 44 neurolysis, 6 nerve graftings, 5 nerve transfers, 1 direct muscular neurotisation, 2 distal releases and 3 tendon transfers.

The false assumption that most postoperative nerve palsies would recover spontaneously still appears to be prevalent among surgeons, as reflected by the significant delay in referrals. Majority of these cases will warrant secondary reconstructive surgery and delay in treatment may have a negative impact on the ultimate outcome.

Keywords:
iatrogenic, nerve Injuries, nerve grafting, nerve transfer, tendon transfer
MICROSURGERY TRAINING WITH SMARTPHONE

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1 Uludag University Faculty of Medicine (Bursa)

Objectives / Interrogation: Microsurgery is widely used in experimental research models and clinical surgery. However, microsurgical applications require precise technical skills and continuous training. Here, we proposed a new, low cost, practical microsurgery training model, which can be easily applied using smartphones at home or at office.

Methods: Test platform was created using latex gloves, and a phone holder was then positioned at one side of a table. A smartphone with 10x magnification was secured on the phone holder. Microsurgical device habit, stitching and knotting exercises by making cuts at different angles on the glove model were performed, which was recorded live under the 10x magnification of the phone camera.

Results and Conclusions: Features that emphasise and distinguish this method from the other microsurgical methods are as follows: Easy implementation, easy accessibility, low cost, can be applied at home or office to allow continuity of practical education, allows taking snapshots or recording live videos of the surgery, the video can be viewed several times to rectify the mistakes made. Moreover, smartphones also have the option of being managed with voice commands for taking photos and videos. The disadvantages of the proposed method are that it does not offer the high magnification rate of a surgical microscope and that it lacks clinical applications.

We recommend that the practical microsurgery model presented in this study should be applied to basic microsurgery education and also used as an alternative training model owing to its easy application, easy accessibility and low cost. We believe that with technological advancements, this model has the potential for incorporation in future microsurgical clinical applications.

Keywords:
Microsurgery, training model, smartphone, practical.
**Surgical treatment for patients who fail to conserve the complete rupture of the collateral ligament in the proximal interphalangeal joint.**

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**Objectives / Interrogation:** The purpose of this study was to compare the preoperative and postoperative outcomes of Surgical treatment for patients who fail to conserve the complete rupture of the collateral ligament in the proximal interphalangeal (PIP) joint.

**Methods:** A complete rupture of the collateral ligament was confirmed by radiologist using ultrasound or MRI for patients who had symptoms after 4 weeks of conservative treatment. Eleven patients underwent operative collateral ligament repair using an anchor. All patient was followed up for at least 6 months postoperatively. We evaluated clinical outcomes preoperatively and at 6 months follow-up: 1) range of motion of the PIP, 2) joint stability, 3) VAS score, and 4) Fusiform index of the PIP joint.

**Results and Conclusions:** There was no instability in the lateral stress test at 6 months follow-up. The ranges of motion of the PIP were not statistically different between preoperative and at 6 months follow-up. Patients had less pain but cosmetic appearance of the PIP joint did not improve.
Surgical treatment for patients who fail to conserve the complete rupture of the collateral ligament in the proximal interphalangeal joint can provide good joint stability, functional recovery.

**Keywords:**
Collateral ligament, Proximal Interphalangeal joint
VERSATILITY OF SURAL FLAP FOR LOWER MEMBER OSTEOCUTANEOUS INJURIES: REVISION OF 40 CASES.

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Objectives / Interrogation: INTRODUCTION. The repair of losses of substances in the leg, ankle and foot, which are produced by high-energy trauma, are a challenge for orthopedic surgeons. For this, the reverse flow sural fascio-cutaneous flap appears as a viable and safe alternative for cutaneous coverage of substance losses or complications of traumas and fractures exposed in these regions.

Methods: MATERIALS AND METHODS.
In the period from January 2014 to May 2018, 40 reverse flow sural flaps were performed. Thirty-eight patients of the 40 operated on were evaluated once one patient lost the follow-up and another did not meet the inclusion-exclusion criteria, therefore, they were not considered in the analysis.
As an inclusion criterion, all patients operated on to make a reverse flow sural fascio-cutaneous flap regardless of age, gender or agent causing the lesion were considered and patients with associated pathologies such as rheumatoid arthritis, peripheral vascular diseases and the abandonment of the disease were excluded treatment.

Results and Conclusions: Of the 40 patients analyzed, the average time of hospitalization was 45.3 days, since all the patients were discharged from the hand surgery team after 24 hours of the procedure.
The series consisted of 32 male patients and 8 female patients with an average age of 38.9 and 31 years, respectively.
Of these patients only three were not victims of direct trauma, being hospitalized for chronic osteomyelitis, cutaneous pressure ulcer in a patient with diabetes mellitus and another derived from spinal cord injury with paraplegia.
Traumatic causes included motorcycling accidents with 17 cases, corresponding to 42%, followed by falls of height with 11 patients, corresponding to 27%, followed by road accidents, direct traumas, crushes, etc.
A total of 11 complications were identified, corresponding to 27% of the total cases, with the partial necrosis identified in 6 patients, of which four were closed by second intention and two required skin graft placements in necrosis. A case of ischemia of the flap, interpreted as a strangulation of the pedicle, had the need to reposition the flap in its normal anatomical position.
There was survival of all the flaps performed, with satisfactory coverage of the lesions despite the complications described.
CONCLUSION.
The reverse flow sural flap, with wide fascia segment, is a useful and versatile flap that can be easily lifted to reconstruct soft tissue defects of the leg in the middle and distal third, ankle, hindfoot and foot.

Keywords:
sural flap, soft tissue lesion, loss of cutaneous substance
CAMPER'S CHIASM: ANATOMICAL STUDY AND CLINICAL IMPLICATIONS IN FLEXOR TENDONS SURGERY

List of authors:
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2 University of Padua (Padova)

Objectives / Interrogation: The complete lesions of the flexor tendons are complex problems in hand surgery. In cases of concomitant lesions of the flexor tendons in zone 2, the exclusive tenorrhaphy of the flexor digitorum profundus (FDP) or the tenorrhaphy of the FDP associated with one of the two slips of flexor digitorum superficialis (FDS) is the intervention that most limits the development of a flexor-extensor deficit in the post-operative period. Inside digital channel, FDS is divided into two slips, ulnar and radial, before insertion from a fundamental structure for stability and dynamic function: Camper's Chiasma. The purpose was to establish correlation between anatomical structure and flexor tendon function at Camper's chiasm, and describe relationships between chiasma and surrounding structures (phalanges, pulleys, skin folds and vincula). This can guide for the best operative option. Another objective is to provide a rational basis for choice the FDS slip to be sacrificed in palliative procedures.

Methods: 36 fingers in 9 hands were studied from fresh corpse. A broken-line incision was made on the volar skin of the fingers. The skin flaps and subcutaneous tissue were lateralized and pulleys were incised exposing flexor tendons. We have observed the anatomy of Camper's chiasma with its vascularization and we have measured the distances between chiasma, articular structures and pulleys.

Results and Conclusions: In all examined fingers we observed a certain degree of asymmetry in the representation and direction of the two slips of the FDS which constitute the chiasm. In most cases at level of II and III finger the ulnar band is constituted by a greater quantity of fibers and some of these decusses in a unidirectional manner at the level of the Camper's chiasma reaching and reinforcing the radial insertion. Inverse behavior was often observed at the IV and V finger of the hands examined. This asymmetry seems to be correlated with the vascular supply by vincula longa. Contrary to literature, we have observed a constant asymmetry of Camper's chiasm tendon fibers. The direction of the tendon structures and the force vectors that are activated during the flexion could be an explanation for this asymmetry for blood supply at the level of one of the two FDS slips. This could guide the surgeon towards the choice to repair and protect the most vascularized slip in case of post-traumatic reconstruction or elective transposition surgery, with advantages for good healing.

Keywords:
BILATERAL CARPAL TUNNEL SYNDROME: A COMPARATIVE STUDY BETWEEN THE RELEASE OF THE SIMULTANEOUS MEDIAN NERVE AND IN TWO STAGES BY LOCAL ANESTHESIA WITH EPINEPHRINE

List of authors:
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¹ Puc Campinas University (Cotia)
² Puc Campinas University, Hospital Santa Casa de Porto Alegre (Cotia)

Objectives / Interrogation: Carpal tunnel syndrome (CTS), is the most common of the peripheral nerve compression syndromes of the upper extremity. Generally, patients have bilateral symptoms. The counterpoint of the need for an earlier return to both daily and professional routine work associated with new outpatient anesthetic techniques has led to studies for the simultaneous decompression of the carpal canal. Such assumptions underscore the importance of decision making in relation to the patient with bilateral symptoms and surgical necessity. In order to perform surgery on an ambulatory level, either in one or both upper limbs, without the need for tourniquet and sedation, the local anesthesia technique with lidocaine and epinephrine combination has been shown to be a good option. Thus, the proposal of this study is to compare the functional and satisfaction results of the median nerve release simultaneously and in two stages in patients with bilateral carpal tunnel syndrome and in these, to verify the feasibility of the local anesthesia technique with the use of lidocaine associated with epinephrine.

Methods: This is a prospective study with data analysis (DASH, functional quality of life, return to activities, ENMG and patient satisfaction) of 106 patients. Divided into two groups, group I underwent bilateral surgery simultaneously and group II underwent two-step surgical procedure using local anesthesia proposed in both groups.

Results and Conclusions: DASH from preoperative to postoperative showed improvement in both groups, with a greater variation in group I from 27.1 to 10.1. The return to daily activities of group I was 7.39 days and the mean of the two values in group II was 5.66 and the sum was 11.31. The return to practical activities was 19.12 days in group I, the mean in group II was 23.95 and the sum of 47.91. Minimal bleeding was observed after the skin incision and dissection in 86.3% without compromising the surgical field. In 2 cases, anesthesia was required. Conclusion: bilateral nerve release performed simultaneously and in two stages presents good results, with significant improvement of the DASH and the time of return to the work activities in cases operated simultaneously. The local anesthesia technique with lidocaine and epinephrine is safe and effective.

Keywords: carpal tunnel syndrome, bilateral, simultaneous surgery, epinephrine, local anesthesia
Epidemiology of postoperative elbow contracture release and associated factors

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Objectives / Interrogation: Little is known about the epidemiology of elbow contracture or of elbow contracture release. The purpose of this study was to define the incidence of elbow contracture development and release after surgical treatment for elbow trauma and to identify patient and treatment factors that may predict contracture development.

Methods: We queried a national insurance database from 2007 to 2017 to identify all patients treated for elbow trauma with a minimum of 1-year follow-up. We identified the subset of these patients who had a concomitant diagnosis of contracture on follow-up visit. Procedural codes were used to determine the cohort who underwent contracture release. Mean time to contracture diagnosis and surgical release were calculated. Multivariate regression analysis was performed to calculate the impact of age, Charlson-Dey Comorbidity Index (CCI), head injury, obesity, and anticoagulation use on the progression to elbow contracture release.

Results and Conclusions: The study population included 15,368 patients who were surgically treated for elbow trauma with a minimum of 1 year follow-up after fracture surgery. In total, 1,033 (6.7%) patients were diagnosed with a contracture following fracture and, of those, 79 (0.5%) patients ended up receiving contracture release. On average, time to contracture diagnosis was 3.6 months (SD: 7 months; range: 1 day- 39 months) and time to contracture release was 8.4 months (SD: 10.54 months; range: 1 month-51 months). A CCI of 5, age less than 30, age between 50-69, head injury, obesity and male gender were independently associated with progression to surgical contracture release, whereas use of anticoagulation, CCI less than 5 and age greater than 70 were protective.

Table 1. Patient Demographics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total Contracture Patients (n=1033)</th>
<th>Contracture Release (n=79)</th>
<th>Contracture, no Release (n=554)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticoagulants</td>
<td>111</td>
<td>40</td>
<td>71</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Under 30</td>
<td>150</td>
<td>19</td>
<td>131</td>
<td></td>
</tr>
<tr>
<td>31-49</td>
<td>134</td>
<td>18</td>
<td>116</td>
<td></td>
</tr>
<tr>
<td>50-69</td>
<td>380</td>
<td>28</td>
<td>352</td>
<td></td>
</tr>
<tr>
<td>70+</td>
<td>382</td>
<td>14</td>
<td>368</td>
<td></td>
</tr>
<tr>
<td>CCI</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>487</td>
<td>48</td>
<td>439</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>195</td>
<td>13</td>
<td>132</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>114</td>
<td>6</td>
<td>108</td>
<td></td>
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<tr>
<td>3</td>
<td>80</td>
<td>8</td>
<td>72</td>
<td></td>
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<td>4</td>
<td>41</td>
<td>0</td>
<td>41</td>
<td></td>
</tr>
<tr>
<td>5+</td>
<td>116</td>
<td>0</td>
<td>116</td>
<td></td>
</tr>
<tr>
<td>Burn at time of fracture</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>—</td>
</tr>
<tr>
<td>Head Injury at time of fracture</td>
<td>26</td>
<td>5</td>
<td>21</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Obesity</td>
<td>55</td>
<td>10</td>
<td>45</td>
<td>&lt;0.001</td>
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</table>
### Table 2. Odds ratio analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds Ratio 1</th>
<th>Odds Ratio 2</th>
<th>Odds Ratio 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticoagulation</td>
<td>0.37</td>
<td>0.32</td>
<td>0.43</td>
</tr>
<tr>
<td>CCI1</td>
<td>0.62</td>
<td>0.56</td>
<td>0.68</td>
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<td>CCI2</td>
<td>0.21</td>
<td>0.17</td>
<td>0.25</td>
</tr>
<tr>
<td>CCI3</td>
<td>0.69</td>
<td>0.59</td>
<td>0.80</td>
</tr>
<tr>
<td>CCI4</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>CCI5</td>
<td>1.15</td>
<td>1.01</td>
<td>1.30</td>
</tr>
<tr>
<td>Age &lt;30</td>
<td>1.21</td>
<td>1.07</td>
<td>1.37</td>
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<tr>
<td>Age 50-69</td>
<td>1.78</td>
<td>1.60</td>
<td>1.98</td>
</tr>
<tr>
<td>Age &gt;70</td>
<td>0.60</td>
<td>0.52</td>
<td>0.68</td>
</tr>
<tr>
<td>Burn</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Head Injury</td>
<td>2.21</td>
<td>1.86</td>
<td>2.62</td>
</tr>
<tr>
<td>Male Gender</td>
<td>1.87</td>
<td>1.73</td>
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<tr>
<td>Obesity</td>
<td>3.91</td>
<td>3.55</td>
<td>4.31</td>
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</tbody>
</table>

**Keywords:**
Elbow, Contracture, Stiffness
The sural flap for "off-label indications". Retrospective comparative study with the sural flap for classic indications.

List of authors:
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2 FMABC (Sto André)

Objectives / Interrogation: The objective of this study is to verify whether or not the sural flap can be employed to treat wounds other than the classical locations or in the presence of local risk factors for the flap's vascularity.

Methods: Between 2006 and 2016, 44 consecutive cases of sural flaps were performed in 44 patients in two universities hospitals. They were retrospectively analysed in terms of flap viability and divided into two groups according to the indication for the sural flap. Group A was comprised of 31 patients with classical indications for the sural flap such as defects located at the distal third of the leg and hindfoot and with an intact posterior leg. The flaps were elevated from the posterior aspect of the leg at the musculotendinous junction of the gastrocnemius muscle. The pivot point was planned approximately 5 cm proximal to the tip of the lateral malleolus, according to the classical description of Masquelet et al.(1992). Group B was formed by 13 patients with local risk factors that could potentially jeopardise the flap's pedicle (scarring or previous incisions located around the pivot point of the flap at the postero-lateral aspect of the leg) or to cover defects in which the sural flap is not usually indicated such as the middle third of the leg or forefoot. In these cases, the flaps were harvested from a more proximal area than usually are and the pivot point was also moved proximally to avoid scarred areas or pre-existing incisions.

Results and Conclusions: In Group A, there were 6 cases of partial flap loss (19,35%) and 2 cases of total flap loss (6,45%). In Group B, we observed only 4 cases of partial flap loss (30,76%), without any complete flap loss. There was no statistically significant difference in the occurrence of partial or total flap loss among the two groups (p= 0.73). Conclusions: The percentage of flap loss was not increased when the sural flap was used to cover more proximally or distally located wounds, even in the presence of previous incisions or scars nearby the flap's pedicle. Although partial flap loss occurred quite frequently with the sural flap, it did not jeopardize the soft tissue coverage because in most instances it occurred at the more distal and superficial part of the flap.

Keywords:
sural flap, soft-tissue defects, leg, risk factors
A New technique for the treatment of the Distal ulnar fractures associated with distal radial fractures in older adults using intramedullary wiring.

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Objectives / Interrogation: There is no clear consensus about the optimal treatment of distal ulnar fractures associated with distal radial fractures in older people. The aim of this article is to review the impact of intramedullary Kirschner wire fixation of the distal ulna fractures associated with distal radius fracture.

Methods: 17 patients in whom an intramedullary Kirschner wire fixation was used to repair the distal ulna fractures associated with the distal radius fractures were reviewed retrospectively with minimum follow-up of 23.6 months (range, 6-42 months) after surgery. The mean age of the patients were 73.2 years and all of the patients were female.
According to the Biyani Classification of ulnar Fractures, there were 9 simple fractures of the ulnar neck (type 1), 3 T or Y shaped fractures of the ulnar head (type 2), and 4 fractures of the styloid process and neck (type 3), 1 comminuted fracture of the neck and head (type 4).
The surgical procedures were as follows: at first, the distal radius fractures were fixed rigidity with a volar locking plate. Secondly, distal ulna fractures were fixed with antegrade intra-medullary wiring from olecranon to the ulnar head. We investigated the clinical evaluation, the radiological evaluation and complications of these cases.

Results and Conclusions: [Results]
All fracture sites displayed union, and the mean loss of reduction of the ulnar variance was 0.36mm, mean angular deformity of the distal ulna metaphysis was measured 2.5(±3.5) degrees.
The mean motion of the wrist was as follows: flexion 63.6°; extension 71.8°; pronation 85°, supination 87.9°. The Average grip strength was 88.1% of the contralateral uninjured extremity. There were no infections and no wound problems. According to the Mayo wrist score, there were 10 excellent, 5 were good, 2 were poor results at final evaluation. There was no instability of the distal radioulnar joint. 16 patients had a second operation to remove the ulnar wires.

[Conclusion]
For elderly patients, the fixation of distal ulna fracture associated with distal radius fracture using intramedullary wiring can achieve healing with good alignment, satisfactory function.

Keywords:
Distal ulna fractures, distal radius fractures, intramedullary wiring
Treatment of Unstable Scaphoid Nonunion Using Volar Locking plate

List of authors:
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¹ Korea University Anam Hospital (Seoul)
² Korea University Guro Hospital (Seoul)

Objectives / Interrogation: Purpose: The purpose of this study was to assess union and complication rates associated with the use of volar locking plate and wedge bone grafting for the treatment of unstable scaphoid fracture waist nonunions.

Methods: Methods: A total of 8 patients (7 male and 1 female; mean age, 32.38 years) with unstable scaphoid waist nonunions were treated by reduction of the collapse deformity, insertion of volar wedge bone graft, and internal fixation with the use of volar locking plate and screws with a mean follow up of 9.25 months. The mean duration of nonunion was 19 months. Three of the 8 patients were smokers. Thumb spica splint was recommend for 2 weeks after operation and The wrist is then supported with a removable thumb spica brace until there are radiographic signs of scaphoid healing. Union was determined by radiographs and computed tomography, and range of motion, scapholunate and radiolunate angles were calculated on final radiographs and follow-up computed tomography.

Results and Conclusions: Results: All 8 scaphoids united in a mean time for 8.5 weeks (6 - 12 weeks). Both scapholunate angle and radiolunate angles decreased, returning to normal range. The average extension-flexion arc of the injured wrists was 128 degrees (59° flexion, 69° extension), which was improving 34% of pre-operative range of motion and 16 % less than that of the uninjured wrists. Pro- and supination were normal. All patients had satisfactory correction of scaphoid deformity and the associated dorsal intercalated segment instability. No hardware problems were identified and no revision procedures have been necessary during follow-up period.

Conclusion: The use of volar locking plate with wedge bone graft for the treatment of unstable scaphoid nonunion is safe and effective. It may provide rapid union and permit earlier rehabilitation of the wrist.

Keywords:
Nonunion, Scaphoid, Wedge bone graft, Scaphoid plate
Osteoid osteoma of the third metatarsal bone: A case report

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Objectives / Interrogation: Osteoid osteoma is a benign bone tumor composed of osteoid and atypical bone. The most commonly known sites of following tumor are long tubular bones, especially femur and tibia. Yet, development of osteoid osteoma in the foot is unusual, and there aren't much reported literatures of metatarsal osteoid osteoma.

Methods: A fourteen-year-old boy was presented in our outpatient clinic with five months history of painful swelling over the dorsal aspect of the left forefoot. Radiographic evaluation, including anteroposterior and oblique views of the foot, demonstrated a small radiolucent area in mid-diaphysis area of the third metatarsal bone, surrounded by reactive sclerosis.

Axial computed tomography of the third metatarsal bone showed enlarged metatarsal containing low attenuation nidus with intrinsic calcification and surrounding sclerosis.

As for surgical intervention, longitudinal incision on the lateral side of the third metatarsal was used for exposure. With guidance of K-wire under C-arm image intensifiers, and the lesion and surrounding bone were surgically excised using rongeur to match the contour of the original metatarsal.

Results and Conclusions: Osteoid osteoma developed in metatarsal bone is relatively rare. A detailed clinical history with a high index suspicion is required for accurate diagnosis. For immediate and permanent remission of symptoms without recurrence, adequate surgical excision of the tumor lesion is essential.

Keywords:
osteoid osteoma
TIP FINGER TRAUMATIC INJURY. TREATMENT WITH SEMI-PERMEABLE MEMBRANE

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Objectives / Interrogation: Tip finger injury is a prevalent pathology in manual workers. Different surgery techniques have been described for their treatment, with the aim to restore length, functionality and to recover sensitivity in tip finger pulps. Our work shows that, by using the conservation treatment with semi-permeable dressing, good results are obtained without causing injury to adjacent parts of the hand, as in the case of flaps and grafts. Moreover, finger length could also be preserved.

Methods: A retrospective study was carried out in 33 patients, 43 fingers, with one-year follow-up, using Professor Dr. Rodolfo Cosentino's classification (TYPE A Amputation with right angle A1- Distal without bone exposure. A2- through bed nail. A3- next to bed nail matrix. A4- next to interphalageal joint. TYPE B- dorsal angulation amputation. TYPE C- palmar angulation amputation. TYPE D- lateral angulation amputation)
Injuries type A to D were included. All of the injuries were treated with semi-permeable dressing every seven days, till epithelialization was achieved.
In order to evaluate results, skin coverage time and return time to work were registered. Besides, monofilament test (Semmens-Weinstein) was used so as to measure sensitivity recovery.
Out of the 43 fingers studied and according to Cosentino classification, we registered: A1 (out of 4 cases: 2 full touch recovery, 2 slight touch reduction), A2 (out of 5 cases: 1 full touch recovery, 4 slight touch reduction), A3 (out of 12 cases: 5 full touch recovery, 6 protective touch reduction, 1 anesthesia), B (out of 6 cases: 2 full touch recovery, 4 slight touch reduction), C (out of 10 cases: 2 cases of slight touch reduction, 6 protective touch reduction, 1 protective touch loss, 1 anesthesia) and D (out of 6 patients: 1 full touch recovery, 1 slight touch reduction, 4 full touch recovery)

Results and Conclusions: RESULTS
In 100% of the cases skin coverage was achieved, independently of the traumatic injury mechanism.
Differences were seen as regards reepithelization time according to injury type, presence of sequels at nail level (bed nail, matrix and onychogyphosis flaws), touch recovery and return to work.

CONCLUSIONS
As a conclusion, we can state that the method is simple, easily reproducible, extrapolable in a wide range of ages and injuries, with good functional and cosmetics results without compromising surrounding areas as it occurs in cases of free skin grafts or local flaps.

Keywords:
finger nail tips, semi-permeable membrane, pulps.
Failure of Percutaneous A1 pulley release in Trigger Digits

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Objectives / Interrogation: The purpose of this study is to identify the risk factors that contribute to persistent symptoms after the percutaneous release, thus requiring further treatment such as triamcinolone (TA) injection or open surgery.

Methods: 341 digits (256 patients) of percutaneous A1 pulley release were performed from December 2014 to August 2017 by a senior surgeon at a single center. We excluded 19 patients (25 digits) whose record of underlying medical condition was not available at this center. We conducted a retrospective study on the remaining 316 digits.

Results and Conclusions: During the period, no serious complication (e.g. infection, tendon rupture) was reported, and 2 cases of incomplete release were observed.
41 digits (12.9%) needed additional TA injection to relieve remaining symptoms. 8 digits (2.5%) required open surgery due to persisting symptoms even after TA injection. We had to perform A2 pulley partial release in 5 patients. Tenosynovectomy was performed on 7 patients. During open surgery, FDS thickening was observed in 2 patients, fibrotic tissue formation in 3, and adhesion in 1.

Of the failure cases of percutaneous release, the middle finger was the most common (40.2%), and the thumb came up second (24.1%). However, the thumb was the least likely to receive further treatments after percutaneous release (5.3%). The percentage of additional procedures done was higher in male patients (18.2%, 14 out of 77 digits) than in female patients (14.6%, 35 out of 239 digits). Age showed a negative correlation with the likelihood of receiving further treatment (30.8% in age group 30-40, 14.2% in 50-60, 14.1% in 70-80). But these were not statistically significant. (gender, p=0.456; age, P=0.144).

We investigated whether DM and rheumatoid diseases, both known to affect the connective tissue, were relevant risk factors, but the results were not significant. (DM, P=0.107: Rheumatoid disease, P=0.313).

Most cases which needed additional treatment after percutaneous release of trigger digits had refractory inflammation. Although not statistically proven, male and younger age patients tend to have higher possibility of additional treatments.

Keywords:
Trigger finger, percutaneous release
Long-term results of thumb polydactyly we operated.

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Objectives / Interrogation: Thumb polydactyly is the most common disorder of congenital deficiencies in the hand, and there are many reports. After initial surgery, it causes cosmetic or functional disorders such as deformation, scar contracture, conflict movement disorder, joint disturbance. Those requiring these revision surgeries We investigated 516 cases of poliomyeliasis experienced in the past 30 years and examined the initial surgery and secondary modification with respect to type classification and surgical procedure.

Methods: From 1985 to 2015, there were 516 cases of thumb polydactyly surgery performed at Tohoku University Department of Plastic Surgery and Sendai Medical Center Surgery surgery. Among 516 cases, 341 cases and 366 fingers were observable for 5 years or more. Among those who underwent secondary revision surgery, 81 cases and 84 fingers were found.

Results and Conclusions: The postoperative results were evaluated according to the function evaluation table of the Japanese Surgical Society and their average scores were 18.1 for Wassel type 1, 16.4 for type 2, 14.9 for type 3, 17.2 for type 4, 16.3 for type 5 and 16.1 for type 6. In addition, the evaluation scores increased in all cases where the second modification was made. Surgery of thumb polydactyly is a good result. On the other hand, many cases require secondary modification. In the distal phalanx type, scar contracture revision and joint plasty are often used, and in the case of the proximal phalanx, in addition to them, there are many requiring osteotomy and replacement of abductor pollicis brevis muscles, MP joint formation. Metacarpal bone type had scar revision, surplus bone resection and so on. There were 81 cases of secondary modification, but the necessary surgical method was found out by type. It is necessary to feed back this by secondary revision surgery and verify initial surgery.

Keywords:
sakura
Midterm results of scaphoid excision and bicolumnar carpal fusion using retrograde headless screws

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Objectives / Interrogation: Longstanding un-united scaphoid fractures or scapholunate insufficiency can progress to degenerative wrist osteoarthritis, termed scaphoid non-union advanced collapse (SNAC) or scapholunate advanced collapse (SLAC) respectively. Scaphoid excision and partial wrist fusion is a well-established procedure for the surgical treatment of this condition. In this study we present a novel technique and mid-term results, where fusion is reserved for the lunocapitate and triquetromatate joints, commonly referred to as bicolumnar fusion. The purpose of this study was to report functional and radiological outcomes in a series of patients who underwent this surgical technique.

Methods: This was a prospective study of 23 consecutive patients (25 wrists) who underwent a bicolumnar carpal fusion from January 2014 to January 2017 due to a stage 2 or 3 SNAC/SLAC wrist, with a minimum follow-up of one year. In all cases two retrograde cannulated headless compression screws were used for inter-carpal fixation. The clinical assessment consisted of range of motion, grip and pinch strength that were compared with the unaffected contralateral side. Patient-reported outcome measures, including the DASH and PRWE scores were analysed. The radiographic assessment parameters consisted of bone fusion and appearance of the radiolunate joint space.

Results and Conclusions: The average follow-up was 2.9 years. The mean wrist extension was 41°, flexion 36° and radial-ulnar deviation arc was 43° (70%, 52% and 63% of contralateral side respectively). Grip strength was 40 kg and pinch 8.9 kg, both 93% of contralateral side. Residual pain for activities of daily living was 1.4 (VAS). The mean DASH and PRWE scores were 19±16 and 29±18 respectively. There were three cases of non-union (fusion incidence 88%). Two wrists were converted to total wrist arthroplasty and one partial fusion was revised and healed successfully. The radio-lunate joint space narrowing had progressed in 2 patients but did not affect their functional outcome.

Conclusion: After bicolumnar carpal fusion using retrograde screws, patients of this series maintained a functional flexion-extension arc of motion, with grip-pinch strength that was close to normal. These functional outcomes and fusion rates were comparable with standard 4-corner fusion technique. This technique has the advantage that compression screws are placed in a retrograde fashion which does not violate the proximal articular surface of the lunate, preserving the residual load-bearing articulation.

Keywords:
Carpal fusion, SNAC, SLAC
Hybrid vascularized bone and soft tissue transfer for massive bone and skin defect of the digit. -Surgical Technique and mid-term follow up-

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Objectives / Interrogation: Although living bone can be transplanted as a vascularized bone graft for traumatic injuries with massive bone and dorsal skin defects of the digit, it is difficult to work the bone into various fine shapes, especially if the parts required are small and contain joints. Applying a free bone graft raises concerns regarding bone resorption, fracture of the grafted bone, and non-union of the docking site. We hypothesize that a vascularized periosteal flap (VPF) from the medial condyle of the femur[1] can promote the blood flow for free bone molded in fine shaped and provide the bed for the free skin graft. The purpose of this study is to evaluate the VPF promote remodeling of the free bone graft and provide the bed of skin graft in clinical setting.

Methods: We reconstructed a bone defect with inadequate surrounding soft tissue using a free bone graft wrapped with a vascularized corticoperiosteal flap from the medial condyle of the femur. We expected the vascularized periosteum to augment blood flow for the free grafted bone and to provide the bed for the free skin graft. We utilized this procedure in 2 cases of traumatic bone injury with a dorsal skin defect of the digit that occurred in industrial accidents.
Results and Conclusions: The vascularized corticoperiosteal grafts from the femur prevented atrophy and resorption of the free grafted bone, promoted bone remodeling, and provided a less bulky appearance of the skin. This method could be a useful option for reconstructing wide defects of small bone with a poor-quality surrounding environment.

Keywords:
Hybrid reconstruction, free bone graft, free skin graft, vascularized corticoperiosteum flap

References:
Clinical characteristics of primary and post-traumatic osteoarthritis of the distal radioulnar joint

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Objectives / Interrogation: Distal radio-ulnar joint (DRUJ) is one of the most frequently affected joint with osteoarthritic (OA) change among wrist articulations. Most articles regarding the DRUJ OA is surgical procedure-oriented, and usually includes both OA and rheumatoid arthritis as the subject. There are few reports which are etiology-oriented, and information about detailed clinical characteristics of the primary and post-traumatic DRUJ OA are lacking.

Methods: Twenty-six wrists with in 23 patients (13 male and 10 female) underwent surgical intervention in our hospital between Apr 2009 and Mar 2017. Their medical records were retrospectively reviewed. Fisher's exact test was used to compare the primary (group A) and post-traumatic (group B) DRUJ OA.

Results and Conclusions: Group A consisted of 21 wrists of 8 male and 10 female patients with an average age of 74.7 year-old. Fifteen (83.3%) of them were in their 7th or 8th decades (p=0.089). In 8 patients who had unilateral surgery, contralateral wrist X-ray showed asymptomatic DRUJ OA, thus 11 (61.1%) had bilateral OA (p=0.037). All of these wrists had ulnar variance of 3 mm or more. Wrist pain tended to be less in group A. Only 3 wrists were with severe pain, and 9 wrists were painless. The most frequent chief complaint was dropped finger(s) in 15 patients (p=0.055). In 7 patients, attritional extensor rupture was observed in more than 2 fingers. None had supination restriction.

Group B consisted of 5 wrists of 5 male patients with an average age of 63.8 year-old. The gender ratio was significantly different from group A (p=0.046). Two had malunion of the distal radius fracture, and 2 had malunion of the Galeazzi fracture-dislocation. One wrist sustained growth arrest of the ulna after a physis injury of the distal ulna in his early teenage. The patients in group B tended to have severe pain (4 wrists, p=0.062), and supination was less than 50 degrees in 2 wrists (p=0.004). In 2 patients, attritional rupture of extensor tendon to the little finger was noted, but there was no patient with multiple finger involvement. Primary and post-traumatic DRUJ OA exhibited distinct clinical characteristics. Most patients with primary OA were over 70 year-old, and bilateral involvement suggested inherent wrist morphology as an etiological factor, therefore the primary OA might increase as the population ages. The wrist pain tended to be mild in primary OA, and the patients often sought medical attention only after the extensor tendon rupture occurred.

Keywords:
distal radioulnar joint, osteoarthritis, extensor tendon rupture
KAPLAN DISLOCATION IN CHILDREN: A RARE PATHOLOGY AND A NEW REDUCTION TECHNIQUE

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Objectives / Interrogation: INTRODUCTION: Kaplan dislocation is described as the blocked palmar displacement of the second metacarpal head in the ligamentous and tendinous structures, which generates an eyelet mechanism that limits the reduction with conventional techniques. This presentation is very rare in children and the lack of knowledge makes treatment difficult that can lead to complications derived from inadequate management.

OBJECTIVES: To evaluate clinically the pediatric patients with diagnosis of Kaplan dislocation and propose a new reduction technique in the pediatric population.

Methods: METHODS: Retrospective Case Series study. Six male patients were evaluated, with an average age of 9.3 years. All of them underwent the proposed reduction maneuver (rotation and ulnar deviation). Clinical and radiological follow-up was performed at 6 months.

Results and Conclusions: RESULTS: In five of six (83%) patients, the proposed closed-reduction maneuver was performed successfully: hyperextension of the index MF while performing rotation and concomitant ulnar deviation of the joint. One of the patients required an open reduction by palmar approach. Post-reduction mobility evidenced almost complete arcs in all patients. There were no complications associated, presence of joint stiffness or instability.

CONCLUSIONS: Kaplan dislocation in children is not frequent. The classical maneuver of reduction is just successful in around 10 - 20 % of the cases. Closed-reduction should be attempted with the proposed maneuver that seeks to reject the volar plate of the MF joint to facilitate its reduction. Its success rate is high, as 83% if it is done early (less than 72 hours). This maneuver is a very good management option with very good clinical and functional results.

Keywords: CHILDREN, KAPLAN DISLOCATION, PEDIATRIC TRAUMA, METACARPOPHALANGEAL DISLOCATION.
SAILOR FINGER

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Objectives / Interrogation: A series of fractures in finger phalanges in sailors' hands, occurring during their work at sea, with completely different retellings as to how the injuries were caused, raises suspicion on whether they could have been self-inflicted. The aim of this report is to reproduce in cadaverous upper limbs the mechanisms related by patients and compare their fracture pattern. The results confirmed the hypothesis of self-inflicted injuries

Methods: Between 2014-2017, 76 patients were assisted in our center. They were sailors in fishing ships, presenting phalange fracture and finger traumatism. All of the cases were reported to have happened in the high seas and all of the fishermen work for three fishing companies with the same labor risk insurance company. Classifying the fractures according to AO classification, we found that 41% belonged to type 78.2.2.3.A1, 30% were type 78.2.2.2A1 and 18% type 78.3.3.2.C, 11% showed variable patterns.
42% had injuries in multiple fingers, 13% combined injuries in one finger. 45% had a single injury in only one of their fingers. The mechanisms described were: 9 cases for winding, 28 for squid pills, 16 caused by doors, 5 for de-glazing, 9 for tray handling and 9 due to falls from height. In order to confirm our hypothesis related to self-inflicted injuries, we carried out cadaverous test using 34 three-phalange fingers reproducing the mechanisms described by patients.

Results and Conclusions: The cadaverous test showed a lack of relationship between the descriptions made by patients and the results obtained when reproducing the mechanism on cadaver upper limbs.
1-In the case of simulated winding using a steel tube, showed only interphalangeal dislocation.
2-As regards simulation of squid pills and de-glazing by using ice blocks, the results showed two type F3 fractures.
3-In relation to injuries caused by slammed doors, two fractures were reproduced with different patterns, depending on the number of fingers involved.
Our hypothesis has been confirmed by using a hammer as injuring tool, which in 100% of the cases reproduced supracondylar fracture (78.2.2.3.A1) and diaphyseal fracture (78.2.2.2A1), which were the most frequent injuries in the patients assisted. The results obtained through cadaverous tests confirmed that the mechanism using a hammer by applying dorsal force.
It is worth mentioning that in 71% of the cases, the patients who were assisted related injuring mechanisms that did not coincide with the mechanism reproduced in cadaverous model.

Keywords: 
Evolution of skin lesion healing in rats submitted to treatment with sterile plastic as a dermal substitute.

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Objectives / Interrogation: Polytrauma patients usually have severe wounds, which require prolonged and costly treatment. Deep skin lesions are characterized by destruction of epithelial tissue and exposure of structures such as fascia, muscles, tendons, and nerves. The healing process occurs through contraction of the wound edges and has three phases: inflammation, epithelization and remodeling, until tissue integrity is achieved. At the closure of these lesions, the simplest form should be used, seeking the best method to achieve the normal function of the limb affected by the lesion. Dermal substitutes are widely used in the areas of reconstructive and plastic surgery. No previous study has investigated if sterile plastic covering a skin lesion would be useful on healing process.

The aim of this study was to evaluate the healing process on induced wounds covered with sterile plastic or rayon bandage in rats.

Methods: We used adult male Wistar rats (~ 420 g, N=9). All procedures were approved by the Animal Ethics Committee. Each rat was anesthetized with 2% isoflurane in 100% O2 and two lesions with 2 X 2 cm separated by 1 cm of distance were carried out in the skin of the rat's back. The lesions were covered with sterile plastic (obtained from the sterile urine collector) or rayon bandage (control) and the edges of both coverings were sutured in the rat skin with 3.0 mm nylon suture. Veterinary Pentabiotic (2000 U/mL, i.m., single dose) was used as prophylactic measure and tramadol (10 mg/kg i.m., every 12 h) was injected for 3 days after surgery for analgesia. At 7, 14 or 21 days after performing the surgery, rats (N=3/group) were euthanized with sodium thiopental (100 mg/kg, i.p.) and the lesion sites were sampled and stored in 10% formalin solution for histological preparation. The tissues were embedded in paraffin and sliced in microtome (20 thickness/slice). Histological sections of the wound were stained using Hematoxylin-Eosin or PicroSirius red and analysed in microscope (Nikon®).

Results and Conclusions: The plastic group shows a slower healing compared to rayon bandage in a period of 14 days and presented a considerable increase of eosinophils at this time point. At the end of 21 days, collagen fibers type 1 and 3 and fibroblasts were found in the healing tissue in samples covered either with sterile plastic or rayon bandage. Conclusion: The sterile plastic could be used as a possible low-cost dermal substitute.

Keywords: skin lesion, dermal substitutes, cicatrization, rats, wounds
Characterization of human nail stem cells

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Objectives / Interrogation: Perfect reconstruction of impaired limb is the ultimate goal of plastic and reconstructive surgery. Comparing to axolotls who can completely regenerate the whole limb, the regeneration ability in mammals are greatly limited. Fingertip is the only compound tissue which can regenerate in human and mice. Regeneration of mouse digit tip requires nail stem cells and their differentiation, suggesting that the nail organ can provide key factors that stimulate digit regeneration. However, the identity and differentiation of human nail stem cells is largely unknown.

Methods: Discarded human fingertip specimens in plastic surgery of congenital polydactyly were used to obtain the nail organ. Immunohistochemistry was applied to detect specific markers and locate different cell types in the nail organ. Immunofluorescence of single-cell preparations of the nail organ was performed to determine the percentage of specific cell populations.

Results and Conclusions: Epithelial cell markers, KRT14 and KRT17, expressed in human nail fold and along the nail bed. At the nail fold, a small cell population positive for KRT17 expressed Ki67 as well. Immunofluorescence of single cell preparation of the nail fold tissue indicated 5% Ki67/KRT17 double positive cells, suggesting a potential stem cell population. Ki67 positive cells were not present in distal nail bed as indicated by both immunohistochemistry and immunofluorescence of the cell suspensions. In conclusion, we identified a potential human nail stem cell population that located at the nail fold and co-expressed KRT17 and Ki67. Single-cell sequencing of the nail fold tissue could be a ideal method to further delineate the identity and the differentiation process of human nail stem cells.

Keywords:
nail stem cells, human, single-cell transcriptome, differentiation
Evaluation of skin lesion healing in rats submitted to Integra treatment as a dermal substitute.

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Objectives / Interrogation: Polytrauma patients usually have severe wounds, which require prolonged and costly treatment. Deep skin lesions are characterized by destruction of epithelial tissue and exposure of structures such as fascia, muscles, tendons, and nerves. The healing process occurs through contraction of the wound edges and has three phases: inflammation, epithelization and remodeling, until tissue integrity is achieved. At the closure of these lesions, the simplest form should be used, seeking the best method to achieve the normal function of the limb affected by the lesion.

Dermal substitutes are widely used in the areas of reconstructive and plastic surgery, and one of the most widely used is the Single Layer Integra®. Nevertheless, no previous study has evaluated the evolution of skin healing through histological analysis in induced wounds.

Objective: This study aimed to investigate the healing process in induced wounds covered with Integra® and rayon bandage in rats.

Methods: We used adult male Wistar rats (~ 420 g, N=9). All procedures were approved by the Animal Ethics Committee. Each rat was anesthetized with 2% isoflurane in 100% O2 and two lesions with 2 X 2 cm separated by 1 cm of distance were carried out in the skin of the rat's back. The lesions were covered with Integra® or rayon bandage (control) and the edges of both coverings were sutured in the rat skin with 3.0 mm nylon suture. Veterinary Pentabiotic (2000 U/mL, i.m., single dose) was used as prophylactic measure and tramadol (10 mg/kg i.m., every 12 h) was injected for 2 days after surgery for analgesia. At 7, 14 or 21 days after performing the surgery, rats (N=3/group) were euthanized with sodium thiopental (100 mg/kg, i.p.) and the lesion sites were sampled and stored in 10% formalin solution for histological preparation. The tissues were embedded in paraffin and sliced in microtome (20 m thickness/slice). Histological sections of the wound were stained using Hematoxylin-Eosin or PicroSirius red and analysed in microscope (Nikon®).

Results and Conclusions: The tissue samples covered with Integra® presented as good cicatrization as rayon bandage at 7 and 14 days, with migration of fibroblasts and collagen type 1 and 3 formation. The great migration of fibroblasts was observed at 21 days, in which the healing was completed.

Conclusion: The data suggest that Integra® act as a great dermal substitute helping for fast skin healing.

Keywords: cicatrization, wounds, dermal substitute, integra
Open treatment of the recalcitrant lateral epicondylitis: Clinical outcome and postoperative ultrasonographic change of the ECRB tendon status

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Objectives / Interrogation: To report on the clinical outcome of the open treatment of the recalcitrant lateral epicondylitis and the postoperative change of the ECRB tendon status using ultrasonography

Methods: Included in this study were 38 patients (10 male, 28 female; mean age, 51.8 years) who underwent the open excision of the degenerative portion of the ECRB for their recalcitrant lateral epicondylitis. Preoperative ultrasonography was performed in all patients. Postoperative ultrasonography was performed at 4 to 6 months (31 patients) and one year (20 patients). The mean follow-up duration was 12.4 (range, 4-40) months. On ultrasonography, preoperative tendon status was classified into three types according to the pattern of the fibrillar disruption (diffuse intrasubstance tear, deep focal defect, large intrasubstance defect). Postoperative ultrasonographic change was recorded according to the degree of restoration of the fibrillar pattern (minimal, moderate, complete). Tendon thickness was also recorded at each time of the ultrasonography and the change was compared.

For a functional evaluation, Visual Analogue Scale (VAS) pain score, The Disabilities of the Arm, Shoulder and Hand (DASH) score, Patient-Rated Elbow Evaluation (PREE) score were recorded and compared with the preoperative data.

Results and Conclusions: At final follow up, VAS improved from a preoperative mean of 4.2 (at rest), 5.7 (at daily living activities) and 8.9 (at sports or occupational activities) to a postoperative mean of 0.3, 1.3 and 2.3, respectively (P < .001). DASH and PREE also improved significantly from a preoperative mean of 59, 130 to a postoperative mean of 4, 29 respectively (P < .001). Preoperative ultrasonography revealed hypoechoic area and swelling and the disruption of the fibrillar pattern of the ECRB origin in all patients (diffuse intrasubstance tear 17; deep focal defect 12; large intrasubstance defect 9). Preoperative mean of the tendon thickness was 6.2 mm at long axis and 5.6 mm at short axis. At postoperative 4 to 6 months, tendon thickness increased to 7 mm and 6.7 mm but decreased to 6.2 mm and 5.9 mm at postoperative one year. Of 20 patients with ultrasonography at one year, the degree of restoration of the fibrillar pattern was minimal 0, moderate 8 and complete 12. Conclusively, open treatment of the recalcitrant lateral epicondylitis yielded satisfactory clinical improvement. Postoperative follow-up ultrasonography showed restoration of the fibrillar pattern and the change of the ECRB tendon thickness.

Keywords:
recalcitrant lateral epicondylitis, open treatment, ultrasonography,
A new entity of carpal instability non dissociative after wrist fractures

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Objectives / Interrogation: Adaptive carpal instability following mal-united extra-articular Colles' fracture is a well-recognized condition. Yet carpal instability non-dissociative (CIND) after intra-articular distal radius fractures or radiocarpal dislocation has not been reported. This study aims to report this new entity.

Methods: 12 patients with an average age of 32 years old were identified with CIND, 9 after intra-articular fractures and 3 after radiocarpal fracture-dislocations between 2013 and 2018. Ten patients exhibited CIND- volar intercalated segmental instability (VISI) radiographically at different post-operative periods, while 2 patients exhibited CIND- dorsal intercalated segmental instability (DISI) already present at initial post-operative x rays.

In cadaveric dissections, CIND-VISI displacement could be reproduced by applying an axial loading and dorsal shearing force on a wrist with sectioned short radiolunate ligament and dorsal radiotriquetral ligament. For the intra-articular fractures with CIND-DISI malalignment the cause is most likely a result of a volar radiocarpal extrinsic ligament injury combined with intra-articular incongruity of the scaphoid fossa.

Results and Conclusions: Eight out of 12 patients with severe wrist pain underwent additional surgery. Three patients with reducible CIND-VISI had open capsular repair and temporary radiocarpal trans-fixation while 5 patients with fixed non-reducible malalignment were treated with radioscapholunate arthrodesis. At an average follow up of 2.3 years, pain relieved was noted, together with an improvement in the grip strength and a functional range of movement of the wrist. Radiographically the wrist alignment was corrected and maintained in the 8 patients. No surgical complications were observed.

This article describes a new CIND entity that may present after acute wrist injuries. Most of the patients are young and are involved in high energy trauma. High index of suspicion is warranted in patients presented with stiffness at the sub-acute period. Early detection of the malalignment can preserve the joint mobility by capsular repair. In cases with fixed deformity, a limited radiocarpal fusion is recommended for treatment.

Keywords:
carpal instability, radiocarpal dislocation, distal radius fracture, wrist trauma, CIND, VISI, DISI, cadaveric dissection
Evaluation of the use of collagen membrane in the repair of joint cartilage lesion in an animal model.

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Objectives / Interrogation: Joint cartilage injury can occur due to joint diseases, especially osteoarthritis, genetic or metabolic conditions, or as a result of trauma. The articular cartilage is a specialized tissue, formed by hyaline matrix and does not present vascularization, innervation or lymphatic network, thereby, when it is injured due to trauma or degenerative process, it presents little capacity for intrinsic regeneration. Studies related to cartilage regeneration are extremely important in the search for possible interventions that accelerate regeneration or minimize the degeneration of articular cartilage.

Objective: To evaluate the use of the equine collagen membrane in the repair of lesions in the articular cartilage of rats by histological analysis.

Methods: Six adult male Wistar rats (~420 g) were used. All procedures were approved by the Animal Ethics Committee. The animals were randomly divided into 2 groups with 3 animals each. Each group corresponds to the postoperative time of 21 days after the accomplishment of the chondral lesion of 2 mm width in the femoral intercondylar region. All rats were submitted to a chondral lesion only in one knee, and rats were submitted to the placement of the equine collagen membrane (Biocollagen®), or sterile plastic for protection. Veterinary Pentabiotic (2000 U/mL, i.m., single dose) was used as prophylactic measure and tramadol (10 mg/kg i.m., every 12 h) was injected for 3 days after surgery for analgesia. Rats from each group were euthanized with sodium thiopental (100 mg/kg i.p.) and the knees were collected for evaluation of the lesion site for histological analysis. If any tissue was observed in the lesion site the one was embedded in paraffin and sliced in microtome (20 m thickness/slice). Histological sections of the tissue were stained using Hematoxylin-Eosin and analysed in microscope (Nikon®).

Results and Conclusions: The tissue formed in the knees submitted to the placement of the equine collagen membrane (Biocollagen®) presented hyaline cartilage with typical mature chondrocytes and chondroblasts. No tissue was found in the knees of the rats in which sterile plastic was placed in the chondral lesion.

Conclusion: The equine collagen membrane (Biocollagen®) showed to be an inducer cartilage repair.

Keywords:
Cartilage, cicatrization, scaffold, membrane, biocollagen
Outcomes of release of the entire A4 and partial A2 pulleys for distal zone 2 primary flexor tendon repair in 27 fingers

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Objectives / Interrogation: We report the outcomes of using 6-strand M-Tang repair method in 27 flexor digitorum profundus (FDP) tendons in distal zone 2 of 23 patients followed by postoperative early active motion.

Methods: We used the 6-strand repair in repairing 27 FDP tendons of 23 patients in the past 4 years. The patients aged 17 to 63 years old, average 34 years. There are 18 men and 5 women. Twelve tendons were in zone 2A, fifteen in zone 2B. All patients were repaired primarily in the day of injury or within the first or second days after injury. The FDP tendon was repaired with a 6-strand M-Tang repair using 4-0 looped suture and sparsely placed simple running peripheral suture with 6-0 or 5-0 nylon. The C1, C2, A3, A4 pulley was completely released and A2 pulley was partial released in all fingers. After surgery, the fingers were immobilized for 3-4 days and active motion was initiated after that. The patient was encouraged to move the fingers interphalangeal joints and metacarpophalangeal joint to about ½ of the total motion range in the first 1-3 weeks after repair. Then the patient proceeded to full range of active motion around the end of week 3. The active motion was performed mostly out of splint and splint was used at the intervals not performing any motion exercise and during night.

Results and Conclusions: We tested the gliding of the repaired tendon during surgery through passive full extension and flexion of the repaired fingers immediately after repair and all repairs passed the test. There was no repair rupture in this case series. The functional outcomes were evaluated with Strickland criteria. The mean total active motion of fingers was 158° at 5 to 27 months of follow-up. The recovery of function was excellent in 17 (63%), good in 8 (30%), fair in 0 (0%) and poor in 2 (7%) fingers. No bowstringing was found in the fingers after venting of partial A2 pulley and entire A4 pulley during follow-up.

Conclusions: Releasing of entire A4 pulley and partial A2 pulley does not cause tendon bowstringing and achieve high excellent and good rate. We conclude that a strong repair method, such as the method used in this report, should be used and pulley should be vented properly to allow smooth tendon gliding, and early out-of-splint active motion is safe.

Keywords:
zone 2, tendon, repair, pulley
CHRONIC DISLOCATION/INSTABILITY OF THE BASE OF THE FIFTH METACARPAL - MULTILIGAMENTARY RECONSTRUCTION TECHNIQUE

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Objectives / Interrogation: The chronic dislocation without fracture is very rare, acute event is less than 1% of hand injuries, and literature does not report cases of chronic dislocation or instability with the cartilage intact. We described two cases and proposed a surgical technique with clinically evaluation.

Methods: A retrospective series of cases study who underwent a ligament reconstruction with the proposed technique. We evaluated pain (VAS), passive and active movement with goniometer, injured and contralateral hand strength with dynamometer, and surgical procedure satisfaction.

Surgical Technique: Dorsal curvilinear incision is made over the fifth carpometacarpal joint. Release interposed fibrosis, then fix the fifth metacarpal to the hamatal, and the forth metacarpal with kirschner wires. The radial hemi tendon of the ECU is taken, with a drill perform a tunnel in the fourth metacarpal between the metaphysis and the shaft, the tendon is directed from ulnar to dorsal, then placed below the insertion of the ECU, and sutured with periosteum or anchored suture over the hamatal.

Results and Conclusions: RESULTS
Two male patients, with 31.5 years of average age, 5.5 months evolution prior surgery, VAS pain 10. One year of POP follow up. Wrist: Flexion: 40 ° and extension 45 °. Pinch straight 8 kg and grasp force 19 kg; 82.5% and 73.3% comparative grip and pinch force. Averaged pain at rest 0 and 1.5 with activity. All patients were satisfied, and no complications reported.

CONCLUSION
There is no treatment in the literature for the chronic injury with undamaged cartilage. The ligament reconstruction tries to restore the anatomy and also maintains the alignment of the joint allowing stability in this mobile joint, does not restrict movement, does not alter the function of the ECU, have good comparative hand function and does not rule out the use of other surgical procedures in patients in whom the described technique fails.

Keywords: CHRONIC DISLOCATION, FIFTH METACARPAL INSTABILITY, MULTILIGAMENTARY RECONSTRUCTION
Non-Tuberculous Mycobacterial tenosynovitis of the hand

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Objectives / Interrogation: The incidence of the hand among musculoskeletal infections caused by Non-tuberculous mycobacterium (NTM) is very rare. Especially, Only a small number of cases have been reported in NTM tenosynovitis of the hand, there has been controversy about appropriate treatment including antibiotic therapy, surgical debridement, and time of drug administration. We report outcomes from two Korean hospitals responding to chronic tenosynovitis of hand caused by NTM treated with surgical debridement and drug administration.

Methods: From January 2010 to December 2017, twenty patients who had a NTM tenosynovitis of the hand were treated at two center. There were 8 male and 12 female patients. The average age was 63.65 years. Symptom were present for 1–24 months (average 9.3 months). A history of trauma or operation was reported in 11 cases. The history of steroid injection before diagnosis was average 1.15 times. Most common species is Mycobacterium intracellulare (11 cases), second is Mycobacterium marinum/ulcerance co-infection (3 cases). Mycobacterium chelonae, Mycobacterium abscessus, Mycobacterium Szulgai, Mycobacterium gordonae, Mycobacterium kansasi, Non-classified were each a case. All patients have been treated by combination therapy - extensive tenosynovectomy and antibiotics. The average period of antibiotic administration was 9.13 months and the mean times of surgical debridement were 2.75 times. Depending on the site of tendon involvement, surgery was required more frequently in cases of extensor tendon (average 3.86 times) than in cases of flexor tendon (average 2.0 times). (p=0.012)

Results and Conclusions: NTM tenosynovitis of the hand is rare and difficult to diagnosis and treatment. In this study, it was found that the species of mycobacterium were different from those of previously published papers, and this might be due to occupational and regional differences. And there is difference in the number of operations between the extensor tendon and flexor tendon. Because that most extensor tendons lack an extensive retinacular system, so well-localized infection of extensor tendons is rare. Since diagnosis is often difficult, clinical suspicion is the most important step of treatment for NTM infection. It takes at least 3 months for response to combination treatment of NTM infection. Therefore, physician should explain to patient sufficient explanation of the progress of diseases.

Keywords:
Tenosynovitis, Non-tuberculous mycobacterium, Hand
Internal brace augmentation of the scapholunate interosseous ligament repair: A biomechanical study

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Objectives / Interrogation: Acute, complete tears of the scapholunate interosseous ligament (SLIL) are best treated by open reduction and direct repair. However, direct repair of this ligament is often unreliable. It is not easy to repair securely, and therefore requires a long period of pin fixation and postoperative cast immobilization. Internal bracing (IB) is a new augmentation method using Fiber tape that has been applied to an orthopedic applications. However, there is no published paper about the SLIL injury treated by this augmentation. This study aimed to compare the biomechanical strength of SLIL repair only and repair augmented with IB.

Methods: Fourteen fresh frozen cadaveric specimens (7 matched pairs) were used in this study. From each matched pair of specimens, one limb was randomly assigned to underwent repair only and the contralateral limb was underwent repair augmented with IB. In the repair only group, dorsal, palmar, and proximal parts of the SLIL were sharply dissected off its scaphoid attachment site and the dorsal part was repaired using 2 single-loaded suture anchors. In the repair with IB augmentation group, the augmentation using Fiber tape (Internal Brace, Arthrex) was performed using SwiveLock suture anchors after the repair. Each specimen was mounted on the Instron machine. Specimens were preloaded to 3 N and then cyclically loaded in tension from 3 to 25N for 30 cycles. After cyclic testing, specimens were tested in tension to failure at a rate of 20 mm/min. Load to failure, extension, and stiffness were calculated, and the mode of failure was noted.

Results and Conclusions: In cyclic tensile testing, the pattern of repair with IB augmentation is much similar to the intact dorsal SLIL model than that of repair only. In other words, under the load of 3 to 25 N, IB augmentation made a condition very similar to the intact ligament. In the repair with IB augmentation group, the maximum extension and the hysteresis were significantly lower than in the repair only group in each cycle. In load to failure testing, the repair with IB augmentation group demonstrated a significantly higher the ultimate load (37.7N vs 98.5N) and load at clinical failure (4mm; 33.4N vs 84.1N) compared with the repair only group. The SLIL repair with IB augmentation demonstrated significantly higher strength compared with the repair only. However, additional testing of the orientation, location, and number of IB should be followed to effectively address flexion of the scaphoid.

Keywords:
Scapholunate interosseous ligament, direct repair, internal bracing, augmentation
ONE STAGE FLEXOR TENDON RECONSTRUCTION USING A SILASTIC ACTIVE TENDON IMPLANT. TEN YEARS OF EXPERIENCE.

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Objectives / Interrogation: INTRODUCTION: The idea of reconstruction in only one stage arose when the extraction of the implant was declined by one patient with good results. This study is the first Case-Series with this treatment

OBJECTIVES: 1. Evaluate clinical and functional results after the management with a single-stage procedure in flexor tendon after chronic injuries using a Silastic active tendon implant. 2. Analyze the biomechanical behavior of the Silastic tendon implant

Methods: Case Series Study. Biomechanical tests of the silastic tendon were performed in the mechatronic engineering laboratory to determine the long-term viability of the implant. Thirty-eight (patients were included, four of them presented situations that led to the removal of the implant and a second time with the conventional technique. 34 patients preserved the active silastic tendon. The longest follow-up is 14 years. 63.2% (24/38 patients) had >10 year follow-up period, with an average of 10.8 years. Two personal assessments (May 2010 - June 2017) of the clinical status were made. The DASH score was used

Results and Conclusions: RESULTS: In the biomechanical tests we found a critical point of failure due to a tear of the tendon fibers in the metallic-elastomeric anchor interface at a breaking load of 400N. This value shows that there will be NO alteration in the functionality of the silastic tendon in the long term because the loads during daily activities (35N) are lower than those of rupture. 100% of the patients improved the previous function and range of motion with an average recovery of 105 degrees for the thumbs and 157 degrees for the long fingers. Complications were few, a non-infectious local reaction and a rupture of the proximal suture. We did not find the presence of complications such as loosening of the implant, infection, rupture or migration, functional loss or joint stiffness. Two patients presented mild mechanical discomfort in the distal phalanx with the pressure at the distal anchor site. Final evaluation with the DASH scale showed a general average of 3.4 (range of 1 to 8)

CONCLUSIONS: The functional and biomechanically results are excellent and the tendon does not alter its function in the long term, which allows its use as a definitive management in the treatment of chronic lesions of the flexor tendons. This technique is a valid and safe option with few complications for the management of these injuries since, regardless of the result of the same, conventional management in two stages will always be available

Keywords:
Flexor tendons. Graft tendon only one time. Trauma of the hand. Flexor tendon injuries. Flexor tendon reconstruction. Silicone tendon
Tips under the Skin: a Simple but Great Modification of Extension Block Pinning for Mallet Fractures

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Objectives / Interrogation: The pins exposed out of the skin keep the patients from washing their hands after the surgery for mallet fractures. The aim of this study was to report the feasibility of placing pin tips under the skin in extension block surgery for mallet fractures.

Methods: We buried tips of all pins under the skin while performing extension block pinning for mallet fractures. 14 mallet fracture patients treated with such a modified procedure were reviewed. To prevent subsidence, the pins for extension block and distal interphalangeal (DIP) joint transfixation were inserted until it just penetrated the volar cortex and to the subchondral bone of the middle phalangeal base, respectively. Then the pins were cut shortly enough to place the tips under the skin. Postoperatively a bulky dressing was applied with or without an aluminum finger splint. The patients were allowed to wash their hands 4-5 days after the surgery, without any dressing or splinting. The pins were removed mean 8 weeks after the surgery.

Results and Conclusions: Solid union was achieved in all 14 fractures. No pull-out or subsidence of the pin was observed. No patient developed infection or other pin-related complications. Mean extension lag at final follow-up was 4° and mean DIP flexion was 75°. Placing pin tips under the skin appears to be a feasible modification in extension block surgery for mallet fractures. Our modification allows patients to wash their hands and keep their bread-an-butter jobs soon after the surgery.

Keywords:
Mallet fracture, Extension block pinning, Pin-related complications
Effectiveness of median nerve decompression in carpal tunnel syndrome in the early postoperative period

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Objectives / Interrogation: Carpal tunnel syndrome (CTS) is a compression of the median nerve in carpal canal. The aim of our research was to compare the results of treatment with an open and an endoscopic method.

Methods: In order to achieve the aim we needed to assess the functions of hand before and after surgery from the patient's point of view according to the DASH questionnaire and cross section area (cm²) of the median nerve by using ultrasound investigation. 40 patients were selected and divided into two groups group 1 (n = 20) - patients who had open median nerve decompression; group 2 (n = 20) - patients who had endoscopic median nerve decompression. There

Results and Conclusions: There were no statistically significant differences between assessed parameters in groups 1 and 2 (p > 0.05). Conclusion: in the early postoperative period, endoscopic decompression is as effective as the open decompression.

Keywords:
carpal tunnel syndrome, median nerve
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THE SAFETY USE OF ONE-PER-MIL TUMESCENT INFILTRATION INTO VIABLE SKIN TISSUES THAT ONCE SUFFERED FROM AN ISCHEMIC INSULTS

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Objectives / Interrogation: OBJECTIVES: In the field of hand surgery, the 'wide-awake' anaesthetic technique using one-permil-tumescent has been shown to allow the possibility of safely and successfully performing on unimpaired vascularity tissues. This study is aimed to establish fact that the methods could also be used safely on viable skin flaps, in which the tissues once suffered from an ischemic condition.

Methods: METHODS: 40 groin flaps from 20 healthy Wistar strained-Rattus novergicus weighing 220-270 grams were conditioned to acute ischemia by clamping the pedicle for 15 minutes. Merely totally survived and viable flaps on the seventh postoperative day were randomly divided into: One-per-mil tumescent infiltration group(A), normal saline infiltration group(B), and control group(C). Before and after the infiltration, transcutaneous oxygen tension (TcPO2) measurement was performed, and the changes values were calculated by statistical analysis using ANOVA and Paired T-Test. Viability of flaps was assessed clinically and by using Analyzing Digital Images® 7 days later.

Results and Conclusions: RESULTS: TcPO2 readings yielded a decreasing value significantly (p<0.001) following both One-per-mil tumescent and normal saline infiltration. All groin flaps had successfully survived with no signs of tissue necrosis.

CONCLUSION: The effect of One-per-mil tumescent injection on viable skin flaps was found safe. This result may bring out a consideration of using one-per-mil tumescent injection as local anaesthesia for assisting the future secondary reconstructive procedures such as flap revision or furthermore, reconstructive procedures after finger replantation.

Keywords: ischemia, skin flap, one-permil-tumescent
Comparison between with or without axillary nerve neurotization for the management of upper brachial plexus palsy.

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Objectives / Interrogation: Restoration of elbow flexion & shoulder abduction is the aim in the treatment of upper brachial plexus injury. Intraplexus surgery is the mainstay of treatment but most of the time is not possible. Our objective is to assess the result of neurotization for the management of upper brachial plexus palsy.

Methods: From January 2014 to June 2018, we have operated 48 cases of upper brachial plexus palsy cases, duration >3 months with C5, C6 ± C7 root avulsion or disruption close to the foramina. Age <60 years old. SAN to SSN transfer and double fascicular neurotization of MCN was done in all cases. Axillary nerve neurotization was done in 16 cases out of 48 patients.

Results and Conclusions: Among 48 patient, 45(93.75%) was male & 3(6.25%) was female, with the mean age of 24.8 years, mean time from injury was 4.8 month & mean follow-up was 18 months (range 6 to 48 months). With double fascicular neurotization of MCN(Oberlim-II), Grade M4 elbow flexion was restored in 45(93.75%) cases remaining 3(6.25%) patient elbow flexion power was M3 and age of those patient was >45 years. We achieved mean shoulder abduction 900 (range 500 to 1100) in those patients who are treated only SAN to SSN neurotization procedure but neurotization of SSN and axillary nerve case mean shoulder abduction was 1100(900-1700). Average strength of elbow flexion was also improves in both SSN & axillary nerve neurotization cases that was 4.5 kg in comparison with only SSN neurotization cases, 3.8kg elbow flexion we achieved. Grip strength decreased by a mean 3kg in the first week postoperatively, then gradually increased on average of 18.2 kg pre-operatively to 24.3kg at the end point follow-up at 1 year.

Our results of neurotization technique for upper brachial plexus injury cases reveal a high percentage of success with excellent results in elbow flexion strength. In cases of shoulder abduction, neurotization of both SSN & axillary nerve reveals excellent result but only SSN neurotization cases, shown limited shoulder abduction.

Keywords:
Axillary nerve, fascicular, neurotization
The Critical Ligamentous Stabilizers of the Intercalated Segment. A Cadaveric Study

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Objectives / Interrogation: Isolated injuries of the scapholunate interosseous ligament (SLIL) are insufficient to cause changes in scaphoid or lunate posture on static radiographs. Complete injuries of the SLIL may not produce lunate extension or increases in scapholunate gap (SLG) and scapholunate angle (SLA) acutely. Disruption of secondary ligamentous stabilizers are critical. The aim of this study was to evaluate the role in carpal posture of the long radiolunate (LRL), scaphotrapeziotrapezoid (STT) and dorsal intercarpal (DIC) ligaments in a cadaveric SL instability model.

Methods: 30 fresh-frozen forearm specimens were randomized to 5 ligament section sequences, studying SLIL, LRL, STT and DIC. The DIC-lunate insertion (DIC_L) and scaphoid insertions (proximal pole and waist, DIC_S) were studied separately, DIC insertions on the trapezium and triquetrum were left intact. Loaded posteroanterior and lateral standardized radiographs were taken at baseline and repeated after each ligament was sectioned. After each step in the sequence, wrists were subject to cyclic loading (71 N load). Radiolunate angle (RLA), scapholunate angle (SLA) and dorsal Scaphoid Translation (DST) were measured in lateral radiographs with load, scapholunate gap (SLG) was measured in loaded PA views. Statistical analysis was conducted using ANOVA for repeated measures with Bonferroni poshoc analysis.

Results and Conclusions: Complete sectioning of the SLIL did not increase RLA, SLA or SLG. Section of SLIL and LRL (p=0.002), STT (p=0.011) or DIC_L (p=0.02) significantly increased RLA. Dorsal intercalate segment instability (DISI) was recreated with SLIL + STT or SLIL + DIC_L + DIC_S disruption. SLA significantly increased when in addition to SLIL, the STT (p=0.0008) or DIC_L (p <0.03) were cut. SLG increased when SLIL, DIC_L, DIC_S, and STT were cut in Group 1, all ligaments sectioned (Groups 2, 3 and 5) or SLIL, LRL, STT and DIC_L in group 4.

Conclusions
In addition to SLIL, division of at least one major secondary ligament stabilizer of the scaphoid or lunate (STT, DIC_L or LRL) produced significant changes in lunate extension.
SLA increase was recreated when SLIL and scaphoid (STT) or lunate (DIC_L) ligamentous attachments were sectioned.
There is a spectrum of radiographic manifestations of Scapholunate dissociation, depending on the secondary stabilizers injured.

Keywords:
scapholunate injury, scapholunate dissociation, dorsal intercalated segment instability, DISI, secondary ligament stabilizers, wrist, ligament, carpal, carpal instability
Immobilization Versus Early Active Mobilization After Surgical Repair of Injured Extensor Tendon of Hand and Forearm.

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Objectives / Interrogation: Extensor tendon injuries are very common injuries in hand & forearm, which inappropriately treated can cause severe lasting impairment of hand function of the patient. After the extensor tendons repair whether to immobilization or to early active mobilization is debatable. Compare the two common protocols, immobilization vs. early active mobilization by using a simple static splint after surgical repair of extensor tendon

Methods: This prospective randomized study was conducted in the Department of Orthopaedic Surgery, BSMMU, Dhaka for duration of January 2014 to December 2017. Forty (40) patients of extensor tendon injuries in zone V-VIII were selected. The patients were divided into two groups by sealed envelope technique, Group A-immobilization group & Group B-early active mobilization group. Extensor tendon was repaired by Doyle proposed technique. Mayo Wrist Score and Dargan criteria were used for evaluation of final result at 12th months.

Results and Conclusions: Mayo Wrist Score and Dargan criteria were used for evaluation of final result at 12th months. Results: Most of the patients were in 3rd decade. Male and right hand injury were predominant in both groups. More than one third, (35.0%) patients were factory worker in immobilization group and 8(40.0%) in EAM group. Majority 17(85%) patients had glass cut injury in both groups. Nine (45.0%) patients had Zone VI injury in immobilization group and 10(50.0%) in EAM group. In immobilization group out of 72 tendon injury EDC injury was 37(51.38%) and in EAM group out of 69 tendon injury EDC injury was 37(53.62%). Complications developed 6(30.0%) in immobilization group and 4(20.0%) in EAM group. Satisfactory outcome was 85% in immobilization group and 95% in EAM group at 12th months. Assessment at 12th weeks and 6th months were statistically significant (p<0.05) but not at 12th months between two groups.

EAM by using simple static splint following extensor tendon repair shown faster recovery, gain complete range of motion and improved grip strength at early post operative period.

Keywords: Extensor tendon ,Repair, Immobilization, Early Active Mobilization.
Significance of tissue savage and sensory recovery in avulsed finger replantation

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Objectives / Interrogation: To achieve satisfactory results in replantation of complete finger avulsion injury remains to be a great challenge. The aim of this study was to assess the outcomes of a series of procedure including microscopic debridement, nerve and vein graft, and tendon transposition in replantation of complete finger avulsion.

Methods: A total of 32 cases with complete avulsed fingers injuries in the past 15 years were included. The mean follow-up period was 5.1 years. Microscopic debridement was performed in all cases. Tendon transposition was performed when the tendon lacerated from muscle belly. Arterial defect was bridged by vein graft from foot. Nerve laceration was trimmed to expose normal nerve papilla and bridged by autologous cutaneous nerve graft. The total active range of motion, sensation, pain, cold intolerance, and percussion tenderness of the digits was assessed. Patient satisfaction with the aesthetic outcome was assess by using the Michigan Hand Outcomes Questionnaire.

Results and Conclusions: The complete survival rate of replantation was 87.5%. Partial necrosis occurred in the left 3 cases, which was repaired by secondary flap transfer. The replanted digits had a mean static 2-point discrimination of 7.8 mm (6 -14 mm), a mean total active range of motion of 185°, and a mean grip strength of 27.4 kg. A total of 53% digits had mild cold intolerance. Only 3 patients reported mild percussion tenderness. A total of 90.6% of the patients were satisfied with the appearance of the reconstructed fingertips.

In conclusion, microscopic debridement was essential to check the tissue status after complete avulsion injury and create the condition for anastomosing. Primary nerve and vein graft, as well as tendon transposition, was advocated to achieve high survival rate and functional outcomes.

Keywords: complete finger avulsion, replantation
Scaphoidectomy with four-corner fusion using dorsal locking plates: a retrospective study with mid-term follow-up

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1 CHRU Nancy (NANCY)
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Objectives / Interrogation: Scaphoidectomy, combined with four-corner fusion, is commonly used to treat scapholunate and scaphoid nonunion advanced collapse (SLAC; SNAC) wrists. We evaluated the effectiveness of this technique using the Medartis Aptus 4CF locking plate in a retrospective study followed up for at least two years.

Methods: We included all patients with SNAC or SLAC wrists grade 2 or 3 who underwent scaphoid excision with four-corner fusion using the Aptus 4CF dorsal locking plate (Medartis® Four-corner fusion dorsal locking plate, Medartis AG, Basel, Switzerland) between January 2010 and February 2015. A total of 50 patients (42 men, 8 women) were included and were followed up for at least two years.

All operations were performed in our department by the same surgical team, and all patients underwent clinical and radiologic assessments by an independent observer.

Results and Conclusions: Fifty patients (median age 58 years; range 23-80 years) underwent surgery. Median pain scores decreased from 9 (range 6-10) to 3 (range 0-8). Postoperative wrist motion was statistically significantly improved, both in flexion and extension (medians, 30° vs. 60° in flexion; 20° vs. 40° in extension). Similarly, ulnar and radial deviation improved from 20° to 30° and from 10° to 30°, respectively. Median grip strength improved significantly after surgery (80% vs. 57% of contralateral grip strength at last follow-up). Nonunion occurred in 7/51 (13.7%) wrists, and conversion to total wrist fusion was necessary in 5/51 (9.8%) wrists. We achieved successful fusion in 44/51 (86.3%) cases. Scaphoidectomy with four-corner fusion using the Aptus 4CF locking plate resulted in successful joint fusion in 86.3% of wrists and led to statistically significant reduction of pain and ROM as well as statistically significant improvement of grip strength. However, we believe that regardless of the type of material used, it is crucial for successful joint fusion to respect all surgical steps, namely complete removal of the cartilage and subchondral bone, proper positioning of the implant, use of a healthy bone grafts from the distal radius, and compliance with a an immobilization period of 4 to 6 weeks.

Keywords:
Four-corner fusion, arthrodesis, scapholunate advanced collapse, scaphoid nonunion advanced collapse, plate
A new strategy with locked-wire type external fixator (the Ichi-Fixator) for hand fractures

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Objectives / Interrogation: Recently, there are plenty of commercial external fixators for hand fractures. However, they are difficult to adjust after application. The ideal external fixator in hand is low profile and adequately rigid for early mobilization, and easy to apply and modify. We developed adjustable linking wire type of external fixator that enable to use all type of fractures and possess several unique features, including exclusive use in hand fractures and on-site, on-demand construction. The aim of this study is to demonstrate its ease of application, low profile, and simple design as well as the possibility to apply it as a static as well as a dynamic fixator.

Methods: The Ichi-Fixator (Neomedical, Saitama, Japan) set includes three different size metal clamps and wires (1.2, 1.5, 1.8mm diameter, two type of each in smooth needle and partial thread screw). For the use of distraction type of external fixator, the basic construct of the Ichi-fixator is made of two wires bent into a wire frame and secured together with two special adjustable metal clamps fixation with small two screws. Because of the adjustable function of small screws inside of fixator, the Ichi-Fixator enable to modulate under fluoroscopic inspection such as a static or distraction fixator for simple or comminuted diaphysis fractures of all phalanges and all metacarpal, and all interphalangeal joints and the thumb metacarpal joint as well as a dynamic fixator.

Results and Conclusions: Twenty-two patients in a variety of fracture patterns were treated with Ichi-Fixator. The fixator was rigid and maintained reduction in all fractures. The procedure lasted 20 to 45 minutes. Ichi-Fixator were removed in a mean period of 6 weeks, and follow-up was 6 to 15 months. Averaged the QDASH score was decreased from 78.69 to 12.35 and the VAS score was decreased from 6.75 to 1.44. The grip strength and total active motion were 84.9% and 76.7%, respectively, compared with the contralateral side. There was no wire site infection and no non-unions. There were no pain and returned to all their previous activities without discomfort. The findings of this case series demonstrated that Ichi-Fixator can be considered for all hand fractures requiring surgical treatment, and especially for comminuted fractures. Ichi-fixator enables enhanced security of fixation, facilitates postoperative mobilization, and may allow an immediate return to work.

Keywords:
Hand fractures, External fixator, Ichi-Fixator
Causes of procedural failures of closed reductions using an extension-block pin for bony mallet finger

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Objectives / Interrogation: This retrospective study evaluated procedural failures of closed reductions using an extension-block Kirschner-wire (K-wire) for bony mallet finger.

Methods: A total of 132 patients who underwent a closed reduction for bony mallet finger in a procedure using an extension-block K-wire technique were radiographically assessed. Radiographs were used to evaluate: (1) postoperative displacement of the reduction before or after K-wire removal and (2) inaccurate reduction of the fragment immediately after surgery. The causes of procedural failure and bone union were evaluated using plain anteroposterior and lateral radiographs and medical records of the intraoperative findings.

Results and Conclusions: Out of 132 patients, 17 patients of mean age 48 (range, 17 to 71) years with procedural failure were enrolled in this study. Displacement of the reduction before and after K-wire removal occurred in 7 and 6 cases, respectively. Inaccurate reduction immediately after surgery occurred in 4 cases. The most common cause of procedural failure was inaccurate insertion of the K-wire to fix the distal interphalangeal (DIP) joint (8 cases) followed by inaccurate insertion of the extension-block pin (5 cases). Two patients underwent a second operation. All patients who underwent a single operation had bone union regardless of the displacement of the reduction or inaccurate reduction of the fragment. Caution should be exercised during the reduction and fixation when an extension-block K-wire is used for a closed reduction procedure.

Keywords:
bony mallet finger; displacement of the reduction; mallet finger; postoperative displacement; procedural failure
Arthroscopic assisted reduction versus fluoroscopic reduction in treatment for AO type C intra-articular distal radius fracture. A review of functional and radiological outcome between two methods.

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**Objectives / Interrogation:** Arthroscopic assisted reduction versus fluoroscopic reduction in treatment for AO type C intra-articular distal radius fracture. A review of functional and radiological outcome between two methods.

**Methods:** Between April 2016 and March 2018, 24 patients (15 males, 9 females, average age 57.3, follow-up time 12.5 months) were recruited into 2 groups and retrospectively reviewed. In Arthroscopic group, articular fragments are reduced and stabilised with K-wire arthroscopically. All patients in 2 groups had fractures fixed with volar distal radius locking plate. Active range of motion, grip strength, Modified Mayo Wrist (MMWS) score and Quick Disabilities of the Arm, Shoulder, and Hand (DASH), radiological assessment in distal radius parameters were assessed.

**Results and Conclusions:** Arthroscopic group had statistically better restoration in articular stepping and gapping as well as volar tilt and ulnar variance. Wrist extension and flexion, forearm pronation and supination as well as grip strength also have statistically improvement when compared with conventional fluoroscopic method.

Concomitant intra-articular soft tissue injuries were detected in arthroscopic group (5 TFCC tear, 3 Scapho-lunate interosseous ligament tear and 1 Luno-triquetral interosseous ligament tear) and treated accordingly.

Arthroscopic group had 2 excellent, 2 good and 8 satisfactory results whereas fluoroscopic group had 1 good, 8 satisfactory and 3 poor results with better mean MMWS score (P=0.02). However, Quick DASH score failed to show any difference.

Our study showed arthroscopic assisted technique precisely restore the distal radius radiological parameters with good functional outcome. Also, missing intra-articular soft tissue injury can be avoided and treated simultaneously.

**Keywords:**
distal radius fracture, wrist arthroscopy, fixation methods, outcome measures
Operative Treatment Options For Treating Pediatric Hand Fractures and Presentation of Results

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Objectives / Interrogation: Fractures in the bones of the hand are a common injury both in children and adolescents. Hand fractures which are unstable, oblique, or have a rotational deformity, or are pathologic or open are an indication for surgery.

Methods: The authors evaluated in a retrospective study the therapeutic options and results of operatively treated paediatric hand fractures of patients treated between 1st January 2016 and 1st January 2018. Gender distribution, age specifics, fracture mechanism, operative treatment method, and final results after metal removal were inspected. In the above period altogether 42 patients were treated because of the fracture of one or more long finger phalanx (33/42) or fracture of the metacarpus (9).

Results and Conclusions: In the case of the phalangeal injuries (33/42), 21 patients were male and 12 were female. All patients with the metacarpal fractures were male. Most injuries occurred both in the phalanx (25/33) as well as in the metacarpus group (9/9) above the age of 10. The most common mechanism of injury was direct trauma caused by a ball. Among the patients with phalangeal fractures an identical function to the contralateral side was found in 28/33 patients, whereas in 5/33 patients good functional results were found. In the metacarpal injury group identical functional results to the contralateral side were found in 7/9 patients, good function was seen in 1/9 and bad function was found in 1/9. In most phalanx injured patients the external retention (aluminum splint, plaster, orthesis) was removed at the 3rd week, whereas the K wires were removed on the 5th-6th week. In the case of patients treated with elastic nails because of a metacarpal fracture (7/9), the involved finger was taped to the neighbouring intact finger. Following a week in a cast, functional therapy was started with a physical therapist. The elastic nail was removed after complete remodelling of the fracture. In the cases of angle stable plate osteosynthesis (2/9) we used external fixation till the healing of the soft tissue. In these cases there was no metal removal.

Conclusion: In the case of hand injuries requiring operative treatment, one should always strive for an accurate reduction. In the case of minimally invasive methods, the most stable and simple fixation should be used. By choosing the above operation types in most cases outstanding results can be achieved in childhood and adolescence.

Keywords: Paediatric hand fractures, treatment,
Unplanned excisions of soft tissue sarcomas of the upper extremity

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Objectives / Interrogation: Unplanned excisions of soft tissue sarcomas is a surgical challenge and overall treatment should be individualized. The aim of the study is to investigate the outcome of repeated surgical treatment of these patients.

Methods: A retrospective study of 18 patients with non-metastatic upper extremity STS referred for further treatment after unplanned excision. Patients with STS at the fingers were excluded. All patients had initial tumor resection in pieces or histologically microscopic or gross positive resection margins. Tumor resection under local anesthesia was performed in 8/18, while no pre-op imaging was performed in 6/18 of the patients. In 6 patients, a palpable mass was present for 3 to 4 years before resection.

Results and Conclusions: An amputation was performed in 3 patients, while 15 patients underwent re-excision of the surgical field. Negative margins were obtained in 16/18 patients. Flap reconstruction of skin graft was used in 6 patients. Adjuvant radiation therapy were offered in 11/15 of the patients within 5-8 weeks after re-excision. No chemotherapy was administered. Local recurrence and metastatic disease occurred in 1 and 3 patients respectively. Follow-up ranged from 12 to 50 months. A long standing mass does not preclude malignancy. The combination of surgical bed re-excision combined with local radiation therapy offers a low local recurrence rate. Extensive neurovascular and tendon infiltration by the tumor will result in amputation.

Keywords:
soft tissue sarcoma, unplanned excision
The Clinical Outcome of The Novel Hand Therapy Protocol That Based on Staged Outcome Assessment for Zone 1 and 2 Flexor Tendon Injuries -a preliminary study-

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Objectives / Interrogation: We treated by modified Kleinert regimens (mKR) combined with 4 or 6 strands core suture for flexor tendon injuries in Zones 1 and 2 to 2015. Watanabe reported the novel core suture technique that named 8-strand core suture cross-locked cruciate procedure (Watanabe procedure: WP) in 2016. The purpose of developing WP is for establishing the standardized EAM protocol that is not depend on experience of hand therapist. We assessed the cases who treated by mKR and compared the outcome between excellent, good outcome cases and fair, poor cases. Thus, we calculated the cutoff value to set target value up. After that, we invent the novel EAM protocol that based on the target value. The purpose of this study, one is to point the evidence of novel EAM protocol out, another is to indicate the clinical outcome of the patients who treated by the novel EAM protocol.

Methods: We reviewed the outcome of the patients who treated by mKR (34 patients 40 fingers) in our institution between 2008 and 2015. We assessed the ROM of the PIP, the DIP joints, and the outcome of original Strickland's criteria. We define them as A group (35 patients 29 fingers) were Excellent and Good in the outcome of original Strickland's criteria, and B group (5 patients 5 fingers) were Fair and Poor in the outcome of original Strickland's criteria. Thus, we calculated the cutoff value by receiver operating characteristic curve (ROC) after the operation 4, 6, 8 weeks. And we reviewed the the clinical outcome of the novel EAM protocol combined with WP (EAMWP) of 7 fingers 7 patients between 2016 and 2017. We assessed the ROM, the outcome of original Strickland's criteria at final visit.

Results and Conclusions: The mean ROMs in group A and B at 2, 4, 6, 8 weeks are shown in Table 1. Thus, the cutoff value at 4, 6, 8 weeks from the ROC are shown Table 2. We set the target value up, PIP flexion 75°/80°/90°/100°, PIP extension -30°/-20°/-10°/0 °, DIP flexion 40°/40°/50°/60°, DIP extension -10°/-5°/0°/0° at 2, 4, 6, 8 weeks respectively. We established the target value of EAMWP at 2 weeks that based on the result. The original Strickland's criteria of all patients who treated treated with EAMWP was excellent. The mean ROMs are PIP flexion 100±4°, PIP extension -3±7°, DIP flexion 71±10°, DIP extension -3±4° at final visit. There was no complication in 7 cases.

Keywords:
Flexor Tendon Injuries , 8-strand core suture cross-locked cruciate procedure, Hand Therapy Protocol
Endoscopic anatomy in carpal tunnel surgery.

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Objectives / Interrogation: Endoscopic release of the median nerve according to Agee's original technique is limited to section of the flexor retinaculum without endocanalar exploration. We present a video of the modified Agee technique the purpose of which is to explore the carpal tunnel, including its contents and walls.

Methods: The procedure is performed under locoregional anesthesia with a tourniquet at the root of the arm. As soon as the endoscope is introduced into the carpal tunnel, the median nerve is located and section of the retinaculum is only performed afterwards. Once the retinaculum has been divided, exploration becomes easier. By longitudinal rotational movements of the endoscope we may visualize the following anatomical elements: the retinaculum margins confirming its complete section, the median nerve and its motor branch on the radial side, the long flexor of the thumb in its sheath outside, the flexor tendons of the 4th and 5th fingers with their lumbrical muscles on the ulnar side, the uncus of the hamatum and finally, behind the flexor tendons, the anterior capsulo-ligamentous parts of the carpus.

Results and Conclusions: On a continuous series of 100 carpal tunnels, the median nerve was always visualized before section of the retinaculum and the motor branch was visualized 82 times. Release of the motor branch was performed under endoscopy in 27 cases who presented thenar atrophy or a compressive anatomical element. In most of these cases, endocanalar vision associated with passive flexion/extension movements of the first metacarpal, revealed shearing of the motor branch due to fibrous reinforcement of the flexor fascia, this arch was sectioned. The long flexor of the thumb was individualized 87 times, the flexors of the 4th and 5th fingers with the lumbrical muscles 68 times. In 18 cases we found degenerative tendon lesions with a rough hamate. The anterior part of the carpus was visualized by passing the endoscope under the flexor tendons. A synovial cyst was found in one case.

This film shows that the endoscopic technique offers endocanalar anatomical vision with better quality than the classical open technique. It proves that complementary procedures, such as neurolysis of the median nerve and its motor branch, associated with section of the retinaculum are possible by endoscopy. This experience has led us to believe that, just as with wrist arthroscopy for the carpus, endoscopy will become a standard means of exploring the carpal tunnel.

Keywords: carpal tunnel, endoscopy, neurolysis
Does a vascularized proximal interphalangeal emi-joint transfer worth the efforts?

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Objectives / Interrogation: Open intra-articular fractures of digital interphalangeal (DIP) joints occasionally destroy major amounts of joint cartilage and supporting bone with functional limitations. Previous reports described the use of vascularized total joint transfers or not vascularized partial toe joint osteochondral autografts as unique alternatives to salvage proximal interphalangeal (PIP) joints with loss of one condyle when open reduction and internal fixation is not feasible.

Methods: A 22 yo carpenter sustained an open fracture of the non-dominant left index finger middle phalanx (P2) with ulnar condylar loss. A homolateral vascularized 2nd toe proximal phalanx (P1) unicondylar transfer to the left index finger P2 head was undertaken. The defect was templated and a corresponding osteochondral graft was harvested from the head of the 2nd toe P1. The defect was measured intra-operatively and then a slightly larger graft than required was harvested, allowing for in situ adjustment. The osteochondral graft and medial collateral ligament, partial extensor tendon, the ipsilateral artery, vein and digital nerve were harvested and joined at the recipient site with microsurgical technique. The osteochondral graft was secured to the P1 head with 2 transverse 1,0 mm K-wires. All other composite tissues were sutured to the recipient site.

Results and Conclusions: The patient was splinted post-operatively and discharged on the 7th day. An early mobilization protocol of the injured finger was started with hand therapists. At 8 weeks post-operatively the two K-wires were removed. At 6-months follow-up, a pain-free active PIP joint range of motion (ROM) of 10-85° and DIP ROM of 10-50° were obtained, with a grip strength of 42 lbs. No donor site complications were found, and post-op. X-rays at 4 months and MRI at 6 months respectively revealed a good bone union, a normal vascular patency and bone viability of the unicondylar graft.

This report represents an example of vascularized toe unicondylar bone grafting as an alternative tool in the management of significant PIP injuries. In spite of technical demand, this procedure is a feasible and represents an ideal alternative surgical therapy in adults with > 5 mm bone loss and asking for a functional interphalangeal joint.

Keywords:
An increasing burden of bureaucracy due to health insurances in Swiss hand surgery practice: a comparative study over 5 years

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Objectives / Interrogation: Previous international surveys report an increasing dissatisfaction among doctors with several aspects of practice, including income, workload and time consumed by administrative tasks being writing certificates and denied insurance claims among the most tedious. Purpose of the study was to assess the number of certificates for health insurances in a private practice, the prevalence and type of claim denials in hand surgery sent to the major health provider in Southern Switzerland.

Methods: An observational study was made, which retrospectively collected data from the claims and denial reports for ‘surgical’ outpatients in hand surgery, including the number of certificates requested and completed for health insurances during the period 2013 to 2017. The denials were classified into “administrative” (AD) and “clinical” (CD). For each case the cause of denial, the time required to reply to insurances’ requests, end result and time for bills to be paid were recorded. The certificates were divided into 3 categories: accidents, detailed reports for any reason and loss of income.

Results and Conclusions: The overall frequency of denials was 294, equivalent to 5.4% of the total number of invoices issued. The frequency of AD was 82.6%, whereas that of CD was 19.4%. Any CD required an average time of 107.8 minutes of work compared to 6 minutes for AD. In 81% of cases the denial was not justified and led to a final payment of the original bill. The number of CD that required the surgeon’s contribution for the invoice to be paid doubled from 2014 to 2016. The total number of certificates increased from 371 to 525 (+41%) being detailed reports the most noticeable. Our data confirm previous surveys that health insurances and bureaucracy rob patients of doctor’s time with a continuous increasing trend over time. Compared to the U.S. literature the overall prevalence of denials in the studied sample was low but the limit of this study is that denials in private offices and for inpatients were not considered. Administrative denials were the most prevalent but the costs of surgeon’s contribution to insurances’ request should be considered and represented the only way for the reimbursement to happen. An easier coding system and a continuous education of all actors of the health system are mandatory to reduce the burden on surgeons and the billing offices of physician organizations.

Keywords:
Bureaucracy, health insurances, denials, certificates
Usefulness of preoperative MRI in pediatric Monteggia fractures

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Objectives / Interrogation: To clarify whether the preoperative MRI for pediatric Monteggia fracture predicts the cases of irreducible or easily re-dislocated radial head dislocations.

Methods: We retrospectively evaluated 6 patients (3 male, 3 female) below the age of 15 years who underwent preoperative MRI and surgical treatment for Monteggia fractures from 2012 to 2018. The average patient age at the operation was 8.7 years (range, 4-14 y). We initially treated the ulnar fractures including acute plastic bowing deformities by closed or open reduction followed by tried to reduce radial head dislocations by closed means. When the radial head dislocations were irreducible or easily re-dislocated, we performed open reduction. On MRI, we obtained the T2-weighted fat-saturated sagittal images of the injured elbow, and checked whether the annular ligament was entrapped between the radial head and the capitellum. Further, to evaluate an extent of interposed annular ligament quantitatively, we measured the length of entrapped anterior band of annular ligament (d mm) below the posterior side of radial head, and the diameter of radial head (D mm) in both open and closed reduction groups. We calculated and evaluated the d/D ratio in each group.

Results and Conclusions: Out of 6 cases, 3 cases (1 irreducible and 2 easily re-dislocated cases) were underwent open reduction of the radial head. On the basis of preoperative MRI, the annular ligament entrapment was detected in 2 cases (67%) with open reduction of radial head and 2 cases (67%) with closed reduction. Furthermore, in the 4 cases which detected annular ligament entrapment, the value of d/D ratio in open reduction group (0.50 and 0.75) was higher than the ratio in the closed reduction group (0.23 and 0.25). On the other hand, in only one case, open reduction of radial head was needed even though the annular ligament was not interposed in the radiocapitellar joint on the preoperative MRI. In this case, we confirmed intra-operatively subluxation of radial head because of partially injured and slightly elongated annular ligament. These results indicated the possibility of the relevance between the extent of interposed annular ligament and the necessity of radial head open reduction. Meanwhile, in case the annular ligament was partially or fully ruptured, we might not be able to detect interposition on MRI. In the present study, we conclude that preoperative MRI may help predict irreducible or easily re-dislocated patients of pediatric Monteggia fracture.

Keywords:
Pediatric Monteggia fracture, MRI, Annular ligament, entrapment
Maximum utility and certain safety for WALANT Technique in Hand Surgery

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Objectives / Interrogation: The aim of this study is to confirm the utility, safety and benefits of using WALANT technique and to encourage its use in Romania and all over the world for as many different hand and wrist surgeries as possible.

Methods: The study was conducted in a group of 75 patients admitted to our institution starting with January 2017. We included in the study 40 men and 35 women (M/F ratio = 1.14) aged 24 to 76 years. They accounted for 25% of the group of patients with carpal tunnel syndrome (CTS) and 35.71% of the group of patients diagnosed with Dupuytren Disease (DD). The anesthetic used in all cases was a solution of lidocaine 1% with 1:100,000 epinephrine without buffering it with 8.4% sodium bicarbonate. The amount of anesthetic solution used did not exceed 20 mL for CTS and 15 mL for each digital ray affected by DD. Onset of anesthesia took 6 to 15 minutes, being checked by subjective testing of the patient and by monitoring for skin color change at the injection site.

Results and Conclusions: Results
No changes in digital vasculature were found in any of these cases. Hospital stay was of at least 6 hours (due to the lack of infrastructure and a legal system for short-term hospitalization). Only one patient stayed in hospital for 48 hours, the patient being diagnosed with neglected high values essential hypertension and oscillations. The correlation coefficient between the amount of anesthetic and number of digital rays affected by DD is 0.63, for p = 0.0002 (Significance F <0.001), showing a positive, direct and high correlation. Therefore, the significant statistical results can be extrapolated to larger groups. Regression (ANOVA) shows a positive, moderate and direct correlation between the duration of hospitalization and the amount of the anesthetic used in CTS patients, with a correlation coefficient of 0.52, statistically significant with p<0.01 (Significance F=0.002).
Applying regression in ANOVA, correlating the amount of anesthetic used to the entire group with the anesthesia onset time we get a correlation coefficient of 0.43, showing a moderate correlation, but high statistically significant, for p<<0.00001.

Conclusions
The use of WALANT technique in hand surgery is safe and efficient, has many advantages for both the patient and the surgeon and is cost-saving. Complications such as digital necrosis are excluded when 1% lidocaine with 1:100,000 epinephrine anesthetic solution not exceeding the safe zone of 7mg/kg is used.

Keywords:
WALANT, Dupuytren disease, hand surgery
Biomechanical Analysis of Thumb Ulnar Collateral Ligament Tear Kinematics

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Objectives / Interrogation: Although thumb ulnar collateral ligament (UCL) injuries are common, the kinematics of thumb UCL injuries have not been extensively described. The purpose of this study was to assess the kinematic changes of the thumb MCP joint with progressive UCL injury.

Methods: Eleven cadaveric specimens were utilized for this study. Thumbs were dissected of soft tissue while taking care to leave the UCL, volar plate and dorsal capsule intact along with the EPL, EPB and FPL tendons. Each specimen was potted in plaster of Paris and placed in a custom jig for kinematic testing of the thumb. Each thumb underwent kinematic testing in four conditions: intact, partial tear (50%) of the proper UCL, full tear of the proper UCL and complete tear of both the proper and accessory UCL. Kinematic testing parameters included varus / valgus stress, pronation / supination and volar / dorsal translation. Each testing parameter was assessed at -10, 0, 15, 30° of MCP flexion.

Results and Conclusions: Partial tear of the proper UCL did not result in any significant increase in varus / valgus angulation, pronation / supination or volar / dorsal translation (Figure 4) at any degree of flexion. Full tear of the proper UCL resulted in a significant increase in valgus angulation (intact: 11.5 ± 1.5 degrees vs. full tear: 18.8 ± 1.7 degrees; p = 0.024) and pronation at 30 degrees of flexion relative to intact (intact: 12.6 ± 2.3 degrees vs. full tear: 15.4 ± 2.5 degrees; p = 0.034). Complete tear of the proper and accessory UCLs resulted in increased valgus angulation compared to intact at all degrees of flexion (p < 0.001). It also resulted in a significant increase in total pronation / supination relative to intact at all degrees of flexion (p < 0.004). Furthermore, complete tear resulted in significant volar translation at 0, 15 and 30 degrees of flexion (p < 0.016).

Sequential tearing of the thumb UCL leads to progressive instability of the MCP. Partial tear of the proper UCL does not significantly affect the stability of the joint, but full tear of the proper UCL increases valgus instability at 30 degrees of flexion. Complete tear of the UCL is necessary for increased varus / valgus instability at all degrees of flexion and also results in significant increases in pronation/supination and volar translation.

Keywords:
Thumb Ulnar Collateral Ligament Tear Kinematics
Essex Lopresti Fracture-Dislocation

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Objectives / Interrogation: Essex-Lopresti injury is a rare entity that consists of a fracture of the radial head, rupture of the interosseous membrane and disruption of the distal radioulnar joint (DRUJ).

Methods: Case report.

Results and Conclusions: We report a case of a 34 year-old male that fell onto an outstretched right hand. He presented to the emergency department with elbow and wrist pain. Clinical examination revealed elbow swelling with tenderness and wrist and forearm pain with DRUJ compression test. Plain radiographs revealed a comminuted radial head fracture and dorsal subluxation of the distal ulna. Intraoperative wrist examination was compatible with wrist instability and elbow approach revealed a lateral collateral ligament (LCL) injury. He underwent LCL repair, open reduction and internal fixation of the radial head with plate and screws. The DRUJ was reduced spontaneously and it was stable in all positions.
A long arm splint was applied in full supination and 90° of elbow flexion for 4 weeks and 2 weeks with munster - type elbow cast. The patient returned to work 2 months after the surgery. At 6 months follow up he presented without pain. Clinical examination revealed full arc of pronosupination, full flexion and a deficit of 10° in extension. This clinical report aims to highlight the importance of a careful examination of the wrist in all patients with displaced radial head fractures as the diagnosis can be often missed. Prompt diagnosis is mandatory for optimal outcome.

Keywords: Essex Lopresti, Radial Head Fracture, DRUJ Dislocation, IOM Rupture
Tumors of the palm - clinical and imagistic diagnosis

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Objectives / interrogation: The purpose of this study is to highlight the possible existence of rare tumors in hand. Clinical diagnosis can be difficult in these cases and only paraclinical examinations, such as IRM and histopathology, can orient and establish the diagnosis. Therefore, these rare tumors must be considered, even when they are present in hand.

Methods: This study included 14 patients, diagnosed and treated over a period of 9 years. In 7 cases, the tumor was a lipoma. Their localization was the thenar eminence in 6 cases and mid-palm region in 1 case. All tumors were over 5 cm (giant), the sizes of the mid-palm one being 9.5/5/3.5 cm, with a weight of 137 grams. The IRM exam oriented us to the diagnosis of cystic formation, but it did not give other details. Also, in the other 7 cases, the IRM exam was very helpful, with oriented-detailed descriptions for liposarcoma in 1 case, epidermal inclusion cyst in 1 case and rice-bodies tenosynovitis in 5 cases. In the liposarcoma case, the image on MRI was of a heterogenous, poorly encapsulated tumor, with thick fibrous septa and nodules on T1-weighted sequences and hypertenseptae on fat-suppressed T2-weighted. The IRM exam with contrast agent for the epidermal inclusion cyst revealed the presence of a cystic-polyloculated tumor (hypersignal T2, hyposignal T1) with a moderate contrast medium uptake in the wall and septa, located on the palmar face of the right hand, with significant deformations of the region and sizes of approximately 21/22/53mm. For the rice-bodies tenosynovitis, MRI exam showed millimetric and nodular images in flexor group tendon sheath in T2-weighted sequences, thickening of the synovial membrane with increased vascularization, fluid within the tendon sheath, reactive inflammation around the tendon and swelling of the tendon. In all cases, the treatment consisted in surgery with complete excision of the lesions and the histopathological examination established the diagnosis.

Results and Conclusions:

Results
In all cases, the ablation of tumors was performed with good results, without relapse at distance. Socio-professional reintegration was complete and fast, functional and aesthetic results were very good. The patients rated the results with "good" and "very good" in one interview.

Conclusions
Although the clinical examination is sometimes uncertain, the symptoms being similar for different tumors, the imagistic exams, like MRI, can orient us for the best. Of course, the histopathological examination offered the diagnostic certainty.

Keywords:
lipoma, epidermal cyst, rice-bodies tenosynovitis.
Biomechanical Analysis of Thumb Ulnar Collateral Ligament Repair with Suture Tape Augmentation

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Objectives / Interrogation: To assess the kinematics and angular stiffness of the thumb ulnar collateral ligament (UCL) repair with and without suture tape augmentation.

Methods: 8 cadaveric thumbs were tested in a custom hand testing system. Varus/valgus kinematics was measured at -10°, 0°, 15°, and 30° degrees of thumb MCP flexion in the following conditions: (1) intact thumb UCL, (2) complete UCL tear (proper and accessory ligaments), (3) UCL repair, and (4) UCL repair with suture tape augmentation. Angular stiffness was measured after application of sequentially increasing valgus torque in the intact, UCL repair, and UCL repair with suture tape augmentation conditions. UCL repair alone was performed by passing 3-0 FiberWire suture (Arthrex, Naples, FL) in horizontal mattress fashion through the distal UCL from a 3.5 mm DX SwiveLock (Arthrex) at the volar ulnar base of the proximal phalanx. Suture tape augmentation was performed with two tails of 1.3 mm SutureTape (Arthrex) and brought proximally over the repaired ligament and loaded into a 3.5-mm SwiveLock anchor at the proximal origin of the UCL.

Results and Conclusions: Complete UCL tear increased varus/valgus angulation at 0°, 15°, and 30° degrees of thumb MCP flexion (p < 0.02). Thumb UCL repair alone and repair with suture tape augmentation decreased varus/valgus angulation relative to complete UCL tear at all flexion angles (p < 0.002). Total varus/valgus angulation was not significantly different from intact for either the repair alone or the repair with suture tape augmentation at all flexion angles (p > 0.19). Repair with suture tape augmentation had significantly higher valgus angular stiffness compared to repair alone (p = 0.040).

Thumb UCL repair with suture tape augmentation is able to restore varus/valgus kinematics after complete UCL tear. In addition, the higher angular stiffness afforded by the suture tape augmentation may allow for earlier rehabilitation after surgery.

Keywords:
Thumb Ulnar Collateral Ligament Repair Suture Tape
Suppression of finger tremor using dynamic vibration absorbers

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Objectives / Interrogation: A major impediment to precise microscope operation is finger tremor. We evaluated tremor and investigated tremor suppression using dynamic vibration absorbers.

Methods: Postural tremor
We evaluated postural tremor in 10 healthy men (average age: 22.7 years). Piezoelectric elements were attached to the dorsal and radial sides of the index fingers. The palmar bases of the fingers were attached to supports, and the fingers were held in extension. We processed acceleration with an amplifier and analyzer and evaluated the time base waveform and frequency characteristics of biaxial tremors.

Intention tremor suppression
We evaluated intention tremor in 10 healthy men (average age: 22.7 years). Subjects gripped a 30-G needle with a needle holder for microsurgery and held the needle tip in the lumen of an 18-G needle under the microscope. We evaluated tremor perpendicular to the nail surface. A passive type dynamic vibration absorber with a weight that induced 10-Hz natural frequency was prepared. Dynamic vibration absorbers were attached perpendicular to the nail surface, and tremor with or without attachments was evaluated. An active type dynamic vibration absorber with active damping force produced by external energy was prepared. Tremor was evaluated in 8 orthopedic surgeons (average age: 33.6 years) in the same manner as for the passive dynamic vibration absorbers.

Results and Conclusions: Postural tremor
The root-mean-square of the time base waveform was calculated, and postural tremor perpendicular to the nail surface was greater than that parallel to the surface. Peak postural tremor frequency was approximately 10 Hz.

Intention tremor suppression
The root-mean-square of the time axis waveform was 0.50 ± 0.09 (V) when a passive type dynamic vibration absorber was not used and 0.46 ± 0.05 (V) when a vibration absorber was used. However, no significant difference was observed. In some cases, the intention tremor showed a peak frequency of approximately 10 Hz. The peak decreased with the use of a passive type dynamic vibration absorber, but in some cases the peak was not clear and in others the decrease in the peak with use of the passive type dynamic vibration absorber was also not clear.

The root-mean-square of the time axis waveform was significantly suppressed to 19.9 ± 3.4 (mV) when an active type dynamic vibration absorber was not used and 18.1 ± 3.5 (mV) when a vibration absorber was used (p = 0.002).

This study investigated an active type dynamic vibration absorber may be effective.

Keywords:
tremor
Use of ultrasonography in carpal tunnel syndrome diagnosis

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Objectives / Interrogation: The aim of the paper was to analyze the effectiveness of ultrasonography in diagnosing carpal tunnel syndrome (CTS), to propose the use of sonographic index of median nerve in carpal tunnel (SIMNCT), and developing a diagnostic algorithm.

Methods: We study a group of 344 patients with SCC symptoms were examined with ultrasonography. The size of the cross-sectional area of the median nerve was measured at carpal tunnel inlet and outlet, nerve morphology at passage through carpal tunnel and the analysis of the neighboring structures, with the purpose of possibly determining the disease etiology. In all patients, we examined, in the affected hand, the vertical thickness of median nerve (MN) as entering into the carpal tunnel (CT) - G1, the lowest vertical thickness in the CT or leaving the CT - G2, the thickness of the MN in the transverse plane, as entering in the CT - L. Normal values were considered the similar measurements in healthy contralateral hand. We proposed the SIMNCT calculation after the formula: SIMNCT = 100% (1-G2 / G1). We have established normal value in the healthy hand as SIMNCT = 16%.

Results and Conclusions: Results
We demonstrated a statistically significant sensitivity of median nerve sonographic index at carpal tunnel level (p <0.0001) compared with cross-sectional area (CSA) and flattening ratio in the diagnosis of CTS. By analyzing the SIMNCT, developed by us, with a higher value than 16%, we demonstrated a sensitivity of 94.81% and a specificity of 99.66% in establishing the diagnosis of CTS. Thus, we proposed a classification of the severity of CTS according to the SIMNCT: normal = 16%, mild = 16-19%, moderate = 19-28%, severe = 28-50%, very severe over 50%.

Conclusions
Ultrasound is an effective method of studying the morphology of the tunnel and compressed nerve at various CTS stages and of determining the cause of compression in patients this disease. The median nerve sonographic index at the level of the carpal tunnel is a valuable and practical indicator and it can be used in the diagnosis of CTS and, also, it may be helpful in determining the severity of lesion. Is has a more valuable significance than the flattening ratio (sensitivity 4.49%, specificity 97.95%) and the cross-sectional area (sensitivity 88.76%, specificity 32.08%).

Keywords:
ultrasonography, diagnosis, carpal tunnel syndrome
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**Oral presentation or poster presentation**

Soft Tissue Reconstruction and Microsurgery

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**Tamai zone I and II replantation functional and cosmetical results versus conservative treatment: retrospective analysis**

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**Objectives / Interrogation:** There are only relative indications for distal digital replantation in zones 1 and 2 according to Tamai. Replantation is a complex procedure that requires skills in supermicrosurgical techniques, a longer hospital stay and the longer time off from work. On the opposite side a conservative treatment with local flap, in order to avoid further finger shortening, offer to the patient an easier course of treatment and healing. The aim of the present retrospective study is to make a comparison in terms of final functional and cosmetical result between reconstructed and replanted finger tip.

**Methods:** The study included 20 patients who underwent replantations distal to the distal interphalangeal joint or conservative reconstruction meaning direct closure with local flap. Lesion involved zone 1 and 2 according to Tamai classification. In case of replantation arterial anastomosis was accomplished after bone fixation, and venous anastomosis and nerve repair were performed whenever possible. When venous anastomosis was not possible, venous decompression was performed with heparinized gauze placed on the bleeding nail matrix. In case of conservative treatment patients were treated with local finger flaps in order to maintain bone length on distal phalanx. Functional and cosmetical results were evaluate at least after one year with test Semmens Weinstein monofilament, Weber Disk Criminator, total range of motion and quickDASH. Data were statistical analysed with t-Student test.

**Results and Conclusions:** All patient healed with no necessity of further operation on long time. All of them went to post-operative rehabilitation protocol. Functional, cosmetical outcome and sensibility result are presented and compared in respect of objective and subjective patient's daily need and quality of life.

Distal digital replantation is complex and technically challenging, the treatment is more demanding both for surgeon and patient if compared to a local flap. A correct analysis of patient need and an exhaustive explanation of all the potential risk and complication of two different approach is fundamental. Even if one could think that a missing finger tip is not so invalidating, long time results, the high patient gratification and the greater functional limitations of a local flap, justify the replantation attempt.

**Keywords:**
Replantation, Tamai zone, finger flap
Using Abdominal Fasciocutaneous Flap to Salvage the Compromised Replantation

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Objectives / Interrogation: The successful rate of replantation depends on a variety of factors including the mechanism of injury, surgical skills and patient conditions, etc. Sometimes, the failure of replantation is upset and frustrating. We provide a case report that the crushing amputated thumb was salvaged by a abdominal fasciocutaneous flap.

Methods: We present a 29-year-old healthy man who sustained a crushing injury on left thumb. Traumatic amputation was seen at the level of base of proximal phalanx (Fig 1). First attempt of replantation was performed but turned into vascular compromise (Fig 2). Abdominal fasciocutaneous flap was created to salvage the compromised stump on the post injury day 3 (Fig 3). After three weeks, the abdominal flap was divided from the abdomen.

Results and Conclusions: The amputated thumb was preserved successfully on the length and is functioning well in two months (Fig 4-6).
It is not necessary to amputate the stump if replantation fails. Abdominal fasciocutaneous flap can be used as a salvage for replantation when vascular compromise occurs

Keywords:
salvage; Abdominal fasciocutaneous flap; replantation; vascular compromise
Outcomes of Supplemental Bridge Plate Fixation of Highly Comminuted Distal Radius Fractures Treated by Open Reduction Internal Fixation

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Objectives / Interrogation: Dorsal bridge plating has been used in complex comminuted intra-articular distal radius fractures (AO 23-C) as a means of supplemental fixation of poorly supported fracture fragments. This allows a fracture to be held out to length with a prolonged period of wrist immobilisation in order to allow healing and prevent collapse. The evidence regarding the use of dorsal bridge plating is limited to retrospective case series in the literature. Most of these cases have utilised dorsal bridge plating as the primary means of fixation, ie as a distraction technique, without attempt at anatomical reduction and fixation of individual fragments. The aim of this study was to define the outcomes of patients with distal radius fractures treated with ORIF plus a supplemental dorsal bridge plate.

Methods: Two hundred and eighty-three distal radius ORIFs were performed by five senior hand surgeons in a single unit from 1 January 2016 to 31 December 2017. Of these, ten patients were identified as having an ORIF + dorsal plate placed as a neutralisation device. All of these fractures were type AO 23-C3. Average follow-up was 16.4 months post removal of the dorsal bridge plate. Intra-operative and most recent radiology was evaluated for radial inclination, volar tilt and ulnar variance. Objective measurements of forearm, wrist and digit range of motion and grip strength were recorded at last follow-up. Patients' subjective outcome measures were reported. This cohort of ten patients was compared to an age and gender matched group of ten patients treated by the same surgeons with ORIF only and 12 months follow-up (1 AO 23-C1, 3 AO 23-C2, 5 AO 23-C3).

Results and Conclusions: Mean radial inclination was 21 degrees with no difference at last follow-up. Volar tilt was lost in two patients (mean difference 1 degree). Ulnar variance was lost in four patients (mean difference -1 degree). ROM outcomes showed a statistically significant difference in flexion, extension and ulnar deviation when compared to uninjured wrist but no statistically significant measures when compared to the control group of patients. Mean active tip to distal palmar crease was 0.5cm. PRWHE was 22 ± 7 and QuickDASH was 18 ± 6 at final follow-up.

This is the first study that reports on outcomes of neutralisation bridge plating as a supplement to truly anatomical fixation with otherwise "standard" distal radius fixation techniques, and compares a bridge plate series to a case matched control group.

Keywords:
Distal radius. Fracture. Intra-articular. Neutralisation plate. ORIF.
What PROMs measure in Dupuytren's disease: unrecognised issues unmasked by combining PROMs with the Aachen item banking protocol

Objectives / Interrogation: A key assumption of a patient-reported outcome measure (PROM) that delivers a summary score is that the items it comprises all measure the same underlying entity, or construct, i.e. that the PROM is unidimensional.

Two of the most popular PROMs for the study of Dupuytren's disease (DASH and URAM) have been examined previously. The URAM has been found to be unidimensional, whereas the DASH has not.

One issue with such studies is that the analysis has to extract the underlying entities and can only do so if enough of the PROM items relate to each underlying factor.

This study hypothesised that the URAM is not truly unidimensional, but that its multidimensionality would only be unmasked when extra information from DASH answers was added to a relevant model. Such analyses form part of "item banking" where items from multiple PROMs are combined.

Methods: This study involved the secondary analysis of cross-sectional data from 1 and 5-year follow ups of aponeurotomy, fasciectomy and dermofasciectomy procedures performed at 5 UK hospitals. Steps from the Aachen Protocol for item banking were employed, using common person equating, as each patient had completed both the DASH and URAM questionnaires.

Factor analyses were performed using principal axis factoring and promax rotation, and with the number of factors extracted in each analysis based on standard heuristics (scree plots, parallel analysis and Eigenvalue>1).

Separate analyses were run for URAM items and DASH items, and then all items from both were analysed together in a single model.

Results and Conclusions: 433 patients completed DASH and 252 patients completed URAM as well. As in previously published results, the URAM appeared unidimensional when studied in isolation, and the DASH did not - the “symptom” items loaded separately from the “task” items.

However, in the combined model the URAM was no longer unidimensional with questions “can you hold a bottle?” and “can you pick up small objects with your thumb and index finger?” loading alongside DASH items, and not with the rest of the URAM items.

This suggests that these two URAM questions might measure a different construct from the others, but because only two questions are affected, this may not be detected when the URAM items are studied alone.

Conclusions

This study suggests that the URAM may be less valid than previously thought. Consideration should be paid to the design of analyses of PROM validity to ensure that issues affecting small numbers of items are still identified.

Keywords:
Dupuytren's disease, patient-reported outcome measure, PROM, validity, DASH, URAM
The reliability of tomosynthesis for Heberden's node

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Objectives / Interrogation: Radiography is widely used for the diagnosis of Heberden's node, however, few studies have reported the accuracy of this technique. The purpose of this study was to report the intra- and inter-examiner errors in the diagnosis of Heberden’s nodes using radiography and tomosynthesis.

Methods: Our study included 136 fingers (17 persons; 6 men and 11 women; average age, 56.7 years) from individuals who underwent radiography and tomography at our hospital. Three examiners evaluated osteoarthritis using the Kellgren/Lawrence classification, from index to little fingers, of each DIP joint. The inter-examiner error was calculated from the data, which were collected twice in total, by the same orthopedic non-specialist at a one-week interval. Intra-examiner error was calculated from the data of three individuals, of whom two were orthopedic non-specialists (examiners 1 and 2) and one was an orthopedic specialist (examiner 3). For the statistical method, we used Cohen’s kappa and Pearson’s (r) correlation coefficients.

Results and Conclusions: The kappa coefficient for inter-examiner error related to radiographic examination showed a moderate match (examiner 1: kappa = 0.497), and the kappa coefficient for intra-examiner error related to radiographic examination showed a mild-to-moderate match (kappa 12 = 0.571, kappa 13 = 0.404, kappa 23 = 0.343). The kappa coefficient for intra-examiner error related to tomographic examination also showed a moderate match (examiner 1: kappa = 0.571), but the kappa coefficient for the inter-examiner measurement error showed very slight-to-moderate agreement (kappa12 = 0.522, kappa 13 = 0.201, kappa 23 = 0.189). The simple radiography and tomography examination methods showed a very strong correlation, with r = 0.683.

For determining the Heberden’s node grade, the Kellgren/Lawrence classification based on radiographic examination is commonly used. The inter-examiner errors were moderate in radiography and tomography for Heberden’s node diagnoses, but the measurement accuracy of tomography was lower than that of radiography. The correlation between radiography and tomography was considerably strong; therefore, it is unnecessary to perform tomography when diagnosing Heberden’s nodes.

Keywords:
Heberden's node
Prospective study of Stage III Thumb Carpometacarpal Joint Osteoarthritis Treated with Arthroscopic Arthrodesis

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Objectives / Interrogation: The thumb carpometacarpal joint (CMCJ) osteoarthritis (OA) is a common pathology with controversial treatment options. Arthroscopic thumb CMCJ arthrodesis for CMCJ OA had never been reported. The aim of our study is to prospectively evaluate the effectiveness of arthroscopic arthrodesis for the treatment of Eaton stage III thumb CMCJ OA.

Methods: This study prospectively recruited all cases with Eaton III thumb CMCJ OA treated with arthroscopic arthrodesis from January 2015 to June 2017. The patients were evaluated objectively with grip strength, pinch strength, range of motion and Kapandji score. Subjective evaluation include Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire and the visual analog scores (VAS) for pain. All cases were assessed before the surgery and at 3 months, 6 months and 12 months after surgery. Radiographs were reviewed.

Results and Conclusions: There were total 11 cases. The average age was 62.2 with M:F = 2:9. The average follow-up time was 26.3 months. The pre-treatment pain score (VAS) was average 6.4. There was improvement of pain score at post-op 3 months (VAS 3.1, p<0.001), 6 months (VAS 1.2, p<0.001) and 12 months (VAS 0.2, p<0.001). There was improvement of grip strength and pinch strength at 12 months (p<0.001). The Dash score improved at 6 months (p=0.003) and 12 months (p<0.001). There was no significant change in the range of motion of the thumb and the Kapandji score. There was no major complication. There was one case of pseudoarthrosis.

In conclusion, this prospective study is the very first report of thumb CMCJ arthroscopic arthrodesis for stage III thumb CMCJ OA. Arthroscopic arthrodesis is a feasible treatment option and provides excellent pain relief, restore thumb strength and stability, retain thumb mobility, and hence improvement in hand function.

Advantages include: 1) allow clear assessment of joint; 2) Small scar and minimal disturbances of joint capsule and soft tissue; 3) Avoid tendon adhesions and 4) better preservation of blood supply resulting in better union rate.

Future study is needed for long-term result.

Keywords:
1st CMCJ osteoarthritis, finger arthroscopy
The incidence of distal ulna fractures by classification

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Objectives / Interrogation: Distal ulna fractures can occur isolated, but often accompany a distal radius fracture. The aims of this study were to investigate the incidence of distal ulna fractures and by classification examine if any fracture types are more common than others. Further to investigate methods of treatment used.

Methods: Data were collected from all patients aged 18 years or older, treated for a fracture of the distal ulna in our region during 2010-2012. Patients were identified in the national registry of diagnose codes using the ICD 10 system, followed by screening of radiographs. The fractures were classified according to the AO comprehensive classification of fractures with a Q-modifier.

Results and Conclusions: The incidence of distal ulna fractures was 0.00074 per year based on the prevalence during 2010-2012. The most common fracture type was a fracture of the ulnar styloid (79 % Q1), followed by fractures of the ulnar neck (11 % Q2). The rarest fracture type was ulna head fractures (1 % Q4). Patients aged 65 years or older more commonly had a Q2 fracture (14%) or a Q3 fracture (6%). Younger patients, aged 18-34 years, were not found to have fractures of class Q3 or Q4 and only one patient had a Q5 fracture. The mean age at the time of injury was 63 years (SD 18), and 76 % of the patients were women. 92 % also had a fracture of the radius. A fall from standing height on an extended wrist was the cause of trauma in 79 % of the patients. 30 % of all the patients with Q2-Q6-fractures were treated operatively with internal fixation of the ulna fracture. We found the incidence of the distal ulna fractures in adults to be 74/100,000 person-years. In comparison, the incidence of distal radius fractures has been reported to be more than three times higher. Most common is fractures of the ulnar styloid, followed by fractures of the ulnar neck. Fractures of class Q2-Q6 were most common in the population over 65 years, probably due to better bone quality in the younger and middle aged population. We found distal ulna fractures to be more common in females, and a high average age. This indicates that, just like distal radius fractures, distal ulna fractures can also at least partially be explained by the higher incidence of osteoporosis in postmenopausal women. Only a third of the ulna fractures were operated, indicating that most were considered either stable without internal fixation or stable after a concomitant radius fracture was internally fixed.

Keywords:
Wrist, distal ulna, fracture, incidence
EVALUATION OF SCAPHO TRAPEZIUM TRAPEZOID JOINT AFTER THE IMPLANTATION OF A TRAPEZIUM METACARPAL PROSTHESIS.

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Objectives / Interrogation: OBJECTIVE: The aim of this study was to analyze the long term impact on the Scaphotrapezium Trapezoid (STT) joint after the implantation of a Trapezium Metacarpal Prosthesis (CMC).

INTRODUCTION: The STT joint is the second most common site in the wrist affected by degenerative arthritis, usually associated with CMC osteoarthritis. Besides, the function of the STT in the biomechanics of the wrist and thumb is not well known. We evaluated the repercussion of the CMC over time on the STT joint.

Methods: MATERIALS AND METHODS: An observational descriptive retrospective study with 100 patients with CMC osteoarthritis grade III of Eaton who had undergone non cemented “ball & socket” total CMC prosthesis, (an average follow-up of 5.9 years -range 4 to 9 years-), was iniciated to evaluate the clinic, radiological and functional changes over STT joint.

In order to avoid the bias of the effect the prosthesis, we decided to evaluate the patient 6 months after the surgery and nowadays. Results were compared by DASH and VAS scales, articular range of motion and clamp force with Jamar dynamometer.

The STT radiological changes on RX and scanner images were classified according to Crosby et al JHandSurg 1978.

Results and Conclusions: RESULTS: Through this study we found out that 95.2% of the patients were satisfied with EVA scale under 3.5 DASH scale parameters changed from an average of 16.5 to 20.1.

Thumb mobility and clamp force slightly modified from the obtained at 6 months.

Radiologic study showed that in most cases (97%) the osteoarthritic degeneration of STT was not modified by the previous surgery compared with contralateral hand.

CONCLUSIONS:
Osteoarthritic degeneration of STT after the implantation of a CMC prosthesis did not change significantly way compared with its standard evolution.

More studies in patients treated by other techniques or non treated would help its evaluation.

Keywords:
SCAPHO TRAPEZIUM TRAPEZOID JOINT, PROSTHESIS, FOLLOW-UP
Ulnar Nerve Entrapment At The Cubital Tunnel. To Transpose Widely Or Not To Transpose At All?

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Objectives / Interrogation: Ulnar nerve entrapment at the cubital tunnel is the second most common peripheral neuropathy, right after carpal tunnel syndrome. Surgical approaches differ, from the standard treatment of care, ulnar nerve release followed by anterior transposition, to novel minimally invasive approaches performed in outpatient surgery. The objective was to compare outcomes achieved after either minimally invasive neurolysis or ulnar nerve transposition when treating ulnar nerve entrapment at the cubital tunnel.

Methods: We performed a retrospective cohort study with all 19 patients suffering from ulnar nerve entrapment at the cubital tunnel who were submitted to surgery, for 5 years, in our institution. Minimally invasive neurolysis was performed in 5 patients, while complete ulnar nerve transposition was performed in 14. The observed ratio between ulnar nerve entrapment at the cubital tunnel versus carpal tunnel syndrome was 1:78. Pre and post-operative nerve conduction study/electromyography data was collected and compared for outcome. Non-parametric tests were performed, assuming statistical significance whenever p<0.05.

Results and Conclusions: Minimally invasive neurolysis offered a better outcome on nerve conduction study/electromyography data, nearly achieving statistical significance (p=0.065). None of the ipsilateral upper limb neurocompressive complaints (9 patients, 2 for minimally invasive neurolysis, 7 for ulnar nerve transposition), obesity (7 patients, 1 and 6, respectively) or Diabetes Mellitus (3 patients, all submitted to ulnar nerve transposition) were related with a worse outcome (p=0.134; p=0.978; p=0.459).

Minimally invasive neurolysis offered a better outcome on nerve conduction study/electromyography data, nearly achieving statistical significance (p=0.065). None of the ipsilateral upper limb neurocompressive complaints (9 patients, 2 for minimally invasive neurolysis, 7 for ulnar nerve transposition), obesity (7 patients, 1 and 6, respectively) or Diabetes Mellitus (3 patients, all submitted to ulnar nerve transposition) were related with a worse outcome (p=0.134; p=0.978; p=0.459).

Keywords:
Ulnar nerve entrapment, elbow, transposition
Computer-assisted preoperative planning of corrective osteotomy for extra-articular distal radius malunions: Surgical technique and a case series of 10 patients

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Objectives / Interrogation: Corrective osteotomies of the distal radius for symptomatic malunion are time-tested procedures that rely on accurate corrections. The positioning of the radius osteotomy line and the creation of a suitable cortico-cancellous bone graft are the two delicate elements during the procedure. In order to facilitate and obtain more precision for these two steps, we propose an approach consisting of a computer-assisted planning and realization. On the preoperative, CT-scans of the pathological and the healthy wrists are made. On these two exams, radial inclination, ulnar variance and palmar tilt are calculated. On the pathological wrist, it is also specified the height and orientation of the old fracture line. Comparing the data and superpostion procedure will make it possible to obtain the better correction. Using specific software and a 3D printer, Newclip Technics lab will provide a specific osteotomy guide, a perfect graft template and an anatomic locking plate. The length of the screws will also be simulated.

Methods: The approach is anterior according to Henry. Elevation of the pronator quadratus muscle, visualization of the distal radius and the original fracture callus. The osteotomy guide is positioned and stabilized by pins. One of them comes to be placed in line with the future osteotomy. A first scopic control is performed to confirm, the correct position of the osteotomy. The radius osteotomy is then performed with the oscillating saw. Using the same guide, the holes of the epiphyseal screws are made. The guide is then removed. The second step is the realization of a cortico-cancellous iliac graft using the model printed in 3D. Then, we performed the distraction of the osteotomy site and the introduction of the bone graft. The third step is the osteosynthesis using the anatomic plate. The epiphyseal screws are first positioned at the level of pre-holes and the metaphyseal screws thereafter. The final scopic control confirms the good correction of the malunion with restitution of a physiological distal radius anatomy. It is also verified the correct positioning of the osteosynthesis material and the bone graft. Skin closure with drainage completed the procedure. An immobilization during the consolidation will be carried out.

Results and Conclusions: We reported results of the first ten cases operated at the same facility. we noted a significant improvement of the pain and mobilities, a restoration of prono-supination and a systematic consolidation with the stability of the reduction.

Keywords:
3D, Computer-assisted, Corrective osteotomy, Distal radius, Malunion
The Digital Artery Perforator Flaps and Dorsal Metacarpal Artery Perforator Flaps for Treatment of a Soft Tissue Defect of the Finger: Versatile Coverage Options to Avoid the Use of a Skin Graft.

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Objectives / Interrogation:
Introduction
The digital artery perforator (DAP) flap, which was first reported by Koshima, is useful in the reconstruction of a soft tissue defect of the finger. Recently, many studies using the DAP flap have been published. However, to adequately close the donor site, Koshima recommended that the DAP flap should be no more than 10 mm wide. If the width of the flap exceeds 10 mm, full-thickness skin graft may be required at the donor site. This type of graft is associated with some complications, and the need of a second donor site to harvest a skin graft is inevitable. Therefore, to avoid the use of a skin graft, the dorsal metacarpal artery perforator (DMAP) flap is used in cases of large soft tissue defects.

Purpose
The aim of this study was to describe the therapeutic strategy for and clinical experience while treating soft tissue defects of fingers using the DAP and DMAP flaps to avoid the use of a skin graft for donor site closure.

Methods: Patients
The included patients (n = 14, all males; average age: 41.7 years, range: 24-84 years) were diagnosed with soft tissue defect of the fingers. The soft tissue defects of the patients included 10 cases of trauma and 4 of scar contracture. The follow-up period averaged 9.6 months.

Methods
The size of the actual skin defect was measured during surgery; the DAP flap was used for reconstruction of the defects with widths of 10 mm or less, and DMAP flap was used when the widths exceeded 10 mm. This study retrospectively investigated the type of perforator flap, size of the flap, and complications.

Results and Conclusions:
Results
All DAP and DMAP flaps survived completely. For the soft tissue defects due to trauma, there were seven cases of DAP flaps and three of DMAP flaps. For the four cases of scar contracture, the DAP flap was used for all. Notably, all donor sites could be closed. The average size of all flaps was 10.3 × 27.4 mm². The average size of the DAP flap was 8.9 × 21.2 mm² and of the DMAP flap was 15.7 × 50 mm². The complication of delayed wound healing in the distal part of the flap occurred in one DMAP flap. Congestion was observed in another DMAP flap, and a leech was used. In all cases, there was no infection, hematoma, and additional surgery.

Conclusion
Use of skin graft to donor site was avoided in all cases, and all donor sites could be successfully closed. Following careful consideration, DAP and DMAP flaps were useful for reconstruction of soft tissue defects of the fingers.

Keywords:
perforator, flap, digital artery, dorsal metacarpal artery,
Innervated Reverse Digital Artery Island Flap through Bilateral Neurorrhaphy using Direct Small Branches of the Proper Digital Nerve

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Objectives / Interrogation: The reverse digital artery flap uses the radial or ulnar surface of the proximal phalanx of the involved digit and has been applied to sensate flaps using the superficial sensory nerve branch and the dorsal branch of the proper digital nerve. As these nerve branches innervate the dorsal surface of the finger, however, hypesthesia of the dorsal side of the middle phalanx is inevitable.
In the present study, we successfully used the innervated reverse digital artery island flap through bilateral neurorrhaphy by using the direct small branches of the proper digital nerve. In a previous cadaveric study, the anatomical constancy of the direct small branches of the proper digital nerve was verified, and these branches have been used in the innervated lateral middle phalangeal finger flap.

Methods: Thirty fingers of 25 patients who had the innervated reverse digital artery flap using direct small branches of the proper digital nerve were included in this study. The minimum follow-up duration was 24 months, and the average defect size was 2.8 cm².
First, the proper digital nerve and its direct small branches were dissected and preserved. Two or three branches that projected toward the donor flap were cut at the branching points from the proper digital nerve, preserving the proper digital nerve and dorsal branch of the nerve. The flap was then elevated and placed on top of the injured finger. Bilateral neurorrhaphy was performed, under a microscope using 10-0 nylon microsutures, between one or two direct small branches and the ulnar digital nerve stump, and between the branches and the radial digital nerve stump.

Results and Conclusions: In all cases, the pulp defects were successfully reconstructed with this flap. The average size of the donor flap was 3.9 cm². At 6 months after surgery, the average static two-point discrimination value was 5.9 mm, the average moving two-point discrimination value was 5.0 mm, and the average Semmes-Weinstein monofilament score was 3.79. At 1 year postoperatively, the average Cold Intolerance Severity Score was 20. The percentage total active motion was measured at 99 percent 2 years after surgery.
Because this flap does not sacrifice the proper digital nerve or dorsal branch of the nerve, the sensibility of the dorsal aspect of the proximal and middle phalanx can be preserved. This flap is cosmetically excellent, as it uses a donor flap similar to the injured fingertip and the donor scar can be hidden by adjacent fingers.

Keywords:
Innervated Reverse Digital Artery Island Flap, Bilateral Neurorrhaphy, Direct Small Branch
High Velocity Distal Radius Fractures - a cohort study

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Objectives / Interrogation: Distal radius fractures are common, potentially disabling injuries. Much of the research done has concentrated on low energy injuries in older patients. In contrast, less has been studied about this injury in young adults, or due to high energy injuries alone. For the latter, work has largely focused on the surgical management of these injuries.

In our practice, we perceived differences between the typical older patient with low energy distal radius fractures, and the less common high energy trauma fractures. These differences included patient and injury characteristics, as well as treatment choices. We performed this study to determine if such differences really existed. If so, the findings would have implications for injury prevention, diagnosis, treatment, and eventual outcome.

Methods: Patients with distal radius fractures who were treated at our institution, were obtained from our database. This included demographic data, injury mechanism, fracture classification (using the AO classification), associated injuries, work-related injury, and associated distal ulna fractures, treatment types, complications and outcomes.

Results and Conclusions: The high velocity distal radius fracture (HVDRF) patient was on average 20 years younger (95% CI 17.1 to 22.9 years), and likely male (77.8% vs 27.3% in the low velocity group, p < 0.05). These group of patients were also more likely to have sustained work related injuries.

Falls, sporting injuries and motor vehicular accidents were the most common causes of high velocity injuries. From falls, 17/41 (41%) were due to a fall from height greater than 2m.

There were also significant differences in the fracture patterns and associated injuries in these patients. All the bilateral fractures came from the high velocity injury group (p < 0.05). Based on the AO classification, the HV group had a much high incidence of AO B type fractures compared to the LV group, were more likely to have associated injuries, including an concomitant ipsilateral arm injury.

The high velocity injuries represent a substantial patient group that has different patient and injury profiles compared to the better-studied osteoporotic fractures. The result of these contrasting profiles is a different treatment profile between the two groups. In order to better understand, treat, and prevent them, HVDRF injuries deserves to be considered a distinct entity, much as paediatric distal radius fractures are now considered separately from osteoporotic adult fractures.

Keywords: Fractures, Distal Radius, Injury
Arthroscopic-assisted reduction and internal fixation with pin-plate construct for distal radius volar rim fracture

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Objectives / Interrogation: Fixation of volar rim in distal radius fracture remains challenging. Small fragment of volar rim fracture may not be easily fixed with conventional implants. Currently, the fixation methods for volar rim fracture includes volar rim plates, fragment-specific devices and pin-plate construct. Volar rim plates can cover more volar rim area compared to regular volar plates, but they also cause more tendon irritation and volar radiocarpal impingement. As a result, volar rim plates usually need to be removed after fracture union. Fragment-specific devices includes small hook plates or various buttress pin implants. They can effectively fix small volar fragments without causing much soft tissue irritation or impingement. However, this kind of implants may not be available in many countries or facilities. Pin-plate construct was also proposed for volar rim fracture, using the common volar plates and Kirschner wires which are available for most facilities. Compare to volar rim plates, pin-plate construct may also cause lesser hardware irritation since the plate is not placed distal to watershed line. Combined with wrist arthroscopy, accurate reduction of volar fragment can be achieved.

Methods: In this article, we demonstrate our cases using arthroscopic-assisted reduction and internal fixation of volar rim fracture with pin-plate construct. Three patients with volar rim distal radius fracture were treated with this method. Bony union were achieved in all three patients without further displacement. No volar tendon irritation or impingement were noted. One patient with poor compliance of physical therapy results in limited wrist flexion and extension, which need for further implant removal and arthroscopic release after one year. Another patient developed extensor pollicis longus tendon rupture about 5 months after operation, which tendon transfer was done.

Results and Conclusions: Arthroscopic-assisted reduction and internal fixation with pin-plate construct can effectively fix volar rim fracture of distal radius. Advantage of this method includes accurate reduction, reliable volar rim fixation with lesser volar tendon irritation. However, proper pin length and adequate post-operative rehabilitation can be crucial for avoidance of complications and achieving better outcomes.

Keywords:
wrist arthroscopy, volar rim fracture
Is it worth operating severe, old carpal tunnel syndrome? Which technique?

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Objectives / Interrogation: Nerve conduction studies (NCS) in carpal tunnel syndrome (CTS) stage 4 show sensory nerve action potential absent but motor response preserved, distal motor latency to abductor pollicis brevis 4.5 ms to 6.5 ms. After several years of disease evolution, median nerve fibrosis is always present. We presume that median nerve epineurolysis (MNE) improves the result of the carpal tunnel release (CTR) in all cases of long lasting, stage 4 CTS (prospective study).

Methods: Inclusion criteria: stage 4 CTS (NCS), at least two years of evolution, nocturnal pain interfering with sleep, neurologist's recommendation for MNE. All patients were operated by the same surgeon, using mini-invasive CTR. In all cases, the epineurium of the median nerve was visibly fibrosed and MNE was performed. Postoperatively: 5 days of AINS, 10 days compressive dressing, follow-up at 12-14 days. All patients completed a questionnaire one day before and one year after surgery. Patient-reported outcomes regarded nocturnal pain and awakening, numbness resolution (measured on visual analogue scale VAS) and overall satisfaction. The NCS were performed by the same neurologist, 1-2 months preoperatively and one year after surgery, using the same device and technique.

Results and Conclusions: We included 208 patients (331 hands), 73 male, mean age 56,5 years. Twenty-two patients had more than 3 months of sick leave in the past year prior to surgery and 16 had to change their workplace. Simple CTR led to median nerve hyperemia. Intraoperative fibrosis was assessed visually and tactiley. Following MNE, the nerve increased in volume. The pain resolution was immediate (7.9 preoperatively to 1.4 VAS postoperatively). Numbness remission was noticed at 2-3 months (7.2 preoperatively to 2.3 VAS postoperatively). All patients were very satisfied with the results. Electrophysiological findings: the distal latencies diminished by a mean of 0.5 ms and the compound muscle action potentials CMAP increased with around 1,5 mV.

No matter how old is a severe CTS, there was a definite improvement in all operated cases, mainly regarding the disparition of pain. All patients with long-lasting evolution of CTS must undergo NCS to evaluate the severity of the disease and median nerve fibrosis (standard of care). In stage 4 CTS surgical intervention is still indicated, but mini-invasive carpal tunnel release needs to be completed by epineurolysis. Intraoperative NCS might be the next step in predicting the need for MNE.

Keywords:
epineurolysis, stage 4 CTS, epineurium fibrosis, nocturnal pain, nerve conduction studies
Wrist traction interferes with the arthroscopic evaluation and surgical repair of the scapholunate misalignment. A kinetic study in cadavers.

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Objectives / Interrogation: Axial loading of a wrist with deficient scapholunate ligament (SLL) induces scaphoid flexion and pronation, the radioscaphoid peak pressure displacing dorsoradially.

This study was designed to document the alignment of the scaphoid and the lunate under axial traction as opposed as what we know for axial compression.

Methods: The changes in the alignment of both, scaphoid and the tandem lunate-triquetrum, were assessed in 5 fresh normal cadaver wrists, axially loaded first and then axially tractioned, using an electromagnetic motion tracking device. The experiment was subsequently repeated after complete scapholunate ligament (SLL) sectioning and the results assessed using ANOVA with repeated measures. Significance was set at p<0.05.

Results and Conclusions:

<table>
<thead>
<tr>
<th>Scaphoid (n=5)</th>
<th>Lunate-Triquetrum (n=5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLL intact</td>
<td>SLL sectioned</td>
</tr>
<tr>
<td>Pronation*</td>
<td>Flexion</td>
</tr>
<tr>
<td>Flexion</td>
<td>Dorsoradial Translation*</td>
</tr>
<tr>
<td>Axial Loading</td>
<td></td>
</tr>
<tr>
<td>Supination</td>
<td>Flexion</td>
</tr>
<tr>
<td>Extension</td>
<td>Volar Translation*</td>
</tr>
</tbody>
</table>

*<0.05 relative to SLL intact
Wrist traction substantially modifies the scaphoid misalignment typically found in the axially loaded SLL deficient wrists.

Consequently, it is mandatory to completely release the arthroscopic traction in three circumstances:
(1) when testing the scapholunate gap from the midcarpal joint,
(2) when checking the dorsoradial radioscaphoid impingement in the radiocarpal joint
and (3) when fixing percutaneously the scaphoid flexion-pronation misalignment, to avoid an incomplete scaphoid supination restoration.

**Keywords:**
arthroscopy traction; unstable scapholunate joint; scapholunate arthroscopic repair
Prospective study of needle fasciotomy for Dupuytren's contracture with four years follow-up

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Objectives / Interrogation: The advantage of needle fasciotomy is a very short recovery combined with high cost effectiveness compared to open surgery. The purpose of this study is to report results, reduction of contracture, complications and early recurrence after four years.

Methods: The indication was contractures of the MCP joint in stages I, II, III and IV with well defined fibrosis. The contracted Dupuytren's tissue is divided longitudinally along multiple points so that the finger can stretch out straight again. The procedure is performed with a needle through the skin and the sharp, small bevel of the needle is used to cut the Dupuytren's tissue beneath the skin. We also administer a corticosteroid injection to the treatment area at the time of the procedure. Stretching, exercises and extension splinting during the recovery phase are important to gain maximum benefit from the procedure. The patients were evaluated preoperatively and per-operatively at one, eight, twenty-four weeks, after one, two, three, four years. 117 patients with 129 fingers were operated. Median age was 59 (44-74) with 114 man and 3 women.

Results and Conclusions: No cases of flexor tendons lesions, hematomas or infections were registered. The patients were allowed to use the hand directly after the procedure. Needle aponeurotomy does not involve incisions to the skin of the hand, so there is less tissue damage, less swelling, less pain, less down time and quicker healing. Needle fasciotomy is a good alternative in cases with well defined fibrosis because of these preliminary good results and low morbidity.

Keywords: -
Percutaneous neutralisation screw fixation with scaphoid arthroscopic bone grafting

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Objectives / Interrogation: Arthroscopic cancellous bone grafting of the scaphoid is a technique with many potential advantages - high union rates, minimally invasive and less deep scarring. The associated fixation is generally buried Kirschner wire fixation, as described by PC Ho. The fixation must remain in situ until union is confirmed, and generally mobilisation must be minimal while the wires remain, due to the risk of migration and soft tissue irritation.

Since cancellous bone grafting is performed, which will not resist compression, headless compression screws are not preferred, since they may lead to deformity, in the presence of a defect. We have designed a non-compressive neutralisation screw, which will hold the scaphoid in its corrected position before the cancellous graft is inserted.

Methods: Study Material
The rationale for the implant design is discussed, and the surgical considerations which have been considered in fine tuning the technique.

Finite element analysis of the implant versus 3 K-wires is presented.

The surgical technique and some cases are presented.

Operative method
Dry arthroscopy is the presenter's preferred option. My preference is for 3 midcarpal ports, the most ulna is the radial midcarpal. The non-union is debrided to cancellous bone.

The wrist is then removed from traction. If there is deformity, a temporary Linscheid wire may be used to stabilise the lunate to the radius. The wrist is then extended over a bump and a retrograde K-wire inserted with image intensification. The correction and wire position are assessed with fluoroscopy. The wire is over-drilled, then the screw inserted. Traction is re-applied and the joint and fixation assessed arthroscopically. Cancellous bone graft is then inserted and sealed with fibrin glue.

Results and Conclusions: Results
The interference screw fixation is markedly more stable than 3 K-wire fixation, as assessed by finite element analysis. Some cases where passive motion has begun prior to bony union are presented.

Discussion
This screw design has the potential advantages of increased stability, which may allow the surgeon to hold correction of deformity without the use of a post-operative Linscheid type wire. It also allows earlier motion, which in conjunction with arthroscopic surgery, may lead to improved range of motion. It also avoids associated K-wire complications and the need for K-wire removal.

Conclusion
The role of intereference, non-compressive screw fixation with arthroscopic scaphoid bone grafting is presented.

Keywords:
scaphoid, arthroscopic, neutralisation screw
Trapeciectomy versus joint replacement in basal thumb osteoarthritis. Prospective study.

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Objectives / Interrogation: Osteoarthritis of the base of the thumb is one of the most prevalent sites of osteoarthritis in the upper limb leading to pain and disability of the hand.

None of the available surgical treatments have proved to be superior to another.

We designed a prospective study in which we compared the clinical outcomes after performing two surgical techniques: joint replacement (Maïa prosthesis, MP) and trapeciectomy with ligament reconstruction and tendon interposition (following Burton-Pellegrini technique, BP).

Methods: Sixty-eight patients with first carpometacarpal joint osteoarthritis grade III of Eaton-Littler were included in this prospective one-year follow-up study comparing joint replacement (MP), n = 43, with trapeciectomy with ligament reconstruction and tendon interposition (BP), n=25.

Pain (using AVS), opposition (using Kapandji index), terminolateral pinch strength and grip strength (using dynamometer) disability and quality of life (using DASH and SF36 questionnaires), were assessed preoperatively and during the follow-up at 4 and 12 months.

Results and Conclusions:

<table>
<thead>
<tr>
<th></th>
<th>MP</th>
<th>BP</th>
</tr>
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<tbody>
<tr>
<td>n</td>
<td>43</td>
<td>25</td>
</tr>
<tr>
<td>AVS pre</td>
<td>7.6</td>
<td>9.5</td>
</tr>
<tr>
<td>4 months</td>
<td>1.5</td>
<td>1.9</td>
</tr>
<tr>
<td>12 months</td>
<td>1.6</td>
<td>1.3</td>
</tr>
<tr>
<td>Kapandji pre</td>
<td>8.0</td>
<td>7.8</td>
</tr>
<tr>
<td>4 months</td>
<td>9.5</td>
<td>9.4</td>
</tr>
<tr>
<td>12 months</td>
<td>9.6</td>
<td>9.0</td>
</tr>
<tr>
<td>Terminolateral pinch pre</td>
<td>5.25</td>
<td>6.72</td>
</tr>
<tr>
<td>4 months</td>
<td>7.95*</td>
<td>6.47*</td>
</tr>
<tr>
<td>12 months</td>
<td>8.74*</td>
<td>7.52*</td>
</tr>
<tr>
<td>DASH pre</td>
<td>58.2</td>
<td>56.2</td>
</tr>
<tr>
<td>4 months</td>
<td>31.4</td>
<td>41.6</td>
</tr>
<tr>
<td>12 months</td>
<td>33.7</td>
<td>48.5</td>
</tr>
<tr>
<td>SF36 pre</td>
<td>63.27</td>
<td>41.85</td>
</tr>
<tr>
<td>4 months</td>
<td>41.75</td>
<td>40.12</td>
</tr>
<tr>
<td>12 months</td>
<td>41.50</td>
<td>47.90</td>
</tr>
</tbody>
</table>

We only found statistical differences (marked as * in the table) in the terminolateral pinch strength at 4 and 12 months.

We suggest that the prosthesis should be indicated in patients who need a quick recovery.

Keywords:
basal thumb osteoarthritis; joint replacement; trapeciectomy
The role of nerve conduction studies in diagnosing and staging of the carpal tunnel syndrome

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Objectives / Interrogation: Carpal tunnel syndrome (CTS) diagnostic is based on clinical symptoms and physical examination, usually confirmed by electrodiagnostic methods. We wanted to assess the diagnostic value of nerve conduction studies (NCS) and if it can be correlated with intraoperative findings (retrospective study).

Methods: Between 2009-2017, 353 patients presented with symptoms of CTS. All patients underwent NCS by the same neurologist 1-3 months before surgery, resulting in CTS staging and indication for median nerve neurolysis (MNE) in selected cases. Surgery performed by the same surgeon - mini-invasive CTR +/- MNE. The operated patients have completed a questionnaire before the procedure and one year postoperatively. NCS was repeated one year after surgery.

We studied the correlation clinical symptoms / NCS result; recommendation to perform MNE based on NCS / intraoperative aspect of the median nerve; the obtained results (patient-reported outcome and postoperative NCS).

Results and Conclusions: NCS did not confirm CTS in 16 patients; other neuropathies with symptoms of median nerve entrapment were diagnosed.

We included 275 patients (446 hands). Cf. Bland (2000) electrophysiologic classification, there were 15 hands (3.36%) grade 2, 93 hands (20.85%) grade 3, 311 hands (69.73%) grade 4 and 27 hands (6.06%) grade 5. No patients with grade 1 or 6 were diagnosed during the study.

Based on NCS, the indication for MNE was recommended for 342 hands (76.68%). In all these cases, median nerve fibrosis was noted intraoperatively and MNE was done. In 8 hands we did MNE without neurologist's recommendation.

Clinical relief was noted in all cases. On visual analogue scale, the pain decreased from 6.2 preoperatively to 0.8 postoperatively, and paresthesia from 5.7 preoperatively to 0.5 postoperatively. All patients were satisfied or very satisfied with the outcome. The electrophysiologic parameters improved: distal latencies diminished with about 0.5 ms, even to normal values, nerve conduction velocities either increased or became normal. The recovery of sensory and motor function varied from good to excellent. In situations with severe axonopathy the degree of denervation in EMG was reduced.

NCS is the standard of care for the positive and differential diagnosis of CTS and for staging the disease. Postoperative NCS help in controversial cases (simulations, litigations, recurrences).

The recommendation for MNE based on NCS correlates excellently with intraoperative findings.

Intraoperative NCS is expected in the future.

Keywords:
Nerve conduction studies, clinical-electrophysiological correlation, carpal tunnel syndrome, median nerve epineurolysis
"Stepwise" method of arthroscopic reduction and plate fixation of intra-articular distal radius fractures - an evolution of technique and instrumentation

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Objectives / Interrogation: Arthroscopic visualisation of articular fractures of the distal radius can allow accurate reconstruction of the articular surface whilst minimising disruption of the dorsal capsular structures. In minimising the iatrogenic injury, this may lead to improved outcomes, though this remains unproven.

Technically, one of the most challenging problems is how to hold the reduction while definitive fixation is employed. Where a volar locking plate is used, typically the plate is applied with proximal fixation, prior to the arthroscopy and articular manipulation. Two technical difficulties often ensue. Firstly maintaining accurate reduction of volar fragments after applying traction. Secondly, inserting distal locking fixation whilst holding the articular reduction under arthroscopic visualisation with the wrist in traction. It is difficult to simultaneously maintain traction for arthroscopy, and retraction to allow safe introduction of the drill and screws.

Methods: The stepwise technique and the newly evolved fixation are presented.
A trans FCR approach is used. The volar cortex is reduced under direct vision. The plate is fixed proximally with screws. Interference K-wire sleeves are then applied to the distal locking screw holes. K-wires are then introduced only as far as the volar fragments, using II. The dorsal fragments remain free.
Traction is applied, dry arthroscopy performed using 1/2, 3/4 and 6R ports.
The articular surface is reduced by the surgeon and provisionally fixed by advancing the wires. Traction is removed, correct wire length assessed with II. Using the cannulated system, peg length is calculated, the sleeve removed, the wire overdrilled, and cannulated locking pegs inserted over the wires.

Results and Conclusions: Results
Some cases will be briefly presented to illustrate the technique.

Discussion
The technique may bring this technically challenging method into the repertoire of most capable wrist arthroscopists. As each step of the surgery is completed, the articular surface is brought closer to anatomical alignment, with increasing stability. The chance of a backwards step is minimised, decreasing frustration and optimising the result.

Conclusion
An evolution of surgical technique and instrumentation for arthroscopic reduction and stable fixation of exploded articular fractures of the distal radius is presented.

Keywords:
arthroscopy, distal radius, intra-articular, fracture

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Objectives / Interrogation: We treated two patients with old digital nerve injury complaining persistant pain in fingers by dissection of the injured part and artificial nerve graft. The artificial nerve is consisted of atelocollagen gel core and polylactic acid (PLLA) shell. In both patients, the same postoperative course were recognized and reported in this article although they are short-term results.

Methods: Case 1, 52-yea-old woman. She got a small cut wound on the radial side of the medial segment of the left index finger while cutting a tin plate. Although the wound was sutured at nearby clinic, persintant pain and numbness remained more than 6 months. Surgery was performed 8 months after injury. The injured part of the radial digital nerve was covered with scar tissue. When the part was dissected, it became a nerve deficit of 10 mm. The defect was reconstructed with a 10cm length, 1.5 mm diameter artificial bridge nerve graft.

Case 2, 65-year-old man. He cut the palmar side of the right index finger at the PIP joint level with a kitchen knife. Persistant pain and numbness remained in the ulnar side of the finger. Surgery was performed 9 months after injury. The injured ulnar digital nerve was completely torn and there was formation of a stump neuroma on the proximal side. The neuroma was dissected and the defect was reconstructed with 20 mm length, 1.5 mm diameter artificial nerve graft.

Postoperative immobilization with a cast was performed for 2 weeks followed by an automatic exercise in both patients.

Results and Conclusions: In case 1, pain and numbness of the left index finger completely disappeared immediately after the operation. However, numbness appeared again at 3 weeks after surgery and Tinel sign was recognized at distal level of the grafted artificial nerve. Nine months after surgery, she was satisfied with the result of no pain but had weak numbness that was gradually improving. The touch sensation by Semmes-Weinstein (S-W) test was normal.

In case 2, pain and numbness of the right index finger also disappeared immediately after surgery. However, numbness and Tinel sign was recognized 5 weeks after surgery. Eight months after the operation, he was satisfied with no pain although slight numbness still remained. The result of S-W test was diminished light touch.

We concluded artificial nerve graft is effective for pain relief for the patients of old digital nerve injury. However slight numbness will remain in a short-term.

Keywords:
artificial digital nerve
Usefulness of Eppikajutsuto for lymphatic malformation

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Objectives / Interrogation: There are macrocystic pattern and microcystic pattern in lymphatic malformations, and sclerotherapy using various curing agents is very effective in the former case, but in the latter case, treatment is often difficult. We were able to control by using the traditional Chinese medicine Eppikajutsuto for the case of recurrence after extirpation of the lesion and the diffuse case difficult to treat. We will examine its use experience and report on the usefulness of Eppikajutsuto for this disease.

Methods: From 2016 to March 2018, image findings and clinical course were examined for recurrent cases and pervasive cases after surgical operation.

Results and Conclusions: In all cases, side effects of Eppikajutsuto were not recognized, and oral administration continued. Although no significant reduction was observed, certain effects such as suppressing increase and decreasing the frequency of infection were observed. It is a disadvantage that the amount of internal use of the day is large and the taste is bitter, but it was possible to cope with children by devising such as enclosing it in chocolate. Eppikajutsuto is a traditional Chinese herbal medicine used for nephritis, nephrosis, rheumatoid arthritis, dermatitis, etc. In 2011, Ogawa et al reported on the usefulness of lymphatic malformations, and gradually the use cases have gradually increased since then. Our case administered Eppikajutsuto acted effectively in all cases and it seemed to be very useful for lymphatic malformations which had been difficult to treat until now. However, it is sometimes necessary to carefully use such as a person with a weak constitution, a person with a bad gastrointestinal condition, a person with a lot of perspiration, etc. Therefore, it is necessary to grasp the state of the patient in detail and use it.

Keywords:
lymphatic malformation, Eppikajutsuto, difficult cases
Bone tumors of the upper extremities. A case series.

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Objectives / Interrogation: The presence of benign and malignant bone tumors that arising in the upper extremities are rare in comparison to other anatomical locations. Even rare are large epidemiological series presenting those lesions in literature.

Methods: We retrospectively reviewed the medical archives of the Microsurgery, Hand and Upper extremity Department, considering patients who were operated for bone tumor and tumor like lesions between 1995 and 2015. Patients were reviewed for demographic data, type of tumor and affected area.

Results and Conclusions: Results: From a total of 1102 patients who were operated for any tumor during a period of 20 years, 143 patients (13%) were found suffering from a bone tumor. 65 patients (45%) were male with a mean age of 38,41 years, while females (78 patients/55%) had a mean age of 38,74 years. Histopathological studies revealed 12 cases (8,4%) of malignant tumors affecting 9 women(6,3%) and 3 men (2,1%), 5 (3,5% of total) of whom were considered primary.

79 patients (55,25%) had a bone tumor on their right extremity, 44 of whom where women. Considering the anatomical area, the hand (104 patients, 72,7%) was most affected, followed by the humerus (13 patients, 9%), the radius and ulna (12 patients, 8,4%), the carpal bones (6 patients, 4,2%), while 8 patients (5,6%) affected at the elbow, clavicle and the scapula. Enchondroma is the most common neoplasma (59 patients, 41,3%), followed by osteochondroma (18 patients, 12,6%), osteoid osteoma (12 patients, 8,4%) and GCT of the bones (7 patients, 4,9%). Other types of bone tumors cover the 32,2% of cases.

Conclusion: Our series confirms the fact that malignant bone tumors are extremely rare in the upper extremity, as well as that the hand is the most affected area considering a variety of bone tumors. Enchondromas cover the majority of cases. Since our department is considered a reference center for upper extremity and hand surgery, this study can be a useful tool when dealing with bone lesions at the referred anatomical areas in the Greek population.

Keywords: bone tumor, benign tumor, malignant tumor, epidemiology
Evaluation using the preoperative three-dimensional computed tomography and clinical results for surgical treatment of mallet fractures

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Objectives / Interrogation: Many authors have reported the good results of the extension block technique described by Ishiguro et al. for the treatment of mallet fractures. However, there are several cases that postoperative extension lag and incongruity of joint surface remain. We aimed to evaluate the clinical results using preoperative three-dimensional computed tomography (3D-CT).

Methods: Between 2012 and 2017, 23 patients (11 men and 12 women; mean age, 35.4 years; range, 12-70 years) with mallet fractures were treated using the extension block pinning by Ishiguro method. Konishiike et al. classified the mallet fractures into 4 types: type 1, avulsion; type 2, rotate avulsion; type 3, split avulsion; and type 4, split compression. According to this classification, there were 3 cases of type 1, 5 cases of type 2, 7 case of type 3, 8 case of type 4. Evaluation of preoperative 3D-CT was classified as center (non-deviation group) and ulnar or radial side (deviation group) in the deviation direction of the bone fragment. Patient outcomes were assessed with DIP range of motion measurement, radiographic examination, range-of-motion measurements, and Crawford classification.

Results and Conclusions: This mean follow-up period was 4.2 months (range, 2-12 months). In preoperative 3D-CT, the non-deviation group were 15, and the deviation group were 8. In Konishiike classification, type 4 was the most frequent in the no-deviation group and type2 was the most frequent in the deviation group. At the final follow-up, the mean extension angle in the non-deviation group was -8.6°, which was significantly different from that of the deviation group (mean, -16.8°). The step-off was seen in the deviation group significantly compared with the no-deviation group in the X-ray. Crawford classification was no significant difference between the non-deviation and the deviation group. It is considered restoring the joint surface with accurate reduction to be important to prevent secondary osteoarthritis, and loss of movement. In the evaluation of bone fragment for mallet fractures, it may be difficult to assess the displace of it in the X-ray. In the preoperative 3D-CT evaluation, the clinical results were poor in the deviation group compared with the no-deviation group. Therefore, 3D-CT examination is a useful, and it is suggested that it will help to determine the surgical technique for mallet fractures.

Keywords:
mallet fracture, three-dimensional computed tomography
HISS SCORE AND MODIFIED VASCULAR HISS SCORE CORRELATION WITH SHORT AND LONG-TERM OUTCOMES IN COMPLEX HAND INJURIES: A RETROSPECTIVE PRELIMINARY STUDY.

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Objectives / Interrogation: Complex hand traumas (CHT) are critical injuries that involve three different structures in the same digital ray at least or one structure in two digital rays at least. These lesions are very difficult to approach and even if they are subject to immediate and correct surgery, outcomes are scarce due to the complexity of injury. The aim of the present study is to verify the incidence of CHT and to investigate the hand injury severity score (HISS) correlation with short and long terms outcomes in these patients.

Methods: From 2012 to 2016, we treated 227 CHT patients arrived in our department. Patients were classified by age, sex, traumatic mechanism, involved digital rays and type of surgical treatment. For each class of traumatic mechanism, we verified HISS score and its correlation with qDASH score recorded at follow-up. We also verified if HISS score might be a short-term prognostic factor.

Results and Conclusions: Among all 227 CHT patients, we counted 201 males and 26 females. The average age when trauma occurred was 49 for males and 47 for females. The most common mechanism of trauma was crushing (125 occurrences). Trauma were mostly pluri-digital (52%). Specifically, we focused on avulsion as mechanism of trauma which concerned 33 patients, accounting for 48 fingers in total (2 were excluded because they were ring finger avulsions). Amputation was performed immediately in 11 patients and in 4 cases at the second look. Eighteen where did not receive this treatment. Patients were classified retrospectively according to HISS score. Residual disability was evaluated with qDASH score at average time of 22 months after trauma. Statistical analysis was performed with Spearman's test and it shows a positive correlation between HISS score and qDASH (p=0.85, p=0.001). We also propose a modified HISS score (modified vascular HISS score, mV-HISS) with additional parameters for vessels examination, and we investigated its possible usefulness as short-term prognostic factor. In conclusion, CHT are serious injuries with significant economic and social consequences for patients and represent a great challenge for hand surgeons. For avulsion as mechanism of injury, HISS score had a statistically significant prognostic factor in long terms outcomes for patients. mV-HISS score might be a valuable prognostic tool in understanding short terms outcomes in CHT.

Keywords:
complex hand trauma, complex hand trauma evaluation, hiss score, mV-HISS score
Minimal endoscopic release procedure of ulnar nerve in the cubital tunnel

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Objectives / Interrogation: Compression of the ulnar nerve in the cubital tunnel is the second most frequent entrapment neuropathy of the upper extremity after carpal tunnel syndrome. None of the described techniques have proved to be superior in randomized prospective trials. We therefore present our series of endoscopically decompression of the ulnar nerve at the elbow to determine the effectiveness of this procedure.

Methods: It was prospective, non-randomize two-center clinical study. In 45 patients: 25 men and 20 women (age's range 28-77) with clinical McGowan grade I (6 patients), II (29 patients), and III (10 patients) and electrophysiological signs of cubital tunnel syndrome, 21-cm of the ulnar nerve was released through a 2-cm long skin incision. Diagnosis was based on history, clinical examination (i.e. pain over medial epicondyle, sensory loss, positive Tinel's sign, weakness or atrophy of the muscles innervated by the ulnar nerve, and positive elbow flexion test) and confirmed by neurophysiological studies (nerve conduction velocity and electromyography). A 4-mm, 30° standard endoscope and Wolf retractor were used during the procedure, and the mean postoperative follow-up examination was 12 months.

Results and Conclusions: Results: There were no visible nerves and vessels injured during the procedure. The main postoperative complication was hematoma in 4 patients that resolved after conservative management. There was no elbow extension deficit after surgery and surgical wounds all healed within a week. Grip strength showed a highly significant increase after surgery. Outcomes were excellent in 27 of 45 cases and good in 13 of 25 cases. Grip strength showed a highly significant increase after surgery compared to the non-operated hand (p<0.005). The mean DASH score was decreased significantly about 65% (from 74,8 before operation to 26,3 after procedure) (p<0,005). 88% patients were satisfied with the procedure.

Conclusion: Endoscopic technique for treating cubital tunnel syndrome is a safe and reliable procedure, characterized by a short incision, minimal soft tissue manipulation, less scar sensitivity and early postoperative mobilization. It demonstrates promising benefits against conventional approaches (complete release and good visualization), and reduced complication profile (painful scarring and elbow contracture). Endoscopy is a widely imaging study for assessing nerves providing useful information on the severity and stage of nerve pathology.

Keywords:
cubital tunnel syndrome, ulnar nerve, endoscopic decompression,
Basilar thumb arthritis: early mobilization versus splinting after trapeziectomy with ligament reconstruction and tendon interposition

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Objectives / Interrogation: The aim of this study was to evaluate the clinical, functional and radiographic benefits of the postoperative immobilization after trapeziectomy with ligament reconstruction and tendon interposition according to Burton-Pellegrini technique.

Methods: A randomized prospective 2:1 study comprised of a sample population of 15 individuals was performed, excluding those who had previous surgeries of this joint and those who do not present the adequate follow-up. Post-operative splinting for a length of 4-6 weeks was performed in 5 patients and not in the remaining 10. The gender, age, laterality and the hand dominance were ascertained. The following parameters were evaluated preoperatively, in the period of 4 to 6 weeks and at 3 and 6 months: Visual Analog Scale (VAS) for pain, QuickDASH, grip strength, palmar and lateral pinch strength. The Dorsal Subluxation of the first metacarpal and the scaphometacarpal distance were measured. The comparison of evolutionary pattern between groups was made by a Repeated Measures Analysis of Variance (rANOVA), assuming Greenhouse-Geiser correction due to an absence of sphericity. Statistically significant value was considered for p <0.050.

Results and Conclusions: All subjects were female, with a median age of 60.5 years (interquartile range of 10.0 years), with no statistically significant differences between groups (p = 0.662). Follow-up for both groups revealed a favorable evolution for all the considered variables (p<0.050). When comparing groups, considering age, dominant hand involvement and Eaton's classification as confounders, only the VAS measured at rest and lateral pinch strength revealed statistically significant measureable differences (p=0.011 and p=0.013), both favoring early motion. The surgical technique according to Burton-Pellegrini's original description includes a 4-week immobilization period with subsequent onset of active motion, with additional protective splinting ranging from 2 to 4 weeks. In this study, up to 6 months after surgery, immobilization between 4 and 6 weeks did not prove to be superior to immediate motion, in regards of pain management, functional development, grip, palmar and lateral pinch strength. Also with regard to imaging parameters, there was no benefit in the use of splint. Although this result may question the true usefulness of splinting in the postoperative surgical treatment of basal thumb arthritis, it will be necessary to include more patients, as well as a longer follow-up to confirm the results obtained.

Keywords:
Basilar thumb arthritis, trapeziectomy, ligament reconstruction, tendon interposition, early motion, immobilization
Supplemental Method for Reduction of Irreducible Mallet Finger Fractures by the Two Extension Block Technique: The Dorsal Counterforce Technique

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Objectives / Interrogation: Extension block pinning consists of a dorsal extension block K-wire and a second volar K-wire to hold the DIJ in extension. This technique has been modified by several authors to improve the accuracy of reduction and stability of fixation. However, dorsal fragments that are large, markedly displaced, or rotated are not easily controlled with a single extension block K-wire. In many cases, this is due to rotation of the dorsal fragment in the axial plane. To address these limitations, we previously proposed a modified procedure, the two extension block K-wire technique. An anatomic reduction is more easily obtained with two extension block K-wires. Together, the wires create a broader stabilizing force that prevents rotation of the dorsal fragment in the axial plane when a reduction force is applied. The parallel and lower angled wires contact a wide area of the fragment, and the fragment is strongly compressed when the distal phalanx is extended. However, there are limitations to this technique in certain circumstances. While two extension block wires can prevent the dorsal fragment from migrating proximally and rotating in the axial plane, they cannot exert sufficient compressive force against the distal part of the dorsal fragment. This results in dorsal rotation of the dorsal fragment in the sagittal plane. The goal of the study was to describe the results of a supplemental method to achieve anatomical reduction in cases that are insufficiently treated by the two extension block K-wire technique.

Methods: Of 95 displaced mallet finger fractures treated using a modified two extension block Kirschner-wire (K-wire) technique, 18 (19%) were found to have an irreducible dorsal fragment and distal interphalangeal joint (DIJ) incongruence, due to rotation of the dorsal fragment in the sagittal plane. In these cases, we additionally employed a dorsal counterforce technique to supplement the two extension block technique. An additional K-wire was used to apply counterforce against the distal part of the dorsal fragment and control rotation in sagittal plane.

Results and Conclusions: All 18 fractures united. Congruent joint surfaces and anatomical reduction were seen in all cases. The mean active flexion of the DIJs was 83.8° (range, 79-88°) and the mean extension loss was 0.4° (range, 0-4°). We believe that the dorsal counterforce technique effectively supplements the two-extension block K-wire technique and aids control of dorsal fragment rotation in the sagittal plane.

Keywords: Mallet Finger Fracture, Extension Block Technique, Supplemental Method
Web creep control with a novel orthosis

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Objectives / Interrogation: Web creep is the most common complication after syndactyly separation. We developed a novel orthosis which can exert consistent pressure on web and incision scar postoperatively. The orthosis is applied with silicone sheet simultaneously. The study was to evaluate the aesthetic and functional outcomes using this novel orthosis to control web creep.

Methods: A total of 71 patients underwent syndactyly separation in past 10 years were included in the study. Among these patients, 40 patients used the novel orthosis, while 31 cases used traditional splinting and scar massage postoperatively. We assessed the height and width of the webs according to the criterion of D'Arcangelo, and total active digital motion compared with the normal side. Scar formation was measured by the Vancouver Scar Scale score. We also administered a parent-based satisfactory questionnaire.

Results and Conclusions: The mean follow-up period was 4.5 years. The height and width of 36 webs were good, 3 webs were fair, and 1 web was poor in the group using the novel orthosis, while 13 webs were good, 10 webs were fair, and 8 webs were poor in the group using the traditional method. Mean total active motion of the index, middle, ring, and little fingers of the affected side was 160, 158, 153, and 150 in orthosis group, respectively, which was significantly greater than those in traditional group. Mean Vancouver Scar Scale score was 1.4 in orthosis group, which was better than that in traditional group with the score of 3.1. All parents were satisfied with the appearance and function of the fingers in orthosis group. In conclusion, applying the novel orthosis was a reliable method to control web creep and restore hand function for patients with syndactyly separation.

Keywords:
Web creep, syndactyly separation, orthosis, pressure, silicone sheet
DISTAL PHALANX Fractures MANAGEMENT WITH 23 GAUGE PERCUTANEOUS NEEDLES VS KIRSCHNER WIRES.

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Objectives / Interrogation: The most common fractured bone in the hand is the distal phalanx (DP). These fractures are often managed conservatively but the presence of high comminution or articular fractures with injuries of nail beds sometimes require a surgical approach. In literature, different techniques of internal fixation were described. The aim of the present retrospective study is to make a comparison between Kirschner wires vs 23 Gauge percutaneous needles in treatment of these fractures, evaluating functional outcomes and time to union.

Methods: We performed a retrospective study in patients who had DP fractures and were treated from 2013 to 2015. Collected clinical data include patient demographic data, mechanism of injury, type of treatment, follow-up, range of motion (ROM), and complications. Patients were divided into 2 groups based on methods of fixation (Group A: K-wire; Group B: 23-G needles) and we compared their baseline demographics and final outcomes accordingly. Statistical analysis was done using t-test for paired samples in case of variables normally distributed or Wilcoxon signed-rank test in case of not-normally distributions. Statistical significance was measured at p <0.01.

Results and Conclusions: A total of 60 patients with surgical DP fractures were treated. 12 of these were excluded from the study because of diabetes mellitus type II or because they are smokers. On remaining 48 patients, 14 were female and 34 were male. 23 patients (52%) had k-wire fixation (Group A) and 25 patients (48%) had 23-G crossed needle fixation (Group B). Time to union was 51 days for group A and 39 days for Group B. The difference was statistically significant (p<0.001). At the final follow-up (six months after surgery), the average DIP joint ROM was 45° for Group A and 60° for Group B. This difference was statistically significant (p<0.001). Side effects were 1 non-union in group B and 4 non-union in group A, which required surgery. In conclusion, the present study shows that DP fractures treated with 23 G percutaneous needles heal faster with a higher ROM, if compared to K wires. The present technique might be a valuable alternative, safe and cheaper if compared to other techniques for these fractures. However, nail bed repair and nail presence are fundamental elements to provide best clinical outcomes in patients.

Keywords:
distal phalanx fracture, DP treatment, percutaneous needles
CMC OSTEOARTHRITIS ARTHROSCOPICALLY TREATED BY HEMITRAPECECTOMY AND MINI TIGHT ROPE SUSPENSION

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Objectives / Interrogation:
We introduce our results of treating CMC osteoarthritis by distal hemitrapecectomy and mini tight rope suspension system performed with a minimally invasive technique and no implant device.

Methods: From 2014 to 2017, 41 patients have been surgically treat by arthroscopic CMC arthroplasty. Volar and dorsal CMC portals have been used, age ranges from 51 to 76 yo, 5 males and 36 females. Thumb traction was done in all cases, and no tissue or tendon interposition is done. All cases have type IV condral lesions in the trapezium and hemitrapecectomy was done by completely excised. When arthroscopic resection is completed under fluoroscope, a mini tight rope suspension system is implanted paying special attention that thumb abduction and retroversion range of motion must be complete. Clinical control is done with the Kaplan score, abduction and grip test; X-Ray controls are also done. Three cases with severe MTC-P hyperextension were treated with sesamoid metacarpal fusion.

Results and Conclusions: Patients mean follow up is 2.2 years. Pinch strength was restored between 100 to 80% compared to the contralateral hand at 4 months postop in 90% of cases, K10 in 87%. The mini tight rope had to be removed in 21% of cases because of disorders caused by metal plate or knot wire. Secondary surgery for trigger finger in the thumb happened in 12% of patients. No revision surgery was done neither to converse it into an arthroplasty or any other surgery on CMC. X-Ray haven't revealed to be a useful tool to evaluate results. Incomplete edge trapezium resection or narrowing arthroplasty have the same functional results to those cases with more 3 mm gap between bases of metacarpal and trapezium resection.

CONCLUSIONS
a very attractive method for patients. Functional outcomes are satisfactory despite we consider it can only be performed by highly skilled surgeons and there still is a high rate of suspension system removes. X-Ray is not a useful technique to get prospective results.

Keywords:
carpo metacarpal, arthroscopy arthroplasty, osteoarthritis
Recovery of Infracavicular Brachial Plexus Injury after Anterior Shoulder Dislocation

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Objectives / Interrogation: We report the patterns of infracavicular brachial plexus injuries (BPI) after anterior shoulder dislocation and their functional recovery rates.

Methods: This was a retrospective review of a prospectively-maintained database of patients who presented with infracavicular BPI following anterior shoulder dislocation. Each patient was examined by the senior author. All underwent EMG and MRI of the affected shoulder. Patients were followed up until functional recovery was achieved.

Results and Conclusions: Between 2014-18, 42 patients (23 male:19 female) with a mean age of 61 years (range 15-87) presented with these injuries. There were 15 pure shoulder dislocations and 27 fracture-dislocations. Twelve had concomitant rotator cuff tears. Four patterns of nerve injuries were observed: a) Isolated axillary nerve (n=20), b) 3-cord plexopathy (5), c) 2-cord injury (axillary & medial - 2, medial & posterior - 4, posterior & lateral - 1), d) Single cord injury (medial - 6, posterior - 3, lateral - 1).

The mean follow-up duration was 15 months (SD 11). Overall, 45% had full spontaneous recovery, 29% had partial recovery and 26% had no recovery at the time of their latest review. All lateral cord palsies recovered spontaneously to M4/5 elbow flexion (either in isolation or in combination with other cords). Amongst 13 posterior cord palsies, 11 recovered to M4/5 elbow extension and 2 did not show recovery at the 7-month review. Of the 17 medial cord palsies, 6 regained M4/5 intrinsic power, 5 recovered to grade M1-3, and 6 did not show any recovery at a mean of 13 months post injury. For those with isolated axillary nerve palsy, 11 recovered to M4/5 deltoid power, one had M3 activity, one did not show recovery at 7-months, and 7 underwent radial-to-axillary nerve transfer at a mean duration of 9 months post injury.

Nerve injury following anterior shoulder dislocation is not necessarily a benign condition. Isolated axillary nerve palsy is the commonest associated nerve injury with 60% spontaneous recovery rate. Lateral and posterior cord injuries have the best spontaneous recovery potential. The presence of medial cord palsy signifies a more severe nerve injury and recovery of hand function is often poor. All nerve palsies should be monitored closely and early referral to a specialist nerve service is recommended.

Keywords: shoulder dislocation; brachial plexus injury; axillary nerve; medial cord; lateral cord; posterior cord
THE ROLE OF NEW REHABILITATION PROTOCOL IN DUPUYTREN'S DISEASE

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Objectives / Interrogation: Dupuytren's disease (DD) is a benign fibroproliferative disorder characterized by the progressive development of a scar-like, collagen-rich cord within the palmar fascia of the hand which typically results in a permanent finger contracture. Recurrences are high in DD and its causes are almost unknown actually. In our opinion the adherence of an appropriate post-operative rehabilitation protocol is fundamental. In literature, there are not studies that assess the correct post-operative management in DD. The aim of the present study is evaluating the outcomes of a new post-operative rehabilitation protocol.

Methods: From February 2016 to February 2018, 78 patients were treated in our department. Collected clinical data included patient demographic data, post-operative side effects, type of treatment, protocol accession, rate of recurring events at follow-up time. The Anova one-way test was performed to evaluate the statistical significance of recurrences (p<0.05) in both groups: patients who adhere to rehabilitation protocol and who not adhere.

Results and Conclusions: We excluded 7 patients treated for recurrences. A total of 71 patients were submitted to the first surgery and in 44 cases (62%) the disease involved a single digital ray. In 34 cases (48%), we performed enzymatic cordotomy (Xiapex), in 37 cases (52%) was performed open surgery (aponeurectomy, cordectomy, dermoaponeurectomy). Post-operative side effects included wound dehiscence (5 cases in enzymatic cordotomy, 3 cases in open group). Statistical analysis does not reveal any correlation between adherence to protocol and rate of recurring events in both groups, according to literature. In conclusion, DD represents a mysterious pathology and currently the causes of recurrences are unknown. Rehabilitation protocol may be useful to regain an early complete function of the hand, but it does not influence the rate of recurrences. However further and multicenter studies will be necessary to understand the role of rehabilitation in this disease.

Keywords: dupuytren's disease, rehabilitation protocol, recurrences
Interpretation of Ulnocarpal Stress Test in Different Forearm Rotation

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Objectives / Interrogation: Ulnocarpal stress test is an essential physical examination for differential diagnosis of ulnar-sided wrist pain. However, there were some debates on the interpretation of the results of ulnocarpal stress test according to different forearm rotation position. Aim of this study was to analyze the correlation of positive results of ulnocarpal stress test in different forearm rotation with specific tender point of the wrist joint.

Methods: From March 2015 to February 2017, 54 patients who were diagnosed as ulnar impaction syndrome or ulnar styloid impingement syndrome by MRI or arthroscopy were included. We performed ulnocarpal stress test in forearm supination and pronation position and checked tenderness on dorsal lunate and ulnar head area (point A) and ulnar aspect of triquetrum and ulnar styloid area (point B). We analyzed odds ratio and statistical significance between positive physical examination and sites of tenderness using Fisher’s exact test.

Results and Conclusions: 46 patients had tenderness on the point A and finally diagnosed as ulnar impaction syndrome through consistent radiologic findings; Subchondral sclerosis, subchondral cysts, and "kissing" lesions of the lunate, triquetrum, and ulnar head. Among them, 40 of 46 patients had positive ulnocarpal stress test in forearm supination position. Odds ratio of positive ulnocarpal stress test in forearm supination and tenderness of point A was 8.25 and it was statistically significant. 8 patients had tenderness at point B and were diagnosed as ulnar styloid impingement syndrome with radiographic chondromalacia between proximal triquetrum and the ulnar styloid. 6 of 8 ulnar styloid impaction syndrome patients had positive ulnocarpal stress test in forearm pronation position. There were 12 patients who were diagnosed as ulnar impaction syndrome had positive ulnocarpal stress test in both supination and pronation position. In conclusion, patients who had positive ulnocarpal stress test in forearm supination tend to have a tenderness on the luno-triquetral joint area and be diagnosed as ulnar impaction syndrome, and who had positive ulnocarpal stress test in forearm pronation tend to have a tenderness on the ulnar aspect of the triquetrum and ulnar styloid area and be diagnosed as ulnar styloid impingement syndrome.

Keywords: Wrist, Ulnar impaction syndrome, Ulnocarpal stress test
Short-term results of Revision Cubital Tunnel Release Treated With Neurolysis and Procine Submucosa Extracellular Matrix

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Objectives / Interrogation: Epineural scarring following decompression of a peripheral nerve results in significant morbidity. We report a single institution experience of using procine submucosa extracellular matrix (AxoGuard® AxoGen Inc., Alachua FL) in revision Cubital tunnel release.

Methods: Twenty-four patients with recurrent ulnar nerve compression neuropathy at the elbow were treated with revision cubital tunnel release, neurolysis and AxoGuard® nerve wrapping. Idiopathic cubital tunnel syndrome was the primary operation in 16 cases and 9 had primary ulnar decompression following elbow trauma. Patient demographics, pre-and post-operative pain scores, sensory function, Tinel's sign and patient satisfaction were recorded in each case.

Results and Conclusions: Results
All patients were followed up to an average of 6 months (range 3-40), mean age of patients 50 was years (range 27-75). Post-operative pain levels improved from 7 to 3 (p<0.05) and sensation improved from a mean of 4 to 8. Following revision surgery absence of Tinel's sign was noted in 18 patients. One case had early re-exploration due to a wound haematoma. There were no complications associated with the use of the porcine submucosa extracellular matrix as a nerve wrap.

Conclusions
In this series of revision cubital tunnel decompression and neurolysis the addition of an AxoGuard® demonstrated good clinical results with no complications.

Keywords:
Nerve Wrap, Cubital tunnel, Neurolysis
**Objective / Interrogation:** Many wounds of extremity were intractable despite of adequate debridement and wound closure which it formed dead space or infectious focus. We tried to treat these intractable wound effectively with strong negative pressure suction using 50cc disposable syringe. We report the method and result of this treatment.

**Methods:** From Sep 2007 to Aug 2015, 150 wounds of 121 patients were treated with NPST. Average age was 49 years with 87 men. Location of wounds were 98 cases of hand, 27 forearm and arm, 11 foot, 10 thigh and leg and 4 trunk. After through debridement of dead or infected tissue, suction tube using connecting tube for IV fluid or butterfly needle was insertion into the wound with multiple hole. Wound was closed with airtight and 50cc disposable syringe was connected to the tube. Negative pressure suction was applied with drawback of piston of syringe to 50mm marking line. Negative pressure was adequately controlled remaining 0~5cc air into the syringe. Syringe was emptied out more than 10 cc of drainage and maintained from 3 to 14 days.

**Results and Conclusions:** 134 of 150 wounds were treated with this method despite of infectious or dirty wound. 110 of 121 patients were treated by 1st try of NPST, 7 patients were 2nd try, 3 patients were 3rd try, and one patient was 4th try of NPST. NPST with 50cc disposable syringe was useful method for the treatment of intractable wound due to through removal of hematoma and infection exudate, obliteration of dead space, and tight contact of separated wound with strong negative pressure into the wound. NPST had the great advantage than can be easy done without any special equipment.

**Keywords:**
Negative pressure suction treatment, disposable syringe, closable wound.
Ray amputation for the treatment of foot macrodactyly in children

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Objectives / Interrogation: To investigate the results of surgery on foot macrodactyly who underwent ray amputation.

Methods: 16 feet of 15 patients were included in the study. We radiologically measured the intermetatarsal width and forefoot area pre-operatively and at six weeks and two years after surgery. Clinical results were recorded using the Oxford Ankle Foot Questionnaire for children (OxAFQ-C) and the Questionnaire for Foot Macrodactyly.

Results and Conclusions: Mean follow-up was 49 months. The intermetatarsal width and forefoot area ratios were significantly decreased after surgery. The mean OxAFQ-C score was 35 (16 to 60) pre-operatively, improving to 48 (5 to 60) at two years post-operatively (p<0.05). The mean questionnaire for foot macrodactyly score two years after surgery was 8 (6 to 10). In conclusion, reduction in foot size with excellent functional results were achieved using ray amputation. For patients with metatarsal involvement, a motionless toe, or involvement of multiple digits, ray amputation is a clinically effective option.

Keywords:
macroductyly, ray amputation
"Less than ten" - Amputation injuries among surgeons

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Objectives / Interrogation: Amputation injuries and their microsurgical treatment are part of a daily routine of a Hand-Trauma-Center. In the majority of these cases, the patients are technical skilled workers appointed in agriculture and industry. Little is known about amputation injuries of surgical colleagues. To best of our knowledge, data about type, numbers, results, long term follow-up, rehabilitation and the psychological impact after amputation injuries among surgeons are very rare.

Methods: Here we present an interesting case of a vascular surgeon, who sustained a three finger amputation in a circle saw accident in private settings. The immediate operative care as well as the follow-up and the rehabilitation is presented. Special attention is paid to the high motivation of this colleague. Furthermore a comprehensive literature review was undertaken.

Results and Conclusions: In the case of the vascular surgeon colleague, due to the devastating injury pattern with multiple trauma locations in all affected digits, only the ringfinger could be successfully replanted. However due to his extraordinary high motivation, he was able to return full-time to his surgical profession even with only 3 fingers in his one hand.

Amputation injuries are an extremely devastating accident for the life of the patients. However our example of an highly motivated surgeon colleague, who is still working as an active surgeon emphasize the impact of the psychological strength and self motivation.

Keywords:
Median Nerve Motor Branch Transfer for Treatment of Severe Cubital Tunnel Syndrome

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Objectives / Interrogation: This study aimed to present a modified method for treatment of severe cubital tunnel syndrome (CuTS), using ulnar nerve anterior subfascial transposition and an additional median nerve motor branch transfer to ulnar nerve.

Methods: From May 2013 to October 2016, 41 patients with grade III CuTS based on McGowan's classification were enrolled. All patients were treated with the same procedure: 1. ulnar nerve neurolysis and anterior subfascial transposition at the elbow, 2. median nerve motor branch of pronator quadratus transfer to motor branch of ulnar nerve at the forearm. Patients were followed at 3, 6, 9, 12 months postoperatively. All patients underwent preoperative and final follow-up assessments of Disabilities of the Arm, Shoulder, and Hand (DASH) score, nerve conduction velocity (NCV), 2-point discrimination, and pinch and grip strength. The mean follow-up time was 33 months using the Modified Bishop scores system.

Results and Conclusions: RESULTS: At the final follow-up, the average DASH score, NCV, 2-point discrimination, and grip and pinch strengths improved in all patients. At least a 1-McGowan grade improvement was achieved in 37 patients (90.2%). According to the modified Bishop scores, 34 patients (82.9%) achieved good or excellent outcomes, 5 patients achieved fair outcomes (12.3%) and 2 patients (4.8%) had poor outcomes.

CONCLUSIONS: The modified method using ulnar nerve anterior subfascial transposition and an additional median nerve motor branch transfer to ulnar nerve, is a reliable and safe treatment option for treatment of patients with McGowan grade III severe CuTS, with satisfactory mid-to-long term functional and patient-rated outcomes.

Keywords:
cubital tunnel syndrome, median nerve motor branch, nerve transfer, neurolysis
Factors Associated with Surgeon Recommendation For Additional Cast Immobilization of a Nondisplaced Scaphoid Waist Fracture

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Objectives / Interrogation: Recent evidence suggests that a shorter period (4-6 weeks) of cast immobilisation is adequate for the treatment of nondisplaced scaphoid waist fractures. This study was set out to investigate patient and surgeon factors associated with surgeon recommendation for prolonged cast immobilisation (>8-12 weeks) of a nondisplaced scaphoid waist fracture.

Methods: 218 orthopedic and upper-extremity surgeons participated in an international online survey study. Participants were presented with 16 case scenarios of patients with nondisplaced scaphoid waist fractures treated with cast immobilisation. They were asked whether they would continue or stop cast immobilisation. Patient variables included sex, age, gender, radiographic fracture consolidation, presence of fracture tenderness and duration of completed cast wear (8 or 12 weeks). Multivariable linear regression analysis was used to identify which characteristics were associated with surgeon recommendation for continued cast wear.

Results and Conclusions: Results:
Up to 84% and 49% of the surgeons recommended additional immobilization after 8 and 12 weeks, respectively. Unclear fracture healing on radiographs increased the likelihood of prolonged cast duration (>8-12 weeks) with an odds ratio (OR) of 35.0 (95% confidence-interval(CI): 4.6-262, p=0.001). The presence of fracture tenderness was associated with an OR of 9.6 (95%CI 2.1 to 36, p=0.001) for continued cast wear compared to no fracture tenderness. Female surgeons (OR 3.0, 95%CI 1.3-6.8, p=0.011) and those not specialized in trauma or upper-extremity surgery (OR 2.6, 95%CI 1.3-5.3, p=0.007) were more likely to recommend continued cast wear, while surgeons practicing in Europe were less likely to recommend additional immobilization (OR 0.15, 95%CI 0.051-0.46, p=0.001).

Conclusion:
In this online survey study, cast duration was dictated by radiographic fracture appearance and the presence of fracture tenderness. This runs counter to good evidence that radiographs are unreliable in assessing scaphoid union. The role of fracture tenderness in assessing fracture healing merits further investigation. Considering the high union rates of this type of fracture following cast immobilisation (>90%), the use of CT may not always be justified to assess union. A clinical prediction rule to determine scaphoid fracture healing may contribute to reducing immobilisation time, or help identify patients who require a CT-scan for follow up.

Keywords:
Scaphoid fracture, non-operative treatment, cast immobilization, Science of Variation Group

References:
Surgical Dislocation and Cancellous Bone Graft is Alternative Operative Treatment in Capitellar and Trochlea Fracture with Elbow Instability

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Objectives / Interrogation: Recently, AO classification using fracture location, degree of articular involvement and type of fracture in distal humerus fracture is widely used and is helping to standardize the treatment results, and determine the treatment method and prognosis. However, fractures involving the capitellum and trochlea are rare and often not consistent with the AO classification or the previously reported classification. In addition, the treatment is still very controversial. Therefore, in this study, we propose a surgical treatment method for elbow instability with capitellum and trochlea fracture.

Methods: Fifteen patients with elbow instability with capitellum and trochlea fracture were treated surgically between 2003 and 2014. The lateral approach was used, and fracture site of the capitellum and trochlea was completely exposed by the medial dislocation of the elbow. The articular bony fragment was anatomically reduced and fixed with absorbable pins and screws. Iliac bone graft was applied to the bony defect. The mean age at operation was 53 years (range, 16 to 76 years), and the mean follow-up period was 24 months (range, 18 to 71 months). Postoperatively, ROM (range of motion) was measured, and Mayo Elbow Performance Index (MEPI) and Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire was assessed.

Results and Conclusions: The range of motion of the elbow at final follow-up was 142.5 degrees (SD = 7.9) in flexion/extension and 162.5 degrees (SD = 8.8) in supination/pronation. The mean MEPI was 90.5 (SD = 7.6), and MEPI stability score was 9.5 out of 10 (SD = 1.5). The mean DASH score was 11.2 (SD = 11.9). One patient had evidence of osteonecrosis, but she had no complaints of pain and adequate ROM at last follow-up.

In elbow instability patients with capitellum and trochlea fracture, we were able to effectively expose the fractured site by lateral approach using medial dislocation of the elbow, without the olecranon osteotomy. In addition, anatomical reduction and stable internal fixation were achieved by disimpaction, autologous iliac bone graft, absorbable pin and screw fixation, and results were good. Therefore, the method proposed in this study may be a good alternative for the surgical treatment of elbow instability patients with capitellum and trochlea fracture.

Keywords:
Capitellar and Trochlea Fracture, Elbow Instability, Surgical dislocation, Cancellous Bone Graft
Wrist proprioception and forearm muscles biomechanical parameters dependency in DISI cases

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Objectives / Interrogation: Dorsal intercalated segment instability (DISI) is problematic, complicated wrist disorder which cause great disturbances in patients everyday living, work and sports activities. Because of pain patients often diminish wrist ROM and function which indicates even more imbalance. In ligamentous DISI cases proper operative or non-operative treatment is crucial for patients recovery. Despite the fact that the medicine know more and more about proprioception and its influence to the wrist stability it is still a great challenge to objectively assess its activation in wrist motion and stability.

Methods: 18 patients with ligamentous DISI (age: 32 y.o) and 20 volunteers as a control group underwent wrist isotonic examination on Biodex System 4 Pro and joint position sense examination on Three Dimensional Upper Limb Movement Zebris System HAF. The examination was concerned with the basic wrist movements: flexion and extension, adduction, abduction and with retrieving the "0" position (the one line with the forearm). For the research the method of assisted presentation and active reproduction was taken.

Results and Conclusions: There was significant difference (p<0.05) between DISI wrist flexors and extensors biomechanical parameters in comparison to the healthy wrist and control group. Wrist and fingers extensors average peak velocity was 308,2 deg/sec and wrist and fingers flexors average peak velocity was 405,7 deg/sec. The agonist antagonist ratio in DISI wrist was 72%, healthy wrist 58% and control group 57%. There were no significant difference in EARJP (error of active reproduction of joint position sense) between DISI group and control group. EARJP for wrist extension was 3,7 ± 1,9 deg in DISI wrist and in control group 3,1 ± 2,4 deg.

Conclusions: Disabled ligamentous stabilization is supported by higher forearm muscles activation. Decreased level of forearm muscles biomechanical parameters is responsible for increased error of active reproduction.

Keywords:
wrist, DISI, instability
Changes in Ulnar Variance after a Triangular Fibrocartilage Complex Tear

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Objectives / Interrogation: The relationship between triangular fibrocartilage complex (TFCC) tear and ulnar impaction syndrome has not been fully understood. We hypothesized that a TFCC tear could change the ulnar variance, which may be the cause of ulnar impaction syndrome.

Methods: A total of 72 patients who underwent TFCC foveal repair between January 2011 and June 2016 were included in this retrospective study. Among them, 44 patients diagnosed with TFCC foveal tear with distal radioulnar joint instability and no ulnar impaction syndrome underwent TFCC foveal repair only (group A) and 28 patients diagnosed with TFCC foveal tear with ulnar impaction syndrome underwent TFCC foveal repair and ulnar shortening osteotomy simultaneously (group B). We measured their ulnar variances in preoperative, postoperative, and last followup plain radiography. We also compared them with the ulnar variance of the contralateral (uninjured) wrist. Postoperative clinical outcomes, such as range of motions of the wrist, the visual analog scale (VAS) for pain, grip strength, and Quick Disabilities of the Arm, Shoulder, and Hand (QuickDASH) score, were assessed.

Results and Conclusions: Ulnar variance increased after TFCC tears compared with that on the uninjured side in both groups (group A: 0.98 vs. 0.52 mm; group B: 2.71 vs. 2.13 mm). Once the TFCC was repaired, ulnar variance decreased (group A: 0.98 to 0.01 mm; group B: 2.71 to 0.64 mm). However, it was increased on the last follow-up radiograph (group A: 0.01 to 0.81 mm; group B: 0.64 to 1.05 mm). There were no significant improvement of range of motion, except for pronation-supination motion. Mean grip strength increased from 56.8 to 70.8% of the contralateral unaffected hand at the last assessment. Mean VAS for pain decreased from 7.4 preoperatively to 2.7 postoperatively. The QuickDASH score significantly improved from 45 to 9. In conclusion, ulnar variance may be changed after a TFCC tear. In our study, it decreased after TFCC foveal repair. However, as time went on, the ulnar variance increased again, which could be one of the causes of ulnar impaction syndrome and ulnar-sided wrist pain.

Keywords:
Wrist, Triangular fibrocartilage tear, Ulnar variance
Use of Kirschner Wires With Eyelets for Tension Band Wiring of Olecranon Fractures

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Objectives / Interrogation: Tension band wiring is a widely accepted fixation technique for displaced olecranon fractures. It has a well-established biomechanical basis and has been reported to provide good outcomes in several long-term studies. However, the technique may be insufficient in the presence of comminution, instability, or substantial extension into the coronoid process. Despite the efficacy of this technique, prominence of the Kirschner wire at the insertion site is a commonly reported problem. In the majority of cases, this prominence is caused by proximal pin migration and can result in pain, skin breakdown before pin removal, secondary displacement, or subsequent malunion or nonunion. Although an alternative technique involving running the distal ends of Kirschner wires through the anterior ulnar cortex has been proposed to reduce the incidence of pin migration, other complications such as restrictions of forearm rotation and anterior interosseous nerve injury have been reported regarding this modification. Therefore, we proposed that a more effective approach was required to prevent pin migration and other complications such as restriction of forearm rotation or neurovascular injury. Accordingly, we have used a modified Kirschner wire, which features an eyelet near the trailing end to prevent pin migration.

Methods: The authors retrospectively reviewed 44 patients treated for an isolated, displaced olecranon fracture and checked range of motion, postoperative pain, complications, and incidence of hardware removal. The mean follow-up period was 41 months (range, 26-73 mo).

Results and Conclusions: All fractures united, and anatomical reduction was achieved in all cases at final follow-up. Mean elbow flexion was 135° (range, 115° to 140°), and mean elbow extension was 4° (range, 0° to 15°). No pin migration, restriction of forearm rotation, or neurovascular injury occurred. Hardware removal was performed in 8 cases (18%). Compared to previous results with conventional Kirschner wires, no meaningful improvement in postoperative pain level or in the rate of hardware removal was observed.

Tension band wiring using the pin studied produced excellent clinical and radiologic outcomes for the treatment of isolated, displaced Mayo type IIA and some type IIB olecranon fractures. The pin was effective in preventing the backing out of Kirschner wires and avoiding the complications associated with anterior cortical engagement of Kirschner wires, such as neurovascular injury or restriction of forearm rotation.

Keywords:
Olecranon Fracture, Tension Band, Kirschner Wire, Eyelet
Pianists most common hand and wrist disorders as effect of forearm muscle overload

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Objectives / Interrogation: Professional musicians are often compared to professional sportsman but the diversity of muscle work and its implications to patients health vast difference. Musicians maintain one improper position for long time which indicates great level of muscle overload in time. Most of the problems are caused not by high energy injury but because of microtrauma and muscle fatigue which leads to muscle imbalance and proprioception disorders. Treating musicians hand is a great challenge for surgeon as well as for therapists because very often patients admit about the problem and pain because of being afraid of playing break and losing their abilities.

Aim of the study was to asses most common hand and wrist disorders according to muscle overload while playing in professional pianist group.

Methods: 17 professional pianists (average age: 31 y.o.) with time of play min 15 years underwent clinical examination, DASH questionnaire and electromyography Noraxon Telemyo examination while playing. All participants were measured at the same instrument and with the same program - sitting position, 3min all board repetitive octave, different rest positions and pace instrumentals. To assess flexors strength global grip strength was measured.

Results and Conclusions: Clinical examination reveled most common problems with wrist pain and painful palpation. 56% of group had positive results of Thomsons, Cozens and chair test. 39% of group claimed ulnar or median neuropathy symptoms. 64% of group present incorrect posture with neck and shoulder protraction. 53% of participants had present skin laxity symptoms. The superficial electromyography reveled significant difference (p<0,05) between resting position and playing. Average amplitude during play of ECU was 72,4 uV, ECRB 55,6 uV while FCR 62,3 uV and FCU 42,3 uV and FCR 47,9 uV. Global grip strength was 29,8 kg for right hand and 28,1 for left hand.

Conclusions: Superficial electromyography indicates high overload of wrist extensors and flexors muscles which are responsible for wrist pain and disorders. Wrist laxity, poor posture and lack of proper warm up may paly important role for wrist disorders.

Keywords:
musicians hand, electromyography, forearm
Informed Consent for trigger finger release - our experience with video consent for trigger finger release.

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Objectives / Interrogation: Informed consent has become mandatory in the current environment for safe surgical procedures. There are specific legal requirements for what has to be disclosed to patients and the accompanying documentation.

Methods: This is a quasi-experimental pilot study on the use of video consenting for informed consent taking for trigger finger release. Prior to obtaining consent for trigger finger release, a validated consent taking video of the procedure that provide the patient with information about the nature of the surgery, the expected benefits, material risks and adverse effects, alternate treatments and the consequences of not having the surgery was shown to the experimental group of 5 patients undergoing the trigger finger release. Material risks included risks common to all surgery and risks specific for the proposed surgery including the very rare. The control group consisted of five patients undergoing trigger finger release who were consented using the standard oral consent form with information provided by the surgeon in the clinic. Following the surgery, the experimental group were then provided with similar information to the control group for trigger finger release and then subjected to a survey about the suitability and utility of the video consent procedure using the System Usability Scale (SUS) score. The control group were then shown the video consent information and then provided with the similar validated suitability and utility survey form.

Results and Conclusions: In general, the patients preferred the video consenting process for trigger finger release. The SUS scores were high for the video consenting process.

Even though video consenting as a process for informed consent has its utility in trigger finger release practice. However, the preliminary results showed that there is a challenge in the acceptance and relevance of informed consent generally in the local context. Further quality studies need to be conducted to see the relevance and acceptance of informed consent in local patients for common hand conditions in Singapore.

Keywords: Informed consent, Trigger Finger
Biomechanical evaluation of wrist flexors and extensors function after arthroscopic treatment of triangular fibrocartilage lesions

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Objectives / Interrogation: TFCC injuries significantly affect patients quality of life. Most of patients complains are concerned with high developed pain which unable performing the everyday living activities. Most recommended treatment is the arthroscopic treatment of the lesion. The aim of the study was to asses patients wrist flexors and extensors biomechanical parameters after TFCC operative treatment.

Methods: 28 patients (9 male and 19 female) with mean age 36 years were biomechanically tested on Biodex System 4 Pro device with isotonic protocol. Mean time of follow up was 5 years after the surgery. There were 15 patients after arthroscopic repair of TFCC Palmer 1B tear, 2 patients after TFCC Palmer 1A tear, 2 patients after TFCC Palmer 1D tear and 1 patient with TFCC Palmer 1A and 1B tears. Wrist flexors and extensors were tested in 3 trials (0,5Nm/1Nm/0,5Nm) in which the patients performed sequentially 4 movements of wrist flexion and extension. Grip strength was measured with electronic dynamometer.

Results and Conclusions: There were no significant differences between wrist extensors and flexors biomechanical parameters in operated and healthy limb. The average functional ROM for the operated wrist was 117.58 degrees and 123.64 degrees for the healthy one. The average velocity of the wrist extensors was 225.96 deg/sec for the operated wrist and 221.14 deg/sec for the healthy one. The average velocity of the wrist flexors was 343.74 deg/sec for the operated wrist and 368.79 deg/sec for healthy one. Grip strength value was 32.07 kg for operated wrist and 33.58 kg for healthy one. Over 75% of patients were extremely satisfied with the operative results and only 2 patients had no improvement.

Conclusions: TFCC arthroscopic treatment enables almost full recovery of the injured hand and allows to achieve high values of wrist flexors and extensors muscles biomechanical parameters. Biomechanical evaluation of wrist function after surgery significantly expands our knowledge of the results of arthroscopic treatment of TFCC lesions.

Keywords:
TFCC, biomechanical examination
Proximally based pedicled first dorsal interosseous muscle flap for index finger pollicisation in children: an anatomical study of the vascular and innervation patterns and surgical technique.

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Objectives / Interrogation: Pollicisation of the index finger is the gold standard treatment for severe hypoplasia or aplasia of the thumb in radial longitudinal deficiency in children. Thumb opposition deficit is a common complication and may require abductor digitii quinti muscle or ring finger superficialis tendon transfer. We hypothesized that failure of the first dorsal interosseous muscle (FDIM) could partially explain these results. We report an original technique of FDIM pedicled flap transfer to recreate the lateral thenar muscle. Before elevating the flap, we investigated the vascular and innervation patterns of the FDIM.

Methods: An anatomical study was carried out. Fourteen fresh upper limbs were dissected to determine the vascular and innervation patterns of the FDIM. Three upper limbs were used for the description of the transfer technique.

Results and Conclusions: The point of penetration of the deep branch of the ulnar nerve (DBUN) in the FDIM was located at 41% (28-48%) from the base of the second metacarpal. Four arteries vascularize the FDIM: the direct dorsal interosseous branch, the first palmar metacarpal artery, the first dorsal metacarpal artery and the dorso-ulnar artery of the thumb. The direct dorsal interosseous branch originating from the radial artery is the major pedicle. The FDIM pedicled flap was moved backward and ulnarly-ward and, then, fixed to the anterior retinacular ligament.

The DBUN is vulnerable during the dissection of the first dorsal and the first palmar interosseous muscle in the index finger pollicization. The DBUN must be seen and protected in order to avoid its iatrogenic section. We demonstrated the feasibility of FDIM pedicled flap transfer in adult cadaver. Moving backward and ulnarly-ward the proximal insertion of the FDIM, hence recreating the lateral thenar muscle, should theoretically improve the opposition capacity of the new thumb.

Study of the anatomical vascular pattern of the hand in children with radial longitudinal deficiency must be performed. Clinical application is the next step toward confirming the reliability and efficiency of FDIM pedicled flap transfer.

Keywords: pollicisation, first dorsal interosseous muscle, deep branch of the ulnar nerve, motor branch of the ulnar nerve, opposition reanimation, thumb hypoplasia, thumb aplasia, radial longitudinal deficiency
Endoscopic Cubital Tunnel Decompression - A True "Keyhole Technique" Using the Tulip ® Endoscope System.

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Objectives / Interrogation: A number of endoscopic techniques have been described utilising a traditional mini-open incision with a steep learning curve. We describe our experience of a suprafascial technique to decompress the ulnar nerve at the elbow using a custom-made Tulip® Endoscope System, and present the results from this novel technique. The Tulip ® Endoscope allows both blunt and sharp dissection, as well as excellent visualisation and access to all structures essential for nerve decompression.

Methods: The majority of patients had regional block anaesthesia with less than 10 opting for WALANT. The patient is positioned laterally, with the shoulder abducted and elbow flexed over a support. A 2 cm endoscopic portal in the proximal forearm allows identification of the flexor carpi ulnaris (FCU) fascia. The Tulip ® instrument is introduced and a channel over the fascia, identifying Osborne's fascia and medial epicondyle. A small constant perforating vessel helps identify the site of incision of Osborne's fascia. The remainder of the fascia and more proximal structures are divided with scissors under direct visualisation. Reversing the direction of the scope allows proximal to distal dissection deep to FCU, allowing for the division of all fascial bands down to distal third of the forearm.

Subsequently a retrospective single surgeon series involving 255 consecutive patients undergoing endoscopic cubital tunnel decompression (ECuTD) over a 9 year period (2008 to 2017) was conducted. The demographics, reoccurrence, and complications were recorded.

Results and Conclusions: RESULTS: From our cohort, there were 57 percent males (N=146) and 43 percent females (n=109). The mean age of our patients were 55 years (range 13 - 90).

2 cases (0.78 Percent) were converted to open procedures, one due to significant scar tissue, and the other for excessive patient movement. One patient (0.39 percent) had a post-operative haematoma. There were no instances of reoccurrence - defined as return of symptoms after a 3 months being symptom-free, However 4 (1.56 percent) patients underwent further open exploration for failure of relief of symptoms. 1 patient ( 0.39 Percent) was found to have a subluxating nerve and underwent anterior transposition. No injury to the medial cutaneous nerve of the forearm was observed.

CONCLUSIONS: Our results demonstrates that the Tulip ® Endoscope provides a safe and reproducible means to decompress the ulnar nerve at the elbow with very low complication, recurrence and re-operation rates.

Keywords:
Novel Technique, Endoscopic Cubital Tunnel Decompression
Stage III basal joint arthritis of the thumb: Clinical and radiological outcome after total trapeziectomy and ligament reconstruction and tendon interposition (LRTI) with partial Flexor carpi radialis (FCR) tendon

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Objectives / Interrogation: Thumb basal joint arthritis is common. Total trapeziectomy and ligament reconstruction and tendon interposition (LRTI) is commonly used surgical option for the stage III, IV basal joint arthritis of the thumb. We reported the clinical and radiological outcome after total trapeziectomy and LRTI with partial FCR tendon for the stage III basal joint arthritis of the thumb.

Methods: A retrospective review was performed for the patients treated with total trapeziectomy and LRTI for their stage III basal joint arthritis of the thumb. Functional outcome was evaluated with a DASH questionnaire and visual analog scale (VAS) pain score. Clinical evaluation examined grip strength and lateral key pinch in kilograms-force. For the radiologic evaluation, stressed and unstressed radiographs assessed metacarpal proximal migration. To evaluate proximal migration, an anteroposterior (AP) wrist view (with true thumb lateral position) was used. The degree of proximal migration was compared with contralateral wrist X-ray and expressed with percentile ratio both at rest and maximal-effort tip pinch.

Results and Conclusions: This study included 18 patients (male 1, female 17) who underwent total trapeziectomy and LRTI for their stage III basal joint arthritis of the thumb. The average age was 62 years (range 57-77 years). The mean follow-up period was 18 months (range, 12 to 27 months). 10 of the affected hands were non-dominant hand.

VAS improved from a preoperative mean of 5.7(at daily living activities) and 7.9(at sports or occupational activities) to a postoperative mean of 1.3 and 2.3, respectively (P < .01). DASH also improved significantly from a preoperative mean of 73(range, 54 to 92) to a postoperative mean of 23 (range, 16 to 43) (P< .05). Grip strength and lateral key pinch improved from a preoperative mean of 13.2kg (range, 5 to 18) to 22.4kg (range 16 to 26) and 3.4kg (range, 1.3 to 4.5) to 5.4kg (range, 4.5 to 7.2) (P< .05). The mean proximal migration was 27% (range, 11 to 43) at rest and 53% (range, 43 to 68) at maximal tip pinch.

Conclusively, this study suggest that total trapeziectomy and LRTI with partial FCR tendon is an effective surgical treatment for the stage III basal joint arthritis of the thumb and provides stable, painless thumb.

Keywords:
basal joint arthritis, thumb, total trapeziectomy, LRTI
Simultaneous Multiple Long Sural Nerve Cable Graft with Saphenous Vein Graft and Staged Tendon Transfer for Brachial Plexus Injury with Ischemic Injury

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Objectives / Interrogation: Many surgical treatments of brachial plexus injury (BPI) such as nerve repair, nerve graft, and nerve transfer have been introduced over the times, but simultaneous neurovascular reconstruction for traumatic BPI with long neurovascular defects has rarely been reported. The purpose of this study was to analyze the outcome of neurovascular reconstruction associated with multiple long sural nerve cable graft, saphenous vein graft and staged tendon transfer in a patient with whole-type paralysis of BPI accompanied by ischemic injury.

Methods: A 43-year-old man who had been injured in the left axillary area by rotating drill machine visited an emergency room. His left upper extremity was completely absent in neurologic function and seemed to be pale. In surgical exploration, complete rupture in axillary nerve, musculocutaneous nerve, median nerve, ulnar nerve, and radial nerve accompanied by complete brachial artery rupture were found. Defect of axillary nerve, musculocutaneous nerve, median nerve, ulnar nerve and radial nerve was 4cm, 4cm, 5cm, 6cm, and 5cm. So he received neurovascular reconstruction using multiple autogenous long sural nerve cable graft with autogenous great saphenous vein graft. 4cm axillary nerve defect was reconstructed by using 2 strands of 6 cm sural nerve graft. 4cm musculocutaneous nerve defect was reconstructed by using 3 strands of 6cm sural nerve graft. 6cm ulnar nerve defect was reconstructed by using 3 strands of 8cm sural nerve graft. 5cm median nerve defect was reconstructed by using 4 strands of 7 cm sural nerve graft, and 5cm radial nerve defect was reconstructed by using 3 strands of 7 cm sural nerve graft. 2 years after surgery, he received opponensplasty and correction of the intrinsic-minus hand using ECRL tendon transfer were performed.

Results and Conclusions: Immediately after the 1st surgery, the ischemic limb was fully recovered, and 2 years after 1st surgery, shoulder, elbow, wrist joint and extrinsic hand muscles were completely recovered. At the last follow-up, opposition and intrinsic function of hand were improved. Simultaneous multiple long sural nerve cable graft with vascular reconstruction in a patient with whole-type paralysis of BPI accompanied with ischemic injury is thought to be a method to restore the function of the shoulder, elbow, wrist joint and extrinsic muscle of hand. And staged tendon transfer such as opponensplasty, correction of intrinsic minus hand may be required for function restoration of intrinsic muscles of hand.

Keywords:
Brachial Plexus Injury, Sural Nerve Cable Graft, Tendon Transfer
Early result of Pyrodisc interposition arthroplasty for advanced thumb CMC joint osteoarthritis

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Objectives / Interrogation: The osteoarthritis of the thumb CMC joint is one of the common medical problems in middle years of life. Management of advanced thumb CMC osteoarthritis is challenging. Resection arthroplasty and arthrodesis have been used traditionally and implant arthroplasty are gaining popularity recently. Since Sep 2013, we performed Pyrodisc interposition arthroplsties for advanced Eaton-Littler stage III thumb CMC joint osteoarthritis and analysed early result of them.

Methods: We analyzed 13 patients who had undergone Pyrodisc interposition arthroplsty for thumb basal joint arthritis in our hospital from September 2013 to March 2017 and had a minimum 6 month follow-up. All patients were women and the mean age at diagnosis was 64.4 (range: 54-75) years. All 14 joints in 13 patients revealed Eaton stage III osteoarthritis. The symptomatic improvement, the position and survivalship of implant and the stability of reconstructed joints, and any secondary procedure performed were evaluated. The mean follow up period was 28.3 (6-56) months.

Results and Conclusions: The Pain was completely relieved in 7 joints and improved in remaining 7 joints. The positions of implants were good in 9 and fair in 3 and poor in two joints. One of joint with poor position revealed a progressive medial subluxation with accompanied swan neck deformity, which required revision of CMC arthroplasty and MP joint fusion. The other joint with poor position showed dislodgement of Pyrodisc which might be associated with rupture of FCR tendon sling and repositioning and stabilization with tendon allograft was performed. All Pyrodics implanted were surviving at last follow up. The stability of reconstructed joints was maintained in 12 joints. Two patient complained hypesthesia on thenar area. The average Quick DASH score in 10 joints was 17.1(5-39).

Conclusion: The Pyrodisc interposition arthroplsties was one of the reliable options in advanced thumb CMC joint osteoarthritis. To obtain good functional result, a proper surgical technique is mandatory.

Keywords:
Thumb CMC joint osteoarthritis, Eaton-Littler stage III, Pyrodisc interposition arthroplasty
Unusual Case of Persistent Choreiform Movements of the Upper Limb after Elbow Injury

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Objectives / Interrogation: There are very atypical cases in the upper limb pathology and the neurological pathology in particular, can have polymorphous manifestations. This was also the case of a healthy young man without any medical history that presented with choreoathetosis of the right upper limb, which started a few hours after an injury of the ipsilateral elbow. Despite the advanced investigations, the patient could not benefit from a diagnosis or effective treatment for four months. Our aim was to find similar cases in the literature and any possible physiopathological mechanism for this situation.

Methods: We present the diagnostic route before, during and after the admission to our hospital, of a healthy young man without any medical history that presented with persistent choreiform movements of the right upper limb, which started after an injury of the elbow. We also studied the available literature, in order to identify the mechanisms that could trigger this situation. About six hours after two consecutive injuries of the right elbow, the patient started to have intense pain and fixed extension of the right forearm that developed, during the next days, into pain and paresthesia of the whole upper limb, the inability to control the limb, progressive choreiform movements and temporary paralysis. The etiology of the disorder was unclear and in spite of the several inconclusive investigations, multidisciplinary approach, aggressive neuroleptic treatment, the patient remained undiagnosed and without any effective treatment. Eventually, exploratory elbow surgery was decided, where we found a small intramuscular haematoma that was compressing the ulnary nerve right at its entrance in the cubital tunnel. We performed external neurolysis of the ulnary nerve and all the symptoms subsided immediately.

In our literature review we found no similar case and very few reports of localized choreiform movements of one single limb.

Results and Conclusions: As a result of the decompression surgery performed, the patient is now free of symptoms. The reports that we found in the literature regarding choreiform movements localized in one extremity were scarce and resumed in situations like autoimmune diseases, paraneoplastic syndrome, stroke or injury of the brachial plexus. It is unclear to us how the choreiform movements were triggered by a peripheral nerve compression and together with the lack of data available on this topic we were encouraged to draw the attention to this case.

Keywords:
choreiform ulnar injury
Worse outcome (DASH) at 12 months in 128 patients with combined radius-ulna metaphyseal fracture than radius fracture alone. A register study of 3666 patients. Need for Evidence Based Treatment Guidelines?

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Objectives / Interrogation: Up to six percent of the distal radius fractures (DRFs) have a concomitant distal ulna metaphyseal fracture (DUF), treatment algorithms are widely used for DRFs, but are missing for a concomitant DUF. In the present study we used our prospective register to describe and analyze patients with combined DRF and DUF.

Methods: Since 2002, all DRFs in patients 18 years and older at our hospital are prospectively registered and patient-reported outcome (DASH) recorded at one year. Between 2003 and 2012, 3666 patients (2833 women) were included in the register (mean age 62 (18-98) years). All patients with a DRF and a concomitant DUF were identified. The radiographs were evaluated and distal ulnar styloid fractures without metaphyseal extension were excluded. 128 patients (111 women) were classified according to AO:s Q Modifier for ulnar fractures, and the Biyani classification. Patient characteristics, type of treatment and 1-year DASH were extracted from the register. Medical records were reviewed for current drug use and comorbidity according to the Charlson index.. Statistical testing was made using the Mann-Whitney U test.

Results and Conclusions: The subjective outcome at one year was worse (DASH 23) in patients with DRF+DUF compared to the whole DRF cohort (DASH 9; p<0.001). 67/128 patients (52%) were treated conservatively in plaster, time in plaster varied between 4 and 8 weeks. 61/128 patients (48%) were operated for the DRF, of these 34 also had internal fixation of the DUF. Six different methods of internal fixation were used. The subjective outcome in the surgically and non-surgically treated DRF+DUF patients were similar (DASH 25 vs 26, ns).

The patients operated for both DRF and DUF were younger (mean 66 years) than the patients treated non-surgically for the DUF (mean 76 years, p<0.001). A high degree of comorbidity was found in the DRF+DUF cohort. 59% had a Charlson score for comorbidity of 1 or higher, 63% were using at least one drug and 29% met criteria for polypharmacy (an intake of 5 or more drugs regularly).

The patient group with both DRF and DUF had a substantially worse subjective outcome one year after the injury compared to patients with DRF alone. A majority of the patients were elderly with multiple health issues. We could not see that the choice of DUF treatment was done systematically. Additional studies are needed to determine how to best treat this subgroup of patients in the future.

Keywords:
Wrist, Distal radius fracture, Distal Ulnar fracture, injuries, DASH
Study of independent extension of little finger after reconstruction of extensor tendon rupture of ring and little fingers in rheumatoid arthritis

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Objectives / Interrogation: The extensor tendon subcutaneous rupture caused by rheumatoid arthritis (RA) is the most commonly observed in the ring and little finger, and we frequently use the extensor indicis proprius (EIP) transfer in its reconstruction. According to the method, the independence movement of the ring and little finger is theoretically impossible. On the other hand, as the number of RA patients returning to society increases, it is expected that more patients need to develop independent fingers such as typing and piano performances. This may make piano playing or typing difficult. In this study, we followed up the cases of surgical reconstruction for subcutaneous extensor rupture of the ring and little fingers and examined the independent function of the little finger.

Methods: Since 1992, there were 32 patients who received reconstructive surgery for extensor tendon ruptures of the ring and little finger. 32 cases were reconstructed with EIP transfer and 6 were reconstructed with end-to-side suture (suture to middle EDC) were targeted. The postoperative function was evaluated by the range of motion of the little finger MP joint, EDM test, the presence / absence of troubles in daily life activity, and deterioration of functions due to exacerbation of RA.

Results and Conclusions: Three cases developed joint deformity due to exacerbation of RA, and two cases developed re-rupture. In the other cases, the averaged the range of motion of the little finger MP joint improved from -48 degrees to -8.8 degrees in the EIP transfer group, while in the end-to-side suture group from -42 degrees to -6.4 degrees. In postoperative EDM test, 20 cases were negative and 12 cases were positive in EIP transition group, 3 cases were negative and 3 cases were positive in end-to-side suture group. As for the troubles in daily life activity, one case (3.1%) in the EIP group and two cases (33.3%) in the end-to-side suture group answered that there was a problem; all of them had positive postoperative EDM test. Although independent extension disturbance of the little finger was anticipated after grouped reconstruction of the ring and little fingers, only limited patients exhibited impairment of independent little finger extension and very few patients complained of ADL disturbance.

Keywords:
tmasuda5263
Outcome in radial polydactyly at the interphalangeal and metacarpophalangeal level: An international multicenter study

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Objectives / Interrogation: The aim of this international multicenter study was to investigate how patient characteristics and surgical technique influence outcome in radial polydactyly.

Methods: Patients with radial polydactyly types II, IV and IV with triphalangism ('IV-Tph') were evaluated using the validated Rotterdam outcome assessment system. Multiple determinants of outcome were studied, including polydactyly type, number of surgeries, age at operation, nail presentation, clinical deviation, tendon anomalies, surgical technique and surgeon experience.

Results and Conclusions: Of the 114 cases in this study, 94 (82%) were evaluated after single surgery with a mean follow-up of 7.8 years, and 20 (18%) cases were evaluated after multiple surgeries with a mean follow-up of 11.5 years. There were no significant differences in overall outcome between the specific types of radial polydactyly. Within the single surgery group, functional domain outcome was worse for type IV (1.3 points; p=0.005) compared to types II and IV-Tph. The multiple surgeries group had worse overall outcome (4.2 points; p<0.001), functional outcome (1.4 points; p=0.010), pain (1.1 points; p<0.001) and satisfaction (0.7 points; p=0.012) compared to the single surgery group. Tendon anomalies were more frequently treated in the worst outcomes. Overall outcome was better in patients primarily treated by dedicated congenital hand surgeons (2.7 points; p=0.014) compared to less specialized consultants.

The most common types of radial polydactyly have similar overall outcome. However, a number of item- and domain-specific outcomes of type IV are worse. This indicates treatment of type IV remains challenging, especially in cases with tendon abnormalities, which are likely to influence outcome in a negative way. Our results suggest treatment of radial polydactyly by dedicated congenital hand surgeons is associated with better outcomes.

Keywords:
Radial Polydactyly, Surgery, Outcome, Multicenter
Early pin removal for pediatric radial neck fracture treated by percutaneous pin fixation

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Objectives / Interrogation: To compare the outcomes of percutaneous pinning and early pin removal (less than 3 weeks) for pediatric radial neck fractures with those of percutaneous pinning and late pin removal (after 3 weeks)

Methods: Forty-one pediatric radial neck fractures treated with percutaneous pinning in a single institute from 2003 to 2015 were divided into the following two groups: the early pin removal group (below 3 weeks, n=21) and the late pin removal group (>3 weeks, n=20). A Steinmann pin (S-pin) was inserted at the fracture site and the fracture was reduced using the leverage technique. The S-pin was then removed to release the soft tissue kinked in the process of fracture reduction and to minimize the potential for posterior interosseous nerve damage. During pin removal, the fracture site was supported by the thumb and a final supporting S-pin was inserted to secure the fracture site. The radiological results were graded based on the Metaizeau classification. The clinical results were evaluated by the range of motion and Mayo elbow performance score (MEPS). Statistical tests, including the Mann-Whitney U and Chi-square tests, were performed to compare the demographic factors and outcomes of the two groups.

Results and Conclusions: There were no significant differences in the demographic factors and other predisposing factors affecting the outcomes between the two groups. There were also no significant differences in the Metaizeau classification and MEPS between the two groups. In view of dressing care and additional oral antibiotics usage, early pin removal is more beneficial. Removal of the pin within 3 weeks after percutaneous pinning in pediatric radial neck fractures showed good outcomes that were comparable to those of late removal.

Keywords:
radial neck fracture, percutaneous pinning, early pin removal
Anatomical Study of Periosteal Vascularization of the Forearm: Design of Periosteal Vascularized Flaps and Clinical Application

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Objectives / Interrogation: Vascularized periosteal flaps (VPF) have been reported as very effective for treating complex bone non-union in pediatric patients with excellent results due to their osteogenic potential. The objective of this study is to present a detailed anatomical description of the periosteal vascularization of the radius and the ulna and the design of vascularized periosteal flaps. In addition, we report here the clinical utility of the VPF in complex cases of forearm nonunion in children.

Methods: Ten latex-colored upper limbs from fresh human cadavers were used. Branches were dissected under 3x loupe magnification, noting the periosteal, muscular, and cutaneous branches arising from the radial (RA), ulnar (UA), anterior (AIA) and posterior interosseous (PIA) arteries for the radius and ulna. The size of the pre and post-dissection flaps and vascular pedicles length were measured.

Three patients under age 18 years with forearm nonunion, who underwent a VPF procedure without bone grafting, were included for this study at a mean follow-up of 26 months.

Results and Conclusions: The AIA Vascular Axis was used to rise the Volar-Radial VPF. An average of 16.2 periosteal branches were obtained, with an average distance of 6.6 mm between them being the average size of the VPF was 41.3 cm² before the dissection and 32.4 cm² after dissection. Average pedicle length of 16.1 cm.

The RA Vascular Axis was used to rise the Radial VPF. The mean of periosteal branches was 20.8 branches with a mean VPF pre-dissection size of 54.8 cm² and 39.3 cm² post-dissection. Average pedicle length of 20.2 cm.

IPA Vascular Axis was used to rise the Dorso-Ulnar VPF. An average of 12.8 periosteal branches were obtained, with the mean CVP size being 26.2 cm² pre-dissection and 20.4 cm² post-dissection with an average pedicle length of 12.6 cm.

The UA Vascular Axis was used to rise the Ulnar VPF. The mean was 10.2 periosteal branches with an average size of the pre-dissection CVP of 37.5 cm² and 28.2 cm² post-dissection and a pedicle of 14.8 cm.

There were two radius nonunions and a ulna nonunion. The mean bone defect was 18 mm. Successful consolidation was achieved in all cases.

Conclusions: we have described 4 new VPF. The most useful and versatile VPF were the Dorso-Ulnar VPF based on the PIA and the Volar-Radial VPF based on the AIA. The main advantages of these flaps comparing to microsurgery techniques, are the simplicity and short time of the technique, its elasticity and adaptability to the surgical site.

Keywords:
Vascularized Periosteal Flap; Forearm Periosteal Flap; Periosteal Flap; Forearm Non-union; Non-union
A multinomial logistic regression analysis on characteristics of hand and wrist tumours: A multi-ethnic study

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Objectives / Interrogation: Hand tumours are frequently encountered in clinical practice, however, large-scale epidemiological data is infrequently published. The existing literature is not homogeneous with differing accounts of the commonest tumours. Epidemiological data can provide diagnostic cues to guide the workup and management of hand tumours. Assessing significant independent demographic factors and tumour characteristics associated with incidence of hand tumours are essential in the planning and delivery of healthcare services.

Methods: A retrospective review of all patients between 2004 and 2015, who underwent excision of hand tumours in a tertiary hospital in Singapore, was conducted. The following data were collected: age, gender, ethnicity, histological diagnosis, malignancy and location of tumour. A multinomial logistic regression analysis was then performed.

Results and Conclusions: A total of 4476 tumours from 4226 patients were identified with a mean age of 51.3 (8-101 years), male to female ratio of 1:1.15. Majority of the patients were Chinese (75%), followed by Malays (9%), Indians (8%) and others (8%). The most common hand tumours excised were ganglions (43%), with the majority located in the wrist. The next most common were giant cell tumours (9%), which were most commonly found in the digits. The majority of soft tissue tumours were benign (97%), with only 3% malignant cases. Interestingly, a multinomial logistic regression analysis showed that the risk of malignant tumours originating from the skin was 22 times higher than from soft tissue, and 7.6 times higher than from bone for patients of the same age, ethnicity and sex. Also, the relative probability of tumours occurring at the metacarpals rather than fingers was about 1.32 times higher for males than for females and close to 2 times higher for patients with malignant tumours than those with benign tumours.

The overwhelming majority of soft tissue tumours of the hand and wrist are benign and this can guide workup as well as counselling of patients prior to operation. Malignant tumours, while the minority, have the potential for significant morbidity and mortality if not appropriately evaluated or treated. The application of a multinomial logistic regression analysis model observed that tissue origin from skin and tumour location over the metacarpals were significant predictors for malignant hand tumours.

Keywords:
hand wrist fingers tumours epidemiology benign malignant malignancy soft tissue skin bone demographic factors analysis
Shedding light on King Cobra bites: A fangtastic story

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Objectives / Interrogation: A bite from the King Cobra is often fatal due to its potent venom. This case report describes a man who survived a king cobra bite to his index finger and the subsequent disease process and management of snake envenomation.

Methods: The patient's case notes were reviewed and details regarding admission and treatment was recorded. A literature review of snake bites and envenomation by king cobras was performed to inform the case recommendations.

Results and Conclusions: A 32 year old professional snake carer working in a zoo sustained a king cobra bite to his index finger when trialling a snake handling glove he had invented. He was acutely admitted to an intensive care unit. His finger progressively swelled around his puncture wound with development of finger compartment syndrome and the entire digit became necrotic over the course of a few days. He was managed with serial debridement and ultimately required an amputation of the finger, however he did survive the potentially fatal envenomation.

In this rare case we discuss the management principles of snake bites and envenomation, the physiological and pathological properties of snake venom, the indication for antivenom and the potentially digit saving procedure of early compartment release and finger fasciotomy.

Conclusion
Prompt management is essential in rare venomous snake bites including antivenom and early washout and decompression of compartments at risk. These early interventions have the potential to be digit, limb and lifesaving.

Keywords: -
Price of a finger

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Objectives / Interrogation: Traumatic loss of an index finger is offered twice the amount of compensation as compared to a loss of little finger. However, the little finger plays a pivotal role in power grip thus is underestimated in its importance. Our aim was to test our hypothesis that loss of the little finger will result in greater loss of grip strength compared to loss of the index finger.

Methods: Grip strength in the power grip position was measured in 12 healthy volunteers using a JAMAR hand dynamometer. Grip strength of their dominant hand was recorded as a mean kg force of three attempts in three grip configurations 1) using all fingers 2) excluding the index finger and 3) excluding the little finger. Grip strength percentage compared to the full hand was calculated and statistical significance was investigated with a two-tailed T-test

Results and Conclusions: Participants' age varied from 19-64 years, with 4 males and 8 females. Mean full hand grip strength was 28.3 kg force; grip strength with index finger excluded was 65.8% and with little finger excluded was 66.2%. There was no significant difference in grip strength percentage between index or little finger exclusion (p=0.92). Conclusion We did not find a difference in power grip using a simulated model of index or little finger loss in a healthy volunteer cohort. Limitations of the study and future study designs are discussed.

Keywords: compensation; traumatic loss of finger; jamar; grip strength assessment
Determination of correct length in total trapeziometacarpal arthroplasty

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Objectives / Interrogation: The goal of this study is to examine the effect of increasing neck length on range of motion and stability of trapeziometacarpal total joint (TMC) arthroplasty. We want to determine the ideal neck length for optimal stability and motion.

Methods: This study is based on the analysis of 7 fresh-frozen human cadaveric forearms with no signs of TMC osteoarthritis. Thumb length and range of motion were measured using a three-dimensional electromagnetic motion tracking device (Patriot system®, Polhemus). Sensor 1 was fixed on the head of the first metacarpal (MC) and sensor 2 on the distal phalanx of the thumb. Raw data was captured with PiMgr GUI and exported to MathLab. All the tendons were individually loaded with a hanging weight of 1N (100g) to simulate muscle tone. Active movement was obtained by additionally loading muscles. Positional data of both sensors was captured. This was first performed for the native TMC joint. Next, an Arpe TMC prosthesis (Zimmer Biomet) was implanted. Assessments were made for progressively longer necks: 0, +2, +4 and +6mm. We repeated each measurement 5 times for every excursion, and the mean of the five tests was used for analysis.

Data processing
1. From the position of the head of the first MC(sensor 1), the center of motion (COM) of the TMC joint could be determined.
2. The range of motion of the TMC joint in the planes flexion-extension and abduction-adduction was expressed as the angle formed by the line connecting the head of the first MC (sensor 1) and the COM.
3. The range of motion of the distal phalanx was determined in the same way, but by using data of sensor 2.
4. The distance between the COM and the first metacarpal head was calculated.

Statistics
The data was analyzed by repeated measures analysis of variance with post hoc Bonferroni analysis. The differences between different neck lengths were compared using the paired t-test.

Results and Conclusions: Thumb length was adequately reconstructed after implantation of a total joint implant with neutral neck length. With increasing neck length, range of motion of the trapeziometacarpal joint and the distal phalanx of the thumb decreased. Longitudinal stability of the TMC joint increased with increasing neck length. By increasing prosthetic neck length, thumb range of motion decreased, while increasing the stability of the construct, as is intuitively assumable. We were able to determine a "sweet-spot" of optimal stability and range of motion. This information can guide the surgeon intra-operatively.

Keywords:
TMC Arthroplasty; Surgical technique
Improving management of NORSE hand referrals by introducing one-click digital advice template: A study of 100 cases in a tertiary hand trauma unit

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Objectives / Interrogation: NORSE is an electronic referral system where all our external hand trauma referrals are received. The referrals are then acted upon by the on-call hand team. The aim of this study was to establish the variation in management plan and advice given through NORSE in order to identify areas of improvement and address these by improving the electronic referral system.

Methods: We conducted a retrospective study of 100 referrals between July and September 2018 on the NORSE system. The diagnosis code for the referrals, information provided by the referees, advice given by our unit and management plan was collected. We then introduced an one-click electronic advice template for each diagnosis referral category and re-audited our results in another 100 patients.

Results and Conclusions: The largest number of referrals consisted of closed metacarpal fractures (24%) followed by single flexor tendon injuries (14%) and single extensor injuries (8%). Forty-seven percent of referrals were open injuries. Our primary study showed that we missed out on requesting antibiotics (19%), tetanus status (19%), washout of wound (7%) and x-ray to be taken (3%) respectively in cases where this was indicated. Upon re-audit these rates showed a significant improvement and decreased time of management plan formulation.

Conclusions
By introducing an editable advice template function in the NORSE system for each diagnosis category we were able to achieve more efficient formulation of patient management plans and standardise the treatment. We showed that incorporating assistive technology in a digital referral management system can simplify the workload for our physicians and reduce variability in essential acute management of hand injuries.

Keywords:
A review of 1000 upper limb infections and their management in a tertiary hand unit

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Objectives / Interrogation: Infections of the upper limb constitute a common presentation with significant morbidity and in rare cases mortality. In a majority of cases, upper limb infections are caused by Staphylococcus and Streptococcus species however patients with a higher risk of infection such as diabetics and immunocompromised patients often have cultures positive for polymicrobial growth, fungi and even mycobacteria. Recurrent and 'difficult to treat' infection in the upper limb pose a challenge for the hand surgeon and our aim was to review the incidence of upper limb infection, the microbiological implications and management in our unit.

Methods: We performed a retrospective study of 1000 consecutive patients presenting to our unit with upper limb infections during 2016-2018. From our digital databases we recorded demographic data, co-morbidities, length of hospital stay, antibiotics used, organisms grown, number of surgical debridements required, amputations and number of recurrent admissions. Statistical tests were performed with SPSS.

Results and Conclusions: Out of 1000 patients, a majority of infections were caused by animal bites, most predominantly dog bites. In our cohort, the patients were treated with intravenous antibiotics and the majority had surgical debridement and washout. The recurrent and persistent infections were more commonly seen in patients with impaired vascular perfusion, diabetes and other immunocompromising conditions. We have reviewed current and future technologies in reducing microbiological load in the treatment of complicated hand infections.

Conclusion
Prompt treatment of upper limb infections with tailored antibiotics and surgical debridement if required is essential. Special notice is also given to the difficult to treat upper limb infections and we suggest a treatment protocol of upper limb infections based on the results in our unit.

Keywords:
recurrent infection; infection;
**Hand surgery in a clinic setting using ultrasound percutaneous procedures : a review of 1100 procedures**

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Pierre Croutzet*, Iskander Djerbi¹, Regis Guinand¹
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**Objectives / Interrogation:** With local anesthesia and ultrasound-guided percutaneous procedures, it is now more often possible to perform hand surgery in minimal settings. Indeed, the authors have reported morbidities in a continuous series of 1167 ultrasound-assisted hand procedures performed under local anesthesia in a clinic setting.

**Methods:** Over a period of 4 years, 1167 in-office procedures (787 patients) were performed using specific ultrasound-guided techniques (previously published) under local anesthesia. We included 372 trigger fingers, 516 carpal tunnel releases, 29 de Quervain releases and 243 Dupuytren contractures, 7 epicondylitis.

Exclusion criteria for office surgery were:
- ASA (American Society of Anesthesiologists) grade 3 or higher
- allergic history (latex, lidocaine)
- age over 85

Asepsis was achieved with a preoperative iodine shower and a 5-step antiseptic skin preparation. Fasting was forbidden and disease-modifying treatments, including anticoagulants, taken as usual. The WALANT technique was used for local anesthesia.

All procedures were performed percutaneously under ultrasound guidance. Surgical blades were proscribed, only a 18 gauge needle was used for skin incision. All the instruments were thinner than 1.5 mm, non-disposable and cost less than 50. Bandages were removed by the patient the day after surgery.

Morbidities were reported systematically:
- before surgery, during local anesthesia (vagal faintness, panic attack)
- during surgery (pain, excessive bleeding, faintness, mild heart attack)
- after surgery (infection, Sudeck's disease, hematoma, scarring problem)

Individual procedure efficacy was assessed in previous studies and not included in this series.

**Results and Conclusions:** Preoperative:
- 21 vagal faintness, including 7 syncopes with spontaneous resolution; 5 faintness with 3 syncopes in the last 1000 patients
- no panic attack

Operative:
- no pain felt
- no excessive bleeding, no specific hemostasis procedure needed

Postoperative:
- 1 infection in a trigger finger requiring re-operation
- 15 Sudeck's disease
- 9 mild hematoma after carpal tunnel release with spontaneous resolution

The combination of the WALANT technique and ultrasound-assisted procedures provides an original approach that can be used in a clinic setting. The morbidities reported were at least equivalent to those published in standard operating theatre procedures; only one patient was re-operated (case of infection).

Hand surgery can be performed in good conditions as in-office surgery using local anesthesia and ultrasound guidance

**Keywords:**
ultrasound surgery, office surgery, mini-invasive surgery
Factors influencing the results of flexor tendon repair

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Objectives / Interrogation: Today, flexor tendon injury is a relevant issue. At the end of the 20th century, a variety of different types of suture tendons and corresponding protocols of postoperative management were introduced, which were subject to a repeated comparison among themselves. However, periodical literature did not address the issue of the effect of the organizational factors on the outcome of the treatment.

The aim of the study was to evaluate the medium-term results of the treatment while providing specialized care to patients with injuries flexor tendons of the fingers. To determine the factors which have a significant impact on the clinical outcomes of this category of patients.

Methods: Materials of the case histories of the patients who received emergency medical care at the hospital RNIITO named after R.R. Vreden during the years 2013-2015 were analysed in the course of the study. The patients were interviewed by phone or summoned for a follow-up examination, while the quickDASH questionnaire was filled in, the amplitude of the finger joint movements was clinically evaluated and the findings were characterized according to the Strickland and Kleinert scales. Statistical treatment of the dependence of the treatment results on organizational factors, clinical factors, features of the surgical team was carried out.

Results and Conclusions: In the course of the analysis, it was found that damage to the tendons of the finger flexors occurs most often among men (77%) of working age (M±SD 35.18 ± 12.3 years). Damage to the flexor tendons on one finger predominates (81%), combined with damage to the finger nerve (32%). The treatment results for the timeframe from 1 to 3 years had been evaluated according to the Strickland and Kleinert scales, and were excellent in slightly more than half of the cases. A significant influence on the result of the treatment was provided by the presence of alcohol intoxication of the patients at the moment of their arrival. The statistically significant dependence of the treatment results on the time of the operation and the presence of a narrow specialization of the surgeon, and, to a greater extent, the timing of the beginning of rehabilitation and the conditions for its undergoing were revealed.

Keywords:
flexor tendon
Characteristics of hand and wrist benign fatty tumours. A study of 32 cases and literature review.

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Objectives / Interrogation: Background
Lipomatous tumours are common and represent 1 to 4% of benign tumors of the hand. Diagnosis and treatment managements could be sometimes non obvious. Very few studies on large series of patients have been published.

Objectives and interrogation
The goal of the present study was to analyze the specific characteristics of fat-like tumors located at the distal end of the upper limb and managed in our adult orthopedic surgery unit.

Methods: Methods
Among all the soft tissue tumors of the hand and wrist treated in the department over a period of 26 years, 28 tissue tumors of lipomatous nature with histological evidence were identified in 28 patients. The characteristics of the symptoms, their duration, the location and the size of the tumor, the therapeutic management and the results of the treatment with a possible recurrence were analyzed with an average follow-up of 5.4 years.

Results and Conclusions: For all 28 cases, there was a palpable tissue mass. This mass was troublesome or disabling in 20 cases and was associated with distal paresthesia in 5 cases: four cases were due to compression of the ulnar nerve in the Guyon canal and the remaining case was due to compression of the median nerve in the canal carpal. Seven tumor lesions were located on the wrist, 11 by hand and 10 with finger chains. The average length of the largest axis of the lesions was: 4.1 cm on the wrist, 3.4 cm on the hand and 2.6 cm on the fingers. In 19 cases, the tumor masses were deep and were often present for several years. Additional investigations have not been systematic. An MRI was performed in 17 cases, an ultrasound in 14 cases, an X-ray in 13 cases and an electromyogram in five cases. All tumor lesions were resected. A previous biopsy was performed in 4 cases. Routine pathological analysis confirmed the benign nature of all lesions. There was no case of liposarcoma. No recurrence was observed.

Conclusions
Patients often consulted late because of good initial tumor tolerance. The use of MRI had made it possible to diagnose localized lesions in the palm and had helped with the decision whether or not to perform the biopsy. Early surgery is preferable because of the risk of developing neurological compression.

Keywords:
Utilization of a Dermal Substitute (Hyalomatrix) in Pediatric Upper Extremity Procedures

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Objectives / Interrogation: Hyalomatrix is a skin graft substitute that may be able to be utilized as an alternative to partial or full thickness skin grafts in a variety of procedures involving the pediatric upper extremity. Composed of an esterified Hyaluronic Acid layer and a silicone layer, Hyalomatrix provides a matrix for dermal induction while protecting the wound from the external environment. The use of this skin graft substitute can potentially decrease the overall operative time associated with a procedure since there is no need to harvest skin graft. The purpose of this study was to assess the outcomes and complications of procedures incorporating Hyalomatrix during pediatric upper extremity procedures.

Methods: Patients were identified utilizing a search of Current Procedural Terminology (CPT) codes to identify patients that had a dermal substitute (Hyalomatrix) utilized. Each identified patient's chart was reviewed retrospectively to assess for functionality (ability to return to daily activities), recovery time (time taken to return to daily activities), and complications associated with the use of Hyalomatrix. Basic statistical analysis was performed.

Results and Conclusions: Hyalomatrix was utilized in 12 procedures, performed on 10 unique individuals, and was applied to 25 total wound sites. Indications for use of Hyalomatrix included syndactyly release procedures, areas lacking coverage following contracture releases, and substantial road rash wounds. The average length of follow-up associated with the Hyalomatrix application was 11.18 (10.97) weeks. Successful healing was achieved in 90% of patients. One patient required a return to the operating room due to recurrent syndactyly, at which time Hyalomatrix was again utilized. Minor complications were noted, including the development of a pyogenic granuloma (n=1), serosanguinous drainage (n=2), and mild scar hypertrophy (n=1). One patient experienced a keloid formation at the operative site (n=1), although it is important to note that this patient had a history of prior keloid formation. No infections were observed in these patients.

Hyalomatrix is a viable dermal substitute for a variety of pediatric upper extremity conditions. The use of Hylomatrix dermal substitute may reduce operative time by negating the need to obtain skin graft while decreasing potential morbidity to the patient. Further prospective investigations into the use of this skin graft substitute are warranted.

Keywords:
hyalomatrix; skin graft; wound protection
Reparing small soft tissue defect in the hand with various free micro-skin flaps

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Objectives / Interrogation: Objective: To investigate and summarize various free micro-skin flaps repairing small soft tissue defect in the hand.

Methods: Methods: From March 2014 to May 2015, 15 patients with soft tissue defect in the hand, including 12 males and 3 females, of which were repaired with various free micro-skin flaps, such as the free lateral metatarsal flap, the free medial plantar flap, the free perforator flap of the lateral iliac artery, the free perforator flap of the radial artery and the free wrist transverse flap. During the operation, avoiding to injury the perforating vascular pedicle for ensuring the blood supply of the flap. The wound was directly sutured except for the medial side of the plantar and the lateral donor site, which were repaired with skin grafting.

Results and Conclusions: Results: All the free flaps survived and all the wounds healed in one stage. The patients were followed up during 6 months, with the average of 4 months. The color and texture of the flap is good.
Conclusion: According to the different situation of the injury, it is an efficient and quick method to design corresponding free micro-skin flap for repairing small soft tissue defect in the hand.

Keywords:
skin defect; micro-flap; perforator flap
Validation of digital tourniquet pressures: T-Ring compared with conventional surgical glove

List of authors:
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Objectives / Interrogation: Digital tourniquets are used for undemanding hand surgeries due to its simplicity and efficacy. However, the pressure exerted by digital tourniquet has not precisely validated yet. In the present study, we investigated the digital pressures exerted by T-Ring and conventional surgical gloves.

Methods: Thirty volunteers were enrolled in the study. The digital pressures were measured on the dorsal and volar side of the 1st, 2nd, and 5th fingers. Artificial finger model was manufactured using 3-dimensional printer, which was used to measure the serial pressure change over 24 hours.

Results and Conclusions: The pressure exerted by T-Ring was 154.3 ± 54.9 mmHg on the volar side, compared with 224.7 ± 57.7 mmHg on the dorsal side (p<0.05). Similarly, the pressure exerted by the surgical glove was 162.6 ± 61.0 mmHg on the volar side and 228.8 ± 66.0 mmHg on the dorsal side (p< 0.05). There was no difference between T-Ring and surgical gloves (p >0.05). Also, the pressure was not influenced by the finger circumference.
There was no significant decrease in the pressure over 24-hour measurement. The digital pressure exerted by finger tourniquet was significantly lower on the volar side compared with the dorsal side, regardless of the tourniquet materials or finger circumferences. Tourniquet pressure was maintained for 24 hours.

**Keywords:**
Digital tourniquet, Finger tip injury
Arthroscopic surgery for recurrence after wrist ganglion excision, a series of 12 procedures

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Objectives / Interrogation: Recurrences after a wrist ganglion excision are a common problem. It occurs either after arthroscopic or open surgery, various series have reported a recurrence rate around 10% whatever the procedure. We wanted to evaluate the efficiency of the arthroscopic surgery after recurrence of a wrist ganglion excision. We report our outcomes concerning 12 consecutive cases.

Methods: Over a period of 5 years, 12 ganglion cysts recurrences were operated on. In these 12 cases, 7 recurrences occur in the first year after excision, 4 between 2-5 years, 1 after 10 years, it was a second recurrence in one case. The first excision was performed open in 11 cases and arthroscopic in 1 case.
To cure these 12 recurrences, all procedures were performed with arthroscopy using two midcarpal portals: an optical ulnar midcarpal portal and an instrumental radial midcarpal portal, portals were switched during the surgery.
Articular diagnosis was performed first then the transverse midcarpal ligament was incised longitudinally. An extra-articular excision of the cyst was performed between the capsule and the extensor then between the extensor and the extensor retinaculum.
A single layer adhesive dressing with a splint was kept for a week.
Clinical examination and Quick-Dash were performed before and after surgery.

Results and Conclusions: The mean follow up was 30 months (12-61).
The pre-op clinical examination reported a ROM of 110°in F/E° and a mean QuickDASH score of 11 (6-24); the post-op examination reported a ROM of 130° (at 3 months) and a phone interview QuickDASH score (at follow-up) of 6 (0-9).
The time of surgery was 28 minutes (22-45), articular abnormalities were reported in 8 cases.
1 recurrence occurs after 6 months.

Although the recurrence after wrist ganglion excision is a frequent issue, this study is the first dedicated specifically to this complication.
This series suggests the recurrence rate would be equivalent after a first or a second excision.

Arthroscopic surgery is reliable to cure recurrences after wrist ganglion excisions.

Keywords: wrist ganglion cyst, arthroscopy, recurrence
Pyrocarbon Interposition Arthroplasty for The Thumb Carpo-Metacarpal Joint Osteoarthritis - mid to long term outcome analysis

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Objectives / Interrogation: This talk presents a mid to long-term result and operative technique on use of a pyrocarbon, non-anatomical implant for arthrosis of the first carpo-metacarpal joint (CMCJ) arthritis.

Methods: Data was collected prospectively for 25 patients (average age 56) with radiological stage I - III arthroses who failed conservative management and underwent interposition arthroplasty over the last 8+ years. Patient satisfaction was high. At the mean follow up of 43 months, pain decreased in all patients from 7.4 to 2.2 and DASH score from 57 to 19 (p < 0.01) whereas pinch and grip strength showed less dramatic improvement from 2.9 to 3.9 kg and 15-19kg (p > 0.05), respectively. Thumb mobility was restored to that of the contralateral thumb at average 7 months post surgery. Two patients had implant dislocations. Both were found to be due to suboptimal technique at the time of primary surgery. One of these patients underwent successful trapeziectomy and another one a revision surgery with larger prostesis. No joint instability or periprosthetic lucency has been observed at this interim period. Results of this single surgeon cohort will be compared against the published literature.

Results and Conclusions: Midterm results appear encouraging, but critical analysis of this technique and data collection on long term outcomes and implant survival continues.

Keywords:
thumb, basal joint, arthritis, interposition arthroplasty, pyrocarbon
The lumbrical plus disease: a review of our experience

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Objectives / Interrogation: The lumbrical plus disease is also described as Park's Syndrome or Paradoxical extension. The lumbrical muscle's proximal origin is from the tendon of flexor digitorum profundus in the palm, while the distal insertion is dorsal on the radial bundle of extensor tendon on the back of proximal phalanx.
If for several reasons the proximal origin of lumbrical muscle shifts proximally or becomes contracted, the increased tension will be applied through the radial bundle on the dorsum of the finger causing paradoxical extension of the PIP joint while attempting to flex the fingers.
Possible causes of this mechanism may be: avulsion of FDP, partial severance of FDP, amputation through the middle phalanx, over long flexor tendon graft, adhesions between muscle and tendon sheath.
The paucity of published material on this condition testifies to its rarity or the condition still going un-recognised after many years since its initial description.

Methods: We reviewed the cases of lumbrical plus observed in our experience, following tendon graft, tendon transfers, amputation and other cases of adhesion between lumbrical muscle and tendon sheath.
On 22 tendon graft who underwent to complete follow up, we found 2 cases of paradoxical extension; only one of 16 Paneva-Holevich procedures; one case after amputation of middle finger at distal inter-phalangeal joint;2 cases following tendon transfer of FS of ring finger pro FP; 4 cases following hand's fractures and 2 cases after tendon suture;
All lumbrical plus diseases were treated with lumbrical release at the proximal origin on the tendon of Flexor digitorum profundus, with successful results.
We had only one case of recurrence.

Results and Conclusions: From 1973 to 2016 we observed a total of 12 cases of lumbrical plus.
The digits more frequently involved were middle finger(5 patients), ring finger (2 patients), little finger(5 patients), little finger was also the finger more frequently injured. Middle finger is the most commonly involved as Park described. We found a relationship with surgeon experience in tendons reconstructive surgery (more frequent in older graft performed).
Our experience confirms that is an un-frequent disease and often diagnosis is missed or delayed.
We recommend Importance of clinical tests and to consider the diagnosis when we have a patient who seems un-cooperative during rehabilitation.

Keywords:
lumbrical plus, parodoxical extension, lumbrical release
Analysis of Large Cohort of Spastic Arm Paralysis Patients after Contralateral Seventh Cervical Nerve Transfer: A Retrospective Study

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Objectives / Interrogation: The application of contralateral C7 transfer in treating central hemiplegia has achieved favorable results in our previous report. The aim of this study was to introduce the authors' experience with contralateral C7 transfer in patients with spastic arm paralysis in a larger number and to analyze the functional outcomes after over 1-year follow-up.

Methods: From 2008 to 2018, a retrospective study of upper limb function in patients with spastic arm paralysis caused by central nervous system injury with a follow-up of more than one year post-operatively were carried out in the hand surgery department of our center. Evaluation methods include Fugl-Meyer upper-extremity scale, Modified Ashworth Scale and active range of motion, which were compared before and consecutively throughout 1-year after operation. Through subgroup analysis, the etiology or factors which might affect postoperative functional recovery and the spasm degree such as gender, age, and affected side were analyzed.

Results and Conclusions: Results: Since 2008, over 200 spastic arm paralysis patients received contralateral C7 nerve transfer surgery in our center. In retrospective analysis, we found that there was a significant increase in the mean Fugl-Meyer score from the baseline to 1-year postoperatively. In the grouped analysis stratified by age, there was an obvious tendency that younger patients acquired higher scores. In the etiological analysis, cerebral palsy patients acquired the largest increase in total Fugl-Meyer score comparing to other groups. There was no significant difference in the functional recovery between paralysis side and gender. Spasticity from baseline to 1-year as measured on the Modified Ashworth Scale showed a decrease in all joints. Conclusions: In a large cohort retrospective study, functional improvement in patients were noted with different etiology, age, gender and paralyzed side. Generally, cerebral palsy and younger patients were expected to have better functional improvement comparing to other subgroups.

Keywords: contralateral C7 transfer, retrospective study, spastic arm paralysis
Patient characteristics in cubital tunnel syndrome at a referral centre and predictive factors for outcome of simple decompression versus subcutaneous transposition of the ulnar nerve

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Objectives / Interrogation: The objectives were to study characteristics of patients with cubital tunnel syndrome at a referral centre and to analyse predictive factors for outcome of simple decompression versus ulnar nerve transposition.

Methods: A retrospective observational study was performed on patients with cubital tunnel syndrome operated 2011 - 2014. Data were obtained from patient charts from, a specially designed form, and a DASH (Disabilities of the Arm, Shoulder and Hand) questionnaire. Patient characteristics and predictive factors for surgical outcome were analysed in 202 cases (173 patients; each arm evaluated as a separate entity).

Results and Conclusions: The mean age was 51 years, 61% of the cases were females, 31% were smokers, and mean BMI was 27. Fifty-four percent suffered from another nerve compression lesion in the same arm, 35% from another nerve compression lesion in the opposite arm, 23% had neck problems, 17% had shoulder problems and 12% had diabetes. Fifty-six percent (n=114) of the cases had simple decompression, 28% (n=56) had primary, and 16% (n=32) had secondary subcutaneous transposition. Patients with secondary transposition were significantly younger than patients treated with simple decompression.

Overall, 55% of the patients were satisfied with the surgical result (56% after simple decompression, 48% after primary and 64% after secondary transposition), but only 8% stated that they would not go through the surgery again. The mean DASH score was 31 (SD 25) with no significant difference in DASH scores between surgical groups, or between patients with positive or negative electrophysiological tests; nor was there any association between results from the tests and type of surgery. There was a significantly increased risk of complications, following primary and secondary transposition compared to simple decompression, and the complication rate was doubled in smokers.

We conclude that surgically treated cases with cubital tunnel syndrome at a referral centre constitute a heterogeneous group with great comorbidity and often other nerve compression lesions with a wide variation in symptoms and surgical outcome. We recommend simple decompression as surgical procedure of first choice. Anterior transposition should only be used in selected cases or when simple decompression fails. All patients should be strongly recommended to stop smoking considering the remarkably increased risk for complications among smokers.

Keywords:
Cubital tunnel syndrome, ulnar nerve, simple decompression, subcutaneous transposition
Frozen Amputated fingers - Replantation and Other treatments

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Objectives / Interrogation: Treatment outcomes presentation of patients with upper limb amputation injuries, whose amputated fingers were inadequately treated during transportation to the replantation center and suffered from cold injury.

Methods: A set of 21 patients (19 men, 2 women) operated at Department of Plastic and Aesthetic Surgery in Brno from 1 January 2007 to 31 December 2017. Following is an overview of malpractices used to treat the amputates: 8 times the amputate was packed in gauze with dry ice, 4 times amputates were frozen in ice cube, 3 times frozen in crushed ice, 1 hand was lined with frozen saline solution, 2 amputates were transported in package of frozen vegetables. There were cases when the amputate was first frozen by ice, then dipped in saline solution and then dried in the ambulance or another case, when the amputate was primarily heavily burned with fire, then it was cooled in the snow for 45 minutes and, then it was wrapped in gauze and brought in a snowball.

Results and Conclusions: Results: Primary amputation was performed in 8 patients (reasons: 3 times - mechanical destruction of amputate, 3 times - thermal damage, 1 - a patient’s wish and 1 - indication of comorbidity). Two patients were treated with the composite graft method, both grafts were successfully healed. Replantation was performed in 11 patients and in one case the hand was completely replanted. Perioperative complications were frequent, repeated arterial thrombosis in 2 patients, necessity of micro anastomosis of both vessels, use of venous graft, 3 patients had repeated venous anastomosis for repeated venous thrombosis, 2 patients had rapid development of burn changes on replanted fingers - skin whitening, then livid color and formation of blisters. In 2 patients, the blood flow was very slow and blood supply was established with a time delay in ICU. Revision operations were performed in 6 patients, the reasons were arterial thrombosis, graft thrombosis, 3 times venous thrombosis, once bleeding, and twice finger amputation for necrosis. 11 fingers and one hand were healed on the sample of 8 patients. Thermal damage was unmasked after the replantation. Replants failure occurred in 3 fingers in 3 patients. The overall success rate of replantation of frozen fingers was 73%. Conclusion: Even inadequately treated and thermally damaged amputates can be replanted with a relatively high success rate but more frequent perioperative and postoperative complications have to be considered.

Keywords: finger replantation, freezing cold injury, finger amputation, composite graft, indication for replantation
Spasticity surgery/What we learned in three years of practicing it.

List of authors:
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Objectives / Interrogation: We present our experience with 7 spasticity patients. We present where we were successful, where we failed and what we have to recommend in the management of this challenging and increasing population.

Methods: We have operated on 7 spasticity patients from 2015 to date. Causes of spasticity were CVA (thromboembolic or haemorrhagic) and traumatic brain injury. Patients were evaluated preoperatively using the Ashworth and House scale. Video evaluations were used as well and two of the patients received Botulinum Toxin injections.

The aim of surgery was primarily to reduce spasticity and if possible, improve the functional outcome as well.

Post-operatively, the patients were referred for physiotherapy and occupational therapy to obtain the best possible outcome.

<table>
<thead>
<tr>
<th>A/A</th>
<th>PATIENT</th>
<th>AGE AT PROCEDURE</th>
<th>CAUSE OF SPASTICITY</th>
<th>DATE OF BRAIN INJURY</th>
<th>PREOPERATIVE PROBLEMS</th>
<th>PROCEDURE</th>
<th>DATE OF PROCEDURE</th>
<th>REMARKS</th>
<th>RESULT</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>NS</td>
<td>50</td>
<td>Traumatic brain injury, Volkmann's contracture</td>
<td>2011</td>
<td>Claw hand deformity, subluxed 1st CMCJ, HO left elbow</td>
<td>Fusion left wrist with PRC, Release of MCPJs, Fusion 1st CMCJ, Zancolli lasso</td>
<td>4/3/15</td>
<td>Ulnar nerve affected due to HO of elbow</td>
<td>Good grip and key pinch achieved, reluctant to use unless absolutely necessary, House from 1 increased to 5</td>
</tr>
<tr>
<td>2</td>
<td>EV</td>
<td>40</td>
<td>Traumatic brain injury</td>
<td>1995</td>
<td>Clenched fist, spasticity of elbow, able to extend wrist</td>
<td>Z-Legthening of FDPs (FDSs not found)</td>
<td>14/5/15</td>
<td>1. Had FCU to ECRB and FDPs lengthenings in the USA in a previous procedure 2. Unmasked intrinsic spasticity after procedure 3. Had problems with hand hygiene preoperatively</td>
<td>Fingers managed to stay open, intrinsic spasticity kept MCPJs in flexion, no improvement in house classification, better hand hygiene achieved</td>
</tr>
<tr>
<td>3</td>
<td>AT</td>
<td>63</td>
<td>Ischaemic CVA</td>
<td>2013</td>
<td>Spasticity of biceps, PT, FDSs, thumb in palm, clenched fist</td>
<td>Lengthening of FDSs, transfer of FDS3 to rerouted EPL, transfer of</td>
<td>30/9/16</td>
<td>Preoperative Botox to FDS and thenar muscles with good results 2</td>
<td>House improved from 2 to 4. Expectations of patient not met, BR to EDC</td>
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<td>Ischaemic CVA</td>
<td>2011</td>
<td>Spasticity of biceps, PT, FDSs, FDPs, thumb in palm, clenched fist</td>
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<td>Lengthening of FDSs, FDPs, FPL, FDS3 to rerouted EPL, FDS4 to APL, BR to EDC transfer, release of PT, release of thenar muscles, tenotomy of FCU</td>
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<td>3/10/16</td>
<td>Preoperativ e Botox to FDSs and thenar muscles, long assessment period, developed wound healing problems</td>
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<td>House improved form 2 to 4, happy with outcome, BR to EDC caused claw hand, FPL spasticity recurred</td>
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<td>5</td>
<td>PD</td>
<td>19</td>
<td>Traumatic brain injury</td>
<td>2008</td>
<td>Spasticity of biceps, PT, FDSs, FPL, intrinsic thumb in palm, FCU spasticity, evident intrinsic spasticity</td>
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<td>Legthenin g of FDSs, FDPs in musculotendinous junction, ECU to ECRB, FDS IV to APB, motor branch of ulnar nerve neurectomy, EPL rerouting, PT release, FCU tenotomy, thenar muscle release</td>
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<td>17/6/17</td>
<td>1. Had preoperativ e nerve blocks to assess, was able to open fingers with extreme wrist flexion</td>
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<td>Significant improveme nt in spasticity, still does not use hand, good finger opening, pleased with outcome and reduction of spasticity, does not use</td>
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<td>6</td>
<td>PS</td>
<td>61</td>
<td>Haemorrhagic CVA</td>
<td>2016</td>
<td>Spasticity of biceps, PT, FDSs and FDPs, intrinsic spasticity, FCU spastic bringing wrist at 90 degrees</td>
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<td>Musculocutaneous nerve hyperselective neurectomy, lengthenin g of biceps tendon, flexor pronator slide, ulnar nerve motor branch neurectom y, PRC and</td>
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**14th IFSSH Congress**

**Abstract no.: IFSSH19-1300**

FDS 4 to APL, BR to EDC, release of PT and thenar muscles, tenotomy of FCU |

Had long assessment period | did not help with finger opening

4. PA 58 Ischaemic CVA |

17/6/17 1. Had preoperativ e nerve blocks to assess, was able to open fingers with extreme wrist flexion |

Functional outcome was not expected, general posture of upper limb improved except from fingers/now in clenched fist/will need superficialis to profundus transfer
Results and Conclusions: All seven patients had a reduction of spasticity. Two patients had an improved functional outcome which allowed them to use their hands again for basic functions. Thromboembolic CVA patients despite having reduced spasticity, did not have any functional gains. One of the patients unmasked intrinsic spasticity after the procedure. Patients with traumatic brain injuries and haemorrhagic CVAs (and no other concomittant injuries) were more prone to developing spasticity of the intrinsics (3 in our series) than patients that suffered a thromboembolic CVA.

Conclusions: Patients with spasticity need to be evaluated meticulously and for a significant amount of time prior to surgical intervention. We believe that there is a link between haemorrhagic brain injuries (of traumatic aetiology or CVA) and intrinsic spasticity but further research needs to be done to solidify this argument. Tendon transfers to augment finger extension have no place in spasticity surgery. Neurectomies tend to produce very good results regarding the elimination of spasticity. Patients need to be informed that spasticity surgery is about reducing spasticity and not about improving the functional outcome, although there are cases that they some functional improvement could be expected(especially in patients following traumatic brain injury)

Keywords: -
**Objectives / Interrogation:** Spasticity in the upper limb has a significant impact on the patient's function. Management of patients inflicted with this condition demands care from across multiple disciplines. There is however little collaborative work process established for adult patients. We aim to develop a comprehensive management for skeletally mature patients who developed upper limb spasticity in a coordinated multi-disciplinary team. Our treatment objectives are to improve patient's well-being through pain reduction, function optimisation, limb posturing reduction, and to prevent complications through early intervention.

**Methods:** An outpatient clinical care pathway involving the neurologist, hand surgeon, advance practitioner nurse, hand occupational therapist, medical social worker, pharmacist and dietician has been developed. Eligible patients are referred to the clinic following diagnosis and stabilization of inciting causes including cerebrovascular accidents, brain or spinal cord injuries and neurodegenerative disorders. Joint assessment by the different disciplines is performed in the same clinic session. Domains of evaluation included patient's general cognitive ability, condition specific pattern of neurological deficits, limb specific degree of spasticity and classification of limb function. A proposed algorithm based on contemporary evidence, techniques and available expertise is used by the team to suggest treatment options for patients and align management objectives with patients' expectations.

**Results and Conclusions:** Six patients have been reviewed under the proposed clinical pathway. There were 4 males and 2 females with mean of 62.9 years of age during the time of review. They were reviewed on average 279 days from the episode of inciting condition. The median number of activities of daily living (ADL) the patients could perform independently was 1.5 out of 6 prior to any treatment. Other patient outcomes and satisfaction will be collected before and after treatment.

We propose an outpatient clinical care pathway for adult patients suffering from spasticity of upper limbs. In view of the complexity of management in these patients, a treatment algorithm will lay out options available for patients, therapists and physicians to provide optimal care in line with current practices and patients' expectations.

**Keywords:**
Spasticity, stroke, hand function
Early Amputation vs Limb Salvage: Characterization of Procedural Management for Limb Threatening Upper Extremity Injuries in Hospital Days 1 to 30

List of authors:
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\textsuperscript{1}Massachusetts General hospital (Boston)

Objectives / Interrogation: There is little quantitative data regarding the acute care burden for patients with upper-extremity threatening injuries. This study characterizes procedural care provided for a cohort of patients with acutely limb-threatening traumatic upper-extremity injuries at an urban level-1 trauma referral center based on the decision to perform early amputation versus limb salvage.

Methods: Retrospective chart review of an institutional database from 2010 - 2017 was performed, identifying patients who were diagnosed with upper-extremity amputation or treated with extremity replant at a level proximal to the MCP joints. Patients were excluded for atraumatic mechanism of injury or for incomplete records. Patient and injury demographics as well as the sequence of procedural management were extracted through chart review.

Results and Conclusions: 22 patients met inclusion criteria; 6 underwent early amputation (EA cohort), 16 attempted limb salvage (LS cohort). There was a 63% limb salvage rate. The EA cohort was more severely injured (average ISS: EA = 54, LS = 33; p = .02), and had more proximal injuries (Table 1). Differences in the average length of ICU admission (EA = 11d vs. LS = 9d), inpatient admission (EA = 19d vs. LS = 23d), or number of upper-extremity procedures during the first 30 days (EA = 3.0 vs. LS = 4.3), did not reach statistical significance. In the EA cohort, only 4 procedure types (I&D, amputation, wound closure, and local flaps) accounted for 75% of upper extremity interventions. In the LS cohort, 6 additional procedure types (ORIF, external fixation, tendon repair, fasciotomies, skin graft, and vessel anastomosis) were needed to account for 75% of upper extremity interventions. Free tissue transfer was ultimately performed in 4 of 22 patients (18%) (Figure 1).

Conclusions
This study demonstrates that LS cohort patients had less extreme global injuries. However, the frequency of their procedural interventions and length of ICU and inpatient admissions did not significantly differ from the EA cohort. Additionally, attempted limb salvage required inclusion of orthopaedic and microsurgical skills not required for early amputation. This information may be used to instruct institutional decision making regarding team composition, training, and resource allocation required to maintain limb salvage programs.

Keywords:
mangled upper extremity amputation salvage
Investigation of RARg Signaling in Human Growth-Plate Chondrocytes

List of authors:
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Objectives / Interrogation: Pediatric fractures involving the growth-plate (GP) require careful follow-up, as these fractures can lead to inhibition of bone growth resulting in progressive growth imbalance, deformity and/or painful conditions. Currently, surgical intervention is the only means to correct substantial imbalance and deformity due to a physeal injury. However, these procedures are invasive and cause substantial burden to the child and their family. Previous studies show that retinoic acid receptor (RAR) isoform RAR gamma (RARg) is a critical regulator of bone growth. RARg is dominantly expressed in GP chondrocytes, regulates matrix synthesis and turnover, and transition of cartilage to bone. Pharmacological activation of RARg causes early closure of the GP and inhibits further bone growth while inactivation delays maturation of GP chondrocytes. RARg agonists/antagonists may have therapeutic potential for the treatment of abnormal endochondral ossification and bone growth. The purpose of this study was to investigate the role of RARg signaling in human GP.

Methods: Expression of RARg and its signaling-related molecules in damaged or normal GPs collected at the time of epiphyseodesis surgery were analyzed via immunohistochemistry. Surgical specimens were immediately fixed in 4% PFA, decalcified and sectioned.

Results and Conclusions: RARg and Aldh1a2, a rate-limiting enzyme of retinoic acid synthesis were detected in pre-and hypertrophic chondrocytes in the intact growth-plate. In damaged GP, the typical pattern of columnar GP was completely gone. There was no sign of progression of active endochondral ossification as the remnant of cartilage (resting or arrested cartilage) is completely sealed by bone tissue. In a subsequent experiment, the response to RARg agonist in human and mouse chondrocytes were compared. Human GP-chondrocytes were isolated from the GP of polydactyly samples and mouse chondrocytes were isolated from new bone mouse epiphysis. Cells were maintained in culture until confluent and then treated with 100nM of selective RARg agonist for 47h. Total RNA was purified and subjected to Clariom Gene Array. In ether cells, pharmacological activation of RARg down-regulated cartilage-matrix genes and up-regulated expression of genes related to MMPs, angiogenesis and osteoclastogenesis.

These findings indicate that RARg signaling is present and functioning in human cartilage, and selective RARg agonists might be an effective therapeutic drug utilized for growth restriction/epiphyseodesis.

Keywords:
growth plate; retinoic acid receptor; physeal fracture
Outcomes of Repeated Treatment in Dupuytren's Disease; a Comparison with Initial Treatment

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Objectives / Interrogation: There are multiple studies about effectiveness of primary treatment in Dupuytren's disease. This is however not the case concerning treatment effectiveness of recurrent disease. Therefore, the primary aim of this study is to compare treatment effectiveness of initial and repeated surgery in patients with Dupuytren's disease.

Methods: Patients who underwent both initial and repeated treatment were selected from a prospectively maintained database consisted of finger goniometry and the Michigan Hand Outcomes Questionnaire (MHQ) prior to treatment and 3 months afterwards. Treatment effectiveness was measured as improvement in extension deficit and patient-reported hand function. In addition, measurements at intake of both treatments were compared. Subgroup analysis was done to evaluate influence of type of surgery of initial treatment on outcomes of repeated treatment. Finally, complications were scored after both treatments.

Results and Conclusions: 114 Patients were included in the final analyses. In the majority of the patients, the initial treatment was needle fasciotomy (49\%) or limited fasciectomy (40\%), whereas most patients (79\%) underwent a limited fasciectomy for their recurrent contracture. Improvement in extension deficit and MHQ outcomes was equal for initial and repeated treatments. Extension deficit and MHQ were significant worse at intake of repeated treatment compared to these outcomes at intake of initial treatment. In addition, patients who initially underwent needle fasciotomy achieved a better contracture reduction after repeated treatment compared to those who underwent limited fasciectomy as initial treatment. A total of 23 complications were observed. The largest groups of complications were alterations in sensation (e.g. pain or numbness), 10 out of 23, and problems with scar tissue (e.g. adhesions or scar tissue contraction), 6 out of 23. The majority of complications, 14, were seen after a limited fasciectomy for recurrent disease.

This study demonstrates that treatment of recurrent Dupuytren's disease is as effective as initial treatment in reducing contracture and improving patient-reported hand function, despite larger extension deficit and worse self-assessed hand function before undergoing repeated treatment. Furthermore, needle fasciotomy for initial treatment results in better outcomes of repeated treatment. These findings can be used for a more evidence-based preoperative counseling with patients with recurrent Dupuytren's disease.

Keywords: Dupuytren's contracture, treatment outcome, recurrent disease, PROM, finger goniometry
Objectives / Interrogation: The metacarpal fractures are common, and to many of this fractures are treated without surgical, but some of the are unstable, the need fixation. There are different types of fixation, like wires, plates, but in fractures near to the articular surface when the metaphysis is fracture and has comminuted, we prefer use codilar plates, because this give angular stability to the fracture. This research wants to review the use of the codilar plates in this type of fractures.

Methods: We review 80 fractures in all we used the condilar plates, all patients was examined by a different surgeon no the same who performed the surgery. All the condilar plates was from the same company (Mondeal). We used the same instruments to measure the results, we use a goniometer and dynamometer

Results and Conclusions: The results was find union at 6 weeks (4 - 9 weeks), range of movement was flexion 80 degrees (62 - 95), grip strength 12 mmHg (8 - 17) pain 3 (2 - 5), return to work at 20 days (15 - 52), All patient was check at 2 week, 6 week and 6 montes post surgical. Our results are compared with other methods of fixation, but we think the condilar plates has advantage because gives angular stability to the fracture

Keywords: Metacarpal fractures, conciliar plates, Hand fractures, mini plates.
Does the Use of a Parent’s Cell Phone Reduce Anxiety During Cast Removal?

List of authors:
Joshua Abzug*1, Serge Tzeuton2, Danielle Hogarth1, Alexandria Case1, Nathan O’Hara1
1 University of Maryland School of Medicine, Department of Orthopaedics (Baltimore)
2 University of Maryland School of Medicine (Baltimore)

Objectives / Interrogation: Cast immobilization of pediatric and adolescent fractures is the mainstay of treatment for the vast majority of fractures. However, cast removal may cause the child to be anxious making the removal difficult and potentially leading to an adverse complication during the removal. Previous studies have demonstrated reduced anxiety utilizing art and music therapy, however this requires substantial resources and may not be possible in the outpatient setting. The purpose of this study was to prospectively determine the effectiveness of visual stimulation utilizing a parent’s cell phone or hand-held device to determine if this “no cost” alternative can reduce anxiety during cast removal.

Methods: A prospective study was performed to enroll all pediatric patients that presented in the outpatient setting for cast removal. Blood pressure and heart rate were recorded using an automated sphygmomanometer and the child’s Faces score was assessed. Measurements of these proxies for anxiety were performed in the waiting area prior to cast removal, in the cast room during cast removal, and in the cast room 5 minutes following cast removal. Patients were randomized to utilize their parent’s mobile device or not. Repeated measures mixed effect models were used to determine the effect of the mobile device to reduce the patient’s heart rate and blood pressure compared to the control group. A student t-test was used to determine the effect of the intervention of the Faces score.

Results and Conclusions: Fifty patients were randomly assigned to either the experimental group (n=21) or the control group (n=29) via REDCap survey. Despite adequate power, no statistically significant difference was present in the heart rate (p=0.82), systolic blood pressure (p=0.45), and Faces score (p=0.06) between the groups.

Using a parent’s mobile device to distract a child during cast removal did not reduce anxiety. Alternative methods such as music and art therapy may be better suited to reduce anxiety during cast removal, but these methods require substantial resources. Future studies are needed to identify a low cost alternative to reduce anxiety during cast removal. Mobile cell phones and personal electronic devices are not effective at reducing anxiety during cast removal and therefore we cannot recommend them as an alternative low-cost distractor.

Keywords:
cast removal; anxiety; pediatrics
'WALANT Carpal Tunnel Release: Technical Considerations and Pain Outcomes

List of authors:
Julia Ruston*, Dariush Nikkhah1, Robert Pearl1, James Blair1
1 Queen Victoria Hospital, Hand Surgery Department (East Grinstead)

Objectives / Interrogation: Carpal tunnel release (CTR) is often performed under local anaesthetic (LA), as a day case. Streamlining the operation to better utilise healthcare resources, and improve the patient experience, led us to compare the use of wide awake local anaesthesia no tourniquet (WALANT) with 'standard' LA and tourniquet (LAT).

Methods: We retrospectively identified and analysed the data of patients who underwent CTR; consulting electronic records, operation notes, self-reported Visual Analogue Scale (VAS) pain scores, and satisfaction reports. WALANT technique involved subcutaneous infiltration of 4.4ml 2% lignocaine with 1:80,000 adrenaline; 15-20 minutes pre-operatively. LAT technique employed plain Lignocaine and Levobupivicaine (injected in the same manner) with the addition of an upper arm tourniquet for the operative dissection.

Results and Conclusions: 46 patients underwent CTR; 22 had WALANT, 24 had LAT. Mean VAS pain scores (0-10 point Likert scale; 10 being most painful) were 0.73 and 1.88 respectively. With the exception of 1 outlier the WALANT cohort all reported pain scores of 3 or less; whereas 5 LAT were recorded at 5 or over. That this descriptive trend was not found to be significant (Mann-Whitney U test p<0.05) inferentially, is likely to represent a type 2 error, as extending to a p=0.08 results in significance. Reasons for discomfort in the WALANT group were deep nerve pain (n=4) and retractor discomfort (n=1). Patients in the other group noted deep nerve pain (n=6) and tourniquet pain (n=5). 93% were extremely satisfied and all would recommend this technique.

Our infiltration volume is smaller than original WALANT descriptions and this may account for intraoperative pain in some patients. In larger hands we recommend increasing volumes, and waiting longer than 20 minutes.

In summary, both methods were acceptable in terms of pain, efficacy and satisfaction. This supports the literature that WALANT is at least as good as the standard LA/tourniquet method for most cases, and would transfer readily to an outpatient procedure room setting if this became a necessity.

Keywords:
median nerve, carpal tunnel, wide awake surgery
Does an Associated Elbow Dislocation Lead to Worse Outcomes in Medial Epicondyle Fractures?

List of authors:
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¹ University of Maryland School of Medicine, Department of Orthopaedics (Baltimore)

Objectives / Interrogation: 50% of all medial epicondyle fractures are associated with an elbow dislocation. The purpose of this study was to assess differences in outcomes and complications between patients with isolated medial epicondyle fractures and those with a concurrent elbow dislocation.

Methods: A retrospective review was performed over a seven-year period. Patients were identified utilizing CPT and ICD-9/10 codes for medial epicondyle fracture and elbow dislocation. Data obtained included demographics, mechanism of injury, concurrent injuries, treatment modality (immobilization alone vs. operative intervention), post-operative range of motion, and complications. Statistical analysis was performed utilizing Student's t-tests to assess differences between the samples. A power analysis concluded that the use of at least 9 patients with complete data yielded a 90.55% power to detect a 5 degree difference.

Results and Conclusions: Forty-eight patients (22 females, 26 males) with an average age of 10.49 years (range: 4-17) were identified with medial epicondyle fractures over the study period, of which 17 had a concurrent elbow dislocation. The most common mechanisms of injury were falls onto outstretched hands (n=22) and falls from heights (n=16). The medial epicondyle fractures with concurrent elbow dislocations more frequently had additional concurrent injuries (8/17 vs 3/31; p=<0.01), which included ulnar nerve injuries (2/17 vs 1/31), anterior interosseous nerve injuries (2/17 vs 0/31), UCL tears (2/17 vs. 0/31), and other fractures (2/17 vs 2/31). Furthermore, the group with concurrent elbow dislocations was more frequently treated operatively (12/17 vs 8/31; p<0.01). However, final range of motion, as compared to the contralateral side, was not statistically different between the groups (p=0.25). There was no difference in the rate of complications between the groups (3/17 vs 8/31; p=0.57), percentage of therapy referrals (6/17 vs 7/31; p=0.35), or length of follow up (p=0.77).

The outcomes and complications of pediatric and adolescent medial epicondyle fractures with a concurrent elbow dislocation are not different than those of isolated medial epicondyle fractures. Further investigation into other influencing factors of medial epicondyle fractures that lead to various outcomes and complications is warranted to better guide treatment planning and counseling to these patients and their families.

Keywords:
medial epicondyle fractures; elbow dislocations; complications; pediatrics
HAND HOT CLINIC -WHAT do Patients think ?

**List of authors:**
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¹ Khoo Teck Puat Hospital (Singapore)

**Objectives / Interrogation:** Emergency departments are constantly experiencing high patient load, and their physicians under high pressure for proper disposition of their patients. We noticed that a significant proportion of admissions to the inpatient ward may be avoided, when the definitive management by the relevant specialty could be carried out in the outpatient setting, and in a timely fashion. This has positive effects on delivery of patient care and on healthcare cost.

Hand Hot clinic has been introduced in our institution to provide quick access to speciality service, improve Hand emergency care, and to reduce burden on the emergency department.

Our objective is to find out patients' experience, to evaluate and improve delivery of Hand Hot Clinic care.

**Methods:** Hand Hot clinic is intended to reduce the admissions of patients with acute hand problems. Patients will be assessed by the hand surgery team, who will institute initial management and draw up a definitive plan.

A questionnaire was specifically designed to explore patients perspectives and experience. All the patients were triaged by the nurse on arrival, followed by review and management by the Hand team doctor on duty.

Patients were then asked to fill in the questionnaire before leaving the clinic. All data were anonymised and no patient identifiable data was used in the study.

**Results and Conclusions:** The initial results are encouraging. Patients as well as the Emergency Department physicians are happy that their immediate concerns get addressed promptly. Deeper analysis will be presented.

**Keywords:**
Hot clinic
Secondary Traumatic Stress and Depression in Obstetrical Providers After Shoulder Dystocia and Brachial Plexus Birth Palsy Deliveries

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² University of Maryland School of Medicine (Baltimore)

Objectives / Interrogation: Traumatic deliveries occur at a rate of 29 per 1000 births in the United States. Shoulder dystocia delivery, specifically, is seen, in 0.2 to 3.0% of all vaginal births posing a risk for brachial plexus birth palsy to the child. Frequent exposure to traumatic birth events that have high rates of secondary complications is suggested to correlate with secondary traumatic stress or depression symptoms. Parents have been found to exhibit secondary traumatic stress symptoms, however, it is unknown whether obstetrical providers are just as, if not more, susceptible to such diagnoses. The purpose of this study is to determine if shoulder dystocia deliveries potentiates secondary traumatic stress syndrome and depression in obstetrical providers following a shoulder dystocia delivery.

Methods: A thirty-eight question survey was distributed to obstetrical providers in three health systems in the metropolitan Baltimore region. Secondary traumatic stress was measured via the Secondary Traumatic Stress Scale while depressive symptoms were evaluated using the PHQ-9 questionnaire included in the survey. Simple statistics were performed to analyze the data.

Results and Conclusions: Eighty-five obstetrical providers including residents, attendings, nurse-midwives, and medical students participated in this study. A significant relationship between exposure to a shoulder dystocia delivery and prevalence of secondary traumatic stress syndrome and depression could not be established. Secondary Traumatic Stress scale scores (range: 34.5-39.2) indicated that moderate or severe (STS scores > 49) levels of secondary traumatic stress was not exhibited. Similarly, the PHQ-9 scores (4.9-6.6) did not demonstrate a moderate to severe (PHQ-9 scores > 10) level of depression. Despite 44.7% of the sample regularly attending shoulder dystocia deliveries, only 28.2% of participants believed they had adequate training for shoulder dystocia deliveries.

Obstetrical providers do not experience secondary traumatic stress and depression following shoulder dystocia deliveries. It is possible that providers have outlets and/or training following to know how to cope with these deliveries. Unlike parents of brachial plexus birth palsy patients, obstetrical providers do not experience secondary stress syndrome and depression following shoulder dystocia deliveries.

Keywords: obstetrics; shoulder dystocia; providers; secondary traumatic stress; depression; post-traumatic stress disorder; brachial plexus birth palsy
A new pattern of extremely distal articular fragments in distal radius fractures

List of authors:
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Hospital Italiano de Buenos Aires (Capital Federal)

Objectives / Interrogation: Fractures of the distal Radius are very common, and they frequently are intra-articular. In most of these cases surgical treatment is required and an adequate fixation is achieved with the current implants. Nevertheless there is an unusual pattern, determined by the presence of extremely distal fragments, where traditional osteosynthesis could not be useful.
The goal of this study is to analyze this distal radius fracture pattern that has some distinctive specific fragments and might be treated in a different way from the standard distal radius articular lesions.

Methods: X-rays and CT scans were used to retrospectively study 1019 distal radius fractures operated in our Hospital between January 2012 and December 2017.
Our inclusion criteria were:
- Radial Styloid fracture
- Avulsion of the ventral and/or dorsal rims of the distal radius
- A very distal articular fragment of the lunate and/or scaphoid fossa of the radius, including a shell of subchondral bone not more than 3 mm thick.
We excluded:
- Patients younger than 18 years-old
- Patients with radiocarpal dislocation
The resulting preoperative X-rays and CT scans were compared looking for a common fracture pattern.
Postoperative studies were evaluated to review the type of fixation used.

Results and Conclusions: Ten patients among 1019 distal radius fractures met the inclusion criteria (1%).
All patients but one were male. Mean age was 39 years old.
In all the cases the 3D CT scans clearly defined the fracture fragments, seldom identified with only plain X-rays. All the patients that met inclusion criteria had an associated fragment of the lunate and/or scaphoid fossa and its subchondral bone, not thicker than 3 mm.
Both Radial Styloid fractures and dorsal or volar avulsion solid fragments were fixed with cannulated headless 2.3 screws. Smaller avulsion or comminuted avulsion fragments were fixed with bone sutures or bone anchors. Dorsal comminution was buttressed with 2.0 or smaller plates. None of the fractures was feasible for standard volar locking plating.
We describe a pattern of distal radius avulsion fracture without dislocation, which is associated with subchondral distal fracture of the lunate and/or scaphoid fossa.
This pattern of fracture affected more frequently young males with high energy injuries.
It is probably necessary to develop new types of osteosynthesis materials to efficiently fix these very distal small fragments, since it is difficult to achieve this with the existing osteosynthesis.

Keywords:
distal radius, avulsion fractures, subchondral bone
Short term results of the adapted Mennen technique of pollicization (no detachment of intrinsic musculature)

List of authors:
Andrea Jester\(^*\), Kerstin Oestreich\(^1\), Sami Alani\(^1\), Carla Baldrighi\(^1\)
\(^1\) Birmingham Women's and Children's Institute (Birmingham)

Objectives / Interrogation: Standard practise during pollicization is to detach and re-attach intrinsic musculature from the MCP region into the PIP region. Most surgeons are reluctant to change their technique once they feel safe with their chosen approach. We have adapted our technique from detachment and re-insertion of intrinsic musculature (Kozin, 2012), to leaving dorsal interossei and extrinsic muscles attached as described by Ulrich Mennen (personal communication). The aim was to demonstrate that the modified technique leads to a decrease in operating time, shorter rehabilitation and good postoperative results.

Methods: In 2017/8, 11 patients with Blauth 3b to 5, including one patient with an underlying Bayne 4 radial hemimelia, underwent surgery according to the Mennen modification. The rest of the technique was as described by Kozin in 2012, except two sutures were used to stabilize the new CMC joint at the base instead of K-wire. All patients were immobilized for 4 weeks in a bulky dressing and then started to move freely.

Results and Conclusions: No intra or postoperative problems were encountered in any of the patients. Despite leaving the intrinsic muscles in place good access to the metacarpal 1 was achieved. Operating time was decreased. Patient used the newly pollicised thumb sooner than with our previous method. Interfering with the intricate anatomy of the MCP capsule including the insertion of the dorsal interossei appears to be unnecessary. Short-term results with regards to speed of recovery and early functionality are promising. Long-term results obviously need to be awaited regarding CMC movement.

Keywords: pollicization, intrinsic musculature,
The Results of Surgical Treatment for Osteoarthritis of the Thumb Trapeziometacarpal Joint: The Correlation With Trapezial Space Height

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Objectives / Interrogation: It is not well known whether the degree of shortening of the Trapezial Space Height (TSH) after trapeziectomy for osteoarthritis of thumb trapeziometacarpal joint has any effects on the results. The aims of this study were to assess the pre/postoperative changes of the TSH and the results and investigate the relationship between them.

Methods: This retrospective study was composed of 33 patients (37 hands) who underwent surgical treatment for osteoarthritis of thumb trapeziometacarpal joint, 5 patients (6 hands) of men and 28 patients (31 hands) of women with ages 63 (45 – 84). All patients were treated with trapeziectomy and Ligament Reconstruction without Tendon Interposition (LR without TI). The K-wires were inserted to stabilize the thumb for 4 weeks after surgery. We assessed the TSH on the X-ray preoperatively and postoperatively at 2 weeks, after removal of the K-wires, 3 months, 6 months and 12 months. We also assessed pain visual analog scale (VAS) preoperatively and postoperatively at 6 months and 12 months. We investigated the relationship between the TSH and pain VAS.

Results and Conclusions: Results: The preoperative mean TSH was 12.4 mm and the postoperative mean TSH was 8.9 mm at 2 weeks, 6.7mm after removal of the K-wires, 6.7 mm at 3 months, 6.3 mm at 6 months and 6.1 mm at 12 months. The mean degree of TSH shortening from preoperatively to 2 weeks postoperatively was 3.4mm, from preoperatively to 3 months postoperatively was 5.7mm and from preoperatively to 12 months postoperatively was 6.3mm. The preoperative mean pain VAS was 6.2 and the postoperative mean pain VAS was 3.2 at 3 months, 2.1 at 6 months and 1.2 at 12 months. Analysis of the correlation between the TSH and the 12 months postoperative VAS did not show any significant correlation (Pearson correlation coefficient was < .20). Similarly, analysis of the correlation between the degree of shortening of the TSH and the 12 months postoperative pain VAS did not show any significant correlation (Pearson correlation coefficient was < .20).

Conclusion: We concluded that LR without TI not only successfully maintained the Trapezial Space Height without significant shortening after removal of K-wires but also yielded the excellent results. There was no correlation between the pre/postoperative changes of TSH and the results. We expected the cause that we performed ligament reconstruction without any compression or traction to the thumb. Because of these results we prefer the "in site" ligament reconstruction.

Keywords:
Osteoarthritis of the Thumb Trapeziometacarpal Joint, Ligament Reconstruction without Tendon Interposition
Wrist Arthrodesis in Patients with Cerebral Palsy

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Objectives / Interrogation: Management of patients with cerebral palsy (CP) with upper extremity involvement is complex. One known deformity in this population is the development of contracture about the wrist. The role of wrist arthrodesis for patients with CP has become much more common. This option was previously used only when the patient has little or no function in fear that wrist arthrodesis will have a negative effect on grip strength by means of altering the tenodesis effect of the finger tendons. To our knowledge, treatment of this complex issue has not been reported among patients in the military health care system. The goal of this study was to examine the outcomes and clinical course of wrist arthrodesis in this population.

Methods: Study design was a prospective case series. Computer-based review of operative codes and a subsequent chart review identified 5 children who had wrist arthrodesis performed between 2014-2018. All patients were diagnosed with cerebral palsy of various severity. 2 patients had hemiplegia, the other 3 patients had spastic quadriplegia. All patients had moderate to severe cognitive impairment and were dependent on their parents and caregivers. Age range at the time of surgery was 13-35 years of age. Mean follow-up was 3 years (range, 0.5-4.3 years). All children are enrolled within the military medical insurance program, TRICARE. Their surgical procedure and post-operative care were all within the military health system.

Results and Conclusions: Prior to surgery, 4 patients were given a trial of casting. This was meant to simulate neutral wrist position obtained by wrist fusion. The parents and the patients observed improved function with casting and subsequently underwent wrist arthrodesis.

In 4 cases, wrist arthrodesis was performed with a proximal row carpectomy. In those cases, the removed carpal bones were used as autograft to aide in fusion. Plate fixation with the Acumed wrist fusion plate or with a Synthes small fragment LCP 3.5 mm plate.

Post-operatively, all patients were casted for 6-12 weeks and enrolled in formal occupational therapy. All patients had improved function and cosmesis after the procedure by patient and parent report. This was true for patients with low and high GMFCS classification. None of these patients required further surgery after the index procedure.

With careful patient selection, surgical intervention for the upper extremity in patients with wrist contracture related to CP may be indicated to improve function, cosmesis, and hygiene.

Keywords:
wrist arthrodesis, cerebral palsy, spastic, proximal row carpectomy
Histological examination of osteochondritis dissecans of the elbow

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Objectives / Interrogation: Osteochondritis dissecans (OCD) of the elbow is a localized injury of the articular cartilage and subchondral bone that is commonly seen in the young athlete. Mechanical factors seem to play an important role. The etiology of OCD lesions remains unclear. The aim was to address the course of pathologic progression.

Methods: The subjects were twelve elbows in 12 patients (average age, 13 years) with osteochondritis dissecans of the humeral capitellum. During osteochondral autograft, cylinder osteochondral plugs were taken from the center of the osteochondritis dissecans lesion and examined with light microscopy.

Results and Conclusions: The specimens were grossly divided into 3 parts: Articular fragment, intermittent part and basal bone. The intermittent part including a partial cleft consisted of fibrocartilage and connected the articular fragment with the basal bone. In the basal bone, there were no findings of osteonecrosis and active bone formation was found. The superficial area of the articular fragment consisted of articular cartilage and the deep area consisted of three components: (1) calcified cartilage, (2) viable bone, and (3) necrotic bone. The deep area of articular fragment consisted of calcified cartilage without bone in eight patients (average age, 12.8 years), although it had viable subchondral bone in two (average age, 12.5 years) and necrotic bone in two (average age, 15 years).

Discussion: Fibrocartilage in the intermittent part seemed to be reparative tissue to connect the articular fragment to basal bone. Basal bone was normal, suggesting that primary separation occurred just beneath the articular fragment. The radiographic images OCD showed delayed calcification and bone formation in the affected subchondral bone. These delayed ossification was observed in the articular fragment: cartilage calcification in eight, viable bone in two and necrotic bone in two. These findings suggest the following course of pathologic progression of OCD: (1) primary separation occurs horizontally under the deep cartilage and is followed by fibrocartilaginous repair, (2) Calcification occurs horizontally in the deep cartilage to be replaced by bone, however repetitive microtrauma causes bone replacement difficult, (3) Subchondral bone is formed by enchondral ossification, (4) Osteonecrosis occurs due to additional injury.

Keywords: osteochondritis dissecans
Conservative Therapy of the Proximal Phalangeal Fracture: Adaptation and Limitation

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Objectives / Interrogation: The purpose of the study was to assess the adaptation and limitation of the conservative treatment with dorsal block functional cast or surgery for proximal phalangeal shaft and base fractures.

Methods: We retrospectively reviewed the medical records and radiographs of patients from January 2015 to January 2017 with a diagnosis of proximal phalangeal fractures. Outcome was analysed in terms of the alignment of the proximal phalangeal bones and %total active motion(%TAM) at the time of injury and 4 months later after treatment.

Results and Conclusions: Ultimately, 46 fractures in 44 patients (mean age 35.8 years(range=7-76 years), female/male 9/35) were enrolled. Fractures affected index finger (n=7), middle finger (n=1), ring finer (n=7) and little finger (n=31). The type of fractures were condylar fractures (n=16), shaft fractures (n=7) and base fractures (n=23). Surgical treatment was performed for 20 fractures of the condylar fractures, the long oblique fractures with gap and the base fractures with intra-articular fracture. 26 fractures with the conservative treatment were retained good alignment. The alignment at the time of injury and the 4 month later after treatment were volar-dorsal angulation:21.0,2.5°, lateral angulation: 11.6,1.8°, lateral dislocation: 0.9,0.2mm and shortening: 0.5,0.4mm. The mean %TAM after the conservative treatment was 92.1%.

All fractures were bone union without overlapping. The proximal phalangeal fractures could be treated conservatively were good outcomes.

However, surgical treatment were needed for the condylar and intra-articular fractures needing anatomical reduction or the long unstable oblique fractures.

Keywords:
Proximal Phalangeal Fracture, Conservative Therapy
Comparison of the efficiency between the extrinsic and intrinsic extensor muscles for extension of the proximal interphalangeal joint of the finger

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Objectives / Interrogation: Extension of the proximal interphalangeal (PIP) joint of the finger is consisted of both the extrinsic and intrinsic muscle function. We aimed to analyze combined role of both functions in extension of the PIP joint of the finger with fresh cadaver specimen.

Methods: Seven fingers of fresh cadaver were used in current study. One tendon of the extensor digitorum communis (EDC) and two tendons of the intrinsic tendon were dissected and the Krackow suture was done for each tendon. Each finger is mounted with Kirschner wires on the custom-made experiment system. One tendon of the EDC was connected to one pneumatic actuator, and two tendons of the intrinsic muscles were connected to the other pneumatic actuator. One pendulum of 120g was connected to the flexor digitorum profundus to give continuous flexion load on the PIP joint. Extension force was loaded on each tendon and the load was gradually increased from 0 to 900g with control of the computer software. Angle of the PIP joint was measured with the sensor connected to the K-wire inserted at the distal portion of middle phalanx. Previous literature noted that physiologic cross sectional area (pCSA) of the EDC and the interosseous muscle are 1.53cm² and 0.86cm², respectively. We assumed that the maximal contraction force of the each muscle system was proportional to pCSA of the each muscle.

Results and Conclusions: With MP joint of 20 degree of flexion, efficiency of the EDC for extension of the PIP joint was 26% greater than the intrinsic muscles. With MP joint of 60 degree of flexion, efficiency of the EDC for extension of the PIP joint was 41% greater than the intrinsic muscles. Proportion of the roles in extension of the PIP joint of the EDC and the intrinsic muscle are, 69.2:30.8%, respectively with MP joint of 20 degree of flexion. Proportion of the roles in extension of the PIP joint of the EDC and the intrinsic muscle are, 71.5:28.5%, respectively with MP joint of 60 degree of flexion. Intrinsic muscles showed trends of decreasing efficiency of the PIP joint extension with MP joint flexion.

The EDC muscle has more role in extension of the PIP joint than the intrinsic muscle. With MP joint flexion, role of the intrinsic muscle for extension of the PIP joint declines.

Keywords:
Proximal interphalangeal joint, extension, EDC, intrinsic muscle
The reserve option for the thumb abduction

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Objectives / Interrogation: The management of the spastic hand remains a surgical challenge, especially for the cases with severe shortening of the flexor and a marked lack of transferrable muscle-tendon units. In order to achieve a significant elongation of the finger flexors and simultaneously provide enough thumb abduction, a modified flexors harvest technique can be used, where the flexor digitorum superficialis is transferred to the flexor digitorum profundus tendon. Initially introduced by R.Brown, this technique in Russian tradition is strongly associated with G.Epstein and V.Rosov, who described this surgical procedure with minor differences.

Methods: We suggest the use of a modified technique in this surgery: the tendons of the flexor digitorum superficialis are cut at the proximal falanx level, and then their distal ends are used for the PIP tenodesis. The proximal ends are sutured with the distal ends of the FDP, that are cut near the carpal ligament. And finally, the proximal parts of the FDP can be used as a motor unit for the transfer. If we may need additional strength in the thumb abduction after its contracture release, we can suture the ends of the FDP to the EPL or the EPB, or anchor the FDP to the 1st metacarpal bone. Two patients, one male and one female, both showing some after-effects of a brain injury with spastic hemiparesis, underwent the procedure.

Results and Conclusions: In the first case, enough finger extension to satisfactorily release the grip and perform thumb adduction was achieved. As per the second case, thumb abduction was attained only due to the tenodesis effect of the FDP attached to the 1st metacarpal bone. In the cases where a lack of transferrable muscle-tendon units is pronounced, this technique can be considered as a good treatment option.

Keywords:
spastic hand, superficialis to profundus transfer, thumb in palm
**Aesthetic reconstruction of palmar soft tissue defects with medial plantar artery perforator flap**

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**Objectives / Interrogation:** Reconstruction of glabrous skin of palm and fingers is a great challenge for hand surgeons. The purpose of this study is to present our experience on using medial plantar artery perforator flaps to repair palmar soft tissue defects.

**Methods:** From 2005 to 2017, 21 patients received free medial plantar artery perforator (MPAP) flap to recover the soft tissue defects in palm or fingers. The causes of the defects included congenital hand malformation, tumor, scar contracture and trauma. A comparison has been made pre- and postoperatively about total active motion, flap survival rates, skin color and texture, static 2-point discrimination, range of motion (ROM) of the hands.

**Results and Conclusions:** The flap size ranged from 25mm x 15mm to 80mm x 40mm. All flaps survived in the mean follow-up period of 50 (36-120) months. The donor sites healed uneventfully in 20 cases, and mild wound dehiscence occurred in one case. At patients' last visits, the mean ROM was 245°. The mean s-2PD was 8.5mm. The mean Vancouver Scar Scale Score of the recipient sites and donor sites were 1.8 and 2.6, respectively. The donor foot functioned well. All the patients were satisfied with the results. In conclusion, medial plantar artery perforator flap is an ideal flap for aesthetic reconstruction of palmar soft tissue defects.

**Keywords:** medial plantar artery perforator flap, aesthetic reconstruction
Tendo-arthrolysis is more Effective than Splinting in the Management of the Stiff Proximal Interphalangeal Joint - A Systematic Review

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Objectives / Interrogation: 1) To review the functional outcomes of surgical (tenolysis, arthrolysis and teno-arthrolysis) and non-surgical (mobilisation and splinting) interventions that are used to treat the stiff proximal interphalangeal joint (PIPJ) following flexor tendon surgery.

2) To evaluate the complication rates of each of these surgical and non-surgical interventions.

Methods: A PRISMA compliant search of databases registering published and unpublished literature prior to May 2018 was conducted. This included Cochrane, Medline, Embase, CINAHL, BioMed Central, Zetoc and PEDro. All studies that evaluated the change in function of the PIPJ following flexor tendon surgery were included. Animal and cadaveric studies were excluded. Methodological quality was assessed using the Downs & Black Protocol.

Results and Conclusions: A total of 1102 studies were identified in the preliminary search. Twelve studies assessing 685 digits met the inclusion and exclusion criteria. The mean age of participants was 35 (5-79) years old. While initial flexor tendon injury was the primary aetiology of PIPJ stiffness in all studies (accounting for 42.5% of all analysed digits), other aetiologies of PIPJ stiffness were included in the analysis of 11 studies. All interventions lead to an overall improvement in active and passive PIPJ motion. Surgical interventions led to a greater improvement in passive motion of the PIPJ compared to splinting (26º vs 18º), with teno-arthrolysis yielding the greatest gain in active and passive motion of the PIPJ. Of the studies reporting post-surgical complications, tenolysis yielded a higher rupture rate (7.78% N=249 vs 0% N=50; p=0.21) and infection rate (2.5% N=152 vs 0% N=50; p=0.42) compared to teno-arthrolysis. Skin dehiscence or necrosis was reported more frequently following teno-arthrolysis compared to tenolysis (6.25% N=67 vs 3.55% N=123; p=0.72). No cases of pulley rupture were noted in either group. There was significant heterogeneity in terms of surgical approach, mean follow-up (6-406 weeks) and timing of the intervention after initial injury (13-234 weeks). Furthermore, 83% of studies were considered to be of poor quality.

Whilst teno-arthrolysis appears superior to other surgical interventions or splinting, further high-quality research is warranted to identify and compare the true value of surgical and non-surgical interventions for managing the stiff PIPJ.

Keywords:
systematic review; hand; finger; proximal interphalangeal joint; splinting; tenolysis; arthrolysis; tenoarthrolysis; flexor tendon; stiffness; range of motion; movement
Survival of Aptis Distal Radioulnar Joint (DRUJ) Implant Arthroplasty.

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Objectives / Interrogation: The purpose of this study was to report survival of the Aptis Distal Radioulnar Joint Implant Arthroplasty (Aptis).

Methods: We performed a retrospective review of patients who had at least 1 year follow up after Aptis arthroplasty from 2013 to 2017. Mean follow up was 3 years (1-5 years). Of 102 consecutive patients 1 was lost to follow up and was excluded. In our database we had one year follow up of functional outcome (DASH). Fifty six patients were treated with the Aptis as primary indication (instability and pain without prior surgery to the DRUJ) and 46 patients with the Aptis as rescue indication (pain after earlier ulnar resection, Sauve-Karpandi, other arthroplasties a.o.)

Results and Conclusions: DASH score improved from 58(14) to 30(15) after one year (n=102), (p<<0.01). Grip strength improved from 10(8)kg to 25(7)kg (p<<0.01).
Seventeen percent needed minor surgery (surgery to relieve pain due to synovitis of extensor tendons in 1st, 5th and 6th Compartment.
Five patients (5%) needed Removal of the Aptis, of these two Aptis were removed and treated with One-bone forearms and 3 had a revision arthroplasty due to infection with a functional Aptis at follow up.
All but two patients (98%) had a functional Aptis at follow up

CONCLUSION: We have had good results with the Aptis Distal Radioulunar Joint Implants with significant improvement of grip strengths, DASH score and a 95% survival after 3 years (1-5 years).

Keywords:
DRUJ, arthroplasty, aptis, wrist
Functional outcome after a surgical reconstruction of a chronic extensor pollicis longus tendon rupture - a case report

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Objectives / Interrogation: The aim of this work is to determine/evaluate the functional outcome of an extensor indicis proprius (EIP) tendon transposition after an extensor pollicis longus (EPL) chronic rupture based on a clinical case.

Methods: The authors report a case of an individual, female, 50 years old, factory worker, that had an EPL chronic rupture on the TV zone with nearby 6 months and complete lost of the thumb extension. The surgery performed was a transposition of the ipsilateral EIP tendon and the tenodesis was done using the pulvertaft technique. Study-specific outcome measures were used to assess function in activities of daily living, pain, and patient satisfaction: grip strength, pinch strength, range of motion, kapandji score and DASH score. The current follow-up was 5 months.

Results and Conclusions: The patient maintained a cast immobilization during the first four weeks of surgery and then it was changed to an orthosis and the patient started to do physiotherapy. After 15 weeks of surgery the kapandji score was 10. After 20 weeks of surgery the kapandji score was still 10, the pinch strength was 2.5 kg (5 kg on the contralateral side), the grip strength was 18 kg (22 kg on the contralateral side), the range of motion was 90° (100° on the contralateral side) and the Quick DASH score of 11.4.

Besides the EIP tendon has been the used tendon on the case reported, the extensor digitorum profundus communis II is also a valid option and the pulvertaft technique was used because of the unequal size of the tendons. The authors concluded that the transposition of the EIP for the EPL chronic rupture is a safe and effective procedure, with good functional outcomes. The success of this surgery depends on a rigorous technique and an appropriate program of functional rehabilitation so that further clinical and biomechanical investigations may give additional informations about the postoperative management, in order to maximize the surgical outcomes.

Keywords:
extensor pollicis longus chronic rupture, extensor indicis proprius
The management of thumb base osteoarthritis - A multicentre service evaluation project

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Objectives / Interrogation: Thumb base (trapeziometacarpal) osteoarthritis is a common problem, with 15% radiographic prevalence across the entire adult population and as much as 91% of those over the age of 80 years. Resultant pain and loss of function can severely affect quality of life. The British Society of Hand Surgery (BSSH) advises surgery be reserved as a last resort option, for those with symptoms refractory to non-operative treatments. We aimed to assess current UK practice in the management of thumb base OA in secondary care, with specific regard to; the nature and duration of non-operative treatments and the surgical procedures performed.

Methods: 10 consecutive patients undergoing surgery for thumb base OA from 12 UK centres were prospectively identified. Patient demographics, symptom duration, radiographic Eaton-Littler grade, non-operative management strategies and the operation performed were recorded.

Results and Conclusions: Data was gathered for 120 patients from 12 centres over a 12 month period. The mean age was 64 years, comprising of 26 males and 94 females. The mean symptom duration pre-surgery was 32 months, and the median radiological grade was 3.

40% of patients had physiotherapy pre-surgery and 50% used a splint. 80% of patients received at least one injection, with a median of two injections pre-surgery. 100% of injections were a corticosteroid derivative. 74% were image guided (61% fluoroscopic and 13% ultrasound) and 26% were landmark guided. Simple trapeziectomy was carried out in 43% of cases, compared to surgery involving ligament reconstruction and/or interposition arthroplasty in 56%. Two patients had alternative operations, including one arthroplasty and one arthrodesis.

There is considerable variation in practice of both non-operative and operative management of thumb base OA in the UK. It is interesting that image guidance is the most common means of injection delivery. These findings likely relate to a lack of high quality evidence from which to guide practice and demonstrate the need for future research in this area.

Keywords: osteoarthritis, trapeziometacarpal, carpometacarpal, thumb base, trapeziectomy
Predictive factors for severe post-operative chronic pain after surgery for cubital tunnel syndrome

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Objectives / Interrogation: There is a wide variation in outcome after surgery for cubital tunnel syndrome. Chronic pain is a well known and relatively common complication with severe consequences for the individual patient. In this study, we aimed to evaluate possible predictive factors for severe post-operative chronic pain after surgery for ulnar nerve entrapment at the elbow.

Methods: A retrospective observational study was performed on patients with ulnar nerve entrapment at the elbow operated at a referral centre 2011 - 2014, using data from medical charts and a post surgical survey. In total 173 patients were included. A subgroup of 28 patients, postoperatively referred to a Pain Centre due to chronic neuropathic pain, was identified and further categorized with questionnaires for: 1) health status (EQ-5D), 2) life satisfaction (Li-Sat 11), 3) fear of movement related to pain (The Tampa Scale of Kinesiophobia), and 4) levels of anxiety and depression (Hospital Anxiety and Depression Scale). Logistic regression was used to evaluate predictive factors for referral to the Pain Centre regarding age, gender, BMI, smoking, civil status, interpreting requirements, comorbidity, and surgical method (simple decompression or subcutaneous ulnar nerve transposition). To compare the EQ-5D values with values for the national population, one sample t-test was done.

Results and Conclusions: Emerged postoperative neurogenic pain was seen in 8% of the whole population (n=173) and 2% developed CRPS (complex regional pain syndrome). Of the patients referred to a Pain Centre (n=28), 12/28 (43%) had previously been in contact with the Pain Centre and 20/28 (71%) suffered from earlier pain problems. A significant association was found between referral and interpreting requirements, depression, other nerve compression lesions in the same arm, and surgery with ulnar nerve transposition instead of simple decompression. The mean value of EQ-5D was significantly lower than for the national population.

We conclude that earlier pain problems, interpreting requirements, depression and other nerve compression lesions are readily identifiable risk factors for developing postoperative severe chronic pain following surgery for cubital tunnel syndrome. Such patients have a low health-related wellbeing and need particular pre- and postoperative care. It should be carefully evaluated whether surgery should be performed or not. Simple decompression is the first choice of surgery.

Keywords:
Cubital tunnel syndrome, ulnar nerve, post-operative pain, chronic pain, neuropathic pain, CRPS, simple decompression, ulnar nerve transposition
Factors affecting union rate when treating scaphoid nonunion using non-vascularized bone grafting with internal fixation: preliminary report

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Objectives / Interrogation: We attempted to investigate whether the union rate changed according to different techniques of non-vascularized bone grafting and internal fixation, when treating unstable scaphoid nonunion at waist.

Methods: 39 patients with unstable scaphoid nonunion at waist were involved. We divided the patients into three groups, according to bone grafting and fixation methods: Cancellous bone grafting with K-wire fixation, cortico-cancellous bone grafting with K-wire fixation and cortico-cancellous bone grafting with headless screw fixation. We longitudinally observed how many patients in each group had bony union. Time to surgery, type of nonunion, time to union and number of union failure were also checked for comparison between the groups. The failure cases were presented for analysis.

Results and Conclusions: There were 37 men and 2 women with mean age 28.7 years (range, 18-56). Mean follow-up period is 26.3 (range 24- 53) months. 13 patients were treated by cancellous bone grafting with K-wire fixation, 12 patients by cortico-cancellous bone grafting with K-wire fixation and 13 patients by cortico-cancellous bone grafting with headless screw. Overall union rate was 86.8% (33/38). Union rate was 100% in cancellous bone grafting with K-wire fixation group, 83% in cortico-cancellous bone grafting with K-wire fixation group and 77% in cortico-cancellous bone grafting with headless screw group. There was no difference in time to surgery, type of nonunion, type to union and number of union failure between the groups. All the failure cases were sclerotic scaphoid nonunion and had DISI deformity.

Cancellous bone grafting seems to be more helpful to achieve union of unstable scaphoid nonunion at waist than cortico-cancellous bone grafting, regardless of the type of unstable scaphoid nonunion. The method of internal fixation seems to have had little impact on union rate of bone grafting for scaphoid nonunion. However, the failure of union was most commonly encountered when sclerotic nonunion with DISI deformity was treated by cortico-cancellous bone grafting + headless screw fixation. Based on this study, further studies regarding the advantages and disadvantages of each bone grafting and internal fixation methods should be performed in a larger number of patients.

Keywords: scaphoid, scaphoid nonunion, bone grafting
Stener Lesion: A Comparison Between Two Methods Of Primary Repair

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Objectives / Interrogation: The aim of this work is to compare the results achieved with two different techniques on the primary repair of Stener lesion.

Methods: The patients (N = 16) with stener lesion were divided in two groups according to the surgical procedure: Group 1 (n = 7) - reattach with miniature intra-osseus suture anchor and Group 2 (n = 9) reattach with pre-fashioned steel wire, the Barb-wire of Jennings (Tendofil®). The clinical assessment included a physical examination and functional testing (QuickDash score, range of motion, grip strength, pinch strength, instability and pain).

Results and Conclusions: The sample average age was 47.8 years (25 to 69 years) with an average follow-up of 57 months (24 to 101 months). The QuickDash score on group 1 was on average 16,5 and on group 2 18,6. The reduction of the grip and pinch strength on both groups was less than 10%. The loss of metacarpo-phalangeal (MP) joint motion was on average 5 degrees. There were no nerve injuries, infections, device failures or reoperations recorded. Persistent instability was not observed in any of the patients. Controlled active range of motion exercises started 3 to 4 weeks after open surgical repair. Protective splinting was continued until the sixth week and unrestricted use allowed at 12 weeks after injury.

The authors concluded that these two methods are safe and effective for repair of complete tears of the ulnar collateral ligament of the first MP joint, verifying a slightly better DASH score with the reattach using miniature intra-osseus suture anchor. There were no significant statistical differences in the grip and pinch strength. In general both have yielded good joint stability and a near-full recover of range of motion, showing a good to excellent functional outcome.

Keywords:
Stener lesion, Barb-wire of Jennings, miniature intra-osseus suture anchor
How to manage a chronic periprosthetic infection after total wrist arthroplasty? - case report

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Objectives / Interrogation: The aim of this work is to present a clinical case of a chronic periprosthetic infection after total wrist arthroplasty (TWA) and to discuss and draw a possible therapeutic approach for similar cases.

Methods: The authors report a case of an individual, male, 58 years old, manual worker, that appears with pain and inflammatory signs with a sinus tract on the right wrist, that had undergone TWA 8 years before. The authors started with an empirical antibiotherapy and then they decided to do a revision procedure in 2 stages: the first one consisted on the removal of the implant, debridement and interposition of cement spacer with antibiotics and immobilization; the second one consisted on a radio-metacarpal arthrodesis with precast plate and interposition of autologous graft harvested on iliac crest. The time of follow-up was 5 years.

Results and Conclusions: After a successful first stage revision, the second one was performed and after 2 years of follow-up, the patient satisfaction had improved, he had no pain, the fusion was radiologic evident and the DASH score was 28. After 5 years of follow-up the DASH score had improved to 22. The algorithm that we propose is based on patient risk factors, blood tests, imaging exams and harvested material for microbiology and antibiogram. The treatment options mentioned are antibiotherapy (empirical and directed) and surgical treatment (two stages revision).

The improvement of the implants in recent years have contributed to the increasing use of arthroplasty as a treatment option. Although it presents itself with an attractive option in terms of future functional capabilities, arthroplasty remains with some risks and has a higher rate of complications in the medium and long term than fusion, so the selection of patients should be careful.

The wrist arthrodesis can always be seen as an ultimate salvation procedure in the treatment of failure of wrist arthroplasty, either a mechanical or infectious failure.

Keywords:
Chronic periprosthetic infection, Total wrist arthroplasty
The Results of Surgical Treatment for Osteoarthritis of the Thumb Trapeziometacarpal Joint: The Correlation With Tenosynovitis

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Objectives / Interrogation: Tenosynovitis has occasionally occurred after Ligament Reconstruction without Tendon Interposition (LR without TI) for osteoarthritis of thumb trapeziometacarpal joint. The aims of this study were to investigate the relationship between pre/postoperative changes of Trapezial Space Height (TSH) and tenosynovitis and the influences of tenosynovitis to the results.

Methods: This retrospective study was composed of 33 patients (37 hands) who underwent LR without TI. After ligament reconstruction the K-wires were inserted to stabilize the thumb for 4 weeks. We assessed the TSH on the x-rays preoperatively and postoperatively at 2 weeks, 3 months and 12 months. We also assessed pain visual analog scale (VAS) preoperatively and postoperatively at 6 months and 12 months. 7 postoperative tenosynovitises were retrieved from the medical record. We found postoperative trigger finger of thumb with 1 patient, index finger with 4 patients and middle finger with 1 patient and carpal tunnel syndrome (CTS) with 1 patient. We diagnosed tenosynovitis 5.6 months postoperatively. 5 trigger fingers had been treated with corticosteroid injection 5.4 months postoperatively, 1 trigger finger without additional procedures and 1 CTS with endoscopic carpal tunnel release 8 months postoperatively. We compared the TSH and pain VAS between tenosynovitis and non-tenosynovitis group.

Results and Conclusions: Results: The mean TSH of tenosynovitis and non-tenosynovitis group were 12.8mm and 12.3mm preoperatively (p=0.48), 7.1mm and 9.3mm 2 weeks postoperatively (p<0.01), 6.0mm and 6.9mm 3 months postoperatively (p=0.24) and 5.5mm and 6.1mm 12 months postoperatively (p=0.47). The mean degree of TSH shortening from preoperatively to 2 weeks postoperatively was 5.7mm and 3.0mm (p=0.01), from preoperatively to 3 months postoperatively was 6.8mm and 5.5mm (p=0.11) and from preoperatively to 12 months postoperatively was 8.1mm and 6.2mm (p=0.07). The mean pain VAS was 6.4 and 5.3 preoperatively (p=0.32), 2.2 and 1.9 6 months postoperatively (p=0.71) and 1.1 and 1.3 12 months postoperatively (p=0.89).

Conclusion: 2 weeks postoperatively, tenosynovitis group had significantly shorter TSH and larger degree of TSH shortening from preoperatively than non-tenosynovitis group. But there was no difference in pain VAS due to the treatment of tenosynovitis. We suggest that it may be preferable to insert the K-wires without compression the thumb toward proximal side after ligament reconstruction to minimize the potential of tenosynovitis.

Keywords:
Osteoarthritis of the Thumb Trapeziometacarpal Joint, Ligament Reconstruction without Tendon Interposition, Tenosynovitis
Vascularized Bone Flaps in Upper Extremity Reconstruction: A Case Series

List of authors:
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Objectives / Interrogation: Upper extremity composite tissue defects encompassing bone and/or isolated bony defects can be challenging; re-establishing a bony framework is critical for successful limb salvage. Vascularized bone flaps (VBFs) can provide a one-stage solution for autologous bony replacement in situations with large or complex bone defects and are often superior options compared with nonvascularized bone grafts or non-bone internal fixation techniques.

Methods: A retrospective review of VBFs performed by a single surgeon over a seven year period was conducted.

Results and Conclusions: Thirty-three total VBFs were completed for traumatic, oncologic, and congenital cases; seventeen of these were performed in the upper extremity. Patient age ranged from 5 to 64 years with the majority of patients being younger than 30 years old. Etiology of injuries included 11 traumatic and 6 oncologic (all 6 of which were pediatric cases). Successful union or bone healing was observed in 12 of 13 cases; at this time, 4 of the cases do not yet have an adequate follow-up period to determine union. There was 1 case of complete resorption of a fibula bone flap requiring salvage with an expandable megaprosthetic and additional soft tissue flap coverage.

VBFs have critical roles in successful limb salvage outcomes where certain bony defects are encountered. As evidenced in our series, VBFs provide reliable single-stage autologous bony reconstructions with relatively low and acceptable complication rates while achieving more functional outcomes. This series demonstrates the utility and success of VBFs for a variety of clinical situations.

Keywords:
limb salvage; bone reconstruction; vascularized bone flap; microsurgery
Evaluation of Factors Influencing Nerve Recovery after Reconstruction of Nerve Transection Injuries with Processed Nerve Allograft

List of authors:
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Objectives / Interrogation: Reported factors historically known to influence outcomes after the repair of peripheral nerve injuries include age of the patient, mechanism of injury, nerve injured, gap length, smoking status, and repair time. Processed nerve allografts (PNA) have been shown to be a safe and effective option to repair nerve gap injuries in a growing number of clinical studies. We sought to evaluate how these factors influenced recovery outcomes of injuries reconstructed with PNA. Here we report from an ongoing international nerve registry on PNA for upper extremity injuries spanning up to 70mm.

Methods: The database was queried for nerve repairs in the upper extremity using PNA (Avance® Nerve Graft, AxoGen) with sufficient follow-up. An evaluation of outcomes by age, mechanism of injury (MOI), gap length, smoking status, and repair time was conducted. Outcome data were incorporated into the MRC scale for sensory and motor function. Meaningful recovery was defined as S3/M3 or greater on the MRC scale. Further covariate analysis was performed to further characterize the sub-groups. Chi-square analysis and Fisher's exact test were performed with significant difference set at p> 0.05.

Results and Conclusions: The current registry has sufficient quantitative outcomes data on 413 repairs. The mean age was 42 ± 17 (18 - 81) years with mean repair time of 102± 384 (0, 4451) days. The mean gap was 22 ± 13 (3 - 70) mm with an average follow up time of 13 months. Meaningful recovery was observed in 85% of all repairs. No significant differences were found by age, repair time, gap, or MOI overall. Differences were noted when evaluating these factors by nerve type. Significant differences were found by MOI between lacerations and complex injuries in the hand. Non-smokers performed significantly better than smokers in mixed and motor repairs. No related adverse events were reported.

This registry is currently the largest multi-center study on PNA. Analysis of 413 nerve injuries demonstrates meaningful recovery in 85% of repairs. Study wide outcomes are consistent across covariates. Subgroup analysis indicates certain factors such as mechanism of injury and smoking may influence recovery outcomes, but these outcomes are still within expected ranges for nerve autograft and exceeded synthetic conduit historical data. The registry will continue to collect prospective data to help further define the role of PNA in peripheral nerve injuries.

Keywords:
nerve injury, nerve repair, processed nerve allograft
Clinical Outcome of Fixation Versus Conservative Management of Basal Fractures of the Ulnar Styloid Following Volar Plate Fixation of the Distal Radius

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Objectives / Interrogation: To compare functional outcome after fixation and conservative management of basal fractures of the ulnar styloid after volar plating of distal radius fractures without DRUJ instability.

Methods: This is a prospective randomized control trial conducted at an academic Level 1 Trauma Center between 2015 and 2017. The study included 31 patients (22 males and 9 females). The mean age was 36 years (20-50 years). The dominant hand was affected in 14 cases and the non-dominant hand was affected in 17 cases. Patients were divided into 2 groups; the first group included 15 patients to whom ulnar styloid fixation was done. The second group included 16 patients with conservative management of ulnar styloid. Randomization was done by using the double blind method. Patients were assessed for pain by Visual Analogue Scale (VAS) and grip strength compared to the sound side. Functional evaluation was performed by using the Modified Mayo Wrist Score (MMWS) the Quick-DASH (Disabilities of the Arm, Shoulder and Hand) questionnaire.

Results and Conclusions: In the first group, the mean postoperative visual analogue scale (VAS) for pain was 0.46 (range, 0 to 2), the mean quick DASH score was 26.23 (range, 17 to 35) and the mean postoperative Mayo modified wrist score (MMWS) was 75 (range, 65 to 85). The mean grip strength was 61.33 % of the sound side (range, 45 to 80%).

In the second group, the mean postoperative visual analogue scale (VAS) for pain was 0.44 (range, 0 to 2), the mean quick DASH score was 23.67(range, 16 to 34) and the mean postoperative Mayo modified wrist score (MMWS) was 72.78 (range, 70 to 85). The mean grip strength was 54.38 % of the sound side (range, 30 to 80%).

To conclude, results were comparable in both groups and differences were statistically insignificant.

Keywords:
ulnar styloid, DRUJ, instability, fixation
Abstract no.: IFSSH19-1346

Oral presentation or poster presentation

Wrist - Carpus

Algorhythmical approach in Ulnar Impactation Syndrome and presentation of a special case: UIS with DRUJ instability

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Objectives / Interrogation: Ulnar wrist pain is frequently caused by Ulnocarpal Impactation Syndrome (UIS) or Ulnocarpal Abutment. As an introduction we clarify the terminology, outline differential diagnosis. The purpose of our presentation to demonstrate our algorhythmical approach based on the experiences of the last four years.

Methods: Our treatment algorhythm will be shown as a flowchart with key points as follows: always conservative therapy at first, in case of DRUJ arthrosis/instability or limited pro/supination, consider Sauve-Kapandji procedure or DRUJ reconstruction, when having significant radius malalignment, consider corrective osteotomy, if only ulna plus is present and it exceeds 2-3 mm, consider extraarticular ulna shortening, otherwise arthroscopical/open wafer resection of the ulnar dome.

We didn't have early postoperative complications, however, implant removal was needed in 3 cases due to local sensitivity or allergic response to the metalwork inside. We had one non-union following extraarticular ulna shortening. Regarding to the 6 months outcome, based on the patients opinion, 0 bad, 1 acceptable, 5 good and 17 excellent results has been reported. We demonstrate our algorhythm with solution of a rare case of UIS with DRUJ instability.

Results and Conclusions: When handling Ulnar Impactation Syndrome, the nonsurgical therapy should be considered as a first line of treatment. It is very important to exclude the other factors in ulnar wrist pain (e.g. ulnar impingement, TFCC pathology, ECU tenosynovitis etc.). Due to the difficult differential diagnosis one should use a well devised, reasoned algorhythmical thinking to get a better outcome.

Keywords: ulnar wrist pain, ulnar impactation syndrome
Opportunities of distraction osteosynthesis in eliminating post-traumatic defects of middle and distal finger phalanges

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Objectives / Interrogation: The objective is evaluating the effectiveness of distraction osteosynthesis (DO) applied to finger phalanges in patients with defects in middle and distal phalanges (DMDF).

Methods: 48 patients aging 16 to 48 were treated (29.2±5.3 years old average). In 38 cases the DMDF were consequences of traumatic amputation, 3 cases were burns, 7 cases were frostbites. 19 patients had DMDF in multiple fingers (79 cases total). Indications for surgery were DMDF to their proximal part.

In all cases, the DO by external fixation apparatus (EFA) was applied individually taking into account the type and location of phalanx defects. With the phalanx shortened less than 50% of the primary stump length, the traditional distraction was carried out in the mode of 0.5-0.8 mm per day. When stump was lengthened by a large amount (120% or more) of its primary length, the distraction regenerate mineralization slowed down, and therefore the second stage after the lengthening was an intermediate autoplasty with a graft from an ilium crest.

The articular cartilaginous area of the stump was moved to the joint, and an autograft was inserted into the interval, which then was fixed in the EFA. The general duration of fixation in EFA during traditional lengthening did not exceed 12 weeks, while two-stage technique required 16 weeks.

Results and Conclusions: Immediate and long-term treatment results (in 6 months, 1 year or more after the surgery) was evaluated according to the DASH and VAS systems, assessing the phalanx shape and length by radiography. Phalanx elongation was achieved in all cases, and averaged 72% of the primary stump length. When using DO with intermediate bone autoplasty, anatomical growth of the phalanges had reliably speeded up in 2.7 times compared to using traditional techniques of phalanx lengthening.

Finger grip function was significantly improved in the restored fingers because the adjacent joint preserved its motions. The restored finger aesthetic appearance became better. Also, nail plate revealed partial restoration, even when it previously had subtotal defects.

Distraction osteosynthesis is effective in eliminating finger phalanx defects. Defects of the distal or middle phalanx with a length loss of more than 50% should involve intermediate bone autoplasty, which ensures restoring the length and shape of defective fingers in a shorter time.

Keywords:
distracttion, osteosynthesis
Percutaneous corrective osteotomy for malunited metacarpal and phalangeal fractures

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Objectives / Interrogation: We evaluated the outcomes of a percutaneous corrective osteotomy technique stabilised with K-wires.

Methods: Technique: The osteotomy is performed by passing multiple 1.1mm K-wires across the bone and then closed manipulation to create a low energy fracture. Once the alignment is corrected, it is held with one or more K-wires supported with a plaster cast for five to six weeks.

Review: We retrospectively reviewed the 21 patients who had a percutaneous corrective osteotomy operated between 2003 and 2014. The mean time from injury to osteotomy was 29 (range: 3-105) months. There were 17 women and 4 men with a mean age at surgery of 30 (range: 11-84) years. Of the 19 phalangeal malunions, 2 had a combined angulation and rotational deformity, 11 had an angulation deformity and 6 a rotational deformity. There were 2 metacarpal malunions, 1 with an angulation deformity and 1 a rotational deformity. The long-term subjective outcome was assessed using QuickDASH, Michigan Hand Outcome and Patient and Observer Scar Assessment Scale (POSAS) Questionnaires at a mean of 96 (range: 5-149) months post-surgery. The long-term objective outcome was assessed by measuring ranges of motion and grip strength at a mean of 63 (range: 2-140) months post-surgery.

Results and Conclusions: Results: Full correction of the pre-operative deformity was achieved in 17 patients (81%), with full correction of all the rotational components. All osteotomies had united. Other than 1 patient with dystrophy, resolving within 3 months, no intra-operative or post-operative complication occurred. The mean QuickDASH score was 20.7 and Michigan Hand Outcome score was 78.7. The PSOAS patient scale total score was 8.4, with an overall opinion of the scar score of 2. The mean ranges of motion, compared to the contralateral uninjured side, were 100% at the MCP joints and 89% at the PIP joints. Grip strength measurements of the operated side averaged 70% of those in the uninjured hand.

Conclusion: Percutaneous osteotomy is an effective and reproducible technique to correct post-traumatic metacarpal and phalangeal malunions, particularly metaphyseal and rotational deformities, with a low complication rate.

Keywords:
osteotomy; percutaneous; metacarpal; phalangeal; fracture; malunited; malunion
Subtypes of Radial Polydactyly bifercating at the Metacarpophalangeal Joint Level

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Objectives / Interrogation: Among different types of radial polydactyly, cases bifercating at the metacarpophalangeal (MP) joint level is the most common, and it can be subdivided into 11 subtypes according to X-rays of the thumb.

Methods: From Jan 2015 to Dec 2017, 256 cases of radial polydactyly bifercating at the MP Joint Level were reviewed. For the radial and ulnar thumb in one case, the relative degree of development, the deviation from the main axis and the angulation of the interphalangeal (IP) joint were analysed in the x-rays.

Results and Conclusions: The radial thumb developed approximately equally to the ulnar one in 170 cases. 84 cases had the obvious hypoplastic radial one and 24 of them did not articulate with the metacarpal. Only 2 cases had the hypoplastic ulnar thumb. For the deviation, both thumbs were divergent in 175 cases, and 1 case showed radial deviation for both. 80 cases had the obvious deflective radial one but the ulnar thumb seemed in line with the main axis. Angled IP joints were presented in both radial and ulnar thumbs in 61 cases, and 69 cases did not have angled IP joints. 114 cases only showed angulation in the radial one, while 12 cases in the ulnar thumb. In conclusion of all the X-rays, we found 11 subtypes.

11 subtypes of radial polydactyly bifercating at the MP Joint level were found in the x-ray and different surgical strategies were indicated.

Keywords:
Radial Polydactyly; Subtype
Split thickness skin graft from the instep region: no recommendation in pediatric palmar burn

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Objectives / Interrogation: Contact burn injuries to the palm are common in toddlers. Full-thickness burns without signs of reepithelization after two weeks need to be skin grafted. The use of split thickness skin grafts from the instep region of the foot has been recommended in adults in order to replace like with like. While split thickness skin grafts from the instep region might show an excellent color match and the texture of glabrous skin, they are prone to scar contraction in pediatric patients.

Methods: We performed a retrospective analysis of all pediatric patients who were referred to our hospital between January 2009 and December 2017 due to a contact burn injury of the palm. Among 109 contact burn injuries in total, 82 patients were between 0 and 4 years old (mean age: 21 months, range: 7-48 months) representing the typical age group concerned by contact burns and were included in the study (n=82 patients).

Results and Conclusions: In this case series, we critically discuss the use of split thickness skin grafts from the instep region and explain our concerns about the use of split skin technique in children.

Full thickness skin grafts remain the reference standard of care in pediatric patients. Children with burn scars should have regular check-up examinations until they are grown up.

Keywords:
Effect of Insurance Status on Rate of Operative vs. Non-operative Management of Clavicle Fractures

List of authors:
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Objectives / Interrogation: The majority of closed clavicle fractures are treated non-operatively. Recent literature has reported differences in the treatment of clavicle fractures based on insurance status in America. Such research has socioeconomic implications and may highlight discrepancies in healthcare delivery. We aimed to conduct the first analysis of a national database, representative of the entire United States, to identify any associations with insurance status and rate of operative fixation of clavicle fractures.

Methods: The Nationwide Inpatient Sample database (NIS) 2001-2013 was queried for closed clavicle fractures using the International Classification of Diseases, 9th Revision (ICD-9) diagnostic codes. Surgical intervention was determined by using ICD-9 procedural codes. Chi square analysis was performed to determine significant predictors of operative intervention. Multivariate logistic regression was then used to account for demographic and other significant variables. Results were recorded as odds ratios (OR) and 95% confidence intervals (95% CI), and significance was defined as p<0.05.

Results and Conclusions: A total of 76,470 inpatients with clavicle fractures were included in the final analysis. Rate of clavicle surgery was 8.6% (n=6,539). Multivariate analysis revealed that having private insurance was predictive of operative fixation (OR 1.55 [95% CI 1.44-1.67]) compared to non-private insurance (p< 0.01). In addition, age >60 years, female sex, Caucasian race, elective admissions, use of emergency services, and fractures of the shaft were significantly associated with operative fixation (p<0.01).

Table 1: Descriptive Data for Patients with Clavicle Fractures, NIS* 2001-2013

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>19-34</td>
<td>13,901 (18.2)</td>
</tr>
<tr>
<td>35-49</td>
<td>14,142 (18.5)</td>
</tr>
<tr>
<td>50-64</td>
<td>14,906 (19.5)</td>
</tr>
<tr>
<td>65-74</td>
<td>7,300 (9.5)</td>
</tr>
<tr>
<td>&gt;75</td>
<td>17,108 (22.4)</td>
</tr>
<tr>
<td>Female</td>
<td>30,728 (40.2)</td>
</tr>
<tr>
<td>Operative Fixation of Clavicle Location of Fracture</td>
<td>6,539 (8.6)</td>
</tr>
<tr>
<td>Sternal end</td>
<td>2,258 (3.0)</td>
</tr>
<tr>
<td>Shaft</td>
<td>23,491 (30.7)</td>
</tr>
<tr>
<td>Acromial End</td>
<td>9,827 (12.9)</td>
</tr>
<tr>
<td>Unspecified</td>
<td>41,165 (53.8)</td>
</tr>
<tr>
<td>Emergency Services Used</td>
<td>35,364 (46.2)</td>
</tr>
<tr>
<td>County Population &gt;1 Million</td>
<td>3,066 (4.0)</td>
</tr>
<tr>
<td>Insurance</td>
<td></td>
</tr>
<tr>
<td>Private</td>
<td>33,265 (43.5)</td>
</tr>
<tr>
<td>Medicaid</td>
<td>7,377 (9.6)</td>
</tr>
<tr>
<td>Medicare</td>
<td>22,396 (29.3)</td>
</tr>
<tr>
<td>Self-Pay</td>
<td>7,404 (9.7)</td>
</tr>
<tr>
<td>Other</td>
<td>5,684 (7.4)</td>
</tr>
</tbody>
</table>

Table 2: Predictors of Operative Fixation of Clavicle Fractures

<table>
<thead>
<tr>
<th></th>
<th>P Value</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 60 and Over</td>
<td>&lt;0.01</td>
<td>0.33 (0.30-0.36)</td>
</tr>
<tr>
<td>Female</td>
<td>&lt;0.01</td>
<td>0.77 (0.71-0.83)</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>&lt;0.01</td>
<td>1.17 (1.06-1.28)</td>
</tr>
<tr>
<td>African American</td>
<td>0.32</td>
<td>0.91 (0.75-1.1)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.86</td>
<td>0.99 (0.85-1.15)</td>
</tr>
<tr>
<td>Private Insurance (vs. Non-Private)</td>
<td>&lt;0.01</td>
<td>1.55 (1.44-1.67)</td>
</tr>
<tr>
<td>Shaft (vs. sternal and acromial ends)</td>
<td>&lt;0.01</td>
<td>2.48 (2.31-2.67)</td>
</tr>
<tr>
<td>Median Household Income &gt;$48,000</td>
<td>0.06</td>
<td>1.07 (1.00-1.15)</td>
</tr>
<tr>
<td>Non-elective Admission</td>
<td>&lt;0.01</td>
<td>0.17 (0.15-0.19)</td>
</tr>
<tr>
<td>Emergency Services Used</td>
<td>&lt;0.01</td>
<td>0.48 (0.44-0.53)</td>
</tr>
</tbody>
</table>

Table 1 and 2: Descriptive Data and Predictors of Operative Fixation of Clavicle Fractures
Having private insurance is independently predictive of undergoing operative fixation of clavicle fractures. While we identify different in rates of surgery, this does not necessarily indicate a disparity in care. We highlight a socioeconomic factor that may play a role in patient education and utilization of healthcare resources.

**Keywords:**
Clavicle Fracture, Insurance, Fixation, NIS

**References:**
The Effects of Static Cold Storage, Pulsatile Hypothermic Perfusion, and Pulsatile Near-Normothermic Perfusion on the Metabolism and Function of Rat Hind Limb Allografts

List of authors:
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Objectives / Interrogation: Static cold storage (SCS) is currently the standard of care for the preservation of vascularized composite tissue allografts. This approach not only limits the time available to perform the procedure, but also has detrimental effects on the muscle microcirculation, resulting in extensive damage particularly during the reperfusion phase. Continuous machine perfusion may have the potential to change the current practice. However, ideal perfusion parameters including the perfusate and the temperature are currently unknown. In this study, we aimed to test competing perfusion modalities on a cost effective VCA model established to study neuromuscular regeneration.

Methods: Sixty male Lewis rats were distributed into 8 groups according table 1. Amputated limbs in groups 6, 7, and 8 were perfused using custom-made mini ex-situ perfusion system for 6 hours. All transplantations were performed between Lewis rats (isograft) eliminating the confounding effects of potential immune rejection. Evaluations were performed at the completion of sciatic nerve regeneration in 3 months after the transplantation. Extensor digitorum longus (EDL) muscle force was used as the primary outcome measure in this study. Metabolomic results including 5 energy pathways and nerve axon counts are currently pending.

Results and Conclusions: Among perfusion groups and SCS, near-normothermic pulsatile perfusion using diluted blood and plasma exchange provided the best outcome after 6 hours of perfusion. Maximum twitch and titanic force measurements in this group showed no statistically significant difference compared to immediately transplanted limbs with 75 minutes of ischemia (p>0.05), while other groups had significantly lower values (p<0.05) on both parameters. Interestingly, cold preserved allografts (static G5, and dynamic pulsatile G6) demonstrated very low CMAP amplitude indicating axonal loss, despite relatively preserved twitch and titanic forces.

In conclusion, 1. Pulsatile perfusion at hypothermic temperatures using HTK is superior to SCS in protecting limb allografts after 6 hours of perfusion.
2. Pulsatile perfusion at near normothermic temperatures is superior to all other modalities only if combined with continuous plasma exchange.
3. Hypothermic temperatures appear to affect the nerve structure more than the muscle.

Keywords: Ex-situ perfusion, composite tissue allografts, transplantation, normothermic
Closed screw fixation versus open reduction and bone grafting in delayed union scaphoid fractures

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Objectives / Interrogation: In acute scaphoid fractures, immobilization up until 12 weeks may be required. However, literature describes that when any resorption at the fracture site suggests that the fracture will not heal by continued immobilization alone it will require surgery. Also, fractures that were delayed in diagnosis may show signs of failed healing and may require an operation.

Methods: We retrospectively investigated our patient cohort with scaphoid fractures which had a delay in diagnosis or showed delayed fracture healing, and were treated by percutaneous screw fixation. We compared them to patients from the same cohort, who were treated by open reduction, bone grafting and screw fixation. The method of treatment was decided by cyst or resorption seam diameter. Patients who needed wide resection of a pseudo-arthritis were excluded. We investigated the time to radiographically confirmed fracture healing, range of motion and return to work.

Results and Conclusions: We included six patients, 1 female and 5 males, treated by closed reduction and percutaneous screw fixation with a mean of 63.5 days since trauma and compared them to six patients, all male, who were treated by open screw fixation and bone grafting after a mean of 68.3 days. In the openly treated group, the mean diameter of cysts or seam formation was 3.2 mm, in the closed group 1.9 mm. Exclusively in the open treated group, two patients with dislocated fractures were treated. The patients in the closed reduction group had a mean age of 36.7 years, the openly treated patients 31.2 years. The percutaneously treated fractures all healed after a median of 11.5 weeks. In the openly treated group, one fracture did not heal and needed surgery using the Matti-Russe technique 14 months postoperatively. The remaining fractures healed after a median of 9 weeks. Range of motion extension/flexion in the closed group was 70/0/70 degrees, in the open treated group 56/0/59 degrees. Patients in the open reduction group returned to work after a mean of 13 weeks, the patients in the closed reduction group after a mean of 9.6 weeks.

Concluding, in our experience, in case of failing signs of fracture healing in the scaphoid, delayed percutaneous screw fixation is a good option in case of a resorption seam with small cysts or no cyst formation at all. In case of larger cysts or dislocation, open reduction with screw fixation shows to be effective in most cases in our cohort.

Keywords:
Scaphoid fracture, delayed union, percutaneous screw fixation, open reduction, bone grafting
Outcome of modified hemihammate arthroplasty in patients presenting after six weeks of injury

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Objectives / Interrogation: To assess the functional and radiological outcome of modified hemihammate arthroplasty in patients presenting after six weeks of injury

Methods: This is retrospective study included 7 patients presented to us between Jan 2015 to Jan 2018 with comminuted and or displaced (unstable) palmer lip fracture. Mode of injury was sports in 3, road traffic accident in 2 and fall in 2 patients. Shotgun approach was used in all patients. Average middle phalangeal articular involvement was 62% on CT scan while volar lip involvement was 60%. In all patients we have used hemihamate autograft and fixed with 2 1.3 mm ao screw. Average timing of presentation was 12 weeks (8-15). Average time to surgery was 85 days (60-110). Range of motion, stability, and grip strength were measured at a mean follow-up evaluation of 12 months. Radiographs were evaluated for union, graft incorporation, and/or collapse.

Results and Conclusions: Results: All the patients had average of 90 degree of flexion at PIP and average of 60 degree of flexion at DIP. There was an average of 5 degree of extension lag. In all patients pain was not a complaint in follow up rather swelling persisted for long and took 6-8 month to resolve. All patients had bony union in follow up and grip strength was 80% of normal side. They were able to return their daily routine on average 3 month post surgery. 6 patients were very satisfied while one is satisfied.

Conclusion: Hemi hamate arthroplasty with modification in surgical technique is one of the reliable and reproducible surgical option for reconstruction of the articular surface of the base of middle phalanx in patients of fracture dislocation of the PIP joint who present late.

Keywords:
proximal phalanx, hammate, fracture
Arthroscopic Staging and Treatment of Stage III Scaphoid Instability with and without Carpal Chondromalacia

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Objectives / Interrogation: To report on the prevalence of associated chondromalacia and other pathologies in patients with Dynamic Scaphoid Instability Garcia Elias (GE) stage III and to report on the efficacy of arthroscopic treatment for stage III with and without chondromalacia.

Methods: From 191 consecutive wrist arthroscopies, 150 were diagnosed with dynamic scaphoid instability. 79 (53%) were classified as GE stage III. 71 (47%) were classified as GE stage III with additional chondromalacia and other associated intercarpal pathologies. Average age at time of arthroscopy was 42 years old and average follow-up was 5.1 years. (range 1-10 years).

Results and Conclusions: Results:
58% of wrists with true GE stage III were treated by arthroscopy debridement alone and did not require further treatment. Average follow-up was 4.7 years. 42% required dynamic stabilization of the scaphoid (Dynadesis).
47% of wrists were classified as GE stage III with chondromalacia of the ulnar column and other disorders (52% radial styloid impingement, 23% hamate chondromalacia, 16% Triquetrum chondromalacia, 50% TFCC tear, 11% ulna head chondromalacia) and were treated by arthroscopy debridement and abrasion arthroplasty, partial carpectomy, TFCC excision, and radial styloidectomy. 62% did not require further treatment and 73% of this group reported no wrist pain. The average follow-up was 5.7 yrs. 38% of GE stage III with chondromalacia required additional surgery (Dynadesis and/or indicated stabilization procedures).

Conclusion:
Dynamic scaphoid instability of GE stage III can include chondromalacia and other associated wrist pathology. We suggest this group be called stage GE3+.
Arthroscopy treatment alone was successful in more than 50% of the GE 3 and GE 3+ patients with an average of 5 years follow-up. We anticipate that with a longer follow-up some of these patients will eventually require further surgery.

Keywords:
arthroscopy, dynamic scaphoid instability, chondromalacia, staging, Dynadesis, SLIL tear, scaphoid instability, treatment
10 years' single center experience over different surgical techniques in treatment of carpal tunnel syndrome.

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Objectives / Interrogation: Carpal tunnel syndrome (CTS), combined compression and traction on median nerve at wrist level, is the most common entrapment neuropathy in upper extremity and its decompression one of the most frequently performed procedures in hand surgery. We evaluated the effectiveness of different operative techniques.

Methods: Between August 2008 and March 2018, 976 operations for carpal tunnel decompression took place in our department. 643 (65.8%) were performed via a classic open approach (group A) and the rest using minimally invasive techniques such as Knife Light in 144 cases (14.7%) (group B) or two mini incisions at the proximal and distal ends of carpal tunnel in 189 cases (19.3%) (group C). Patients' records were retrospectively studied in terms of operation technique and postoperative complications.

Results and Conclusions: The majority of open procedures and all minimally invasive operations were performed by experienced hand surgeons. There was no recorded iatrogenic nerve injury, excessive hematoma formation, or deep infection. The complications included recurrence in 6 pts of group A (0.93%) and 2 pts of group B (1.4%), Complex Regional Pain Syndrome (CRPS) in 8 pts of group A (1.2%) and 2 of group C (1.0%), painful scars in 12 pts of group A (1.7%) and 2 of group B (1.4%) and pillar pain in 9 of group A (1.4%). It seems that the rate of morbidity is low, almost equally distributed in the different groups with slightly better results in groups B and C concerning volar pillar pain and scar formation.

Mini open techniques offer attractive alternative techniques in CTS operative treatment in terms of pillar pain and scar formation. However, comparable rates of complications in conjunction with required caution regarding anatomical variants and structures, learning curve and cost-effectiveness rationalize the fact that open carpal tunnel release remains the most commonly selected procedure for CTS.

Keywords: carpal tunnel syndrome, nerve entrapment syndrome, CT open release, CT endoscopic release, pillar pain
Using wide-awake local anesthesia in the secondary reconstructive surgery after wrist replantation

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Objectives / Interrogation: Previous studies have shown that tenolysis and tendon transfer were the most common secondary procedures following distal forearm and wrist amputations. Recently, wide awake local anesthesia with no tourniquet (WALANT) became more and more popular in hand tendon surgery because it can ensure tendon gliding and adequate tension during the surgery. However, little literature has addressed the safety and effectiveness of WALANT in secondary reconstructive surgery in patients who have had a wrist replantation.

Methods: We report a 17-year-old young man who suffered a nearly total amputation at left radiocarpal joint. He underwent successful replantation. But misconnection of flexor digitorum superficialis (FDS) tendons among thumb, index and middle fingers was found post-operatively. He underwent tenolysis and corrective tendon repair at 1.5 months after replantation. At 6 months post-replantation, he also underwent tendon shortening, pulley reconstruction for the extensor pollicis longus (EPL) tendon bowstringing and subsequent extension lag.

Results and Conclusions: Results
These two operations were done successfully under WALANT, and we injected 80cc and 40 cc 0.5% lidocaine with 1:200,000 epinephrine respectively. During the operation, correct flexor tendon repair was revised and checked by asking the patient to bend his fingers one by one. And the tension of EPL tendon after shortening was also adjusted by intraoperative active extension. The hand and finger circulation remained well post-operatively, and the finger flexion and thumb extension function had achieved satisfactory improvement at the 18-month follow up. We are going to demonstrate with videos the way we injected the local anesthetics and the process of the surgery.

Conclusion
WALANT allows the tendon to move actively and test tendon function intraoperatively ensuring the tendon is properly repaired before leaving the operating table. It is also safe and feasible for patients who have had replantation before.

Keywords:
local anesthesia, tenolysis, tendon repair, wrist replantation
A new approach in treatment of rheumatoid arthritis in metacarpophalangeal and interphalangeal joints

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Objectives / Interrogation: Improving the treatment of patients with rheumatoid arthritis (RA) of the metacarpophalangeal joint (MCPJ) and proximal interphalangeal joint (PIPJ).

Methods: We have conducted a retrospective study of 14 female patients (aged 22 to 64) with hand RA treated in the period from 2010 to 2017. The rheumatoid process duration was 8 years or more (average 10.5 years). In total, there were affected 17 hands (72 MCPJ and PIPJ). The finger joint damages comprised a) ulnar MCPJ deviation with palmar phalanx subluxations of the "walrus fin" type (48 cases), b) 15 deformities of "boutonniere" type and c) 9 "swan neck" deformities.
All patients indicated significant deterioration in their life quality: weakness of their hand grips, pain when performing hand grips, joint deformities. In 100% of cases, the joint deformities were accompanied by failures of basic finger grips and prominent contractures with movement restriction of more than 60% compared to normal movement.
All patients underwent total synovectomy of the affected MCPJ or PIPJ. The external fixation distraction device was mounted.
Fixation and subsequent distraction with finger stabilization was carried out for 5-6 weeks. After removing the external fixation device, the patients worked out their finger movements.

Results and Conclusions: Immediate and long-term (12 months or more after surgery) results were studied in all patients according to DASH disability questionnaire. All patients had an average decrease in DASH points from 116 to 34 points in the end of 6 month after the surgery. After 6 months, we noted that the position of the operated joints had been preserved correctly, the movements in MCPJ and PIPJ were restored up to average 91% and 84% of the norm, respectively. In the long term (1 year after surgery), the correct position of fingers in the affected joints was observed in 65 cases out of 72, and 62 cases (86.1%) observed complete restoration of MCPJ and PIP joint movement amplitude. In one year or more after the operation, according to radiography, there were no cases of progressive destruction in the affected joints. Of the 8 patients observed in period of more than 3 years, the cases of deformity relapse in the operated finger joints have not been registered.
Applying synovectomy to affected joints in combination with distraction method demonstrates high efficiency. This technology allows restoring the correct bone positions and proper movements in the MCPJ and PIPJ, which helps to improve the life quality of patients.

Keywords:
rheumatoid arthritis, metacarpophalangeal joint, proximal interphalangeal joint
3D printing assisted accurate arthroscopic treatment of scaphoid fracture and nonunion

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Objectives / Interrogation: Scaphoid fractures are the most common fractures of the wrist, with a high clinical incidence. The fracture line without dislocation is often not obvious in X-ray image at the initial stage, which causes a high misdiagnosed risk, and leads to scaphoid nonunion. The commonly used clinical treatment is open reduction and internal fixation with bone graft. However, open surgery, due to certain damage to blood supply, might affect the healing rate. The development of wrist arthroscopy has transformed many wrist diseases from open surgery to minimally invasive surgery. The application of 3D printing guiding plate technology has made the operation of clinical surgery more precise and further reduced the surgical related trauma. In our previous paper, 3D printing was applied to treat acute scaphoid fracture. In this paper, we introduced the using 3D printing assisted technique and results for patients with scaphoid nonunion.

Methods: 8 cases with scaphoid nonunion underwent preoperative CT scan and DICOM data were obtained, which was imported to a 3D designing software. According to the location of the nonunion, three fixing axes were designed, and then the percutaneous plate was designed around the skin surface. 3D printing was used to produce the plate with a material with medical compatibility. The plate was used during the surgery to introduce precisely k-wire percutaneous fixation, intraoperative application of arthroscopy graft technology was used at the following procedure.

Results and Conclusions: There were 8 patients, all male, with an average age of 26.9 years (20–41 years), 6 patients on the left and 2 patients on the right. All the patients got union in the last follow-ups. The VAS score and the PRWE score got improved with a satisfying functional recovery. 3D-printing assisted arthroscopic bone graft fixation of scaphoid nonunion is an effective clinical treatment with a good union rate and wrist function recovery.

Keywords: 3D-printing, scaphoid nonunion
Distraction osteosynthesis in treatment of acute distal radius fractures

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Objectives / Interrogation: A retrospective group study was carried out to evaluate the effect of the external Ilizarov apparatus on treating acute intra-articular fractures.

Methods: Between September 2015 and December 2017, 58 patients with articular distal radius fractures were treated by closed reduction and external fixation with Ilizarov apparatus. The mean age at the time of surgery was 63.7 (ranging 47 to 69 years old). The fractures were categorized according to the AO system: 16 cases of B2,B3 and 42 cases of C1,C2. The follow-up period was 19 months (ranging 8 to 24 months). In 35 cases, the traditional osteosynthesis (with typical Ilizarov apparatus) was performed which implied inserting K-wires (6-7 pins total) into the proximal and distal radius fragments. In 23 cases, under local anesthesia, the osteosynthesis was performed by Ilizarov apparatus on an outpatient basis. Simplified Ilizarov constructions allowed implementing ligamentotaxis, while the radius and metacarpal bones were fixed by only 3-4 K-wires. The fixation time in the external fixation apparatus averaged 33±4 days. After removing the external fixation apparatus, the patients were engaged in exercise therapy of wrist joint and finger joints for 1.5-2 weeks.

Results and Conclusions: All fractures were healed in a mean of 5.2 weeks (ranging 4 to 7 weeks). At the final follow-up (in 6 months after the surgery), the average motion range was 77.3±10.3 in flexion, 59.6±3.9 in extension, 68.5±9.8 in pronation, and 62.4±12.3 in supination. The overall clinical and functional outcomes, according to the Gartland and Werley scoring system, showed that 22 patients (31.4%) had excellent results, 36 (51.4%) had good results, 9 (12.9%) had fair results, and 3 (4.3%) had poor results.

Patients who underwent traditional surgical treatment had positive results in 68.5% of cases, satisfactory results and poor results totalled 31.5% of cases in the form of persistent wrist joint contractures and malunions. In the group of patients who underwent surgical treatment with a simplified Ilizarov apparatus, positive results were achieved in 86.9% of observations, while 13.1% revealed wrist joint contractures. Malunions were not detected.

Closed reduction and external fixation with the Ilizarov apparatus is useful and effective in management of displaced comminuted articular fractures of distal radius. Simplified Ilizarov apparatuses should be preferred.

Keywords:
distraction, osteosynthesis, distal radius fractures
Computer Assisted Double Osteotomy (CADO) for Madelung Disease, A New Approach of Treatment

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Objectives / Interrogation: Establish the applicability and reproducibility for the treatment of an advanced case of Madelung Deformity (MD) in a young patient using computer assisted double osteotomy (CADO).

Methods: It was the case of a 12 year old female with an advanced bilateral MD who was seen in our Hospital with complains of progressive deformity, pain and limitation of wrist extension. Initially it was planned to perform a CADO using X rays and CAT scan with tridimensional reconstruction, determining the length of the ulna, radius and the radioulnar joint angles, then comparing the results with the same measurements of a healthy person of same sex, age and height, same measures that were used as a mold to develop customized cutting guides and fixation plates for both extremities performing the surgeries at first for the left forearm and 6 months later after gaining full recovery for the right forearm. Also an epiphysiodesis of the ulna was performed on each side to stop its growth to prevent an ulnar impactation syndrome in the future. The patient's bone angles, range of motion of the radioulnar and radiocarpal joints, grip strength were measured preoperative. Recovery was followed with the Quick DASH scale and X rays to follow the consolidation of the osteotomies as well as all the same parameters were measured.

Results and Conclusions: Results: Applying CADO led to a short intraoperatory time, improvement in exact location for the osteotomies, leaving enough bone to place the fixation plate and good bone surface contact in the osteotomies places to allow correct consolidation and start early rehabilitation. The patient's deformity, arcs of movement of the radioulnar and radiocarpal joints, grip strength and pain improved and were demonstrated with the measures in the Quick DASH scale. Conclusion: In the case of this young age patient with an uncommon pathology with advanced deformity and functional limitation, the decision was made to operate applying the CADO instead of the usual release of the Vicker's ligament and performing an epiphysiodesis, as it was considered not indicated based on the severity of her case, nor waiting for a more advanced age to perform a Sauve-Kapandji or another salvage procedure. It was found that applying a CADO using the measures of a healthy person of the same sex, height and age as a mold to develop cutting guides and a customized fixation plate, gave a much better aesthetic and functional result than with the conventional treatments.

Keywords:
radius, ulna, wrist, Madelung deformity, radius osteotomy
Arthroscopic assisted treatment of distal radius fractures combined with TFCC injuries

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Objectives / Interrogation: Distal radius fracture is the most common fracture in emergency room, for which open reduction and internal fixation is often performed. However, wrist arthroscopy might be needed in those patients with intra-articular fractures both in the acute phase and in the post-fixation phase. This study introduces our technique and preliminary results of arthroscopic assisted treatment of distal radius fractures combined with TFCC injuries.

Methods: 23 patients with acute DRF and 19 patients with second stage after DRF fixation were included and undergone the wrist arthroscopy. Wrist arthroscopy was used to facilitate the reduction of the articular surface. TFCC were explored and recorded if there were injuries.

Results and Conclusions: With Wrist arthroscopy, big gaps were often found between the fragments after routine open reduction and internal fixation. DRF was often accompanied by type I injury, especially the Type ID and IB injuries. In addition, DRF often accompanied by ulnar styloid injury, which led to TFCC tension disappearing. Adhesion bundle after DRF fixation was often found at the radial-carpal joint in the post-fixation phase. Regular follow-up after DRF found that Positive ulnar variance may increase. We found that better reduction of the articular surface could be achieved with wrist arthroscopy. TFCC tension will recover after ulnar styloid fixation. IF type II injury occurs, positive ulnar variance should be corrected as early as possible.

Keywords:
distal radius fracture; TFCC injuries
Tree Man Syndrome: World's Third Reported Case

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Objectives / Interrogation: Epidermodysplasia verruciformis or tree man syndrome is a rare inherited skin disorder which creates wart-like lesions anywhere on the body. It is caused by abnormal susceptibility to human papillomaviruses (HPVs), which eventually leads to the overgrowth of widespread skin eruptions, including wart-like lesions and reddish-brown pigmented plaques, especially on the feet and hands. He was not able to maintain his normal activities without others assistance.

Although several types of HPVs contribute to this condition, HPV types 5 and 8 are most commonly associated with tree man illness. Notable cases include a Romanian man named Ion Toader who was diagnosed with the condition in March 2007, and the Dede Koswara, from Indonesia. Our case, Mr. Abul Bazander is the third reported case of the world who was treated successfully.

Methods: We evaluated the patient and the histopathology report revealed Filiform viral wart (verruca) without dysplasia or evidence of malignancy. 14 high risks and 5 low risks strains of HPV from wart tissue were isolated by real-time PCR.

We applied a special technique of dressing to make the lesions soft, termed as ‘surgical marination’. The bark-like lesions were excised gradually using electro-dissection and surgical scissors. It took 24 surgical sessions under regional block to make his limbs free of lesions.

Results and Conclusions: The hands and lower limbs were free from the lesion and the tree man was able to maintain his personal care and day to day activities without help. So, it is a success story for a developing country.

Keywords: Tree man syndrome; Epidermodysplasia Verruciformis
Trigger Digit Incidence after Carpal Tunnel Release: Z-Plasty Reconstruction Vs Traditional Carpal Tunnel Release

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Objectives / Interrogation: The development of trigger digit after carpal tunnel syndrome release surgery has been widely reported. Anterior displacement of the flexor tendon has been reported after carpal tunnel release (CTR), causing it to lose its pulley function increasing flexor tendon friction at the proximal digital pulleys. Lluch described Z-plasty reconstruction of the flexor retinaculum to prevent such complication.

Methods: We conducted a retrospective review to determine whether patients who undergo Z-plasty reconstruction have a lower incidence of trigger digit postoperatively. One thousand fifty patients were included, 865 whom had undergone traditional carpal tunnel release and 185 Z-plasty reconstruction.

Results and Conclusions: No differences were found in terms of incident trigger digit after surgery (9.3% of the patients who underwent traditional release versus 11.9% in the Z-plasty group, p>0.05). Neither difference was found when comparing mean time to development of trigger digit. The thumb was the most frequently (41%) involved digit. In the absence of randomized long-term studies comparing traditional and Z-plasty CTR, given our results, we see no reason to favor Z-plasty reconstruction over standard carpal tunnel release as a means to prevent postoperative triggering of digits.

Keywords:
trigger digit; carpal tunnel release; Z-plasty reconstruction
Osteoid osteoma of the hand and wrist - a report of 5 cases

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Objectives / Interrogation: The hand and wrist bones are infrequent sites for osteoid osteoma. Diagnosis of this tumor could be difficult and challenging. It consists of a well-demarcated osteoblastic mass that is surrounded by a distinct zone of reactive bone sclerosis. It is associated with characteristic clinical features, like local pain, usually more severe at night and often completely responds to aspirin and other NSAIDs. However, initially the lesion causes unspecific symptoms, and the radiographic changes are discrete. An accurate clinical history and a high index of suspicion are required.

Methods: Records of 5 patients who had osteoid osteoma of the hand and wrist were reviewed and analyzed in a retrospective study. All patients underwent surgery between 2014 and 2018, the patient data included symptoms, history of trauma, night pain, relief of pain by NSAIDS and duration from onset of symptoms to operation.

Results and Conclusions: There were 4 men and 1 woman, with an average age of 21.6±1 (range:21-23) years, 3 lesions on the right, 2 lesions on the left side. 2 cases involved the proximal phalanx of the middle finger, 2 cases the distal phalanx of the thumb and 1 lesion at the hamate. All patients had severe pain, which was worse at night, 2 of them were not responding to NSAIDs. None of the patient reported history of trauma. One patient had previous synoviectomy because of PIP joint synovitis one year before her presentation to our department, her complaints were not decreased after the surgery, there were no signs of osteoid osteoma on the X-rays. The duration of the symptoms was from 6 to 28 months. Physical examination at presentation revealed local swelling and point tenderness. In the phalanges, osteoid osteoma induced marked fusiform soft tissue swelling. Distal phalanx involvement caused finger clubbing. All patients had preoperative X-rays, but only two cases showed obvious signs of osteoid osteoma. High resolution CT scans were performed in all cases and showed the osteoid osteoma in every case as an obvious lytic lesion with a central granular opacity surrounded by a well-defined sclerotic margin. One patient underwent a CT-guided percutaneous ablation, but his symptoms recurred after 5 months. All the patients were treated surgically, by removal of the tumour, with complete resolution of all symptoms. The diagnoses were confirmed by histological examination. There were no recurrence during the follow up period (6 months - 12 months).

Keywords: osteoid osteoma, hand, wrist
Examining the Accuracy of the Hand Examination

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Objectives / Interrogation: Diagnosis of the injured hand tests anatomical knowledge, examination skills and bedside manner. An accurate examination is crucial for good management of patient expectations and efficiency in planning theatre. The majority of hand assessments are undertaken by juniors, without the benefit of clinical experience.

The aim of this retrospective audit was to identify areas where juniors require more support to improve their examination of the injured hand, by assessing the accuracy of the hand examination in our unit.

Methods: The first two hundred hand operations performed in August were collected electronically. Duplicates and elective cases excluded, and the 187 remaining cases underwent an electronic notes review. Operative findings were compared to documented examination findings of the hand team. An assessment of accuracy was made, and missed diagnoses and over diagnoses recorded.

Results and Conclusions: Pathologies were grouped into categories of structural damage (82), fingertip and nailbed injuries (33), fractures (35) and infection (4). The most commonly inaccurate group was structural damage with 62.2% of examinations incorrect. The most commonly missed diagnoses were extensor tendon injuries (38.9% of true injuries missed) and nerve injuries (38.5% of true injuries missed). The most commonly overdiagnosed were nerve injuries (28 instances of overdiagnosis). Sensitivity of hand examination was 67.5%, and specificity 11.6%.

Assessing the performance of a test allows the user to better understand a test result, and identifies areas for improvement. This audit has allowed us to identify commonly made mistakes, and to create a targeted hand curriculum for future teaching.

Keywords:
hand examination, hand trauma
Patient radiation exposure in fluoroscopically guided injections

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Objectives / Interrogation: The increased awareness of radiation exposure in the general population has led to patients enquiring about radiation risk following treatment for fracture fixation or guided injections. This study evaluates patient radiation exposure following the use of a Mini C-arm for guided joint injections in the hand and wrist.

Methods: The records of all patients who underwent injections during a four month period in a dedicated clinic were reviewed to assess the total dose area product (DAP) and screening time for the various sites injected. The patient effective dose was then estimated using a DAP to effective dose conversion factor of 0.01mSv/Gycm2 for extremity x-rays.

Results and Conclusions: 138 injections were performed during this time. The majority, 49%, were for first carpometacarpal joint osteoarthritis. Other injection sites were the scaphotrapeziotrapezoid, radiocarpal, distal radio-ulnar and pisotriquetral joints, in addition to various metacarpophalangeal and interphalangeal joints. Patients underwent injections at single (78%), bilateral (12%) and multiple sites (10%). The estimated mean effective dose was 0.08µSv for a single injection site; 0.18µSv for bilateral sites; and 0.11µSv for multiple injections. The most commonly performed injection into a unilateral first carpometacarpal joint had an estimated mean effective does of 0.08µSv. In order to appreciate these values with regard to cancer risk, 0.35µSv results in a 1 in 50,000,000 risk of developing cancer later in life, therefore the above doses provide negligible risk. In the country where this study was performed, the natural background radiation dose is 6.6µSv per day, hence exposure from any of the above injection procedures does not exceed more than approximately one hour of natural background radiation.

Radiation exposure risk should always be taken into consideration when planning patient management. This study shows that patients can be reassured that the risk of fluoroscopically guided injections in the hand and wrist using a Mini C-arm is negligible.

Keywords:
patient radiation exposure
Upper Extremity Reconstruction Following Sarcoma Extirpation: A Case Series

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Objectives / Interrogation: Sarcomas are rare tumors that make up roughly 1% of all malignancies, and complete resection remains a mainstay of current treatment guidelines for localized disease. Post-extirpative defects following sarcoma resection often pose a difficult challenge to the reconstructive surgeon. Sarcoma resection commonly results in large soft tissue and/or osseous defects requiring a multitude of reconstructive techniques to restore form and function. Here, we report a single surgeon’s experience in upper extremity reconstruction following sarcoma resection.

Methods: An IRB-approved retrospective review of all patients undergoing upper extremity reconstruction by a single surgeon following sarcoma resection at a single institution was conducted.

Results and Conclusions: Between 2015 and 2018, a total of 13 patients were identified as having underwent reconstruction by the senior author following upper extremity sarcoma resection. Our patients consisted of 10 males and 3 females, with an average age of 64.7 yrs (range 54-87) at time of reconstruction. Common comorbidities included hypertension 54%, diabetes 31%, coronary artery disease 23%, and 46% of patients with history of smoking. Types of sarcoma treated include: fibrosarcoma (3), epitheloid sarcoma (3) chondrosarcoma (2), synovial sarcoma (1), osteosarcoma (1), leiomyosarcoma (1), and undifferentiated sarcoma (2). 38% of patients had underwent previous radiation therapy and >50% of patients were undergoing resection of recurrent disease; nearly 25% of patients required post-operative chemoradiation. Immediate reconstruction was performed in 85% patients. Reconstruction options included amputation with concomitant targeted muscle reinnervation (TMR) (38%), free tissue transfer (23%), pedicled tissue transfer, adjacent tissue transfer and skin grafting. Our overall complication rate was 30% (4). Minor complications included neuroma, cellulitis and dehiscence. Major complication requiring reoperation included pseudoaneurysm of recipient vessel requiring vein grafting after a free ALT flap. There were no flap losses. Mean follow-up time was 224 days.

Upper extremity reconstruction following sarcoma resection presents challenging cases, requiring a myriad of reconstructive options. Reconstruction must be tailored for each patient in conjunction with a multidisciplinary team to deliver the patient optimal treatment and reconstruction.

Keywords:
sarcoma, upper extremity reconstruction, free tissue transfer
Functional and radiographic assessment in rheumatoid patients submitted to total wrist arthroplasty - 4 years of follow up

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Objectives / Interrogation: The purpose of our study is to determine clinical and functional outcomes and analyze radiological evolution of total wrist arthroplasty (TWA) in patients with rheumatoid wrists, with a minimal follow up of 4 years.

Methods: We performed a retrospective study and included patients diagnosed with a rheumatoid wrist, submitted to TWA in our institution. Pain was assessed using visual analogic scale for pain (0-10). Active ROM and pinch and grip strength were obtained. Radiological assessment was performed at immediate postoperative period and at 1, 2 and 4 years to analyze alignment, osteolysis, loosening and heterotopic ossification. We also registered complications.

Results and Conclusions: 22 patients, with an average age of 56 years, were submitted to TWA with the same implant. No patient was submitted to revision surgery nor conversion to joint fusion. We had a superficial wound dehiscence that resolved without further procedures but evolved to a relevant stiffness. Most of the patients experienced complete or very significant symptomatic relief (VAS - 1,14). ROM was 38º of extension, 36º of flexion, 7º of radial deviation, 15º of ulnar deviation, and 83º of pronation/supination arc. Grip and pinch strength was, at 4 years, 9,7 Kg and 4,1 Kg, respectively. Radiological assessment demonstrated heterotopic ossifications in 5 patients. Peri implant osteolysis was found to be frequent, next to radial dome in 8 patients and adjacent to carpal component in 8 patients as well, remaining stable over the years. We did not find unequivocal signs of loosening. Clinical and functional outcomes, with 4 years of follow-up, are extremely satisfactory. The procedure did not imply an increased risk of complications. The procedure did not imply an increased risk of complications. It is important to recognize that heterotopic ossifications are frequent but they do not have correlation with clinical outcomes. Peri implant osteolysis is common but its significance remains unclarified and is not synonym of loosening. Although represents a procedure with a notable learning curve, TWA is an excellent solution for rheumatoid wrists, allowing good clinical and functional results in the medium term.

Keywords: -
Ligamentoplasty of the palmar ulnar radial ligament at the distal radioulnar joint by bone ligament transplant from the extensor retinaculum - technique and preliminary results

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Objectives / Interrogation: For painful instability of the distal radioulnar joint (DRUJ) in some cases a ligament reconstruction is necessary. The ulnar radial ligaments may be replaced by a free tendon graft either by reconstructing the whole complex or -more simply- by replacing only the ulnar part ascending from the fovea fixing this to the remnants of the ligaments at the radius. In the many cases, in which due to the secondary stabilizers only the palmar translation of the radius in relation to the ulna is clinically evident and needs to be addressed a reconstruction of only the palmar ulnar radial ligament is sufficient. However all these reconstructions using tendons as a graft are prone to secondary loosening. A new technique of a bone ligament transplant to overcome these problems is presented.

Methods: A bone ligament transplant taken from the extensor retinaculum is used. The bone taken as graft by chisels between the 2nd and 3rd compartment is cut to shape by a fine rongeur and pressed by a template block to be a cylinder which fits into a 6,0 mm drill hole made in a oblique direction from the ulnar neck towards the fovea. The exit at the fovea is only drilled to 4 mm, so the exit of this channel is narrower than the entry and the graft is firmly pressed into the bone. The ligamentous part, which includes fibres from the extensor retinaculum towards the 6th and the 1st compartment is grasped by a multiple looped thread and pulled out of the end of the channel in the fovea and is interwoven to the remnants of the palmar ulnoradial ligament under adequate tension. The arm is immobilized for 6 weeks.

Results and Conclusions: From 2016 5 patients (4 female, 1 male, average age 36 y), all cases of recurrent instability after previous surgery, have been operated by this technique with a minimum of 6 months follow up. All of them regained free motion and stability of their DRUJ. Standard X rays of the wrist taken after 6 weeks showed good healing of the transplanted bone in all cases. No complications referred to the technique of taking and inserting the graft occurred. In one case an additional ulnar shortening was done at the same time. 4 patients are free of pain, one has a stable joint but pain due to arthritic changes at the radiolunate joint.

Replacing the ulnar part of the palmar ulnar radial ligament by a free bone ligament graft from the extensor retinaculum is an option to stabilize the DRUJ in the numerous cases of unilateral palmar instability (palmar subluxation of the radius against the ulnar head).

Keywords: distal radioulnar Joint, instability, ligament reconstruction, bone ligament graft
Objectives / Interrogation: Surgical repair of muscle belly lacerations remains a challenge for surgeons treating extremity trauma. We have previously described a technique for repair of mid-substance muscle belly lacerations using an orthogonally placed “anchor suture” to augment purchase in the muscle belly [REFERENCE01]. The purpose of study was to evaluate the integrity of this repair against that of a standard modified Kessler repair and an intact control specimen.

Methods: Fifteen hindleg specimens from fresh-frozen adolescent pigs were divided into 3 proportionate groups: an intact control group, a modified Kessler repair group (MK), and an anchor suture repair group (AS). Five specimens underwent repair with the modified Kessler technique. Each repair comprised of six Kessler constructs, producing twelve strands across the repair site. Another five specimens were repaired with the anchor suture (AS) technique as previously described by the authors [REFERENCE01]. A total of six anchor sutures were placed in the repaired specimens with a total of twelve strands crossing the repair site. The proximal and distal bony attachments of each muscle-tendon unit were secured in a custom-made cylindrical polymethylmethacrylate fixation apparatus which was then mounted on a robotic manipulator with a six-degree-of-freedom load cell to determine the tensile load through the muscle. Specimens were subsequently loaded to failure. Pattern of failure, strain, and ultimate tensile strength were determined for each specimen.

Results and Conclusions: Suture pullout was the principle mode of failure in each group. The ultimate tensile strength of the control group was found to be 608.1 ± 107.9 N. This was significantly (p<0.05) higher than the pullout strength of the MK and AS groups. The pullout strength of the AS group was 143.1 ± 36.7N, about twice that of the MK group who pullout strength was 69.8± 16.4N (p=0.11).

The Anchor suture proved to be a superior method of repair with ultimate tensile strength roughly twice that of the of the Kessler repair. The improved performance of the anchor suture may be due to the simple fact that more epimysium is incorporated into the repair. Similarly, the perpendicular orientation of each anchor suture allows for the recruitment of more muscle tissue per suture. To conclude, the anchor suture technique is a viable and robust option for repair of mid-substance muscle belly lacerations.

Keywords:
Suture techniques; trauma; muscle injury; lacerations; tensile strength

References:
Earlier Intervention for Osteoarthritis of the Basal Joint Is Reflected to More Optimal Outcome

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Objectives / Interrogation: Thumb carpometacarpal joint (CMC) arthritis is a common hand degenerative joint disease, predominantly affecting women leading to pain, laxity, and weakness of the CMC joint. Surgical treatment is highly varied from partial or total trapezium excision alone, combined or not with suspensionplasty (SS) or ligament reconstruction and tendon interposition (LRTI).

Methods: Between March 2015 to June 2016, 20 patients, were operated for CMC joint arthritis, 3 with LR alone for Eaton stage I but hypermobile CMC and 17 with LRTI using flexor carpi radialis tendon. Partial trapeziectomy(PT) was performed in 9 patients with Eaton stage II and III and total trapeziectomy(TT) in 8 patients with Eaton IV arthritis. Each patient was assessed clinically at 2, 3, 6, 12, and 24 months after surgery. The assessment included pain (VAS score), thumb pinch strength, and thumb CMC joint range of motion. Standard anteroposterior and lateral radiographs of the thumb were also obtained and used to assess CMC joint subluxation or collapse.

Results and Conclusions: Follow-up ranged from 2 to 3 years. All patients were free of symptoms at the final evaluation. Those who underwent LR report pain relief 2 weeks post-operatively while PT and TT groups report an average pain plateau at 2 and 3 months respectively. Thumb pinch strength and range of motion showed improvement in accordance with pain relief. Height of the trapezial space only remained the same in LR group whereas PT group patients retained more space than those of the TT group.

Diagnosis of thumb carpometacarpal joint arthritis in an earlier Eaton stage might indicate a less invasive operation. A less invasive technique shows faster recovery in pain and function. Ligament reconstruction successfully stabilizes first metacarpal relative to the second metacarpal. The height of the trapezial space is best preserved the less trapezium is excised.

Keywords:
Osteoarthritis; Basal Joint; LRTI; Eaton classification;
The Thoracic Outlet Syndrome - a new surgical approach

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Objectives / Interrogation: The thoracic outlet syndrome represents a nerve compression syndrome at the root and trunc level of the brachial plexus. The diagnosis is a clinical one, no imaging or neurophysiological monitor system is available for diagnostic purpose. The clinical symptoms mainly center on a compression neuropathy of the inferior trunc. A substantial number of patients have unsuccessfully been operated for peripheral nerve compression syndromes. The surgical results of decompression at the truncular level lead to unsatisfactory results in a number of cases. With this study, a new surgical approach is presented.

Methods: From 10/02 to 3/17 142 operative decompressions were performed in our unit, in 28 cases bilaterally. Following the hypothesis, that resection of the first rib would not provide adequate decompression, one of the authors started in 2012 to perform an exarticulation of the first rib. We now present an evaluation of 80 exarticulations vs. 62 resections, with respect to the clinical outcome.

The underlying grading scheme uses 5 categories: 0 (no symptoms), 1 (Symptoms with heavy physical stress), 2 (Symptoms under moderate physical stress), 3 (Symptoms under light physical stress, frequent analgetic medication), 4 (permanent symptoms, sensory and motor deficits, permanent analgetic medication).

Results and Conclusions: Indication for operative decompression was a TOS stage 3 and 4. Evaluation was performed at a minimum of one year postop. The two groups were comparable according to mean age, female to male ratio and severity of symptoms at the time of operative intervention.

As a result, the exarticulation group presented with significantly better clinical outcomes. These results will be analysed with respect to the underlying anatomic causes.

Keywords: Thoracic outlet syndrome, 1st rib resection, 1st rib exarticulation

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Objectives / Interrogation: Scapholunate advanced collapse (SLAC) of the wrist is one of the most common pattern of degenerative arthritis in the wrist. The hallmark of SLAC is scaphoid or scapholunate ligament injury with collapse on the radial side of the wrist. Surgical intervention is warranted for individuals with symptomatic SLAC and degenerative disease that affects the radioscaphoid joint with sparing of the midcarpal joint and the radio-lunar joint. There are currently two main options for motion-preserving reconstruction and treatment for this disease. These include four-corner arthrodesis (4CA) and proximal row carpectomy (PRC). There is a lack of consensus in the literature regarding which of the two procedures provides an overall better result and better clinical outcomes. We conducted a systematic literature review and meta-analysis to identify any differences in the clinical outcomes 4CA to PRC for scapholunate advanced collapse. Our Hypothesis is that proximal row carpectomy will have increased range of motion, increased grip strength, and decreased level of pain when compared to four-corner arthrodesis.

Methods: An electronic literature search of PubMed, Embase, OVID, and the Cochrane Library was conducted to identify studies published before January 2018. All randomized controlled trials and cohort studies evaluating clinical outcomes of four-corner arthrodesis versus proximal row carpectomy for the treatment of scapholunate advanced collapse were included. Primary outcome measures included flexion/extension range of motion, grip strength, and level of pain. Data were analyzed using Comprehensive Meta-Analysis (CMA) statistical software.

Results and Conclusions: Eight studies encompassing 355 patients met the inclusion criteria for the meta-analysis. Our meta-analysis indicated that when compared with 4CA, patients that underwent proximal row carpectomy had significantly increased flexion/extension range of motion by 14.2 degrees (p=0.008), significantly increased Grip strength by 7.2% (p=0.002), and reduced level of pain by 0.69 (p=0.011).

This study demonstrated that PRC is superior to 4CA for the treatment of scapholunate advanced collapse. Compared with 4CA, patients treated with PRC had increased range of motion, increased grip strength, and decreased pain. Limitation to these findings is the small number of studies available and the increased heterogeneity between the studies. Further studies need to be conducted to confirm these findings.

Keywords:
SLAC, scapholunate, PRC, 4CA
Total Wrist replacement using the MOTEC® PEEK Cup

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Objectives / Interrogation: We aim to assess the efficacy, functional outcomes and safety of patients undergoing total wrist replacement (TWR) using the MOTEC® PEEK cup. All patients had debilitating wrist arthritis either primary or secondary. This new device is modular in design compared to the previous MOTEC Cup which used a pure cobalt chromium molybdenum alloy (CoCrMo) articulation. The new design introduces a carbon fibre reinforced PEEK articulation on CoCrMo. The intended properties of the PEEK cup include reduced stress distribution, elimination of metal on metal ion concerns and improved durability long term.

Methods: This is a prospective case series of 38 patients who underwent a MOTEC TWR between Nov 2016 & Aug 2018 across two hospital sites under two surgeons using the PEEK cup 15mm diameter. Indications for TWR included persistent pain, malalignment or instability, failure of previous surgery such as primary wrist replacement, four corner fusion, proximal row carpectomy, fixation or arthrodesis. We recorded functional outcomes pre- and post-surgery. Patients were followed up to minimum of 12 months. Functional assessments used were PRWE, MAYO, QuickDASH scores.

Results and Conclusions: Results
The series had a distribution of 20 male and 18 female patients, age range 33-83 (mean 62.6). Most patients were tertiary referrals and had surgery as a 23-hour stay. Using the PRWE, MAYO, QuickDash scores allowed us to determine post-operative function with minimal loss at follow up. There was a significant improvement in functional outcomes using the PEEK cup. There were no serious adverse events.

Conclusions
Overall the PEEK MOTEC cup showed safe and improved functional outcomes at 6 months and one-year post-surgery. There are no obvious safety concerns and patient satisfaction was rated high with patients being discharged from hand clinic rapidly after surgery.
Patients returned to improved levels of function with dramatically reduced pain. This case series shows that the PEEK MOTEC cup to be a safe and effective implant in TWR. It also reduces the metal on metal complications.

Keywords:
total wrist replacement, arthritis, MOTEC
Subjective and Objective Assessment of Homodigital Neurovascular Direct Flow Flaps Used in Distal Phalangeal Amputations

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Objectives / Interrogation: Usage of homodigital neurovascular direct flow flaps (NVDFF) in reconstruction of distal phalangeal amputations lead to minimal donor site morbidity with high rates of patients' satisfaction. We aimed to assess the results of these flaps with an emphasis on their objective sensorial status in comparison with contralateral healthy fingers.

Methods: Study was done in patients who were operated for an unrepairable distal phalangeal amputation between January 2016 and July 2018. Eleven patients (2 women, 9 men) with completed assessments were included. Mean age of patients at the time of operation was 32 (3-62) years. There were 3 index, 2 middle, 4 ring and 2 small injured fingers. Eight of amputations were distal to the level of DIP joint while 3 were disarticulations through DIP. Nail matrix had been lost totally in 5 patients while the other 6 have still partial or total matrixes. All of the patients, except 3-year-old child, were operated under local anaesthesia. In all of them a triangular shaped volar neurovascular island flap was dissected. In two of them a skin grafting of donor site was required. Assessment of study parameters was done at a mean time of 13 (2-33) months postoperatively.

Results and Conclusions: There was no flap necrosis in any of the patients. Ten patients rated their sensorial status as good and 1 as moderate. Seven patients rated their flap softness as good and 4 as moderate. Ten of them had no cold intolerance while one stated intolerance in some degrees. Five patients rated their overall satisfaction as very good, 4 as good and 2 as moderate. There was no flexion contracture in PIP joints while there were 2 in DIP. There were nail deformities in 2 patients. Static two point discrimination test (2PDT) showed a significant difference (p=0,049) between the pulps of operated fingers (mean=4,45 mm, SD=1,57) and healthy contralateral hand fingers (mean=3,27, SD=1,00). Semmes Weinstein monofilament test (SWMFT) showed no significant difference (p=0,157) between the pulps of operated fingers (mean=2,73, SD=0,65) and healthy contralateral hand fingers (mean=2,36, SD=0,50).

Subjective results of NVDFF's remain in an overall range of good, although joint contracture, cold intolerance and nail deformity remain as probable postoperative problems. Subjective results are also supported by objective assessments in this small study group. As a more reliable objective test than 2PDT, SWMFT showed that there is no difference between operated and non-operated contralateral fingers.

Keywords:
homodigital flap, fingertip reconstruction, objective sensorial status, SW monofilament test
Novel Technique of Vascularized Longitudinal Hemi-Metatarsal Second Toe Transfer for Reconstruction of Congenital Hand Differences

List of authors:
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Objectives / Interrogation: As an alternative to pollicization, Chow et described a non-vascularized longitudinal hemi-metatarsal second toe transfer to reconstruct the CMC joint of the Blauth grade IIIb or IV hypoplastic thumb. Previously others described the whole second toe MTPJ transfer. We describe the novel microsurgical vascularized longitudinal hemi-metatarsal second toe transfer to reconstruct the CMC joint based on the dorsal metatarsal artery system, in Blauth grade III-IV thumbs or to provide vascularized growing bone grafts (VBG) in children.

Methods: We performed a retrospective analysis of nine patients who underwent vascularized longitudinal hemi-metatarsal second toe transfer at the Oxford University NHS Hospital Trust from December 2015 to December 2017. We will present the technique of harvesting and transfer, outcomes and the secondary surgery.

Results and Conclusions: Six hypoplastic thumbs Blauth grade IIIb-IV were reconstructed with a microsurgical vascularized longitudinal hemi-metatarsal second toe transfer. Three hemi-metatarsal VBG’s were performed to create digits in nubbins-type symbrachydactyly. Successful transfer of the split portions of the second toes occurred in all patients. Stable yet mobile CMC joint reconstruction occurred in all cases. Preservation of a fully functioning second toe is reported in all cases. Future secondary surgery will be required to improve functional mobility and use in the thumbs.

For those patients whose parents refuse pollicisation or whom present later in life, we report that microsurgical reconstruction of the severely hypoplastic thumb is possible using longitudinally split second toe metatarsal. When children require growing bone, the vascularized split second toe metatarsal reliably provides this with minimal donor site morbidity.

Keywords:
Anatomical correlation between the presence of a distal oblique bundle and the type of radioulnar joint according to the classification of Tolat.

List of authors:
Emmanuelle Richard*, PASCAL KOYOUUMDJIAN†, REMY COULOMB‡, OLIVIER MARES†
† Nîmes (Nîmes)

Objectives / Interrogation: The distal oblique bundle (DOB) is represented by obvious stretched fibers at the distal portion of the interosseous membrane (IOM) between the ulna and the radius below and on the outside. It has been shown as an important stabilizer of the distal radioulnar articulation (DRUJ) and is however only present in 40% of cases according to studies on cadaverous studies.

Tolat described in 1996 four types of incisures of the DRUJ in the frontal plane, from most stable to least stable: S-shape, C-shape, Ski-slope, and Flat face. [Ref1]

![Diagram of incisures types](image)

Fig 1. Type of sigmoid notch according to Tolat classification (JHS Oct 86)

The objective of this cadaverous study was to evaluate the existence of a correlation between the presence of a DOB and the type of DRUJ according to the classification of Tolat.

Methods: Twelve specimens (1 fresh frozen, 11 conserved) were dissected. The presence of a DOB was evaluated according to the description of Moritomo: the IOM was exposed in its distal portion to search for stretched fibers between the ulna and the radius below and on the outside.

The group of specimens was then evaluated by tomodensitometry to determine the type of DRUJ incisure according to Tolat’s description on frontal cuts at one centimeter from the DRUJ.
The statistical analysis was performed using the odds ratio.

**Results and Conclusions:** The DOB was found in 7 specimens, (58%). The presence of a DOB was more frequent in less stable incisures (4 flat face, 3 ski slope). They were never found in other more stable configurations according to Tolat’s classification.

The less stables configurations (such as flat-face and ski-slope) should deserve a reconstruction according to the native anatomy like the DOB orientation such as proposed by De Vries & al and Peter.R & al.

**Keywords:**
distal oblique bundle, distal radio-ulnar joint, sigmoide notch, interosseous

**References:**
Ref1. A.R Tolat , A cadaveric study of the anatomy and stability of the distal radioulnar joint in the coronal and transverse plane, 1996
Anatomical correlation between the presence of a distal oblique bundle and the type of radioulnar joint according to the classification of Tolat.

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A. Flat face sigmoid
B. Ski-Slope sigmoid
C. “C” type sigmoid
D. “S” type sigmoid

Fig 1. Type of sigmoid notch according to Tolat classification (JHS Oct 86)
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Ref1. A.R Tolat , A cadaveric study of the anatomy and stability of the distal radioulnar joint in the coronal and transverse plane, 1996
Playing-related disorders among professional violinist

List of authors:
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Objectives / Interrogation: Professional musicians are increasing, difficult group of patients. They often complain of playing-related musculoskeletal disorders (PRMDs) meaning chronic, unspecified pain, localized usually in neck or wrist, paresthesia, tremor or muscle weakness. It is a group of patients that postpone the visit to a doctor, because of intermittent character of symptoms and anxiety of being diagnosed and withdrawn from regular practicing in course of treatment, what implicate delayed visit in a doctors office, when the symptoms are usually advanced. The goal of our study was to functionally evaluate professional violinist according to their complains, as their background can not be compared with any other group - chronic, low intensity and long overload of motor units in a strained position.

Methods: 23 professional violinist underwent clinical examination focused on upper limb and cervical neck disorders(25 functional tests). To assess everyday living activities and playing restrictions DASH questionnaire was provided. Musicians were also evaluated due to the length of play and time of warm up before playing by the questionnaire prepared by authors.

Results and Conclusions: DASH result for violinist group was 8.63 ± 10.3 while in disorder group 15.3 ± 10.7 but the difference between groups was non-significant. Examination revealed most common symptoms in wrist area and ulnar nerve neuropathy in left hand. Average time of warm up was 13 ± 3 min. More than 55% of examined group complained also because of cervical neck disorders and headaches. During clinical examination positive result were registered with Cozens, Thomsons, and skin and joints laxity. Average time between beginning of the symptoms and medical appointment was 7-8 months.

Violinists complains are concerned mostly with the left upper limb and cervical neck which are responsible for holding violin up. Lack of significant difference in DASH and prolonged time of medical appointments suggest that symptoms increase slowly and with the proper diagnosis in time we could adjust better therapy.

Keywords:
musician hand, playing, overload, violinist
Biomechanical characterization of ulnar styloid fracture size for instability of the distal radio ulnar joint

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Objectives / Interrogation: The deep component of the distal radioulnar ligaments (DRUL) inserts on the ulnar styloid and ulnar fovea and is considered as the most important stabilizer of the distal radioulnar joint (DRUJ). Ulnar styloid fractures (USF) may cause DRUJ instability depending on the fracture size. The aim of this study was to determine the relevant fragment size, leading to a significant increase in dorso-palmar (DP) translation and pronosupination.

Methods: Soft tissue was removed from a total of 8 cadaveric upper extremities (3 female) aged 60 to 77 years (mean: 66.4), preserving the interosseous membrane, extensor carpi ulnaris (ECU), pronator quadratus (PQ), and triangular fibrocartilage complex. The ECU and PQ were both loaded with 5N weight in a custom fixture, which permitted free rotation and DP-translation of the radius around the fixed ulna. For biomechanical testing, DRUJ stability in DP-Translation and pronosupination were evaluated. Four specific points on the DRUJ were chosen, to record the positional change of the DRUJ using a MicroScribe 3DLX. 1Nm of torque was applied to reach an endpoint in Pronosupination. DP-translation was measured in neutral, full pronation and 90° supination with 15 N translation loads. Measurements were repeated for four different ulnar styloid fractures done sequentially in the same specimen: intact, USF of the tip, basal USF and an USF including the fovea. Statistical analysis was performed using a repeated-measures ANOVA and Tukey multiple comparison post hoc tests.

Results and Conclusions: Compared to the intact condition (170.9°), the pronosupination significantly increased after all three fractures (Tip:181.5°, p<0.002; base: 184.3°, p<0.001; Fovea: 190.5°, p<0.001). The fovea fracture also showed a significant increase compared to the tip fracture (p=0.031). Total dorso-palmar translation significantly increased in neutral rotation after the fovea fracture (10.0mm) compared to the intact (6.8mm, p=0.002) and tip fracture conditions (7.8mm, p=0.029). There was also a significant increase in dorso-palmar translation in supination from intact (5.8mm) and tip fracture (5.9mm) to the fovea fracture (7.3mm, p<0.001 and 0.002). All tested fracture sizes of the ulnar styloid led to rotational instability of the DRUJ; however, the DRUJ remained stable in dorso-palmar translation unless the ulnar styloid fracture involved the fovea. Styloid fracture repair should be considered in fractures of the ulnar styloid involving the fovea.

Keywords:
ulnar styloid; fracture; DRUJ; instability
Surgically Treated Brachial Plexus Tumours: the Oxford University Hospitals 20-Year Experience

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Objectives / Interrogation: Tumours of the brachial plexus region are rare. Whilst the majority of tumours are benign, patients can develop devastating neurological deficits and disabling pain. The aim of this study was, firstly, to assess the clinical presentation, and subsequent pathological diagnosis of patient’s presenting with brachial plexus tumours and, secondly, to assess motor functional outcomes, patient-reported upper extremity function, and pain following tumour extirpation +/- reconstruction.

Methods: We performed a retrospective analysis of 135 consecutive patients (n=135) who underwent excision of both primary and secondary brachial plexus tumours +/- reconstruction by a single-surgeon over a 20-year period. Data was collated from medical records, neuro-imaging, operative reports, and histopathological findings. Outcomes were assessed using the British Medical Research Council power grading system, quick Disability of Arm, Shoulder and Hand questionnaire, and Pain Visual Analogue Scale (PVAS).

Results and Conclusions: The mean age at presentation was 49.2 years (range: 9 - 89 years). The most common presentation was an expanding lump (87.3%). Additional presenting signs and symptoms included paraesthesia (44%), radicular pain (51%), local pain (15%), and motor weakness (10%). Duration of symptoms ranged from 2 months to 10 years.

Histologically, the cohort comprised a heterogeneous group of lesions, 76.3% (103/135) benign and 23.7% (32/135) malignant. Benign nerve sheath tumours were the predominant sub-type - namely schwannomas (41%) and neurofibromas (35%). Of the malignant tumours, soft tissue sarcomas occurred most frequently, 50% (16/32). The overall recurrence rate was 23.2% for the cohort at latest follow-up, 80% represented by malignant tumour recurrence.

Functionally, post-operative nerve preservation was achieved in 93.1% of patients at long term follow-up. Motor function (BMC) scores improved in 65% of patients. Quick DASH and PVAS response rate was n=56 of n=116 surviving patients (48.3%). At follow-up, the mean quick DASH score for this cohort was 26.1 (range 0-79.5). The mean PVAS score was 29.1 mm (range 3-100 mm).

To conclude, a multidisciplinary approach combined with early referral to specialist services, is vital to optimise outcomes for these potentially debilitating lesions. We report a low complication rate with good functional and patient self-reported outcomes following surgical intervention for brachial plexus tumours.

Keywords:
brachial plexus tumours, sarcoma, neurofibroma, schwannoma
Subcutaneous spread of squamous cell carcinoma in the digit in association with primary radiotherapy

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Objectives / Interrogation: Squamous cell carcinoma (SCC) is the commonest malignancy encountered on the hand and is generally treated by surgical resection. Here we present a case managed by primary radiotherapy, which subsequently recurred locally with deep subcutaneous dorsal to volar spread along tissue planes, in addition to a literature search on the efficacy of radiotherapy for SCC.

Methods: A case report is provided with retrospective data and clinical photographs. A structured search of the Medline database was performed to include terms related to radiotherapy, SCC and hands.

Results and Conclusions: Case report. A 92-year old male with multiple co-morbidities was offered primary radiotherapy for a biopsy-proven, well-differentiated SCC on the dorsum of the middle phalanx of the left ring finger as primary surgical excision would have necessitated amputation of the digit. Following radiotherapy, an ulcerated lesion developed at the site which was confirmed to be a recurrent SCC. Amputation was performed to include the 4th metacarpal head. Subsequent histology demonstrated, unusually, SCC present at not the dorsal but the volar excision margin, with evidence of the cancer having spread through bone and along the flexor sheath to the base of the finger.

Discussion. SCC is generally managed surgically. Surgical excision with pre-defined margins has an approximately 95% clearance rate, with a 2% local recurrence rate even when margins are confirmed as histologically clear by standard histopathological techniques. However in some cases, radiotherapy is used as a first-line modality, and upwards of 90% cure rates are reported. The use of radiotherapy as a secondary modality where SCC is recurrent or refractory to surgical management is common, although data on the efficacy of this approach is lacking; in particular, data does not appear to exist with respect to rates of subsequent recurrence. Radiotherapy has an important role in managing cutaneous SCC in the hand, and may often be the patient's choice when given the alternative of amputation. However, this report highlights the potential pitfall of local recurrence, as well as an unusual type of local extension of disease which important implications for achieving complete surgical clearance.

Keywords:
squamous cell carcinoma, digit, radiotherapy, excision, margin
**Functional Outcomes after Single-Bone-Forearm Surgery: A 3-Dimensional Analysis and Clinical Assessment**

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**Objectives / Interrogation:** Several upper limb deformities can cause functional impairment and pain due to forearm instability and/or proximal migration of the radius. The creation of a single-bone-forearm has been shown to be a successful intervention to stabilize the forearm though at the cost of a loss of pro- and supination. Despite the reported good outcomes in small case series, it remains unknown how patients are capable to compensate for the lack of forearm rotation. This is particularly important as e.g. shoulder or wrist overuse may eventually lead to joint degeneration. The purpose of this study was therefore to analyse this patient cohort while performing well-defined functional tasks in order to obtain information about joint motion and potential compensation mechanisms.

**Methods:** We performed a prospective re-evaluation of 4 patients (3 children, 1 adult) who underwent single-bone-forearm surgery due to radial longitudinal deficiency (n=1), ulnar longitudinal deficiency (n=2), and a posttraumatic forearm deformity (n=1), respectively. Patients were clinically assessed using the Southampton hand assessment procedure (SHAP test) and Disabilities of the Shoulder, Arm and Hand (DASH) score, and a 3D-motion capture analysis was performed to specifically evaluate the performance of important tasks of daily life activities.

**Results and Conclusions:** Overall, a wide spectrum of functional impairment and deviation from the norm was observed. Both concerning the time to do certain tasks (e.g. turn a book page, pour a glass of water, rotate a key) as well as the quality of performance (linear index of function; LIF, and APS items), some patients showed normal behavior and function while others presented markedly altered mechanisms to achieve their tasks. Nevertheless, all cases were able to complete the tasks as requested. Compensatory movements were found in the trunk, shoulder, elbow and wrist, respectively (sagittal, frontal, transverse plane). No unique, distinct mechanism of compensation was however identifiable. Postoperative DASH scores ranged from excellent to poor (7 to 61 points).

Patients who received single-bone-forearm surgery are generally capable to perform important tasks of daily life. However, the time to achieve these tasks may be longer, and compensatory movements in several other joints are necessary to achieve these outcomes. Further long-term studies with more patients are warranted to assess any degenerative effects of these potential overuse movements.

**Keywords:**
single bone forearm, one bone forearm, 3D motion capture analysis, compensation
Reconstruction of Long Tibia Bone Defect using Free Vascularized Fibula Graft and Locking Plate

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Objectives / Interrogation: Recent advances in multimodality treatment with chemotherapy and wide surgical resection margins have improved the prognosis of patients with musculoskeletal sarcoma. Following wide resection of the tumor, several reconstructive procedures have been applied for large bony defects, including mega-prosthesis implantation, as well as allograft and vascularized bone grafts.

The reconstruction of tibia defects following tumor resection remains a surgical challenge. Our group aimed to achieve biological reconstruction with living bone autografts. Free vascularized fibular graft (VFG) has become an established procedure for the treatment of massive bone defects. Bone defect of the tibia is reconstructed by various methods. Bone transport or free vascularized fibula graft are selected for the defect. We are to report the clinical outcome for the bone defect more than 15-cm long using free vascularized fibular graft.

Methods: We analyzed retrospectively 14 patients who sustained long tibia defect more than 15-cm long and underwent free vascularized fibular graft from contralateral side. Average follow-up period was 5 year and average age of the patients was 28 year-old. Operation was performed as following: free vascularized fibular graft was harvested from contralateral side and inset inlay method. Overlapped portion of the graft was fixated with locking plate and screw. The tibia-fibular graft construct was stabilized with long locking plate. The artery of the graft pedicled was anastomosed to the anterior tibial artery with end-to-side method, but veins were in end-to-end methods.

Graft survival was evaluated by bone scan in all cases. Bony union and hypertrophic changes of VFG and the occurrence of stress fractures were confirmed by plain radiographs obtained monthly for one year after surgery. Functional recovery was evaluated at final follow-up using the system proposed by the Musculoskeletal Tumor Society (MTS).

Results and Conclusions: All graft survival was confirmed with the bone scan. All patients obtained bone unions between the host bone and fibular graft. There were 3 metal failures of the locking plates, but implant changes with longer plate could induce the bone union.

Free vascularized fibula graft with locking plate could be considered as a reliable and safe method for the long tibia bone defect.

Keywords:
Tibia Bone Defect, Vascularized Fibula Graft, Locking Plate
Bilhaut-Cloquet procedure: the type and aesthetic evaluation of nail deformity

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Objectives / interrogation: A retrospective review was made to classify the type of nail deformity and its aesthetic evaluation in radial polydactyly which was treated by the Bilhaut-Cloquet procedure (BCP).

Methods: From January 2005 to December 2015, the BCP was performed in 129 thumbs of 125 patients with radial polydactyly. 88 thumbs of 84 patients received more than 6 months of follow-up and were included in this study. The operation age was 7 to 216 months with an average of 31.4. There were 51 males and 33 females. Unilateral radial polydactyly was in 80 patients (left: 31, right: 49), bilateral in 4. According to the Wassel classification, there were 3 cases of type I, 20 of type II, 12 of type III, 3 of type IV, 6 of type VI, and 10 of type VII. The reconstructed nail were evaluated by Wang-Gao scoring system.

Results and Conclusions: The average follow-up period was 34.4 months (6-128 months). The occurrence of different nail deformities were as follows: abnormal nail flatness were found in 51 thumbs (57.95%), lunula malposition in 27 (30.68%), malposition of the nail fold in 22 (25.0%), abnormal nail width in 16 (18.18%), dehiscence of nail or growth failure in 7 (7.95%). According to Wang-Gao score (total 12), the score was 2-12 (average 9.18). Excellent results were in 58 thumbs (65.91%), good in 23 (26.14%), fair in 5 (5.68%) and poor in 2 (2.27%).

When the BCP were used, the improvement of the thumb volume and nail width was clear. The nail deformity varied in different types and its incidence was high. But it was mild and acceptable. Including more than 3 types of nail malformations in one thumb was the main cause of dissatisfaction among patients or family members, but the incidence was not high. Therefore, BCP is still a good choice for the patients with hypoplastic duplicated thumbs.

Keywords: Congenital malformation, Polydactyly, Surgical treatment, Bilhaut-Cloquet procedure, complication, Nail deformity
Treatment of closed unstable proximal phalangeal fractures in the long fingers with a reusable and inexpensive external fixation system

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Objectives / Interrogation: The objective of our study was to evaluate the treatment of closed proximal phalangeal fractures with closed reduction and external fixation using a reusable external fixator.

Methods: A retrospective analysis was performed of data collected in a prospective database of all the patients with unstable isolated closed proximal phalangeal fractures of long fingers of the hand treated from 1999 to 2015.

The indication for external fixation was the inability to achieve and maintain a stable reduction with an intra-articular step or gap < 1 mm, an angulation < 10°, a shortening < 2 mm and without any rotational deformity.

Fluoroscopic closed reduction was performed under regional anaesthesia, K-wires were positioned perpendicular to the fracture and connected with a small external fixation system that uses a thicker K-wire as a frame. The K-wires were bended as needed to correct minor malalignment. Immediate postoperative active mobilization was encouraged and continued for 6 weeks. The external fixator was removed after 4 weeks and unrestricted usage of the injured finger was allowed after 8 weeks.

The results were assessed at 4 months and classified as excellent if the total active movement (TAM) was equal to the uninjured contralateral digit and good if the TAM was at least 230° or 85% of the contralateral digit. As poor were classified all the cases with TAM < 230°, an angulation >10°, any rotational misalignment or if any secondary procedure was required to improve the outcome.

Results and Conclusions: 88 patients were treated for closed isolated unstable proximal phalangeal fractures in the long fingers. Nine patients were excluded from the analysis, five due to poor compliance (drug or alcohol abusers or demented) and four due to lack of follow-up. Of the remaining 79 patients, 72 were males and 7 females, with an average age at trauma of 35,8 years. The results were excellent in 25 cases, good in 34 and poor in 20: 74,7% of the patients achieved a good or excellent result (TAM greater than 230°). In patients with poor results there was most frequently an extension deficit of the proximal interphalangeal joint.

The procedure was inexpensive as every set of fixators can be used on average for 20 or more procedures and the only material used were the K-wires.

With external fixation we achieve minimally invasive stabilisation of dislocated and fragmented phalangeal fractures with immediate active mobilization and good functional results while maintaining low running costs.

Keywords:
external fixator hand fracture proxymal phalanx phalangeal long fingers reusable closed unstable
Nerve Diameter of the Hand: A Cadaveric Study

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Objectives / Interrogation: Nerve injuries in the hand are common and continue to pose a challenge to the upper extremity surgeon. Depending on the injury, means of coaptation include primary repair, hollow-tube (conduit) repair, and repair with autograft or allograft. Appropriate size matching, related to nerve diameter, is important for many of these techniques. The aims of this study were to 1) describe the nerve diameters of the hand and their relative differences and 2) investigate if there is a relationship between nerve diameter and external hand dimensions or body mass index (BMI).

Methods: We utilized eighteen freshly-frozen cadaveric hands from adult donors aged 20-86 of both sexes for this study. External hand dimensions were measured across three axes: length, width, and span. Two independent observers measured nerve diameter to the nearest 0.1mm using a digital caliper. Using the flexor zones as boundaries, we performed a total of 33 nerve measurements for each cadaveric hand (Fig 1). Provided values are based on the mean measurement of these two observers.

Results and Conclusions: Nerve diameter increased from the distal to the proximal flexor zones. The internal common digital nerves in flexor zone three were larger than the external digital nerves. The median nerve was found to be nearly two times larger than the ulnar nerve at two locations within the wrist. There was a positive correlation between BMI, hand span, hand width, and nerve diameter at several measured locations.

This study provides reference values for nerve diameters of the hand and wrist and describes their relative differences. It is important for surgeons to be aware of these differences and to consider this information as we advance our efforts to reconstruct the hand and develop technologies for nerve repair.

Keywords:
Hand; Peripheral Nerves; Upper Extremity; Adult; Ulnar Nerve; Median Nerve; Wrist; Body Mass Index
Objectives / Interrogation: The goal of surgery of the spastic upper limb is to rebalance forces between spastic and contracted muscles on one side, and paralyzed or pseudo-paralyzed antagonists. Surgery for contracted muscle involves various standard techniques of muscle lengthening. The spastic component is also amenable to surgical improvement through partial neurectomy, but this procedure has not gained much popularity yet, and reports on outcome are scarce in the literature. In light of our recent anatomical studies (96 cadaver dissections), new guidelines have been described and we have conducted a prospective study in order to re-evaluate the results of this treatment.

Methods: We performed a prospective study on 48 consecutive patients who underwent hyperselective neurectomy (HSN) of one or several spastic muscles of their upper limb(s). Indication of selective neurectomy was spasticity, exclusive of muscle contracture. Patient selection was based on repeated clinical evaluation and pre-operative botulinum toxin injections. HSN consisted in resecting 2/3 or more of every motor branch of the target muscle at the neuromuscular junction. Assessment performed pre-operatively, at 6 months and at last follow-up (average 22.2 months) was based on the resting position, active and passive motion, muscle strength, modified Ashworth and Tardieu scales, several functional scales, ADL questionnaires, and patient satisfaction (VAS).

Results and Conclusions: Twenty-nine adults and 19 children were enrolled in the study. HSN was performed in 56 cases, involving 185 muscles, mostly elbow and wrist flexors. Associated procedures (muscle lengthening, tendon transfers) were performed simultaneously in 35 cases. Results showed a statistically significant decrease of spasticity (Ashworth from 1.4 to 0.7 and Tardieu V1-V3 from 40° to 27° for elbow flexion and from 24.5° to 8° for wrist flexion) without weakening of the involved muscles, increase in the strength of antagonist muscles by 0.4, and improvement of all other parameters. Patient satisfaction averaged 8.5/10. The general trend indicated a minimal loss of correction between 6 and 12 months postop, and then the results remained stable over time.

Although spasticity is difficult to evaluate objectively, these results have been promising. They show effective reduction of spasticity without loss of strength, and improved motion and function. A larger cohort and a longer follow-up will be useful in order to confirm the evolutive trend.

Keywords:
Spasticity, Neurotomy, Selective neurectomy, Tardieu scale
Modified Bilhaut-Cloquet procedure: meticulous nail plasty, bone reconstruction and radial side incision

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Objectives / Interrogation: The complications of Bilhaut-Cloquet procedure, including nail deformity, joint stiffness and dramatic unaesthetic scar, were common. In this study, we analyzed the surgical results which were treated by Bilhaut-Cloquet procedure in our patients.

Methods: From January 2010 to April 2014, 39 thumbs of 36 cases acquired more than one year follow-up, including 21 boys and 15 girls (average age: 22.3 months). The right thumb was involved in 25 cases, left in 14 cases. All cases were hypoplastic and the nail width was less than index-finger or 80% of non-affected thumb. All thumbs were treated by our modified Bilhaut-Cloquet procedure: A modified nail fusion technique included nail lunula design, nail fold plasty, meticulous nail bed suture and nail plate replantation; Bone reconstruction remained intact interphalangeal (IP) joint and metacarpophalangeal (MP) joint; A new incision design retained an intact pulp. The results were evaluated by Tada scoring system and Wang-Gao scoring system.

Results and Conclusions: According to the Tada scoring system, excellent result were found in 30 thumbs, good in 8 and poor in 1. The total mobility of the IP and MP joint was more than 70° in 33 thumbs, 50-70° in 5 thumbs and less than 50° in 1 thumb. The axis deviation was less than 10° in 21 thumbs, 10-20° in 12 thumbs and more than 20° in 6 thumbs. The joint instability was found only in 3 thumbs. According to the Wang-Gao nail appearance scoring system, excellent results were in 32 thumbs, good in 7 thumbs. The nail width was 85% of the contralateral side in 37 thumbs. Smooth nail was found in 4 thumb, and ridge or gap was found in 35 thumb (mild: 33, severe: 2). The continuous curve of the lunula was found in 29 thumbs and lunula malposition was found in 10 thumbs (mild: 7, severe: 3). 28 thumbs had no nail fold malposition, and 11 thumbs had nail fold malposition (mild: 9, severe: 2). One nail was hypoplasia and one nail was dehiscence. 33 thumbs were satisfied by the patients or their parents, fair in 5, unsatisfactory in 1. The scar was hidden at the radial and distal side of the thumb, and the intact and plump pulp was found in all the cases.

The nail deformity is inevitable according to our technique, but the nail appearance and thumb function is satisfying. The modified Bilhaut-Cloquet procedure should be recommended as the first choice for duplicated thumbs in hypoplasia type.

Keywords:
Thumb duplication; Bilhaut-Cloquet procedure; Congenital deformity; Nail fusion plasty; Surgery incision.
Gouty arthritis of hand: tendon and joint involvement.

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Objectives / Interrogation: Gout is uncommon in the upper extremity. Gouty involvement of hand is typically associated with an advanced stage of the disease in patients with uncontrolled hyperuricemia. The usual lesions are tophi, which are subcutaneous or bursal deposits of monosodium urate. The treatment is primarily medical. Surgery should be considered if the medical treatment is not tolerated by the patient or if the gouty deposits produce nerve compression, tenosynovitis or tendon rupture.

Methods: We present the case of a 49-year old patient with a previous hyperuricemic event that presents palmar nodules on 4th and 5th fingers of the dominant hand which limits the flexion with no prior traumatic event. The physical examination showed palmar nodules and a limited flexion of 4th and 5th fingers. An MRI was performed showing important synovial proliferation and distension concerning the common synovial sheath of the 4th and 5th flexor tendons, as well as partial rupture of flexor digitorum profundis and probable rupture of the flexor digitorum superficialis of 5th finger. It also showed an interphalangeal arthritis of 5th finger. A blood analysis confirmed hyperuricemia. The patient was referred to Rheumatology. A surgical treatment is then performed: A volar Brunner approach over the 4th and 5th fingers showed a partial rupture and proliferative tenosynovitis of the flexor digitorum profundis and a tenosynovitis of the superficialis of the 4th finger and a tenosynovitis of both tendons of 5th finger with an important degenerative arthropathy of the distal interphalangeal joint. Consequently, the surgery consisted in a reconstruction of the flexor tendon using an autograft of the palmaris longus for the flexor digitorum profundis and superficialis of the 4th finger and a distal interphalangeal arthrodesis of the 5th finger. The tenosynovial tissue was excised and sent for histological examination. The patient was immobilized with a forearm splint in flexion. After two weeks the surgery wounds were in good state with no signs of infection, and the splint was removed to allow early protected mobilization. The analysis of the tissue showed various gouty tophi and presence of synovitis.

Results and Conclusions: Patients with flexor tendon ruptures and degenerative arthropathy present an high disease activity. Prevention of tendon ruptures by early tenosynovectomy is advised, due to poor prognosis. Aside from surgery, the multidisciplinary management of gouty arthritis is necessary.

Keywords:
Gouty Arthritis Thopii Flexor Tendon Arthrodesis Finger Repair Surgery Hand
Madelung’s deformity - long-term results of ulnopalmar correction osteotomies in 12 wrists

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Objectives / Interrogation: Do the corrective osteotomies in the case of Madelung deformity have good successes over the long term and are therefore justified?

To date, we have performed 32 corrective osteotomies on Madelung deformities. To clarify this question, we reviewed 12 corrective osteotomies for Madelung deformity, which we operated in our own new technique between 1998 and 2008 for adolescents between 12 and 16 years, after at least 10 years.

The surgical technique we used consisted of a palmar correction osteotomy, an ulnopalmar extension of the radius, and an angle-stable plate osteosynthesis.

Methods: 1 boy with unilateral correction, 3 girl with unilateral correction and 4 girl with bilateral correction were followed up after at least 10 years. It examined subjective complaints, wrist mobility, pro- and supination, forearm length, and cosmetic outcome. Mayo wrist score and DASH-score.

Results and Conclusions: Although corrective osteotomy can never achieve complete anatomical reconstruction, many biomechanical values have improved.
Pro-and supination and wrist mobility are still better than pre-operative even after 10 years. Discomfort in the ulnar area of the wrist are not or only slightly present. All patients are very satisfied with the cosmetic result.
DASH and Mayo-wrist score are still under evaluation.

According to the preliminary results, the correction osteotomies are a very useful operation compared to the same age non-operated patients.

Keywords:
Madelung Deformity Correction Osteotomy long-term results
Pathology distribution of upper limb emergency cases admitted in plastic and reconstructive surgery department of SCUB - eighteen months retrospective study

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Objectives / Interrogation: Since introduction and organization of major trauma centers worldwide, the overall mortality decreased significantly. This is a result of close multidisciplinary approach between surgical specialties as general, orthopedic, neurosurgery and plastic surgery. Furthermore progresses in microsurgery and their adaptation to trauma surgery have contributed consistently to the improvement of patients' outcome and postsurgical quality of life. The aim of the study is to show a precise picture of traumatic upper limb pathology distribution from our plastic surgery department.

Methods: We assessed all upper limb cases admitted in our unit between 1st of January and June 30th 2018, from which we excluded the tumoral emergencies and chronic pathologies.

Results and Conclusions: Our clinic is one of the busiest department from Romania in terms of acute surgical pathologies which requires a plastic surgeon expertise. From the number of 2064 acute upper limb cases 80% involved hand injuries, followed by forearm (16%) and arm injuries (4%). Males were three times more affected than women and the median age was 47. The leading causes of trauma were contact with different types of saws, sharp cuts, crushing injuries, infections and bites. All this produced a wide range of injuries from simple wounds to amputations of different levels. We identified in the top of pathology distribution tendon injuries (17%), followed by fractures (13%), simple wounds (12%), fingertips lesions, nerve lacerations, amputations.

Emergency Clinical Hospital from Bucharest deals with a wide palette of acute upper limb events, from simple lacerations to polytrauma patients who need an interdisciplinary approach. Within our trauma team the plastic together with orthopedic surgeons plays a pivotal role between other surgical specialties.

Keywords:
Fat graft interposition arthroplasty as a source of stem cells in radiocarpal arthrofibrosis treatment. A Case report of a novel technique.

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Objectives / Interrogation: Wrist arthroplasty is a therapeutic option in cases of joint pain that do not respond to other treatments. The use of stem cells is being highly studied for its potential application in different medical fields and has been become an alternative for the management of joint disorders due to its ability to regenerate cartilage and even bone. The aim of this article is to present a new technique in which we use fatty grafts as a source of stem cells for the treatment of radiocarpal joint arthrofibrosis.

Methods: We present the case of a 53-year-old male patient age with a history of left distal radius fracture with articular involvement and a Geisler II scapholunate ligament injury arthroscopically diagnosed that required open reduction, plate internal fixation and arthroscopically ligament debridement. Four months in the follow up the patient reported pain and limited motion arcs. Diagnostic arthroscopy was performed, a severe arthrofibrosis and synovitis of the radiocarpal joint was evidenced. Fatty grafts were placed through direct arthroscopic vision into proximal wrist joint.

Results and Conclusions: In a 1-year follow-up, we found pain improvement and increase in flexoextension, ulnar and radial deviation movement as well in the grip strength of the wrist. The use of stem cells in arthroplasty procedures is still under study however given the multiple applicability in regenerative processes, multiple donor sites and easy harvest, becomes an alternative for the treatment of degenerative joint pathologies.

Keywords:
Fat transfer, radiocarpal joint, arthrofibrosis, wrist arthroplasty, stem cells.
Dorsolateral biplane closing radial osteotomy for Kienböck's disease: long-term follow up.

List of authors:
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Objectives / Interrogation: Purpose: To clarify long-term clinical and radiological results more than 8 years after dorsolateral biplane radial osteotomy for Kienböck's disease.

Methods: Methods: Twenty-one patients that had been classified as Lichtman stages II (7 wrists), IIIA (11 wrists) and IIIB (3) underwent dorsolateral radial biplane osteotomy for Kienböck's disease. This technique was performed to reduce radial inclination angle and the dorsal angle on the sagittal plane (ie, palmar tilt), thus achieving the dual effect of decompressing the lunate on the frontal and sagittal planes in Zero Variant cases. The mean follow up period was 10.3 years (8-17 y.). Clinical outcomes were quantified using the Disabilities of Arm, Shoulder, and Hand (DASH) questionnaire and the modified Mayo wrist score. Radiographic and Magnetic Resonance imaging (MRI) studies were performed in all patients preoperatively and at follow-up. A Statistical comparison of preoperative clinical, radiologic, and MRI studies with those performed before and after follow-up was performed using the wilcoxon test. Statistical significance was determined to be p< 0.05.

Results and Conclusions: Results: There were 10 males and 11 females with a mean age of 32 years (range, 18-72). Fifteen patients were asymptomatic and the remaining six had mild occasional pain. No patients complained of constant pain (p< 0.001). Average preoperative grip strength was 24 Kg. and average postoperative was 54 Kg (p< 0.001). The mean range of extension and grip strength significantly improved. The mean Mayo wrist score and DASH scores were 94 (range, 80-100) and 5 (range, 0-15), respectively. At follow-up, no progression of the Lichtman stage was found in any patient. There was no significant progressive lunate collapse in any patient. The MRI in fifteen wrist showed increased signal intensity of the lunate; the remaining 6 wrists had no alteration in signal intensity of the bone.

Conclusions: Our study demonstrated satisfactory clinical results after 8 or more years follow-up in patients who underwent dorsolateral radial osteotomy for Kienböck's disease. Although we found no improvement in signal intensity of the lunate in 6 wrists, unloading of the diseased lunate after dorsolateral radial osteotomy gives long-lasting symptom relief and may prevent lunate collapse.

Keywords:
Kienböck's disease; Avascular necrosis; lunatomalacia
CORRECTIVE OSTEOTOMY AND DISTRACTION TECHNIQUE USED IN DISTAL RADIUS MALUNION TREATMENT

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Objectives / Interrogation: The goal of the work was to improve treatment of patients having distal radius ephysysis/metaphysis region malunion combined with persistent wrist joint (WJ) contractures.

Methods: Research materials and methods. We performed a retrospective investigation of 67 patients with distal radius ephyshis/metaphysis (DREM) malunion during the period of 2011 to 2017. The patients were 12 men and 55 women, aged 18 to 78. Time period elapsed after injury was 1.5 months or more (the average time was 79±18.7 days). The admission of patients for surgical treatment revealed: all 67 patients had a significant deterioration in their quality of life due to the weakness of the hand grips, pain when performing hand grips and axial load on the forearm. The post-traumatic deformities of the DREM were accompanied by 100% contracture in wrist joint (WJ). Flexion-extensor movement had 74 degrees limitation (52% of normal state) in average. Before surgery, control radiographs had determined: the fusion of radius was shorter than 3 mm, there also were radius articular surface axis violation with displacement of wrist bones (wrist collapse), subluxation or dislocation of ulna head. 48 (71.6%) cases revealed osteoporosis of distal forearm and wrist bones.

All 67 patients underwent radial bone osteotomy at deformation apex using the distraction method. On 6-7th day after the osteotomy, bone fragments reposition was gradually carried out (1 mm per day) using the distraction device. Distraction regenerate was formed and position of the radius fragments was stabilized after completing the restoration of articular surfaces of radius and ulna. The time of treatment in the device was 7-9 weeks.

Results and Conclusions: Conclusions. Immediate and long-term results (6 months or more after surgery) were studied in all 67 patients according to the DASH system. (Decrease from 88 to 23 points). Fusion of the radius in correct position was achieved in 63 cases out of 67 (94.0%), complete restoration of movement amplitude in wrist joint was achieved in 61 case (91.0%). In 3 cases, satisfactory results were obtained, and one case were bad due to premature removal of the device. Restoration of length and axis of the radius provides the elimination of WJ contractures. Distraction technologies allow simultaneous restoration of radius anatomy and WJ and forearm joint movements. The distraction method is effective in treatment of patients with DREM malunions in combination with DOUH, persistent WJ contractures.

Keywords:
distal radius malunion, distraction, wrist joint contracture.
Use of negative-pressure wound therapy to overcome venous congestion in fingertip reimplantation.

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Objectives / Interrogation: Currently there is little literature on the use of negative pressure wound therapy (NPWT) to overcome venous congestion in fingertip reimplantation. As in free flaps, venous congestion has demonstrated to be one of the main causes of partial or total loss. In the literature NPWT has demonstrated a high success rate in salvaging free flaps with venous congestion. NPWT is known to increase local blood flow, decrease edema, stimulate granulation tissue, and decrease the concentration of reactive oxygen species hens reducing the likelihood of soft tissue infection. Given the forth mentioned we used NPWT in fingertip reimplantations, which suffered venous congestion. With this we wished to demonstrate NPWT could be successful in overcoming venous congestion in fingertip reimplantation, salvaging the reimplanted segment.

Methods: A retrospective analysis was performed on two cases of fingertip reimplantation in which NPWT was used to overcome venous congestion and persistent edema. Patients where followed for at least a year ensuring adequate functionality given by protective sensibility of the fingertip, movement that allowed day to day activities and return to normal life.

Results and Conclusions: Two patients with fingertip amputation where included, a male with a left thumb injury (Allen IV) and a female with a right index injury (Allen IV). In both cases venous congestion presented after reimplantation was carried out on an average of 2 days. Continuous NPWT was then applied improving the venous drainage and resolving tissue edema and venous insufficiency, which enabled total fingertip salvage. Both patients recovered protective sensibility, returned to their normal life activities and have a functional finger.

NPWT is a useful instrument in managing and improving venous congestion in fingertip reimplantation. Even though further and larger studies are necessary on the use of NPWT and its role in venous congestion in fingertip reimplantation it is a solution that has demonstrated high efficacy to salvage a fingertip that present venous congestion. It is a nonsurgical alternative that has demonstrated high success rate with minimal complication according to the results obtained in this report.

Keywords:
Fingertip, Reimplantation, VAC, Venus Congestion, Negative Pressure
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Objectives / Interrogation: Osteoarthritis of the trapeziometacarpal joint is a common problem that affects up to 10% of women between the ages of 45 and 70. The majority of patients are treated by trapeziectomy, which can be associated with interposition- and suspension arthroplasty. Different ligament reconstruction techniques have been described over the years. However, there is a small group of patients who only have a temporary benefit from the first surgical treatment, or not have any at all. The persistence of symptoms such as pain or impaired range of motion after surgery is considered a failure of the treatment.

In our clinic, several revision surgeries using the Carpo Metacarpal Implant® (CMI®) were performed. The rationale behind this treatment, is that a neoarticulation through proximalization of the base of the first metacarpal base with scaphoid or trapezoid can be treated by resection of the articular surface of the first metacarpal base and replacing it with a non-cemented monopolar implant. This treatment has not been described in the literature before.

The goal of this study was to follow up patients who have had a trapeziectomy with tendon arthroplasty and who needed revision surgery because of neoarticulation through proximalization.

Methods: We examined patients who received a CMI® Prosthesis after failed trapeziectomy with tendon arthroplasty with a retrospective follow-up examination concerning pain, range of motion, grip and pinch strength and radiographic evaluation.

Results and Conclusions: We describe three female patients, with a mean follow up of 7 years. Mean age at treatment was 58 years, at revision 61 years. Primary surgery was performed by trapeziectomy with one FCR and two APL arthroplasties. At follow up, overall range of motion was 86.8% of the opposite extremity. Mean grip strength was 83.3% and pinch strength 59.7% of the contralateral side. Mean Quick DASH score was 12.1, mean VAS with maximal weight bearing was 3.7/10. Radiologically, no progressive proximalization was seen. One patient also had an MCP arthrodesis at the time of revision surgery. One patient showed no Z-deformity and the third patient developed a mild Z-deformity with MCP extension of 35 degrees. Subjectively, all patients were happy with the outcome despite of their residual complaints.

Concluding, in our opinion, the non-cemented monopolar CMI® Prosthesis is a good option for treatment of persisting pain after trapeziectomy because of neoarticulation through proximalization.

Keywords:
Trapeziectomy, persisting pain, revision surgery, CMI® Prosthesis
EARLY STIMULATION OF BONE CONSOLIDATION IN PATIENTS WITH PATHOLOGICAL PHALANGES FRACTURE: THE ROLE OF BIOPHYSICS STIMULATION

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Objectives / Interrogation: The aim of a treatment when hand surgeon facing with a fracture is to promote bone healing. It is not always easy to understand if and with which probability, a fracture will evolve to a delayed consolidation or a pseudoarthrosis. Currently we do not have clinical, instrumental or laboratory investigations useful to identify "a pathological fracture", meaning as such a fracture that may require a longer time for healing or greater probability of incurring in non-consolidation. The aim of the present work is to evaluate the role of biophysical stimulation in the surgical treatment of simple and complex phalanges fractures. Biophysical stimulation was approved by the Federal Drug Administration (FDA) for treatment of delayed unions after long-bone fractures.

Methods: We treated with Capacitively coupled electrical field (CCEF), 40 patients divided in three groups: recent fractures, delayed consolidation and non-union. The segments involved were predominantly the phalanges and metacarpal bones. The patients underwent treatment with CCEF for an average time of 40 days (range 15 days - 120 days).

Results and Conclusions: Healing time was relatively shorter in the group treated with CCEF than expected considering the difficulties often occurring in the management of fractures and non-unions of the phalanges. Data were analysed with t-Student test.
The use of CCEF can shorten healing time of the bone, and consequently reduce the potential damages related to a prolonged immobilization. Biophysical stimulation can be an option in selected clinical situation: neither feasible surgical tretment nor accepted by patients with non-displaced and stable fractures, in case of delayed union, or lastly in non-union requiring bone flap or grafting as additional therapy after the surgery procedure.

Keywords:
Biophysical stimulation, CCEF, Osteobit, non-consolidation fractures, pseudoarthrosis
Results on Dupuytren disease course from a five-year follow-up cohort study

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Objectives / Interrogation: The exact natural course of Dupuytren disease (DD) is unknown. This study was aimed to determine the long-term natural course of DD in patients with different disease stages, and to find potential predictors for progression.

Methods: 258 DD patients (63% male, age at inclusion 66.4 SD 10.4 years) were included in this longitudinal cohort study. Measurements took place every 6 months, during 5 years. In total 17,645 observations were available for statistical analyses. Disease extent (surface area) and contracture severity (total passive extension deficit, TPED) were outcomes, and demographic, health-related, genetic, and lifestyle details were registered as potential predictors. Subject-specific mixed-effect models were used to estimate the natural disease course for both outcomes, and stepwise linear regression analyses on the acquired slopes were used to determine covariates associated with progression.

Results and Conclusions: Average yearly increases in disease extent were 0.50 [95% CI 0.41; 0.60] and 0.61 [95% CI 0.49; 0.72] cm² in area, for dominant and non-dominant hands respectively. An average yearly increase of 5.05 [95% CI 2.75; 7.36] and 14.3 [95% CI 8.8; 19.7] degrees of summed TPED was observed for dominant and non-dominant hands. About 11% to 16% of the participants did not show progression. Model fits ranged between 89.9-94.9% (R²). Several predictors for progression were found (e.g. Ledderhose's disease, first degree relatives, diabetes, and manual labour).

In conclusion, DD is progressive, although the speed of progression is variable across participants. Several suggested predictors for progression were identified, but a consistent view on DD progression across hands and outcomes was not found.

Keywords: Dupuytren disease, Dupuytren's disease, Dupuytren's contracture, natural course, progression, predictors
LONG-TERM OUTCOME OF INNERVATED DIGITAL ARTERY PERFORATOR FLAP

List of authors:
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2 Akdeniz University Faculty of Medicine (Antalya)

Objectives / Interrogation: The aim of study is to evaluate long-term clinical outcomes of the patients who underwent reconstruction with innervated digital artery perforator flap (IDAP) flap in the treatment of fingertip tissue loss.

Methods: 83 patients (93 fingers) who were operated due to fingertip amputations between August 2011 - October 2016 were included in the study. Acute or late reconstructions were performed to the fingertip injuries with the use of IDAP flap. Mean age of the patients was 35.2 years (range 5-65 years). Objective and subjective evaluations were performed in the postoperative controls. Statistical two-point discrimination (s2PD) and Semmes-Weinstein monofilament (SWM) tests were performed as objective parameters in comparison with contralateral hand. Range of motions of the reconstructed fingers were evaluated. Conditions that affect regional blood flow negatively (diabetes mellitus, vasospastic problems, smoking etc.) were questioned. Subjective assessment parameters consisted of hypersensitivity, cold intolerance and patient.

Results and Conclusions: The mean follow-up period was 33.1 months (range 12-60 months). The static 2-point discrimination measured on the flaps ranged from 2 mm to 6 mm (mean 3.7 mm); compared with 2 mm to 5 mm (mean 2.7 mm) on the contralateral fingers. Semmes-Weinstein test results ranged from 2.44 to 4.31 on the contralateral fingers, compared with 2.44 to 4.56 on reconstructed fingers. No partial or total flap loss was observed in any of the patients. There was no donor site morbidity. Superficial epidermolysis was observed in 4 fingers (4.3%). However, no second surgical procedure was applied to any patient. 4.3% of the 93 fingers (4 fingers) had hyperesthesia. Mild cold intolerance was observed in 18 fingers (19.3%). When evaluating both functional and aesthetic conditions of the patient, 75 patients (90.3%) reported being "very good" and 8 patients (9.7%) reported being "good".

The innervated digital artery perforator flap is a quick, sensory, reliable and versatile flap with excellent functional and aesthetic results, which can be used for early and late reconstructions of all types of fingertip defects.

Keywords:
fingertip injury, reconstruction, perforator flap, digital artery
UPPER TRAPEZIUS TO TRICEPS TRANSFER A NOVEL TECHNIQUE FOR RESTORATION OF ELBOW EXTENSION IN PATIENTS WITH BIRTH BRACHIAL PLEXUS PALSY

List of authors:
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Objectives / Interrogation:
Restoration of elbow extension in patients with birth brachial plexus palsy has received much less attention in the literature. Restoration of elbow flexion is considered as a prime aim and recovery of elbow extension is relied on assistance by gravity. However, in absence of elbow extension, the capacity of the child to reach for objects especially above the shoulder level is greatly limited which henceforth dramatically limits the use of the hand. Lack of elbow extension causes the elbow (with the hand) to fall into flexion when the child abducts the shoulder overhead, again limiting the reach to the objects.

Methods: The techniques described for restoration of elbow extension include the posterior deltoid-to-triceps transfer and lower trapezius to deltoid transfer. In our experience, the posterior deltoid to triceps transfer gave good results but it was possible only when the function of posterior deltoid is normal. Most of the children with birth brachial plexus palsy have limited deltoid function. We have performed the described lower trapezius to triceps in four patients. Two of them achieved grade 2 triceps function but other two could not perform any active extension of the elbow. This operation has not given good results as reported for adults. So we modified the technique and used the upper trapezius to triceps transfer in six patients. The upper trapezius was extended with the fascia lata and connected to the triceps to restore elbow extension. In last two years, we have performed six cases of upper trapezius to triceps transfer (with fascia lata graft).

Results and Conclusions: All the six patients could actively perform elbow extension against gravity (grade 3). They reported that their ability to reach for objects has improved and overall function of the limb as well. Since the transfer also transverses the shoulder it also improved the shoulder abduction.

Keywords:
Birth brachial plexus palsy; elbow extension; trapezius transfer
Differences in the Predictive value of Elixhauser Comorbidity Index and the Charlson Comorbidity in Patients with Hand Infections

List of authors:
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Objectives / Interrogation: The Elixhauser and Charlson Comorbidity indices are two of the most commonly used measures of clinical prognosis. Superiority of one index over another largely depends on the condition or procedure being studied. To date, there is no analysis of a nationwide database comparing the two indices for complications of hand infections.

Methods: The Nationwide Inpatient Sample 2001-2013 database was queried for hand infections using International Classification of Diseases, Ninth Revision (ICD-9) codes for hand infections (10 codes). The Elixhauser (ECI) and Charlson (CCI) comorbidity scores were calculated based on defined sets of ICD-9 codes that have been previously validated. Primary outcomes included mortality, prolonged length of stay (defined as >95 percentile), discharge destination, and postoperative complications. Indices were compared using receiver operating characteristic (ROC) curves. If confidence intervals overlapped, statistical significance was determined using the DeLong method for correlated ROC curves. This is a previously validated, non-parametric comparison used for the calculation of the difference between two AUCs.

Results and Conclusions: A total of 316,397 patients were included in this study. The AUC (95% confidence interval) for mortality was 0.710 (0.699-0.720) and 0.726 (0.715-0.736) for the ECI and CCI, respectively. The differences in AUCs were uniformly significant (p<0.05).

<table>
<thead>
<tr>
<th>Table 1: Descriptive Data for Study Population</th>
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<tbody>
<tr>
<td>Total 316,397</td>
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<tr>
<td><strong>Demographics</strong></td>
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<tr>
<td>Age &gt; 60 101,382 (32.1)</td>
</tr>
<tr>
<td>Female 122,104 (38.7)</td>
</tr>
<tr>
<td>Caucasian 180,597 (57.1)</td>
</tr>
<tr>
<td>African American 35,558 (11.2)</td>
</tr>
<tr>
<td>Hispanic 31,007 (9.8)</td>
</tr>
<tr>
<td><strong>Complications</strong></td>
</tr>
<tr>
<td>Mortality 2,612 (0.8)</td>
</tr>
<tr>
<td>Nonroutine Discharge 42,520 (13.4)</td>
</tr>
<tr>
<td>Prolonged Length of Stay 17,188 (5.4)</td>
</tr>
<tr>
<td>Postoperative Complications 16,931 (5.4)</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Table 2: Areas Under Curve (95% Confidence Interval) for Outcomes after Applying Comorbidity Indices, p&lt;0.01</th>
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<tbody>
<tr>
<td>Mortality</td>
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<tr>
<td>Non-routine Discharge</td>
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<td>Prolonged Length of Stay (&gt;95 Percentile)</td>
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<td>Postoperative Complications</td>
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Tables 1 and 2: Descriptive Data and AUC Analysis
There is a significant difference in the predictive value of the ECI and CCI. The CCI was superior in predicting mortality rate in the treatment of hand infections. The ECI was superior in predicting non-routine discharge, prolonged length of stay, and postoperative complications.

**Keywords:**
Comorbidity Index, Hand Infection, NIS

**References:**
VERSATILITY OF THE HYBRID DYNAMIC MINIFIX AND ITS MODIFICATION TECHNIQUE FOR METACARPAL AND PHALANX FRACTURES: REVIEW OF 83 CASES.

List of authors:
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4 HOSPITAL ORTOPEDICO - BELO HORIZONTE (BELO HORIZONTE)
5 HOSPITAL FELICIO ROCHO - BELO HORIZONTE (BELO HORIZONTE)
6 HOSPITAL ACCIDENTADOS - GOIANIA (GOIAS)
7 HOSPITAL ORTOPEDICO - BELO HORIZONTE (BELO HORIZONTE)
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Objectives / Interrogation: PURPOSE:
Present a bigger series (83 cases) of the new technique for fixation of the metacarpal and proximal phalangeal extra articular fractures.
Show that Hybrid Dynamic Minifix ® consist of a combination of intramedullary nailing and external fixation system.
Demonstrate that a hardware stable but not rigid fixation is achieved, then permits immediate motion without cast immobilization.
Enlarge the indications and present some modifications to the original technique presented by the former author in the last IFSSH 2016 congress.

Methods: METHODS

Results and Conclusions: Type of bone:5MTC (30%), 1MTC (20%) and 5 proximal phalanx (12%). Withdrawal of Minifix performed up 4 weeks in 90.3% of cases. Return to work 77.4% of cases less than a month after surgery, 22.6% between 1 to 2 months. Basic disabilities only 9.7% of patients were over 15 days with basic daily disabilities. Pain after surgery only 6.5% had high pain more than 3 days. Satisfaction: all patients were very satisfied. Regarding surgical complications just 6% had k-wire inflammation well-controlled by antibiotics. There were any cases of non union, delay in consolidation or sympathetic nerve dystrophy. Just one case had rotational deformity and only 5 cases had relative decreased of range of motion. We also apply this technique for correction of non-unions, segmental bone fractures, mal rotations deformities with successful results.

CONCLUSIONS:
Hybrido Dynamic Minifix (HDM®) technique represents a highly reproducible simple method, inexpensive, with successful results and a low rate of complications.
The time of return to daily activities or work is reduced due to immediate mobility, thus stimulating the consolidation and avoiding rigidity.
Modification technique using the non-injuried and parallel metacarpal bone showed the same security and success for the consolidation and represents an alternative to inset two k-wires for the same circular bone.
Hybrido Dynamic Minifix (HDM®) is presented as a new treatment option for percutaneous extra articular fractures of the proximal phalanx and metacarpals avoiding all risks associated with open surgery or prolonged cast immobilization.

Keywords: metacarpal, phalangeal fractures, hybrid dynamic minifix
Modified thumb CMCJ stabilisation, accounting for contemporary biomechanical evidence: a case report applying systematic review findings

List of authors:
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2 Imperial College Medical School (London)
3 Lister Hospital (Stevenage)
4 Ganga Hospital (Coimbatore)

Objectives / Interrogation: Early biomechanical studies focus on the volar beak ligament as the primary stabiliser of the thumb carpometacarpal joint (CMCJ). However, more recent work summarised in a systematic review highlights the role of dorsal ligament complex (DLC) in stabilising the joint.

A common approach to stabilising the thumb CMCJ joint uses flexor carpi radialis to reconstruct the ligament, akin to an LRTI following trapeziectomy.

Alternative approaches that account for the role of the DLC exist, such as Rayan's dorsoradial capsulodesis. However, such techniques tend to focus on one joint structure or the other.

We describe a novel modification of the FCR-based technique that simultaneously reconstructs the volar beak ligament and to DLC, and its use in a challenging case.

Methods: A 28-year-old right handed was treated for a recurrent left thumb CMCJ dislocation. The closed injury was sustained two months earlier in a motorbike road traffic collision and was initially treated with closed reduction and k wire fixation. However, the dislocation recurred after the wires were removed after 4 weeks.

Under regional block and tourniquet control, the FCR tendon was identified and divided proximally in the forearm and reflected into the hand maintaining its insertion. A drill hole was made through the base of the metacarpal and the cut end of FCR passed through this from volar to dorsal, as would be performed in an LRTI. This reconstructs that volar beak ligament.

Instead of immediately pulling the FCR around the metacarpal base and suturing it to itself as would be done in an FCR, the FCR was anchored to the dorsoradial aspect of the trapezium. This reconstructed the DLC.

This approach was supported by the biomechanical studies identified in a contemporary, PROSPERO-registered systematic review that combined index and free text searching of multiple databases.

Results and Conclusions: On table, the novel CMCJ stabilisation achieved immediate stability of the CMCJ throughout passive range of motion and was confirmed with image intensifier control.

The patient continues to make a good recovery.

In the systematic review, 55 studies were included of 345 identified from searches. The evolving understanding of the roles of the volar beak ligament and DLC from 1973 to the present demonstrates the importance of both.

This simple modification of CMCJ stabilisation demonstrates how systematic reviews can impact on clinical hand surgery practice.

Keywords:
thumb, carpometacarpal joint, CMCJ, stabilisation, flexor carpi radialis
REIMPLANT OF TRAUMATIC HAND: CASE REPORT RESOLVED IN FUSAT CLINIC.

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3 Hospital de Rengo (Santiago)

Objectives / Interrogation: The experience and ability to solve highly complex pathologies in reconstructive traumatology, integrate the management of complex wounds with multisystemic commitment and microsurgery. Secondary to complex traumatic subtotal hand amputation.

Methods: Male patient, 34 years old. Enter by subtotal amputation with circular saw. Start of cut dorsal area in the right distal ulnar region. Exposed radio-ulnar fracture (GIIIC), extensor apparatus damage in zone 8, radial nerve injury and partial radial artery section. Damage control. In pavilion, wound washing, identification of structures, control of bleeding with partial repair of radial artery, superficial closure and placement of external tutor. 48 hours later, withdrawal of external tutors, new wound washing. Reduction and radio-ulnar osteosynthesis is performed, after regularization of bone ends, with LCP plates. Identification of nervous, tendon and vascular tissue sectioned. Revision and new repair of the radial artery is performed, revision of flow without active bleeding. Epineurorrhaphy of radial nerve in zone 8 posterior regularization of ends, primary with suture without tension. Functional identification of extensor tendons, distal and proximal ends are identified. Primary tenorrhaphy of extensor tendons in all the compartments of 1st to 5th fingers at the level of the retinaculum with double point kessler plus point running between ends. Complete mobility check of the wrist is made with correct nerve tension and tendon, it is expected to achieve early controlled mobility. Operative wound closure. Placing of ante-brachial palmar plaster valve including phalanges.

Results and Conclusions: Repair of complex wounds with multisystemic compromise is a big challenge, secondary to that, Traumatic injury in February 2018, with circular saw. Complete repair 48 hours after first intervention with damage control. 2 weeks after performing surgery, removal of sutures, passive mobility test, sensitivity and pain scale. On the part of our rehabilitator, evaluation with DASH 70.8%. Great pain secondary to surgery. Follow-up was performed for 7 months. Achieving pain reduction, without complications such as complex regional pain, almost complete sensitivity, complete passive and active mobility and DASH (7 months) 18.3 with complete work reintegration. Good planning and achieving what is theoretically demonstrated (neurorrhaphy, tenorrhaphy), it is essential for a good result of the management of these complex wounds, it makes life easier for the surgeon and the patient is grateful.

Keywords:
Amputation, Hand, epineurorrhaphy, Mycrosurgery
The bony anatomy of the radius and ulna: AComputed Tomography study for implant design and related research.

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Objectives / Interrogation: Objectives: CT scans where utilized to measure multiple anatomical dimensions of the radius and ulna in a reproducible manner. Intramedullary fixation for length unstable forearm fractures could render favorable results and this information could aid in optimizing the size and design of these devises.

The specific objectives of the study will be to evaluate the radius and ulna structurally, especially the radius curvature and the canal diameters of both bones. This may aid with future implant design and for current implant modification. No current comparable descriptive or comparative studies are available in the literature.

Methods: Methods: We retrospectively looked at 100 CT forearm scans with unaffected radius and ulnas. We measured the length, radius of curvature, canal width and head measurement in both plains.

Results and Conclusions: Results: The length of the radius shows a mean of 238mm. The mean curvature will be an arc with a radius of 558.27mm. The radial head diameter in two planes are 23.84 and 23.24 respectively. The canal size shows a mean of 5.48mm. Radial inclination, radial styloid length and volar tilt show a mean of 21.57°, 10.47mm and 12.8° respectively. The maximum distal radius height 20.56mm. The length of the ulna shows a mean of 259.7 mm. The ulna head diameter in two plains show means of 19.48 and 16.76 mm respectively. The canal size in the ulna shows mean of 5.28. Radial length predicts ulna length, and both radius and ulnar length predict radius curvature. Radial head diameter predicts radial length and ulna head diameter predicts ulna length. Radial canal maximum diameter predicts ulnar canal minimum diameter.

Discussion: This anatomical measurements will aid with implant design and ranges. Radius: Implant length of 230-240 mm cover 95% of patients. Radius curvature can be set at the mean for most forearms at 558mm and this would correct the arc within 19mm for 95% of the patients. A 4 mm rod diameter will pass through most radial medullary canals. The distal height of the radius allows adequate space for the 6mm nail locking block.

Ulna: The ulna is consistently 20 mm longer than the radius which has prosthesis design implications. The ulnar nail should be longer than the radius range and anatomical bend of 12°. The proximal ulna entry point will accommodate a 6mm reamer. The ulnar shaft will easily accommodate a nail diameter of 4 mm.

Keywords:
Radius Ulna CT scan Predictive
Longterm outcome after Ulnar Tunnel Release

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Objectives / Interrogation: Ulnar tunnel syndrome (UTS) is a rare nerve compression syndrome with a variety of causative factors. The aims of this study are to describe the distribution of causes of ulnar tunnel syndrome, the rate of revision, and to evaluate the long-term outcome of ulnar tunnel release (UTR) in patients with UTS.

Methods: We identified 225 patients using Current Procedural Terminology code 64719 at two urban hospitals between 1/1/2003 and 12/31/2016. After manual chart review we included 143 adult patients with UTS. We excluded 54 patients with a direct injury of the ulnar nerve, four patients who had an UTR because of an infection and two patients who had an incomplete medical chart. Our retrospective cohort consists of 81 patients, of which 27 patients completed a follow up survey. The mean±SD age at surgery was 53.5±15.6 years and 39 (46.4%) patients were men. Fifty-one patients (63.0%) had an UTR and another concomitant nerve decompression procedure or carpectomy (Figure 1). The median time to last clinical visit was 4.6 months (IQR 1.8 -12.1) and the mean±SD to the follow up questionnaire is 7.1±32. years.

Results and Conclusions: The intra-operative findings for the cause of compression was ganglion cyst in 12 patients (15%), fibrous or muscular compression in 19 patients (23.5%), scar tissue in seven patients (8.6%), tumor in guyon canal in three patients (3.7%), compression by the pisohamate ligament in four patients (4.9%), bony impingement in two patients (2.5%) and unclear in 31 patients (38.3%). Two (2.5%) patients had a revision ulnar tunnel release. At time of last clinical visit, 18 (22%) patients still had residual pain, 57 (70%) had residual sensory or motor symptoms but 67 (82.7%) were noted to be improved (Figure 2). The mean±SD PROMIS score of all patients that had a UTR was 45.2±11.9 and 47.4±14.1 for all patients that solely had a decompression of Guyon canal (Table 1). The follow-up questionnaire revealed that 23 patients (85.2%) improved after UTR and that 25 (92.5%) would have the same surgery again if they were in the same situation.

Conclusion
Patients with UTS improve after UTR but residual symptoms may remain. Despite residual symptoms most patients would choose to have surgical treatment again if they were in the same situation again.

Keywords: guyon's canal syndrome ulnar tunnel decompression surgery ulnar nerve
Is MRI better than CT in the diagnosis of occult wrist fractures?

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Objectives / Interrogation: MRI has been shown to have high specificity and sensitivity in detecting occult wrist fractures. However it is more expensive and less widely available than CT scan. For patients with suspected scaphoid fracture, our practice is to use CT imaging. We invited patients with clinical suspicion of scaphoid fracture, but normal X-rays and CT to come for an MRI scan. Our aim was to identify those with MRI evidence of scaphoid fracture or other occult injury and thus demonstrate whether our current clinical pathway misses significant pathology.

Methods: Patients were reviewed 10-14 days after their initial injury. If there was ongoing clinical suspicion of a scaphoid fracture, repeat radiographs were performed. Those with normal radiographs but ongoing pain had a CT scan. Those with normal CT scans were invited back for an MRI scan. These patients also completed functional and pain scores at the time of assessment and 6 months post-injury.

Results and Conclusions: 100 patients were studied. 14 fractures were discovered in 13 patients:
Scaphoid - 6
Scaphoid plus capitate - 1
Capitate - 1
Lunate - 1
Trapeziun - 2
Distal radius - 2
Another patient had an SL tear, one had marked arthritis and 15 further patients showed equivocal findings with bone bruising or significant fluid.

Summary
Our results demonstrate that a significant proportion of patients with normal X-rays and CT scan have a scaphoid fracture, an alternative occult fracture, or other finding that might need intervention. These would not have been detected by our current pathway. The study shows that radiographs and CT scans fail to detect significant numbers of occult wrist injuries that are detectable on MRI scan.

Keywords:
scaphoid fracture MRI CT
**NERVE REPAIR AND REGENERATION BY BIOLOGICAL TUBULIZATION OF AMNION MUSCLE COMBINED GRAFT (AMCG): FROM BENCH TO BEDSIDE**

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**Objectives / Interrogation:** Peripheral nerve physiology and regeneration has been observed and investigated in literature but surgical applications to reconstruct and restore motor or sensory functions are still in a developmental phase. Recent surgical attempts to treat proximal nerve injuries include direct nerve restoration, transfer, and autografting measures with favorable results. In this report, we present a completely new tubulization method, the amnion muscle combined graft (AMCG) technique, that consists in the combination of the human amniotic membrane hollow conduit with autologous skeletal muscle fragments for repairing the substance loss of peripheral nerves and recover both sensory and motor functions.

**Methods:** In a series of patients with loss of substance of the median nerve ranging 3-5 cm at the wrist, excellent results graded as S4 in two cases, S3+ in two cases, and S3 in one case; M4 in four cases and M3 in one case were achieved. Moreover, we evaluate the final outcome of nerve regeneration morphologically and functionally, across the AMCG compared to nerve autograft in fourteen Wistar rats. Functional results were evaluated at 30, 60 and 90 days performing grasping tests. Morphological and stereological analyses were performed at T90 using high-resolution light microscopy and design-based stereology.

**Results and Conclusions:** Functional recovery was observed in both groups with AMCG conduits group showing lower values and a regeneration of median nerves with more myelinated fibres with the same axon size, but thinner myelin than the autograft group. Though the autograft remains the gold standard to restore wide nerve gaps, the AMCG conduit has proved to be effective in enabling nerve regeneration through a critical rat's nerve gap of 15 mm. No iatrogenic damage due to withdrawal of a healthy nerve from donor site was observed.

The amnion muscle combined graft (AMCG) conduits showed good clinical results in peripheral nerves gap repair. These results seem attributable to the biological characteristics of human amniotic membrane: Pluripotency, anti-inflammatory and low immunogenicity. The use of autologous sural nerve grafts is still the current gold standard for the repair of peripheral nerve injuries with wide substance losses, but with a poor rate of functional recovery after repair of mixed and motor nerves, a limited donor nerve supply, and morbidity of donor site.

**Keywords:**
nerve regeneration, nerve tubulization, amniotic membrane
Brachioradialis to Extensor carpi ulnaris transfer to address the radial deviation deformity in posterior interosseous nerve palsy

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Objectives / Interrogation: Radial deviation deformity after the tendon transfer for restoration of wrist and digital extension is frequently talked about. It is a great concern while performing tendon transfer for patients with posterior interosseous nerve palsy because these patients have a functioning extensor carpi radialis longus which is more of a radial deviator and secondary extensor in absence of paralyzed extensor carpi radialis brevis (main wrist extensor) and the extensor carpi ulnaris (main ulnar deviator). In such patients it has been suggested not to use the flexor carpi ulnaris as donor for extensor digitorum. Instead, flexor carpi radialis has been suggested to be transferred to the extensor digitorum. Preserving the flexor carpi ulnaris is an effective way of preventing a severe radial deviation deformity but some patients still continue to have a radial deviation deformity especially in wrist extension. Techniques described to prevent the radial deviation deformity include- transfer of the extensor carpi radialis longus to brevis for more central wrist extension; transfer of extensor carpi radialis longus to the third metacarpal or transection and transfer of the extensor carpi ulnaris to the extensor carpi radialis.

Methods: We have performed brachioradialis to extensor carpi ulnaris transfer to address the radial deviation deformity in these patients. It is much simpler and is much more effective as it restores the normal radio-ulnar balance of the wrist by providing a dynamic ulnar stabilizer. Moreover, there is no donor muscle deficit as brachioradialis is always available in these patients and is an expendable tendon.

Results and Conclusions: This tendon transfer was performed in five patients with good results in all. All patients could do an active ulnar deviation and extension. None had radial deviation deformity at the wrist. A balanced wrist was achieved in all the patients resulting in excellent cosmesis and function.

Keywords:
Posterior interosseous palsy; radial deviation deformity; brachioradialis transfer
Stability of the distal radio-ulnar joint provided by the remnant distal radio-ulnar ligaments following ulnar styloid fracture including the fovea: A cadaveric biomechanical study

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Objectives / Interrogation: Clinical studies suggest that untreated ulnar styloid fractures (USF) and ulnar styloid non-unions do not affect patient outcomes. This may be due to the contribution of remaining soft tissues providing sufficient residual stability following USF. However, basal USF that include the fovea have a risk of causing distal radio-ulnar joint (DRUJ) instability, because they include deep portion of the distal radio-ulnar ligament (DRUL) insertions. This study investigated the importance of the remaining soft tissue attachment of the DRUL in USF involving the fovea for the stability of the DRUJ.

Methods: Seventeen cadaver forearm specimens (7 male; mean age 64.5) were tested in a custom DRUJ testing system. Soft tissue was carefully removed preserving the interosseous membrane, extensor carpi ulnaris, pronator quadratus, and triangular fibrocartilage complex. The positional change of the DRUJ was measured with a MicroScribe. DP-translation was quantified in neutral, full pronation and 90° supination applying 15 N of translational load. Pronosupination was measured with 1Nm of torque. All specimens were sequentially tested in intact condition, after an ulnar styloid fracture including the fovea, followed by transection of the remaining portions of the DRUL where in eight specimens the remaining dorsal ligaments were transected first and in 9 specimens the palmar ligaments first. Finally stability was tested with both portions of the ligaments transected. Differences were compared using ANOVA and Tukey post hoc tests.

Results and Conclusions: The pronosupination increased significantly compared to the foveal fracture (mean: 205.8°) after transection of both the palmar and the dorsal remaining soft tissue (mean 217.0°; dorsal first: $p=0.010$; palmar first: $p=0.031$). The DP-translation significantly increased after transection of both parts of the remaining soft tissue in neutral (dorsal first: $p=0.019$; palmar first: $p=0.018$) and supination (dorsal first: $p=0.012$; palmar first: $p<0.001$). Transection of one portion of the ligaments did not significantly increase translation; however, the percent increase in dorso-palmar translation was larger for the dorsal tear both when it was transected first or second.

In an USF including the fovea, there are still soft tissues attached to the ulnar head, giving residual stability to the DRUJ. The remaining dorsal portion of the ligaments may have a more important role in the DP-stability.

Keywords:
DRUJ; distal radio-ulnar ligament; stability; ulnar styloid fracture
Sonographically guided percutaneous A1 pulley release in trigger finger - preliminary results

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Objectives / Interrogation: After a recent revisions of the insurance system for ambulatory treatment, certain operations have become a financial burden. Currently, the reimbursement for open release of the A1 pulley in stenosing tendosynovitis only covers 78% of the cost at our clinic. Percutaneous release of the A1 pulley has been around for many years with ever evolving techniques and instruments. Combined with sonography, we are able to visualize the A1 pulley, pinpoint the location of nerves and vessels and therefore safely release the A1 pulley percutaneously. Performed in the outpatient clinic, we expect percutaneous A1 release to be cost effective.

Methods: To establish a treatment protocol, 20 cadaver hands were used. The A1 pulley was evaluated sonographically, specifically noting the extent of the A1 pulley as well as the relative position of the nerves and vessels. Through a small incision just distal to the palmodigital fold, a cone tipped probe was inserted into the tendon sheath just distal to the A1 pulley and advanced between tendon and A1 pulley under sonographic guidance. Once correctly placed, a hook knife was inserted through a groove in the probe and the probe removed. After advancement of the knife to the proximal end of the A1 pulley the knife was retracted and in doing so the A1 pulley was released. Open inspection allowed for documentation of possible injuries. With very promising results in cadaver hands, we intend to proceed to a clinical trial series.

Results and Conclusions: Percutaneous release was attempted in all A1 pulleys except for the A1 pulley of the thumb (n=80). The A1 pulley was released in 64 attempts (80%). Upon open inspection, no injuries to the nerves or vessels were noted. 9 lesions of the tendons were found, of which 4 were suspected sonographically (1 ulnar slip FDS, 2 partial (60%, 5%) lesions FDP, 2 longitudinal FDS splits, 4 perforations FDS). However, these results include our very early experience and inadequate instruments. The final 24 procedures were performed with improved instruments, resulting in 100% pulley release rate and without injuries. As of yet, no clinical data has been collected. We intend to report on our first experience, as soon as they’re available.

We propose a sonographically guided, percutaneous A1 pulley release suitable for the outpatient clinic. However, as the results represent only preclinical experience many limitations apply. Furthermore, contrary to the open release, no inspection of the tendon and no synovectomy can be performed.

Keywords:
A1 pulley release, percutaneous, sonography
Pattern of arthritis noted during the surgery for stage 3B Keinbock's disease basis for classification & its clinical implication

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Objectives / Interrogation: Kienbock's disease or avascular necrosis of the lunate is an uncommon condition affecting the wrist joint. The treatment basically depends on the radiological stage of the disease as described by Lichtman. Beyond 3B the salvage operations are generally recommended. The options include- proximal row carpectomy, scapho-trapezio-trapezoid (STT) fusion, scapho-capitate fusion, lunate replacement, or a total wrist fusion. Choice of surgery depends on the surgeon's personal preference and the pattern of arthritis seen during the surgery i.e. the involvement of the capitate articular surface or distal radius articular surface. However, the information regarding the arthritic pattern observed in Kienbock's disease is sparse in the literature.

Methods: The present study is a prospective observational study involving consecutive 48 patients of stage-3B Kienbock's disease considered for salvage surgery over period of 9 years. The pattern of arthritis involving the wrist joint during the salvage operation was noted.

Results and Conclusions: We noted that out of 48 patients- 22 patients did not have any arthritis whereas in 26 patients arthritis was noted. In 24 of these 26 patients the arthritis involved the lunate articular surface of the radius. In two cases the capitate articular surface involvement was seen without the lunate articular surface involvement. Only in one patient there was arthritis involvement of the scaphoid articular surface of the radius along with arthritis involvement of the lunate articular surface of the radius. These findings form a basis of the classification of the arthritis pattern observed in Kienbock's disease which has been described. Also, it helps in objectively deciding the type of salvage operation recommended. Since the lunate articular surface of the radius is commonly affected in Kienbock's disease one must observe this surface before proceeding for proximal row carpectomy as this surface must be arthritis free for doing a proximal row carpectomy. In such patient a scapho-capitate fusion or STT fusion should be performed. We observed that the scaphoid articular surface is the last to be involved in Kienbock's related arthritis and the lunate articular surface could be the earliest to get involved. This information has great implication when deciding the salvage option for stage-3B Kienbock's disease.

Keywords: Kienbock's disease; arthritis; proximal row carpectomy; partial wrist fusion
Professional violinist biomechanical and electrophysiological wrist and forearm muscles evaluation

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Objectives / Interrogation: Professional playing musicians are one of the most difficult group of patients because of constant overloads during prolonged time of play and reluctance to medical treatment. Because of specific upper limbs biomechanical work and often improper position while playing it is a great challenge for surgeons and physiotherapists to treat fingers, wrist, elbow and cervical neck disorders. Aim of the study was to assess muscles activity, overloads and biomechanical parameters during violin play.

Methods: 23 professional violinist (aged: 27 y.o) with average time of play 25 ± 7 years underwent examination of forearm muscles biomechanical parameters with Biodex System 4 Pro isotonic protocol. To assess muscles activity during play, wireless electromyography Noraxon Telemyo was used. Examined muscles: ECRB, FCR, FCU, biceps and triceps. To evaluate violinists muscles overloads standing position as control group was recorded. All examined participants had to play the same 3 instrumentals by Bach, Kreutzer and Wieniawski in the same order.

Results and Conclusions: The average peak velocity of wrist extensors was 180,2 ± 62,4 deg/sec, while the flexors was 295,8 ± 59,7 deg/sec. There were significant difference (p<0,05) between wrist flexors and extensors which influence the forearm muscles balance parameters. There were no significant difference in muscles activation between instrumentals. Right wrist extensors mean amplitude was 41 ± 3,1 uV, while the left wrist flexors was 38,9 ± 5,1 uV. The study revealed significant difference (p<0,05) between muscles overload during playing and control position in all examined muscles.

Conclusion:
Mean muscle tension shows that the symptoms are not provoked by an intensity of playing. Chronic overload by training may be more likely responsible for causing the symptoms then strained position itself. Imbalance of the forearm muscle may be responsible for aggravating the symptoms.

Keywords:
violin, biomechanical, forearm
Diagnosis and treatment of median nerve entrapment at the elbow by isolated section of the lacertus fibrosus

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Objectives / Interrogation: Entrapment of the median nerve at the elbow has been reported in the literature to be rare and difficult to diagnose. The compression by the lacertus fibrosus (LF) has a predominant motor clinical expression differentiating it from other syndromes. The purpose of this study was to provide the different stages of management of median nerve compression by the LF at the elbow, from diagnosis to treatment, and to underline the benefits of a procedure under WALANT surgery.

Methods: 15 patients (7 female, 8 male), with a mean age of 42.5 years (28-56), were managed for compression of the median nerve at the elbow. 16 nerves (12 on the right, 4 on the left) were released. The diagnosis was made in the presence of the clinical triad: elbow pain in 13 patients, muscle weakness in all patients (Flexor Pollicis Longus (FPL), Flexor Digitorum Profundus of the index (FDP II), Flexor Carpi Radialis (FCR)) and a positive scratch collapse test (SCT) at the elbow in 14 patients. Tinel's sign was positive in 4 patients. The electromyogram revealed compression of the median nerve at the elbow in only one case. 8 patients had concomitant CTS and underwent endoscopic decompression at the same time. Neurolysis of the median nerve at the elbow was performed under WALANT surgery (7) or axillary block (9) if an associated procedure was indicated. Muscular testing was performed intraoperatively or the day after surgery.

Results and Conclusions: Neurolysis of the median nerve consisted of a simple section of the LF by an anterior minimally invasive approach of the elbow. All patients recovered full muscle strength of the median nerve innervated muscles. Return of strength was “immediate” when surgery was performed under local anesthesia. At 3 months' follow-up, pain had totally disappeared in all patients.

Diagnosis of entrapment of the median nerve at the elbow is often misunderstood. The clinical association of elbow pain, muscle weakness and positive SCT is very suggestive of the diagnosis. The EMG-study is most often normal but remains mandatory for the diagnosis of an associated CTS. The anatomical position of the nerve fascicles of the concerned muscles innervated by the median nerve when passing under the LF (anterior for the FCR, medial for the FPL and FDPII) could explain this specific symptomatology. WALANT surgery offers the advantage of performing intraoperative muscular testing to appreciate the immediate strength recovery after median nerve release in addition to simple postoperative care and low morbidity.

Keywords:
median nerve entrapment, elbow, lacertus fibrosus, neurolysis
An anatomical study of the ulnar footprint of the distal radio-ulnar ligaments in relation to the ulnar styloid and the ulnar head

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Objectives / Interrogation: The distal radioulnar ligaments (DRUL) are considered major stabilizers of the DRUJ. The DRUL can be separated into superficial and deep layers and the dorsal and volar portions of each tighten reciprocally during forearm pronation and supination. Ulnar styloid fractures (USF) may affect the insertions of these ligaments and therefore the mechanics of the DRUJ. Knowledge of the topography of the DRUL insertions is essential to better understand possible instability that could accompany ulnar styloid fractures. The purpose of this study was to anatomically evaluate the location and size of the footprints of each portion of the DRUL in relation to the bony landmarks of the styloid.

Methods: 24 fresh cadaver forearm-wrist-hand complex were dissected free of soft tissue while taking care to retain the TFCC and the DRUJ capsule. Characteristic bony points were digitized to define the geometry of the ulnar styloid and head. The superficial and deep ligaments were sharply transected sequentially at their base and the circumference of each footprint was digitized. The area and distances between the footprints and bony landmarks were then calculated. Distances were also calculated in two dimensions along the long axis of the ulna to simulate a plain radiograph projection onto a 2D plane.

Results and Conclusions: The average styloid height (length from base to tip) was 17mm, the average anterior-posterior width was 6.5mm and the average fovea depth was 1.8mm. In the coronal plane, the superficial DRUL inserted from the tip of the styloid down to 87% of the styloid height. The deep DRUL inserted from 81% of the styloid height down to the fovea. The superficial footprint had an area of 10.6mm^2 on the radial face of the ulnar styloid. The deep DRUL attachment had two distinguishable parts: the dorsal portion (23mm^2) and the volar portion (7.8mm^2). The dorsal portion had a separate footprint in 47% of the cases.

This study quantified the relationships between the footprints of each of the component parts of the DRUL relative to the bony landmarks of the ulnar styloid. The deep portion attaches from the fovea up to 81% of the styloid. USF more distal that 81% may only minimally affect the DRUJ stability. Furthermore, the deep portion has distinct dorsal and volar footprints with the dorsal portion inserting more dorsal and radial. In the setting of an USF, whether the fracture traverses each of these footprints may result in preferential detachment of the DRUL and thus affect stability of the DRUJ.

Keywords:
distal radio-ulnar ligament; ulnar styloid; anatomy; ulnar head; DRUJ
Reconstruction of large volar skin and soft tissue defects of the digits using the radial artery superficial palmar (RASP) branch free flap: Case report and literature review

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Objectives / Interrogation: Soft tissue defects of the fingertip vary shapes and sizes, and in most cases, they can be covered with secondary delayed healing, skin grafting or local flap surgery. However, in the case of relatively large volar soft tissue defect extending to the distal interphalangeal joint or more proximal, it is difficult to recover. The donor site skin condition for volar skin loss on the digit should be glabrous, sensate and provide padding or cushion. We report a case of reconstruction for large volar soft tissue defect on a finger using radial artery superficial palmar (RASP) branch free flap and discuss related literature.

Methods: A 61-year-old female patient had no history of diabetes or peripheral vascular disease. Her left hand rolled into a meat grinder and her 2nd and 3rd digits were crushed accompanying with the fracture of the distal and proximal phalanx. Emergency surgery was performed on the day of the visit. The index was subjected to arterial anastomosis using a vein graft after reduction and internal fixation of the fracture site, and for the middle, reduction and internal fixation of the fracture site and end to end artery and vein anastomosis was performed. Skin necrosis of the second finger was observed at 2 weeks after surgery. After debridement of the necrotic tissue, soft tissue coverage was performed with a 3 x 1.5 cm sized RASP branch free flap. At 6 months follow-up, the flap was well-engrafted without loss and showed a 9-mm static two-point discrimination at 1-year follow-up.

Results and Conclusions: For relatively large volar soft tissue defect of the digit, Homo or Hetero-digit island flap can be applied. However, If the defect is too large, donor tissue may be insufficient or the pedicle may be short. Also, finger stiffness may be retained due to donor scar formation. Therefore, it is often necessary to reconstruct the defect with a sensate free flap which has similar skin texture with skin pulp. Typical flaps satisfying these conditions include free flap from the foot and toes or palm. The thenar free flap has some advantages of obtaining a wider flap, showing similar skin color and less donor morbidity compared with the flap of the toe. In addition, the donor and recipient are in the same surgical field.

The radial artery superficial palmar branch free flap is a good indication for the reconstruction of large volar soft tissue defects on the digit which is not covered by locoregional flap or island flap, and it has the advantage of less donor site morbidity.

Keywords:
PIK3CA somatic mutation in a patient with Aberrant Muscle Syndrome and Lymphatic Malformation

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Objectives / Interrogation: Aberrant muscle syndrome (AMS), a rare congenital hand difference, is characterized by unilateral non-progressive muscular hyperplasia of the upper limb. PIK3CA is an upstream regulator of the AKT-mTOR cell signalling pathway, and activating mutations of this gene promote cell proliferation. Multiple syndromes of overgrowth (CLOVES, FAO, Macroductyly) have been found to have associated mutations of PIK3CA, and the umbrella term ‘PIK3CA related overgrowth spectrum’ (PROS) has been created to characterise this group of conditions.

Two cases of AMS with mutations of PIK3CA have previously been reported. We report the first case of a patient with AMS and a lymphatic malformation, both found to have the same mutation of PIK3CA.

Methods: Targeted next generation sequencing of DNA extracted from formalin fixed paraffin embedded (FFPE) slides was undertaken on both skeletal muscle affected by AMS and tissue from a lymphatic malformation of the chest wall in one patient. Regions of interest from exon 15 of the BRAF gene, exons 9 and 20 of the PIK3CA gene, exons 2, 3, and 4 of both KRAS and NRAS genes, and exons 18, 19, 20 and 21 of the EGFR gene were amplified using multiplex PCR. Sequencing was performed on an Illumina MiSeq Next Generation Sequencer, and mutations were detected using MiSeq Reporter software.

Results and Conclusions: In the skeletal muscle a PIK3CA E542K (c.1624G>A, exon 9) mutation was detected with a mutation allele fraction of 19%. The same PIK3CA E542K mutation was detected in the lymphatic malformation tissue at a much lower mutation allele fraction of 0.22%.

Five common PIK3CA mutation locations have been determined within the PIK3CA Related Overgrowth Spectrum (PROS). Our case and the previously reported AMS cases all have mutations among the five canonical PIK3CA mutations previously described. The fact that the same PIK3CA mutation has been found in multiple different tissue types suggests that this mutation arises in a cell that contributes to the development of several tissue types during embryogenesis. This is the first description of the same PIK3CA somatic mutation in a patient with both AMS and a lymphatic malformation. Our case extends the breadth of clinical presentations of patients with PIK3CA mutations.

Keywords:
PIK3CA, genetics, overgrowth syndromes
Loading the pronator quadratus improves distal radio-ulnar joint stability in the setting of an ulnar styloid fracture

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Objectives / Interrogation: With a volar approach to repair distal radius fractures (DRF) the pronator quadratus (PQ) is often violated. The merits of repairing the PQ to restore pronation strength, protect flexor tendons and increase distal radioulnar joint (DRUJ) stability remain controversial. Several studies reported no change in clinical outcome due to PQ repair. DRFs are often associated with ulnar styloid fractures (USF), which have been shown to lead to a significant loss of DRUJ stability when the styloid fractures involve the fovea. The PQ may be key in reducing postoperative DRUJ instability in a DRF with a USF involving the fovea. Therefore the objective of this study was to quantify the effects of PQ loading on DRUJ stability in a cadaveric model of USF.

Methods: Soft tissue was carefully removed from 17 forearm specimens (7 male, 10 female; mean age 64.5; range 56-77), leaving the interosseous membrane, extensor carpi ulnaris (ECU), pronator quadratus (PQ), and triangular fibrocartilage complex. Forearms were mounted on a custom testing system and the ECU was loaded with 5N. A USF including the ulnar fovea was performed. Pronosupination was measured with 1Nm of torque and dorso-palmar (DP) translation was measured using 15N of load. DP-translation was measured in neutral, full pronation and 90° supination. Measurements were repeated with loading the PQ with 0N; 2.5N; and 5N.

Results and Conclusions: In full pronation with a 5N load, DP-translation decreased significantly compared to 2.5N (p<0.006) and 0N (p<0.001) loads. Significant decreases were also found in neutral with a 5N load compared to the 2.5N (p<0.001) and 0N (p<0.001) loads. Total pronosupination decreased significantly from 0N to 5N (p<0.001), changing on average from 206° to 203°.

Loading the pronator quadratus significantly decreased translation and rotation of the DRUJ. Even though the amount of change in stability was small repair of the pronator quadratus may be warranted if there are concerns about residual DRUJ instability.

Keywords:
pronator quadratus; DRUJ; stability; ulnar styloid fracture
Nerve Compression due to Benign Tumors or Ganglion Cysts in the Upper Limb—Case Series

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Objectives / Interrogation: Tumor nerve compression in the upper limb are relatively rare, usually involving ganglion cysts and benign tumors. Accurate diagnostic and treatment are mandatory for adequate functional recovery.

Methods: We present a case series of five patients with peripheral nerve compression in the upper limb due to tumor or cystic masses—large median nerve schwannoma generating anterior interosseous nerve compression, voluminous lipoma compressing median nerve in the proximal forearm, superficial branch of radial nerve compression encountered in two patients by a lipoma respectively a synovial cyst and ulnar nerve compression in the Guyon tunnel due to a ganglion cyst—and highlight the particularities in diagnostic and treatment of these patients.

Results and Conclusions: In the beginning, those benign lesions are asymptomatic but, as they continue to grow adjacent to a peripheral nerve clinical manifestations appear progressively as compressive neuropathies. All the patients have received surgical treatment—excision of the compressive masses with consecutive releasing of the nerves with very good clinical results in terms of symptom remission and functional recovery.
In conclusion, after a preoperative imagistic analysis, tumor resection with careful microsurgical dissection in order to preserve the neurovascular structures is the elective surgical procedure in order to obtain an optimal functional outcome.

Keywords: -
Biomechanical effects of ulnar styloid fracture repair techniques on distal radio-ulnar joint stability

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Objectives / Interrogation: Ulnar styloid fractures (USF) accompany up to 65% of distal radius fractures; however, the cases in which fixation of an USF are indicated is not conclusively defined. Approximately 10% of USF fractures are addressed surgically but there is no consensus as to the optimum fixation technique to restore stability. Therefore the objective of this study was to compare the pronosupination and the dorso-palmar (DP) translational stability of the distal radioulnar joint (DRUJ) following the repair of USF using four different surgical techniques.

Methods: 9 forearm specimens (1 male; mean age 64.0) were mounted on a custom jig, preserving the interosseous membrane, extensor carpi ulnaris, pronator quadratus, and TFCC. The positional change of the DRUJ was recorded with a MicroScribe. 1Nm torque was applied to measure Pronosupination. DP-translation was measured in neutral, full pronation and 90° supination with 15 N. Six sequential conditions were tested in the same specimen: intact, USF including the fovea and 4 repair techniques (2 K-wire, tension band wiring (TBW), headless compression screw (HCS), and suture anchor).

Results and Conclusions: The pronosupination increased significantly after the foveal fracture from an average of 202.5° for intact to 219.4° (p<0.001) and the DP-Translation in neutral from an average of 8.1mm for intact to 10.5mm (p<0.001). The DP-translation in neutral was reduced significantly with all 4 techniques (range: 7.2-8.9mm; K-wire p=0.006; the other techniques p<0.001). In supination the TBW and suture anchor significantly decreased DP Translation. In neutral rotation the TBW and suture anchor reduced the DP translation even below the intact condition. Only the K-wire fixation (215.1°; p=0.118) and the TBW (to 212.2°; p=0.657) restored the rotation to the intact condition.

All four ulnar styloid fracture repair techniques were effective in restoring DP translation in neutral rotation; however, only K-wire fixation and TBW techniques restored rotational stability. The TBW technique may be biomechanically superior to the other techniques as it was able to restore translational stability in different forearm rotations and also rotational stability.

Keywords: ulnar styloid; fracture; repair; stability; DRUJ
Abstract no.: IFSSH19-1454

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CONNECT: CONduit Nerve approximation versus Neurorrhaphy Evaluation of Clinical outcome Trial

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Objectives / Interrogation: The gold standard treatment for a complete traumatic peripheral nerve lesion involves direct end-to-end microsurgical repair. Repair with higher magnification improve the macroscopic appearance and the potential for improved neurological regeneration. Conduits are established for bridging small gaps in peripheral nerves to avoid interposition grafts or suture with tension. The objective of this study is to evaluate the recovery following repair of digital nerves within the hand treated with direct microsurgical suture, suture with nerve conduits augmentation or nerve conduits apposition with remote suture distal to the injury site

Methods: A multi centre randomised controlled trial with three parallel groups and blinding of patient and assessing hand therapist will be conducted at a tertiary referral centre for the management of hand and peripheral nerve injuries in the UK. The study will enrol participants with traumatic injuries to the digital or common digital nerves within the hand and randomisation in a 1:1:1 ratio for each nerve injury. They will be stratified according to the age group. The power analysis estimates 62 nerves recruited to each group to demonstrate equivalence. 240 nerves will be recruited to allow a drop out of 30% with the modified Weber scale as a primary outcome measure of sensory recovery using static and moving two point discrimination at 12 months

Results and Conclusions: We present the data and results from our trial that has been recruiting since August 2017 of over 50 patients. The challenges that are faced in running the trial and also our experience in setting up multi-centre randomised controlled trials at the Birmingham Hand Centre

Keywords:
nerve repair, digital nerve, nerve, polyganics, conduit
Arthroscopically assisted bone grafting reduces time to healing of scaphoid non-unions compared to percutaneous screw fixation alone

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Objectives / Interrogation: Recently, minimally invasive techniques have been recommended in the treatment of stable scaphoid non-unions regardless of the presence of cystic formations or small contact area. The purpose of this study was to determine whether arthroscopically assisted bone grafting gave superior results in healing as compared to percutaneous screw fixation alone.

Methods: 164 consecutive patients with scaphoid non-unions were retrospectively analyzed. 148 patients were treated with the open grafting either with iliac bone or from distal radius, leaving 16 patients treated with minimally invasive techniques. The Mini Acutrac headless fully threaded compression screw system of Acumed, (Hillsboro, Oregon, USA) was used in all cases. Healing was assessed clinically and radiographically at a minimum follow-up of 12 weeks (range 4-56 weeks). In the group treated percutaneously (n=8), the median time from injury to operative treatment was 2,3 months (range 2 - 4 months) and it was 27,3 months (range 3-180 months) in the group treated arthroscopically (n=8). All patients were male except one female in the percutaneous group. The mean age was 42,5 years in the group treated percutaneously, 22 years in the arthroscopically treated group, (range 20-66) and (range 16-32), respectively. Data were calculated with two-tailed Mann-Whitney U test based on associated p-value of p<0.05 which was considered statistically significant. All patients were investigated with the CT scan to distinguish any humpback deformity of the scaphoid bone which also was the exclusion criteria. Postoperative CT scan were performed only in cases where radiographs did not show progressive healing to avoid unnecessary exposure to radiation. The postoperative regime was identical in both groups.

Results and Conclusions: We recorded no complications in any of the groups. All patients treated arthroscopically received cancellous bone grafting from the distal radius. They healed at median of 7,8 weeks (range 5-18). 7 patients in the percutaneous group healed at mean of 10,8 weeks (range 7-24). Mann Whitney U test showed the u value of 11, the critical value of U to be 13 (p<0.05).
Arthroscopically treated patients achieved significantly faster healing, despite significantly longer time from injury to surgery. Local bone grafting is considered as the main reason for this outcome. Younger population in the arthroscopically treated group may have influenced the result. A larger, randomised trial between different treatment methods is desirable.

Keywords:
scaphoid non-union, arthroscopically assisted grafting of the scaphoid non-union, percutaneous treatment of the scaphoid nonunion
Thumb Duplication Classifications - Still Need Improvement?

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Objectives / Interrogation: Thumb duplication is seen 0.8-1.4 per 1000 live births in Caucasians and Asian countries. Wassel system is the most frequently used for the classification of the deformity. Wassel type IV is most frequently seen followed by type II and type VII, respectively. However, some modifications have been made additionally because of Wassel classification system is insufficient in anatomically complex cases. Rotterdam classification system combining Wassel system and Buck-Gramcko and Behren's intercarpal modification is proposed to indicate different complex deformities such as triphalangism and triplication. We aimed to compare these two classification systems in our thumb duplication cases.

Methods: Fifty patients with thumb duplications who were admitted to our hospital were evaluated with posteroanterior and lateral x-rays according to Wassel and Rotterdam classification systems. 29 patients were male, duplication was present in right hand in 28, in left hand in 21, and in both hands in a patient.

Results and Conclusions: According to Wassel classification system, type IV, type VI, type VII, type V, type III, and type II duplication was found in 27, three, five, two, four, and five patients respectively. Five patients could not be classified. 13 patients were type IVD, 11 patients were type IV H, three patients were type II, three patients were type III, two patients were type VI, seven patients had triphalangism, and three patients could not be classified.

Keywords: thumb duplication, Wassel classification, Rotterdam classification
Does Reconstruction of Proximal Pole Scaphoid Nonunions With Hamate Autograft Restore Carpal Kinematics?

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2 Mayo Clinic (Rochester)

Objectives / Interrogation: The purpose of the current study was to determine whether proximal pole scaphoid nonunion reconstruction with hamate autograft restore carpal kinematics.

Methods: Eight fresh-frozen cadaveric wrists underwent evaluation of their radiocarpal and midcarpal kinematics within the intact state, after fracture of the proximal pole of the scaphoid and after reconstruction of the proximal pole with a hamate autograft. A wrist stimulator was used to apply cyclical load to the flexor carpi ulnaris, flexor carpi radialis, extensor carpi ulnaris, extensor carpi radialis brevis and longus. Kinematic motion was captured using Moiré Phase Tracking 3-dimensional motion-tracking sensors to evaluate the radiolunate, radioscaphoid, scapholunate and lunocapitate angles for each condition.

Results and Conclusions: Proximal hamate reconstruction of the proximal pole after scaphoid fracture significantly improved wrist kinematics ($p<0.05$). During wrist flexion-extension, hamate to scaphoid reconstruction significantly corrected the abnormal motion of the scaphoid relative to the lunate in the coronal plane ($p<0.05$ (Figure 1)). During radio-ulnar deviation, the hamate reconstruction corrected the abnormal scaphoid kinematics to the lunate in the sagittal plane ($p<0.05$) (Figure 2).

Conclusion
After proximal pole scaphoid nonunion, reconstruction with a proximal hamate autograft improves wrist kinematics towards the native intact state.

Keywords:
scaphoid fracture; Scaphoid nonunion; hamate graft; wrist biomechanics
Three-dimensional planning of corrective osteotomies for paediatric malunited diaphyseal forearm fractures: do we achieve the desired functional gain and the planned correction?

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² Reinier de Graaf Gasthuis (Delft)
³ KU Leuven (Leuven)

Objectives / Interrogation: Conservative treatment of both-bone forearm fractures in children can result in a malunion with impairment in pronosupination. Three-dimensional (3D) planned corrective osteotomy has been described as a promising technique for accurate reconstruction of these malunions. The objective of this study is to evaluate the functional outcome and accuracy of the achieved correction after 3D-planned corrective osteotomies for malunited diaphyseal both-bone forearm fractures in children.

Methods: Patients with paediatric malunited diaphyseal both-bone forearm fractures underwent 3D-planned corrective osteotomy. Inclusion criteria were a paediatric both-bone forearm malunion with a pro- or supination of <50°, unsatisfactory improvement after conservative treatment and a minimum age of 10 years. Exclusion criteria was an osseous deformity of the contralateral forearm. A 3D-planned corrective osteotomy was performed according to the following steps: (1) CT scans of both forearms are obtained; (2) the location and degree of deformity is determined by overlaying a virtual model of the malunited bones on a mirrored version of the healthy contralateral side; (3) virtual cutting planes are set to best match the contralateral side; (4) patient-specific guides are 3D-printed and used during surgery. Our primary outcome measure was the gain in pronosupination at 12 months follow-up. Our secondary outcome measure was the accuracy of the achieved correction on CT relative to the preoperative plan.

Results and Conclusions: Six participants underwent 3D-planned corrective osteotomies for paediatric malunited both-bone forearm fractures. There was a median age at trauma of 9 and a median age at osteotomy of 14 years. Pre-operatively there was a mean pronosupination of 66° compared to 150° of the contralateral side, a deficit of 66%. At 12 months follow-up there was a pronosupination of 118°, a remaining deficit of 21% compared to the contralateral side. An anatomical correction in coronal, sagittal and axial direction was achieved in 10 out of the 12 operated forearm bones, as confirmed by CT. There was one case of overcorrection of the radius (9° dorsally) and one case of overcorrection of the ulna (5° radially, 4° dorsally).

This prospective study demonstrates that 3D-planned corrective osteotomy for paediatric malunited diaphyseal both-bone forearm fractures provides an accurate correction and leads to a reliable improvement in pronosupination.

Keywords:
corrective osteotomy, paediatric, radius, forearm
Metabolic Syndrome is an Independent Predictor of Unplanned Re-Operation After Operative Fixation of Forearm Fractures

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Objectives / Interrogation: Metabolic syndrome is increasing in prevalence in the United States and around the world, producing an enlarging burden on healthcare systems. Previously defined by a simplified, 3-comorbidity index consisting of hypertension, diabetes, and obesity (BMI>30), metabolic syndrome has been shown to be predictive of adverse outcomes after a variety of orthopaedic surgeries. To date, there is no analysis of a nationwide database assessing the impact of metabolic syndrome on outcomes after operative treatment of forearm fractures.

Methods: The 2005-2014 National Quality Improvement Program Database (NSQIP) was retrospectively queried for patients undergoing operative fixation of radial and/or ulnar fractures based on 31 current procedural terminology (CPT) codes. Open and closed treatments were included. Primary outcome was unplanned readmission after surgery. Univariate analysis was conducted on comorbidities with Pearson's Chi Square. Binary logistic regression was performed with significant comorbidities and demographics.

Results and Conclusions: A total of 21,082 patients were included in our analysis. Approximately 30% of patients were of age 65 or older, and the majority were Caucasian. Metabolic syndrome was present in 616 (2.9%) of patients, and unplanned reoperation occurred in 303 (1.4%) of cases. Mortality rate was 0.4% (86 patients).

| Table 1: Descriptive Data for NSQIP Forearm Fracture Repair 2005-2016 |
|-----------------------------|---------------------|-------|
| Age >65                      | 6,249 (29.6%)       |
| Female                       | 14,392 (68.3%)      |
| Race                         |                     |
| Caucasian                    | 14,118 (67%)        |
| African American             | 916 (4.3%)          |
| Hispanic                     | 959 (4.5%)          |
| Open Treatment               | 20,624 (97.8%)      |
| Unplanned Reoperation        | 303 (1.4%)          |
| Metabolic Syndrome           | 616 (2.9%)          |
| Mortality                    | 86 (0.4%)           |

| Table 2: Chi Square Results of Predictors of Unplanned Re-operation After Forearm Fracture Surgery |
|-----------------------------|---------------------|-------|
| Predictor                    | Frequency (%) | P Value |
| Systemic Sepsis              | 335 (1.7%)      | <0.01 |
| Impaired Functional Status   | 494 (2.6%)      | <0.01 |
| Open Wound                   | 644 (3.4%)      | <0.01 |
| Bleeding Disorder            | 321 (3.4%)      | 0.02  |
| Pre-operative Transfusion    | 81 (0.4%)       | <0.01 |
| On Dialysis                  | 72 (0.4%)       | <0.01 |
| Dyspnea                      | 566 (2.9%)      | 0.04  |
| COPD                         | 752 (3.9%)      | <0.01 |

*CHRONIC OBSTRUCTIVE PULMONARY DISEASE
Predictors of Unplanned Re-operation After Forearm Fracture Surgery

<table>
<thead>
<tr>
<th>Predictor</th>
<th>P Value</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age &gt; 65 years old</td>
<td>0.91</td>
<td>1.03 (0.64-1.64)</td>
</tr>
<tr>
<td>Female</td>
<td>0.06</td>
<td>0.65 (0.41-1.01)</td>
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<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>0.82</td>
<td>0.95 (0.59-1.51)</td>
</tr>
<tr>
<td>African American</td>
<td>0.44</td>
<td>0.57 (0.13-2.43)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.05*</td>
<td>0.24 (0.05-1.02)</td>
</tr>
<tr>
<td>Metabolic Syndrome</td>
<td>0.01*</td>
<td>2.95 (1.38-6.32)</td>
</tr>
<tr>
<td>Open Treatment</td>
<td>0.03*</td>
<td>0.4 (0.18-0.91)</td>
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<td>Bleeding Disorder</td>
<td>0.98</td>
<td>0.99 (0.39-2.49)</td>
</tr>
<tr>
<td>Preoperative Transfusion</td>
<td>0.02*</td>
<td>5.32 (1.3-21.69)</td>
</tr>
<tr>
<td>Systemic Sepsis</td>
<td>0.18</td>
<td>2.00 (0.73-5.43)</td>
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<tr>
<td>Open Wound</td>
<td>0.78</td>
<td>1.13 (0.47-2.7)</td>
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<tr>
<td>On Dialysis</td>
<td>0.11</td>
<td>4.06 (0.71-23.08)</td>
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<tr>
<td>Impaired Functional Status</td>
<td>0.08</td>
<td>2.09 (0.92-4.76)</td>
</tr>
<tr>
<td>COPD(^a)</td>
<td>&lt;0.01*</td>
<td>3.11 (1.54-6.24)</td>
</tr>
<tr>
<td>Dyspnea</td>
<td>0.85</td>
<td>0.92 (0.37-2.29)</td>
</tr>
</tbody>
</table>

\(^a\)COPD Chronic Obstructive Pulmonary Disease

* significance defined as p<0.05

Patients in our cohort with metabolic syndrome undergoing operative fixation of radial or ulnar fractures have 2.95 increased odds of having an unplanned reoperation. Metabolic syndrome is an independent risk factor for adverse outcomes after surgery and presents an increasing burden on healthcare systems worldwide.

Keywords:
Metabolic Syndrome, Forearm, Fracture, NSQIP
Bilateral Endoscopic Carpal Tunnel Release versus unilateral carpal tunnel release

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Objectives / Interrogation: Evaluate functional outcome in patients treated by mini Open Carpal Tunnel Release (mOCTR) and Endoscopic Carpal Tunnel Release (ECTR, one portal Agee technique, Microaire®) with Bilateral Endoscopic Carpal Tunnel Release (BECTR)

Methods: Patients with CTS seen between in our Hospital with failure of conservative treatment and confirmation with electrodiagnostic studies were operated by mOCTR or ECTR and BECTR. Boston score and grip strength, were evaluated at pre op, and 2 and 12 weeks. Patients with previous carpal tunnel surgery, acute CTS and with concomitant hand pathology that needed surgery were excluded. Approval of the hospital ethics committee was obtained for this study. Statistical analysis was done with programs IBM SPSS Statistic version 20 and STATA and the Friedman Test for the analysis for Boston Carpal Tunnel Questionaire (BCTQ), and Wilcoxon Test to compare between techniques.

Results and Conclusions: in this retrospective non randomized study, a total of 63 patients meet the inclusion criteria (BECTR 12, ECTR 29, OCTR 21 in each group). Demographics of both group were comparable. Boston score were similar in the pre op evaluation in all groups and at the 2 weeks control decrease in almost the same way with no statistical difference between groups using the Wilcoxon rank sum test (p=0.19, p=0.18). At 12 weeks, we found statistical difference between group with a better outcome in the BCTQ for the Endoscopic techniques. Grip strength had a similar behaviour in all groups, having diminished than preop at 2 weeks evaluation. At 12 weeks all groups had better strength than 2 weeks and pre op. No significant differences were established between groups. Conclusion: no difference between de BECTR and ECTR or OCTR after surgery, which it's beneficial in patients with indication for surgery in both hands in terms of Operating Room, sick leave and costs for the BECTR Group vs the staged procedures (ECTR and OCTR).

Keywords:
Bilateral Endoscopic Carpal Tunnel
Anatomy, frequency and distribution pattern of plantar fibromatosis (Ledderhose's disease)

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Objectives / Interrogation: The distribution pattern of the palpable nodes on the sole of the foot was documented in 174 patients with Ledderhose disease and the concomitant diseases from Dupuytren diathesis were recorded. After years of collection, the evaluation should be made.

Methods: Most of the patients were requisitioned by the Dupuytren contracture on the hand. The sole of the foot was divided into 25 zones and the tactile knots were drawn and photographed. Any contractures on the toes were also recorded. The first appearance on the foot, on the hand, Garrod's knot and Peyroni's disease, Grade of the disease in the hand and foot were documented.

Results and Conclusions: The frequency of Ledderhose disease in patients undergoing Dupuytren surgery is 12.3%. Only a few patients (11) had no signs of Dupuytren's disease. The central zones of the 1st and 2nd toes are by far the most frequently affected. An infestation of the toes was found only in 3 patients - without contractures. Garrod's knots were found in twenty-six patients. Only 1 patient was simultaneously treated urologically with Peyronie's disease. Only 10 patients were operated on due to disturbing large nodes on the foot. The postoperative recovery time is long, so that an indication for surgery is only made in exceptional cases.

Though the anatomy of the plantar aponeurosis has a lot of similarities to the palmar aponeurosis, the distribution of the affected parts differs a lot.

Keywords:
Dupuytren Ledderhose distribution frequency diathesis
Open Reduction and Internal Fixation with Headless Compression Screws for Coronal Shear Fractures Dubberley Type 3. Outcomes at a Mean Follow-up of 7 Years.

List of authors:
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Objectives / Interrogation: Background: To evaluate the sustainability of the early clinical and radiological outcomes of a series of patients with Dubberley type 3 fractures of the distal humerus at long-term follow-up.

Methods: Methods: Twelve consecutive patients with capitellum and trochlear fractures who underwent to open reduction and internal fixation using headless compression screws with minimum of 6 years of follow-up were evaluated. Functional and radiological outcomes at one year and final follow-up were compared. We assessed Mayo Elbow Performance Score (MEPS), Quick-Disability of the Arm Shoulder and Hand (Q-DASH) and modified-American Shoulder and Elbow Surgeons Scores (m-ASES). Radiological evaluation included Broberg and Morrey classification and Hastings classification for heterotopic ossification.

Results and Conclusions: Results: The mean age of patients was 70 years, with a median follow-up was 7 years. At final evaluation, mean flexion, extension, supination and pronation were 127°, 20°, 87° and 90°, respectively; mean MEPS, m-ASES and Q-DASH scores were respectively 92, 95, and 5 points. There was no statistical difference between early and final follow-up range of motion, MEPS and Q-DASH. However, radiological changes were observed in 75% of the patients at final follow-up. Five patients underwent reoperation and one of them required revision with a total elbow prosthesis.

Conclusion: Our results suggested that satisfactory clinical outcomes at early follow-up could be maintained over time. However, a high early reoperation rate and osteoarthritic changes at long-

Keywords:
Arthroscopy in thumb carpometacarpal joint osteoarthritis.

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² Rehasport Clinic (Poznan)
³ Poznan Hand Surgery Department (Poznan)

Objectives / Interrogation: Degenerative changes in the wrist and metacarpophalangeal joint (CMC I) are a very common degenerative joint (OA) disease, especially of women. If conservative treatment has not been successful, surgical treatment is recommended.

CMC I arthroscopy allows for easy diagnostics, classification, and treatment of OA.

Methods: 17 patients (16 K, 1 M, mean age 59) with diagnosed OA of CMC, who underwent arthroscopy in 2011-2015. The treatment included -synovectomy, debridement of the articular surfaces, in 4 cases micro-fractures were performed, one patient required APL interposition additionally. Clinical evaluation before and after surgery of the patients included pain scales according to VAS, evaluation of the thumb function, (satisfaction), provocative tests, X-ray.

Results and Conclusions: There were no indications for reoperation. In earlier observations, there was a reduction of pain (before surgery: 5 severe pain, 12 very severe pain after 5 pain and moderate pain 12) and improvement of the thumb function where patients reported a significant dysfunction before surgery. The provocative tests were evaluated and improved. No complications or revision/reoperation were reported.

Conclusions
Arthroscopy of the CMC I joint allows more accurate diagnostics and effective and minimally invasive treatment of degenerative changes.

Keywords:
CMC joint, OA, arthroscopy, synovectomy, micro-fracture
Labral Tape suture as an Internal Brace Augmentation for a subacute scapholunate injuries

List of authors:
Laura Velasco-González*, Marta Almenara-Fernández¹, Sara Wahab-Zuriarrain¹, Claudia Lamas-Gómez¹
¹Hospital de la Santa Creu i Sant Pau (Barcelona)

Objectives / Interrogation: Scapholunate (SL) injuries are the most common intercarpal ligament injury according to severity as predynamic, dynamic, static reductible, static irreductible or arthritic.
There is a new technique that incorporates a combination of a biologic tendon graft and a ligament augmentation repair.
The aim of our study is to describe our results using the all dorsal SL reconstruction with this new technique.

Methods: We included two cases of a subacute SL injuries. There were two men with ages of 39 and 42 years-old respectively.
We explore the patients and did x-rays and a Magnetic Resonance Imaging (MRI) to confirm the diagnosis.
Ligament reconstruction was performed using two 3,5x8,5mm Dx Swive Lock SL suture anchors, a 2mm wide extensor carpi radialis brevis (ECRB) tendon autograft and Labral Tape suture as an Internal Brace augmentation. The strenght of the repair was testes intraoperatively.
The minimun follow-up was 12 months.

Results and Conclusions: Patients had pain with the activities but they had not constant pain. Visual analog scale was 2. The range of motion decreased in the two cases. The mean postoperative wrist extension was 65º, flexion 60º, radial desviation 15º and ulnar desviation 12º. In both patients grip strength decreased if we compare with the contralateral side. Postoperative x-rays and MRI showed a SL gap of 4mm in one patient and 5 mm in the other.
In our cases we restore the correct motion of the wrist without pain at rest and with daily activities. Nevertheless, there is still a SL gap despite the strenght of the repair was correctly tested intraoperatively. Although our study is preliminary and there are few patients, we can not say that this new technique can perfectly correct, as in other ligaments located in the shoulder the scapholunate junction.

Keywords:
Scapholunate injuries, Labral Tape suture, intercarpal ligament injury

List of authors:
KONSTANTINOS TOLIS*, Aliki Kotsilini¹, Panagiotis Kanellos¹, Sarantis Spyridonos¹
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Objectives / Interrogation: Closed carpal dislocations are complex rare injuries, usually a result of a fall on the outstretched hand. Active youngsters are mostly affected, amongst which adolescents are rarely mentioned in the literature. We present a rare case of a fracture dislocation in a 14 year old female adolescent, treated with primary lunocapitate arthrodesis

Methods: A 14 year old female patient was evaluated at the emergency department after sustained a fall in a motorcycle accident, 6 hours before administration. The patient reported pain and inability to complete any motion of the left carpus, immediately after the fall. During clinical examination extended edema of the carpus and weak grip was documented. No neurovascular deficit was documented. On plain radiographs a perilunate volar dislocation was demonstrated. Computed Tomography (CT) was unavailable at the time and the young patient was moved to the operation room. Under tourniquet and brachial block anesthesia a dorsal incision through the 3rd and 4th extensor compartment was performed. Lunate was identified volarly and reduced. Due to extensive bone loss of the lunate, it was decided to perform a primary lunocapitate arthrodesis, with the use of K-wires. Ligaments were reconstructed using absorbable sutures and anchors. A volar plaster cast was used for rest and immobilization

Results and Conclusions: Results: K-wires and the plaster cast were removed 6 weeks after surgical operation. The young patient started intense, but gradual physiotherapy. At 3 years follow up the patient had an almost painless wrist with 450 volar and 450 dorsal wrist flexion, early primary carpal arthritis and complete pinch and grip strength, compared to the healthy one.

Conclusion: A closed volar perilunate fracture dislocation is a rare and complex injury. Anatomical reduction and partial fusion of the wrist is an option, when the reduced lunate is anatomical unaffected. In cases where bone loss is adequate, a primary lunocapitate arthrodesis is a satisfying treatment, so as to prevent against future collapse of the wrist. Although bibliography lacks treatment options in adolescents, we believe it can be performed with safety, minimal chances for pseudarthrosis and fair results, as far as wrist kinematics are concerned.

Keywords:
fracture dislocation, lunate, arthrodesis, adolescent, carpus
Frailty is a Predictor of Unplanned Reoperation in Management of Forearm Fracture

List of authors:
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¹ Rutgers New Jersey Medical School (Newark, New Jersey)

Objectives / Interrogation: Frailty is an important predictor of surgical outcomes. It has been quantified by several models, including the modified frailty index (mFI), which has demonstrated applicability in many surgical subspecialties. We aim to conduct the first decade-long retrospective analysis of frailty and unplanned reoperations after forearm fractures.

Methods: We used the American College of Surgeons National Surgical Quality Improvement Program (NSQIP) database 2005-2014 to identify closed radial and/or ulnar fractures using ICD-9 and ICD-10 codes. The mFI was calculated based on the presence or absence of 15 possible comorbid conditions. Our primary outcome was unplanned reoperation. Chi square and multivariate logistic regressions were used to identify significant predictors of outcomes.

Results and Conclusions:

<table>
<thead>
<tr>
<th>Table 1: Descriptive Data and Chi squared results.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
</tr>
<tr>
<td>Under 40                          1,503 (15.4%)</td>
</tr>
<tr>
<td>41-60                                2,387 (24.5%)</td>
</tr>
<tr>
<td>61-80                                2,393 (24.5%)</td>
</tr>
<tr>
<td>&gt;81                                  536 (5.5%)</td>
</tr>
<tr>
<td><strong>Female</strong></td>
</tr>
<tr>
<td>6649 (68.2%)</td>
</tr>
<tr>
<td><strong>Race</strong></td>
</tr>
<tr>
<td>Caucasian                             6,375 (65.4%)</td>
</tr>
<tr>
<td>African American                      379 (3.9%)</td>
</tr>
<tr>
<td>Other                                 1,259 (12.9%)</td>
</tr>
<tr>
<td><strong>Unplanned Re-operation</strong></td>
</tr>
<tr>
<td>98 (1%)</td>
</tr>
<tr>
<td><strong>mFI &gt;3</strong></td>
</tr>
<tr>
<td>0.35</td>
</tr>
<tr>
<td><strong>Preoperative blood transfusion</strong></td>
</tr>
<tr>
<td>&lt;0.01</td>
</tr>
<tr>
<td><strong>Systemic Sepsis</strong></td>
</tr>
<tr>
<td>&lt;0.01</td>
</tr>
<tr>
<td><strong>Dialysis</strong></td>
</tr>
<tr>
<td>&lt;0.01</td>
</tr>
<tr>
<td><strong>Metabolic Syndrome</strong></td>
</tr>
<tr>
<td>0.044</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2: NSQIP Variables to Calculate mFI¹</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COPD</strong> or recent pneumonia</td>
</tr>
<tr>
<td><strong>Myocardial infarction</strong></td>
</tr>
<tr>
<td><strong>Congestive heart failure</strong></td>
</tr>
<tr>
<td><strong>Angina, previous coronary intervention, or previous coronary surgery</strong></td>
</tr>
<tr>
<td><strong>Diabetes mellitus</strong></td>
</tr>
<tr>
<td><strong>Transient ischemic attack or cerebrovascular accident</strong></td>
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<tr>
<td><strong>Cerebrovascular accident with neurological deficit</strong></td>
</tr>
<tr>
<td><strong>Hypertension requiring medication</strong></td>
</tr>
<tr>
<td><strong>Functional status (totally or partially dependent)</strong></td>
</tr>
<tr>
<td><strong>Impaired sensorium</strong></td>
</tr>
<tr>
<td><strong>Peripheral vascular disease or ischemic rest pain</strong></td>
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</tbody>
</table>

* = National Surgical Quality Improvement Program
a = modified frailty index
b = chronic obstructive pulmonary disease
**Predictors of Unplanned Reoperation after Forearm Fractures**

<table>
<thead>
<tr>
<th>Variable</th>
<th>P value</th>
<th>OR (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under 40</td>
<td>0.88</td>
<td>0.91 (0.25-3.25)</td>
</tr>
<tr>
<td>41-60</td>
<td>0.78</td>
<td>1.17 (0.38-3.61)</td>
</tr>
<tr>
<td>61-80</td>
<td>0.64</td>
<td>1.3 (0.44-3.84)</td>
</tr>
<tr>
<td>Female</td>
<td>0.48</td>
<td>0.79 (0.42-1.51)</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>0.25</td>
<td>1.73 (0.68-4.43)</td>
</tr>
<tr>
<td>African American</td>
<td>0.75</td>
<td>1.31 (0.25-6.95)</td>
</tr>
<tr>
<td>mFI(^a) ≥3</td>
<td><strong>0.03</strong></td>
<td><strong>3.77 (1.17-12.14)</strong></td>
</tr>
<tr>
<td>Preoperative blood transfusion</td>
<td>1</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Systemic Sepsis</td>
<td>0.01</td>
<td>5.52 (1.61-18.94)</td>
</tr>
<tr>
<td>Dialysis</td>
<td>0.36</td>
<td>2.83 (0.3-26.67)</td>
</tr>
<tr>
<td>Metabolic Syndrome</td>
<td>0.45</td>
<td>1.32 (0.65-2.7)</td>
</tr>
</tbody>
</table>

\(^a\) modified frailty index

**Table 3: Predictors of Unplanned Reoperation after Forearm Fractures**

**Predictors of Unplanned Re-operation After Forearm Fracture Surgery**

Our study analyzed the relationship of frailty and postoperative complications in patients with forearm fractures. With a frailty score of 3 or greater, patients had increased odds of having an unplanned reoperation, independent of other comorbidities and demographic factors.

**Keywords:**
Frailty, Forearm Fractures, mFI, NSQIP
Total arthroplasty in the treatment of previous infection of the elbow. Two-stage surgery

List of authors:
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Objectives / Interrogation: The total replacement after a previous infection is a procedure well reported in some articulations like hip and knee; but it is not overly reported in the elbow. The infection is a difficult condition that can be associated with bad results. The two-stage surgery with an antibiotic cement spacer and a Total Elbow Arthroplasty can be a good option of treatment.
The aim of this study is to report the results of an infected elbow treated in a two-stage surgery with a total elbow arthroplasty.

Methods: We report 6 patients with a prior infection of the elbow, treated with the same procedure. First stage: debridement of the infected tissue and introduction of the antibiotic cement spacer, and reconstruction, in a second stage, with a Total Elbow Arthroplasty.
Three were women and 3 men with a mean age of 62 years old (35-80). The causes of the infection were: 1 psoriatic arthritis, 1 reumatoid arthritis, 1 chronic elbow dislocation, 1 Total Elbow Arthroplasty and 2 distal humerus fractures. All the spacers were impregnated with vancomycin.
The most commonly isolated germ was staphylococcus epidermidis. The second stage was performed at an average of 82 days. The Conrad-Morrey prosthesis was used in all cases. Allografts were used in 4 of the cases. The number of previous surgeries was 1,8 (1-8). Mean pain according to VAS was 6,5. Mean DASH was 43. Average follow-up was 83 months (30-120)

Results and Conclusions: Flexo-extension was 133-22°. Pain was 2 (0-4) and DASH 31. MEPS was 86. The strength of extension was M5 in 3, M3 in two and M4 in one. Two complications were present, 1 ulnar nerve paresthesia and 1 earlier decoupling of the peg.
All patients presented normal laboratory parameters and no reactivation of the infection was reported. According to Morrey classification 3 patients had no loosening of the implant, one type 1, one type 2 and one type.
The two-stage procedure for the reconstruction of the elbow with a Total Elbow Arthroplasty in the context of a previous infection is a good option of treatment with no reactivation of the infection at an average of 7 years of follow-up.

Keywords:
Management of avascular necrosis of the carpal bones- a clinical study

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Objectives / Interrogation: Avascular necrosis of the carpal bones is a relatively rare condition of the wrist and can be divided into degenerative and post-traumatic. Post-traumatic necrosis is very common after neglected fractures or dislocations of the scaphoid or the lunate. Our aim was to create local protocols based on results and patient's satisfaction. We also present clinical cases and compare different techniques, complex or simple.

Methods: We present a prospective study that included 16 patients with carpal bone necrosis. We divided the patients into degenerative and post-traumatic necrosis and the surgical interventions were represented by reconstructive procedures such as: vascularized (free and local) or non-vascularized bone grafts, salvage procedures or even modern replacement implants. Distal radius and medial femoral condyle were most common donor places.

Results and Conclusions: Reconstructive procedures was found in 14 patients without a second intervention. Two patients needed a secondary intervention and the final results were satisfying. The wrist range of motion was improved in all the patients with reconstructions and the pain was significantly decreased or totally gone.

The avascular necrosis of the carpal bones can be very challenging and the indications have to be really precise. Reconstruction of the wrist is sometimes technically demanding surgery and the rehabilitation of the patients can be prolonged and difficult. If a standard protocol is used for all the patients, the results will significantly improve and the patient's satisfaction too. Replacement implants are technical demanding procedures but also promising due to its bone-like properties.

Keywords:
carpal necrosis, bone grafting, scaphoid, microsurgical reconstruction, implants
Case Report: Acute calcific periarthritis of metacarpophalangeal Joint presented with acute pain and swelling.

List of authors:
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Objectives / Interrogation: Acute calcific periarthritis is a subset of acute calcium deposition disease which is characterised by the presence of calcium hydroxyapatite crystals in the periarticular soft tissues. It is frequently seen around shoulder joint and greater trochanter of the hip. Hand and wrist are rarely affected.

Methods: Case Report:
A 47-year-old right-handed lady presented with a 4-day history of worsening pain and swelling of her left ring finger metacarpophalangeal joint (MCPJ). She has no past medical history and reported no history of hand trauma. On examination, swelling and tenderness over A1 pulley were noticed with limited range of movement due to pain. There was no evidence flexor sheath infection. WCC, CRP and serum urate were all normal.

X-rays were requested and showed amorphous calcifications in relation to the left fourth MCPJ in keeping with acute calcific periarthritis. Symptoms settled after four days of resting splint, hand elevation and non-steroidal anti-inflammatory medications. Resolution of calcification was seen on follow-up x-rays eight weeks after onset of symptoms.

Results and Conclusions: Acute calcific periarthritis is idiopathic self-limited monoarticular periarticular inflammation which is characterised by sudden onset of pain and swelling. These painful periarticular calcifications were described by Painter CF in 1907. In 1938 Standstrom reported that of 329 cases with acute calcium deposits, only eight (2.4%) involved the hand and wrist.

Due to it is low incidence in the hand as well as its clinical resemblance of other acute presentations, many cases were reported to be misdiagnosed and, unnecessarily, treated aggressively with antibiotics and surgical intervention. Hand surgeons should be aware of this pathology and associated radiological signs in order to avoid unnecessary intervention.

Keywords:
acute calcific periarthritis, acute calcium deposits, hand
Syndactyly of the index and thumb, "functional limitation and frustration".

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Julián Hernández*, Iván Ramírez1, Ana Pineda3
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**Objectives / Interrogation:** To describe the case of a female patient with syndactyly of the index and thumb and its clinical repercussions and to contrast it with literature published

**Methods:** A literature review was made using Pubmed database between May to September 2018 using the key words Sindactyly, thumb, first commissural space, first digit, hand, thumb/physiology and English language restriction was used. Articles whose topic were syndactyly of the foot or acquired syndactyly were excluded. We searched for articles that included epidemiological data, physiology description of the thumb and index, emotional impact of the hand malformations and age and surgical technique indicated

**Results and Conclusions:** It was found that congenital syndactyly of the hand that compromises the first web space is the most infrequent and it has less female presentation. At functional aspect it generates inabilty to make thumb opposition and thus grip objects, also it causes deformities mainly on the index finger, and all of these difficulties cause sometimes anxiety and frustration in patients. The 12-month patient with syndactyly of the index and thumb presented the functional and emotional alterations found in the reviewed literature.

In the syndactyly of the hand and especially the one that compromises the digits at its edges, an adequate and timely surgical intervention is fundamental in order to avoid the functional and emotional consequences derived from this malformation.

**Keywords:**
Sindactyly, thumb, first commissural space, first digit, hand, thumb/physiology
Pedicled Vascularized Bone Graft Versus Induced Membrane Technique for Reconstruction of Forearm Medium Size Bone Defects

List of authors:
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² Sanatorio guemes (Buenos Aires)
³ Hospital San bernardo (Salta)
⁴ Practica Privada (Buenos Aires)

Objectives / Interrogation: Induced membrane technique has proven satisfactory results for reconstruction of infected nonunion. However, more complex techniques such as vascularized bone grafts (VBG), are usually indicated in the presence of prior graft failure or a poor soft tissue bed. The purpose of this study is to compare the clinical and radiological outcomes of a series of patients treated for ulnar nonunion with medium size bone defects. Patients were treated with either pedicled distal radius VBG, or induced membrane technique (IMT).

Methods: Twelve patients who underwent surgery for reconstruction of infected forearm nonunion with bone defects up to 6 centimeters (minimum follow-up, 2 years) were selected retrospectively. We excluded patients with bone defects smaller than 3cm or articular involvement. Seven patients underwent to distal radius pedicled VBG (group A) and five patients underwent to reconstruction with the induced membrane technique (group B). Mean follow-up was 34 months. The time between the original injury and the index procedure was 16 months (range, 11-20). The mean age was 42 years (range, 26-64). Patients were evaluated clinically and radiographically. The number of previous surgeries was recorded. Elbow and wrist range of motion, Visual Analogue Scale (VAS) for pain, the Quick-DASH questionnaire, and Mayo Elbow Performance Score (MEPS) were assessed. Complications and the need for reoperations were recorded.

Results and Conclusions: Results: All nonunion were healed at final follow-up. The average defect size was 5.3 centimeters (range, 4.2-6). The average number of previous surgeries in the VBG group was 4.2 (range, 3-7) and in the IMT group was 2.8 (range, 2-5). The average time to union was 3.8 months (range 3-6) for group A and 4.6 (range 4-6) for group B. Active ROM did not differ significantly between groups. Average Quick-DASH was 13, and average MEPS was 83. At the 2-year follow-up, there were no significant differences in the VAS pain score (1.3 in group A; 0.9 in group B). There were two complications. In the VBG group, one patient required implant removal and in the IMT group, one nonunion required autogenous iliac crest bone graft. Final results were satisfactory for both. No fracture or persistent donor site pain was observed in the VBG group.

In this limited series, both techniques showed favorable results, and could be considered surgical alternatives for the treatment of infected ulnar nonunion.

Pedicled VBG showed a shorter time to union when compare with induced membrane.

Keywords: -
Mid- and Longterm Results after Transosseous TFCC Refixation

List of authors:
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1 Department of Orthopedics and Trauma Surgery, Medical University of Vienna (Vienna)
2 Praxis für Handchirurgie (Marbach/Neckar)

Objectives / Interrogation: The Triangular Fibrocartilagious Complex (TFCC) is composed of the articular disc, the meniscus homologue, the ulnolunate and ulnotriquetral ligaments, the dorsal and palmar radioulnar ligaments (RUL) and the extensor carpi ulnaris (ECU) tendon sheat. The palmar and the dorsal ulnoradial ligament are considered the primary stabilizers of the distal radioulnar joint (DRUJ) during rotation. Lesions of the TFCC especially the ulnoradial ligaments may be the cause of ulnar sided wrist pain. Different surgical procedures addressing the instability problem with open, arthroscopic or arthroscopically assisted repair of the foveal attachment have been described. Short-term outcome reports of these methods indicate favorable results, but the long-term outcome remains to be reported. In the present study, we report the clinical mid- and long-term outcome of patients treated with arthroscopically-assisted transosseous reattachment of the deep TFCC insertion.

Methods: We included patients suffering from TFCC avulsions classified as Palmar type 1B with arthroscopically evaluated avulsion of the radio-ulnar ligaments who were treated with wrist arthroscopy and transosseous re-fixation of the TFCC between 2000 and 2009. Functional and clinical outcome of the patients were objectively measured with the Mayo Modified Wrist Score (MMWS), a Disabilities of the Arm, Shoulder and Hand (DASH) Score and a Patient Rated Wrist Examination (PRWE) score.

Results and Conclusions: We included 27 patients (18 female, 9 male) in this study. The first follow-up examination was at a mean of 25 months. All evaluated clinical measures significantly improved at first follow-up investigation compared to measures obtained preoperatively. At a mean of 84.5 months (range 32 - 128 months) the final follow-up examination was performed. Compared to preoperative measures, DASH score, mayo wrist score, and VAS remained significantly improved. Stability assessment showed a stable DRUJ in 17 patients (62.9%). In 9 patients (33.3%) moderate instability was assessed, while in 1 patient (3.7%) clear instability was observed. We did not observe differences in the MMWS and PRWE score between patients with stable, patients with moderate instability, and patients with unstable DRUJ. We found overall satisfying results at both evaluated time points with mainly excellent clinical outcome and high rates of patient satisfaction. Our results are comparable to short-term and mid-term outcome reported in literature.

Keywords:
TFCC, refixation, long-term Outcome
THE VALUE OF INITIAL RADIOGRAPHIC CHARACTERISTICS OF DISTAL RADIUS FRACTURE IN PREDICTION OF ASSOCIATED LESION OF TRIANGULAR FIBROCARTILAGE COMPLEX

List of authors:
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² University Surgery Clinic "St. Naum Ohridski" (Skopje, Macedonia)

Objectives / Interrogation: Our purpose was to determine the correlation of initial radiographic parameters of distal radius fracture with the presence of associated injury of the triangular fibrocartilage complex (TFCC).

Methods: In a prospective study, 85 patients with surgically treated distal radius fracture were included. Wrist arthroscopy was used to identify and classify TFCC lesions. Initial radial length and angulation, dorsal angulation, ulnar variance and distal radioulnar distance were measured.

Results and Conclusions: Wrist arthroscopy identified TFCC lesion in 45 patients. Statistical analysis did not identify a correlation of any single radiographic parameter of the distal radius fracture with the associated TFCC lesion, as well as the type of the TFCC lesion. In between the group with intact and the group with injured TFCC there was no significant difference of the initial radiographic characteristics of the distal radius fracture. The initial radiography of the distal radius fracture was not a significant predictor of associated TFCC injury.

Keywords:
Distal radius fracture, Triangular fibrocartilage complex, Wrist arthroscopy
VALIDITY OF THE "SCRATCH COLLAPSE TEST" FOR THE DIAGNOSIS OF THE CARPAL TUNNEL SYNDROME.

List of authors:
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1 Hand and Microsurgery, HM Montepríncipe (Madrid)
2 Hospital Clínico (Valladolid)
3 Hospital Infanta Leonor (Madrid)
4 Data Scientist, Geoblink (Madrid)
5 Hospital Infanta Leonor, Quirón Hospital (Madrid)

Objectives / Interrogation: Analyze the Scratch Collapse Test in an objective way, by replacing the subjective evaluation made by the physician with an objective evaluation measure, made with a digital dynamometer.

Methods: An observational study was carried out, in 90 patients divided into three groups. The first two groups were patients clinically and electromyographically diagnosed of carpal tunnel syndrome CTS (moderate and severe) and the third group, without CTS. The main variable to analyze is the external rotation strength. It was measured with a dynamometer. The purposes are: firstly describe if there were differences in the strength between the three attempts per patient of each group, and secondly analyzed if there were differences in the strength in the four different situations (no scratch test, scratch test in the carpal tunnel, dorsum of the wrist and shoulder).

Results and Conclusions: There were no discrepancy in the result of the scratch-collapse test in patients with moderate carpal tunnel. That existed in the result of the test in patients with severe carpal tunnel. But this statistical difference is only 0,08 kg, in the mean and this such a small difference is clinically undetectable; and in any case, it would be able to collapse the strength of external rotation.

Scratch Collapse Test is not a valid diagnostic exam if the strength is measure directly by the physician. A complete collapse of external rotation has not occur in any of the groups and a small loss of strength has been detected only in those patients with the highest grade of severity in carpal tunnel syndrome. If a physician wants to use this test for carpal tunnel, our advice is to measure the strength with a dynamometer.

Keywords: Scratch Collapse Test, objetive measure, carpal tunnel syndrome
HAND REANIMATION: FREE FUNCTIONAL GRACILIS VERSUS TRANSFER OF THE BICEPS TO THE LONG FLEXORS OF DIGITS AND THE FLEXOR POLLICIS LONGUS

List of authors:
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Objectives / Interrogation: Hand reanimation of the hand is still a challenge and in most cases of upper limb paralysis is the last treatment of reconstruction cascade. The objective of this study is to describe cases of patients without hand function and to compare functional results of cases of free functional gracilis transfer and cases of transfer of the recovered biceps to the long flexors of digits and the flexor pollicis longus

Methods: Results were evaluated and described with both techniques

Results and Conclusions: Case 1: male, 41 years, electric shock injury, SCIP flap for wrist contracture. Submitted to functional free gracilis for fingers flexors with neurotization with motor branch of the pronator teres Case 2: male, 38 years, total brachial plexus palsy, Submitted to free gracilis for elbow flexion and free gracilis for fingers flexors with intercostal nerve Case 3: male, 17 year, total brachial plexus palsy with absence of hand function recovery. Submitted to free gracilis for finger flexors. Case 4: female, 32 years total brachial palsy. Submitted to a lower trapezius transfer for external rotation. Transfer of the biceps to finger flexors with fascia lata graft Case 5: male, 38 years with total traumatic brachial plexus injury, submitted to shoulder arthrodesis and latter to biceps for fingers flexors with semitendinosus graft Case 6: female, 24 years patient with forearm avulsion work-related accident. Macro-replantation was performed and an Anterolateral thigh flap for skin necrosis. Submitted to biceps transfer for hand reanimation. The difficulty of resuscitation of the hand are known and still without definitive algorithm for treatment of these serious lesions. Initially, neurological reconstruction with nerve graft should be attempted when possible. In late cases, we perform functional free muscle transfers for hand reanimation when muscle transfers are not possible. However, the free transfer of functional muscle is a highly complex surgery with variable results in these cases hand reanimation. In 2009 Oberlin et al and Goubier and Teboul described the transfer of biceps for finger flexors. Similar results were obtained in our patients with both techniques, with fingers flexion for bimanual activities.

We consider the transfer of biceps for long finger flexors and flexor pollicis longus, a viable alternative for the treatment of patients without hand function, with reduced technical difficulties and surgical team when compared with free functional gracilis

Keywords:
Free muscle transfer, Functional outcome, Grip function, Biceps tendon transfer
Contribution of the integrity of the vincula tendinum in the delay of the repair of the flexor digitorum profundus tendon in zone II

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Objectives / Interrogation: Isolated laceration of the flexor digitorum profundus (FDP) tendon appears when the section is in zone I or and sometimes in zone II. In some cases, due to a delayed diagnosis or to a fail of the primary suture, the reparation is performed some weeks after the injury. In most of these cases, the intact vincular system prevents the retraction of the FDP tendon and this can be repaired as would be done in a primary repair. Finger in which the vincular system was not disrupted had greater final total active motion than had those without intact vincula. The objective of the study was to explain our experience and outcomes in the delayed treatment of the lacerations of the FDP tendon without tendon retraction due to the presence of the intact vincular system.

Methods: Between 2005 and 2016, 8 patients were operated with delay reparation of the FDP tendon without retraction of the same in zone II. The injury was diagnosed clinically and with MRI. The injury was localized in the proximal interphalangeal (PIP) joint in 5 cases and in middle phalanx in the other 3.
Surgery treatment and outcomes were analysed. Visual analog scale (VAS) scale, range of motion and Disabilities of the Arm, Shoulder and Hand (QuickDASH) score were evaluated at the final of the follow-up.

Results and Conclusions: There were eight patients with FDP tendon lacerations. There were 5 men and 3 women with a mean age of 27 years old. Reparation was performed after 3.3 weeks (3-5). The initial injury was located in zone II in all the cases. The lacerations were in the index finger in two cases, long finger in 2, little finger in 3 and in ring finger in one case. Minimum follow-up was 12 months.
The intraoperative findings found the intact VLP (vinculum longum profundus) in all cases that avoided the proximal retraction of the FDP. A modified Kessler suture was performed in all cases. All patients had good functionality measured with the Quick-DASH score at the final of the follow-up.
The integrity of the VLP could be one reason of the lack of retraction that occurs sometimes in FDP tendon injuries. When it occurs and the diagnosis is delayed, tendon suture can be performed like an acute primary repair. In cases of intact VLP, the vincular blood supply in combination with the synovial fluid nutrition maintain tendon viability and permits tendon healing after tendon repair.

Keywords:
Vincular system, flexor digitorum profundus, tendon injury
4D CT scans of the DRUJ - a novel method in identifying and describing instability

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Objectives / Interrogation: This novel radiological protocol allows temporal imaging of a cross section of the DRUJ with movement of the forearm from pronation to supination. The aim of this study was to optimise the imaging for 4D CT scanning in investigating instability of the DRUJ and describe the displacement of the ulnar head at the sigmoid notch with movement and time.

Methods: This was a prospective study. Adult patients with acute or chronic symptoms and signs of DRUJ instability presenting to our Institution from 2017 were included. Patients were identified in the outpatient clinic. Clinical information was gathered using the electronic health records. The imaging was viewed on PACS and the 4D viewer on the Osirix system. The point of maximal displacement of the ulnar head from the sigmoid notch was identified and measured using a modification of the radioulnar ratio method. The results were analysed on a spreadsheet.

Results and Conclusions: The optimal radiological protocol is described. The patient demographics and clinical presentation of six patients are described. The maximal radioulnar ratio for each patient is currently being analysed and will be presented. The degree of displacement at the sigmoid notch with time, from supination to pronation is also described. This is compared to the unaffected side. The clinical utility of this imaging modality is discussed.

Patients with instability at the DRUJ present a diagnostic and management challenge. Using this novel protocol, 4D CT scanning of these patients allows a much improved understanding of the degree of instability at the DRUJ with movement and time. This is shown to aid in clinical decision making. Further studies using this protocol in investigating the variety of patterns in DRUJ instability are warranted.

Keywords:
DRUJ, instability, 4D CT scan, protocol
Stimulated Grip Strength Testing: Validation of Novel Method for Functional Assessment

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Objectives / Interrogation: Accurate and reliable assessment of functional recovery remains a challenge. Grip strength testing is a validated method for measuring function of the median nerve-innervated extrinsic digital flexors. Because the rat must be dangled by the tail to elicit grasp of the force transducer bar, this method is limited by behavioral variability and poor control of the vector and speed of distraction. Isometric tetanic force testing (ITFT) is accurate and reliable but does not allow for serial in vivo measurements. Combining aspects of these methods, we developed a novel technique for functional assessment in which grip strength is measured with percutaneous electrical stimulation of the median nerve to elicit grasping via isometric, tetanic contraction of the extrinsic digital flexors. We hypothesize that stimulated grip strength testing (sGST) provides greater accuracy and reliability than volitional grip strength testing (vGST) and similar quality data as ITFT with the added benefit of allowing for serial in vivo measurements. (Fig 1)

Methods: Function in both the right and left forelimbs was measured with sGST, vGST, and ITFT (n=10 rats), with the assumption that a perfect test would produce an average ratio (L/R) approaching one.

Results and Conclusions: sGST is more accurate than vGST in measuring side-to-side equivalence (p<0.05) and demonstrates comparable side-to-side equivalence as ITFT, but with less variability in measurements (Fig 2). It is less technically demanding and time-consuming than ITFT and requires less expensive equipment to perform.
Figure 1: Photographs demonstrating volitional grip strength testing (above) and stimulated grip strength testing (below).
Figure 2: Average side-to-side concordance ratios per testing modality. Error bars depict standard error. * denotes p<0.05

Keywords:
**Objectives / Interrogation:** First dorsal metacarpal artery flaps (1.DMF) are used for reconstruction of thumb distal amputation stumps or other fingers’ dorsal defects. The aim of this study was assessment of the results of these flaps with special emphasis on the objective sensorial status in comparison with contralateral healthy regions.

**Methods:** The study was done in 7 patients whose traumatic defects were repaired by 1.DMAF between September 2015 and March 2018. Four of them had unrepairable thumb distal phalangeal amputations. Amputation was distal to IP joint level in one patient, at IP in 2 and at MCP in another one. Two of the dorsal defects were over the 3rd finger and one over the dorsum of the hand. Mechanism of injury was crush in all of them. All of patients were men with a mean age of 43 (min:24-max:66) years. Operations were performed under local anaesthesia in 4 and general anaesthesia in 3. Mean dimensions of the flaps were 2X1.5 cm and included the dorsal cutaneous branch of radial nerve. A tunnel was developed under the skin to advance the flaps toward the defects in thumb amputations. Donor site was closed by skin graft. Assessment of study parameters was done at a mean time of 20,14(6-36) months postoperatively.

**Results and Conclusions:** There was no flap necrosis in any of the patients. Four patients rated their sensorial status as good, 2 as moderate and 1 as weak. Five of the patients stated no cold intolerance, 1 stated minimal and 1 moderate intolerances. Four patients rated their overall satisfaction as good and 3 as moderate. There was flexion contracture in thumb MCP joints in 2 patients. There was thumb nail deformity in 1 patient.

Static two point discrimination (2PD) test showed no significant difference (p=0,084) between the flap sites (mean=7.00 mm, SD=3,56) and similar healthy contralateral hand regions (mean=4,29, SD=1,38). Semmes Weinstein monofilament (SWM) test showed a significant difference (p=0,007) between the flap sites (mean=3,43, SD=0,79) and similar healthy contralateral hand regions (mean=2,29, SD=0,49).

Regarding the patients’ point of view, subjective results of 1.DMAF’s remain between overall ranges of moderate to good. But regarding the results of SWMF, as a reliable objective test in assessment of protective sensation loss, although innervated this flap type has no good sensorial results. We think that static 2PD remains as an unreliable tactile perception test.

**Keywords:**
- First dorsal metacarpal artery flap
- defect reconstruction
- objective sensorial status
- static 2PD
- SW monofilament test
Reconstruction of distal oblique bundle of the interosseous membrane of the forearm by percutaneous ligamentoplasty.

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Objectives / Interrogation: Describe indications, technique and results of the reconstruction of the distal oblique bundle (DOB) for longitudinal instability of the distal radioulnar joint (DRUJ) of the wrist.

Methods: 5 patients with DRUJ instability in the period between January 2016 and June 2018. The indication for surgery was pain and loss of pronosupination of the forearm. All cases had a previous radial head fracture. In 4 of the 5 cases they presented partial lesions of the interosseous membrane verified by MRI and ultrasound of the forearm.

All the cases were operated according to the technique described by Brink et al: percutaneous ligamentoplasty with autologous palmaris longus, crossing from radius and fixing on ulnar bone with an interferential screw. Pre-operative and postoperative clinical and radiological parameters were evaluated. The mean follow-up was 14 (3-26) months.

Results and Conclusions: The average age was 26.3 (15-32) years and all were male. In 100% pain disappeared and they recovered the complete arch of movement, without signs of instability. There were no recurrences or new necessary surgeries.

The DOB reconstruction indications are still under debate. In our experience this plasty is a useful technique in patients with longitudinal radio-ulnar instability, sequela of an injury in radial head and longitudinal stabilizers of the forearm. Bigger series with longer follow-up are needed to be able to verify these results.

Keywords:
Distal oblique bundle, ligamentoplasty, percutaneus surgery
Comparative Analysis of Three Techniques of Scapholunate Reconstruction for Dorsal Intercalated Segment Instability

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Objectives / Interrogation: The scapholunate interosseous ligament (SLIL) is the most commonly injured ligament in the wrist. No reconstructive technique has been demonstrated to have better outcomes for a patient with reducible DISI than another. The purpose of this study was to compare the biomechanical and radiographic outcomes of the tri-ligament tenodesis (TLT) (1), Anatomic Front and Back (ANAFAB) reconstruction, and the Reduction and Association of the Scaphoid and Lunate (RASL) for reducible DISI deformity.

Methods: Scapholunate instability and DISI (defined as an absolute increase in RLA>15°) were created in 15 fresh-frozen cadaveric specimens by cutting the SLIL, long radiolunate ligament (LRL), dorsal inter-carpal ligament (DIC) and scaphotrapezo-trapezoidal (STT) ligaments. Specimens were randomized to receive the TLT, ANAFAB (Figure 1) or RASL procedures. Cadaver limbs were mounted onto a biomechanical testing jig in the clenched fist position with attached loads. Fluoroscopic images were taken in standardized PA and lateral positions to measure scapholunate gap (SLG), dorsal scaphoid translation (DST), radiolunate angle (RLA), and scapholunate angle (SLA). The specimens were cycled and compared radiographically in 3 states: intact, all ligaments cut and after reconstruction.

Results and Conclusions: The mean difference between intact and post-reconstruction measurements for RLA was 1.1°, 12° and 16.7° respectively for the ANAFAB, TLT and RASL groups, with a significant difference (Figure 2; p=0.024). The mean difference between the reconstruction and the intact status for SLA was -1° for both RASL and ANAFAB and 8° for TLT, with a significant difference (p=0.012). The mean difference of the DST between intact and reconstruction was 0.63 mm, 0.92 mm and 0.12 mm respectively for ANAFAB, TLT and RASL procedures (p=0.581). Compared with the measurements with all ligaments cut, the ANAFAB reduced the SLG 4.2mm, the TLT 3.9mm and the RASL 3.6mm, with no significant difference (p=0.878). Considering the different radiographic measurements, we noted no significant difference between the 3 techniques in maintaining the reduction after loading (p>0.05).

The ANAFAB procedure offered significantly improved correction of the RLA relative to the modified TLT and RASL procedures. The ANAFAB technique was the only reconstruction that addressed the volar and dorsal extrinsic stabilizers of the proximal carpal row. Further biomechanical studies are needed in order to confirm these results for several wrist positions.

Keywords: chronic scapholunate dissociation; dorsal intercalated segment instability; scapholunate reconstruction

References:
Diaphyseal and proximal ulnar non-union: anatomical and epidemiological risk factors.

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Objectives / Interrogation: Non-union after operative treatment of an ulnar fracture is very uncommon. There are severely disabling and challenging to treat. Multiple factors have been associated with the establishment of this non-union. Many non-unions are associated with soft tissue damage, fracture site vascularity, persistent instability, infection, and the surgical treatment technique. This study analysed the systemic conditions and local factors associated with the failure of bone fracture healing.

The aim of our study was to identify the risk factors for ulnar nonunion.

Methods: We retrospectively reviewed a cohort of ulnar fractures treated surgically with open reduction and internal fixation (ORIF), during a period of 10 years (2007-2016). We identified 211 ulnar fractures, 16 distal, 52 diaphyseal, 143 proximal. All patients had a minimum follow-up of 1 year. We defined non-union if there was no radiological consolidation of the fracture after this period, and we classified them according to Weber classification. We assessed risk factors like: fracture site vascularity, surgical treatment technique, biological factors of the patient, and the fracture's mechanism. Data were analysed using SPSS software system version 21. Multivariate regression analysis was performed to assess independent risk factors of ulnar non-union. Chi square test or Fisher exact test was used to compare categorical measurements. Statistical significance was considered as p less than 0.05.

Results and Conclusions: We found 17 ulnar non-union (8,1%), 13 diaphyseal and proximal ulna (6,2%). The 94% were hypertrophic non-union, and 6% of atrophic non-union. There were 12 male and 5 female. The mechanism of the fractures was high-energy traumatism in 30%. The 30% of patients smoked, 10,4% have diabetes mellitus, the 40,7% have vascular pathology. The fractures were open in 15,2%, the 72,5% were isolated ulnar fracture, the 25,6% were comminuted. We analyzed the ORIF and the 93,8% were well done (according to AO principles). We obtained statistically significant results in the relationship of high-energy injuries (p=0,0001), comminution (p=0,0001) and suboptimal fixation of the fracture (p=0,013), with the risk of developing nonunion. We didn't find statistically significant results in relation to the others clinical data analyzed.

Our results showed that a high-energy injury, a comminuted fracture, and a suboptimal treatment of the fracture, are risk factors of an ulnar nonunion.

Keywords:
Ulnar non-union, risk factors
**One-bone forearm technique for chronic post-traumatic forearm instability: a case report.**

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**Objectives / Interrogation:** To present a case of severe longitudinal instability treated by one-bone forearm technique with good functional and painless result.

Is one-bone forearm (OBF) technique an effective salvage procedure in patients with longitudinal forearm instability?

**Methods:** We present a 52-year-old patient with longitudinal forearm instability secondary to a traumatic accident 30 years ago. She had suffered a subtotal amputation of the left hand with a severe neurovascular injury associated to ulnar open fracture that produced severely impaired hand with little grip function but well tolerated for daily activities. 3 years ago she consulted to our hand unit because of severe lateral elbow pain secondary to a chronic non union ulna fracture and forearm instability. Xrays showed an elbow osteoarthritis with radiocapitellar impaction. She was managed surgically with a proximal radio-ulnar synostosis. 8 months later, the patient presented a stress fracture in the middle shaft of the radius, secondary to excessive torque forces that was treated with an open reduction and internal fixation in more pronation with a good result in terms of radiological healing, pain-free, good range of motion. She doesn't need further intervention.

**Results and Conclusions:** OBF is the ultimate salvage procedure for a forearm instability. The procedure attempts to create a single, stable, bone bridge between the ulnohumeral and radiocarpal joints to rescue a chronically unstable forearm. The postraumatic etiology, is the one with higher complication rates because of multiple prior surgical procedures. Despite some published series, it is an uncommon procedure and there is no clear agreement regarding the best indication, which is a symptomatic, angular, axial or rotational radioulnar instability in the setting of segmental bone loss or refractory non union. There is either no consens in which technique to use. Autologous bone grafting at the fusion site is highly recommended. The best rotational position of the fusion is at neutral or 10 degrees of pronation, although this is something that must be treated with the patient.

The OBF technique provides a stable forearm with good functional and cosmetic results as well as patient satisfaction. This reconstructive technique has a high complications rate, but once is healed appears to be a satisfactory option in extremities without many alternatives.

**Keywords:**
one bone forearm, longitudinal instability, lateral elbow pain
THE USE OF JOSHI EXTERNAL FIXATOR (JESS: JOSHI EXTERNAL STABILIZATION SYSTEM) IN HAND FRACTURES: THE BEST COST-BENEFIT RATIO

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Objectives / Interrogation: The objective of present study is to review the surgical technique (different kind of mounting) in a group of 225 fractures of phalanxes and 285 fractures of metacarpals. The objective is to have an algorithm in kirschner wire positioning and mounting of ex-fix for each pattern of fracture. We also analyze, time of healing, the number of complication as non union, defect of rotation or residual stiffness.

Methods: We reviewed 410 frame metacarpals and phalangeal fracture operated between 2012 and 2017 in our unit (285 metacarpals and 225 phalanges). The mean age is 37 years (min 12 years max 75 years) with a 3/1 man-woman ratio; of these patients 213 metacarpal fractures and 166 phalanges fractures were treated in a closed manner by reduction and percutaneous synthesis with k-wires and positioning of Joshi external fixator, under scopic control.
K-wires were positioned parallel in case of 5th 4th and second metacarpal, in few cases a inter-fragmentary k-wire has been also positioned to effort more stability and permit early motion.
This technique is useful even in case of Bennet or Rolando fractures, it's important stabilise the first metacarpal bone to the second metacarpal bone and trapezium after the reduction of the fracture.
In case of P1 base fracture K-wires has been positioned crossed, fixing the fragment to the diaphysis, or parallel in case of diaphyseal fracture,
in case joint PIP fracture the JESS has been used as a distractor
in case of Bush fractures, the Jess has been used to avoid k-wire migration in Ishiguro technique.
The position of k-wires in case of third or forth finger fracture is with a 40 degrees inclination.
The EF was removed after a 40-days (min 35 max 45 days) from surgery; active mobilization was started the day after surgery treatment.
We evaluated, at 6 months follow up, in 200 pts ROM and eventual complications.

Results and Conclusions: The treatment of hand fractures using JESS resulted in an average radiographic healing time of 40 days, complete recovery of ROM in 75 days; we had greater rigidity in extension recovery in case of phalangeal fractures, no case of deep infection or superficial irritation occurred.
In case of multiple metacarpal fracture we observed there could be a delayed x ray healing and stiffness, we had in one head P2 fracture 1 mm mal-rotation but the patient was satisfied about functional result.
Use of JESS external fixator in case of hand trauma is a valid solution to treat fractures without performing open surgical access.

Keywords:
hand fractures k-wire external fixation
Abstract no.: IFSSH19-1494

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Congenital and Pediatric Trauma

**Congenital hand anomalies in patients with polydactyly of the foot - a single unit experience.**

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**Objectives / Interrogation:** To study a cohort of patients with congenital hand anomalies associated with polydactyly of the foot.

**Methods:** Retrospective review of patient notes, online records, radiology and medical photography. Hand anomalies in patients with polydactyly of the foot were recorded along with family history, associated anomalies and genetic work-up.

**Results and Conclusions:** Of thirty six patients with foot polydactyly, nineteen had congenital hand anomalies. Eleven patients had 5th ray polydactyly of the foot, five had first ray polydactyly, two had bilateral polysyndactyly and one had central polydactyly. In most patients the anomaly of the hands was mirrored in the feet with radial anomalies associated with first ray polydactyly of foot, ulnar anomalies with fifth ray polydactyly of foot. Sixteen cases had bilateral hand anomalies. Types of hand anomaly observed included nine type A ulnar polydactyly, three bilateral triphalangeal thumbs, two polysyndactyly, one third web space syndactyly, one patient with a left type A and right type B ulnar polydactyly.

Nine patients had a positive family history for anomalies of the hands or feet. Six patients had an associated congenital anomaly. These anomalies included Bardet Biedl syndrome, 22q11 (with cleft and cardiac anomalies), laryngomalacia and left sensorineural hearing loss. The majority of patients were referred to genetics for assessment. Of these one was found to have GLI3 mutation, one to have Grieg cephalopolysyndactyly syndrome (caused by mutation in GLI3 gene), one autosomal dominant polysyndactyly and one triphalangeal thumb polydactyly syndrome (abnormality in LMBR1 gene).

Our cohort is similar to the second group described by Burger et al (Acta Orthopaedica 2018; 89 (1): 113-118) in their population with foot anomalies i.e. combined hand and foot anomalies without severe anomalies in other parts of the body. However it was highlighted in their paper that subtle craniofacial features of Greig syndrome may be missed. Many of these patients will test positive for GLI3 mutation. We had two patients with confirmed GLI3 mutation. We hope reporting on our population will add to the knowledge of what are rare phenotypes and aid future investigation in this field.

**Keywords:**
hand anomalies, foot polydactyly
Advantages of radiolucent PEEK-circular plates in midcarpal arthrodeses

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Objectives / Interrogation: 1. Known problems with conventional metal-plates
2. Comparable usability and results with PEEK-plates
3. Advantages of PEEK-plates because of radiolucency

Methods: About 20 patients with conventional metal-plates were compared to about 20 cases with PEEK-plates concerning:
- adequate mid-term functional outcome in four-corner-fusion
- X-ray-analysis on accuracy and time of determination of consolidation

Results and Conclusions: PEEK-midcarpal-plates have the same biomechanical potential for similar clinical outcomes as conventional materials, but they offer a much better and earlier evaluation of the fusion rates. (Tables will follow soon!)

So PEEK is much more reliable not only for the operating specialist, but also for surgeons outside when deciding the end of splinting and start of physio and increasing load. PEEK even might help shorten rehabilitation time, because assessing the X-rays is reliable earlier and possible for at least two weeks (vs. up to 3 months).

Keywords:
PEEK, midcarpal arthrodeses, four-corner-fusion
**Rotation correction plate in the hand - experience of 51 cases**

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**Objectives / Interrogation:** Fractures healed with torsional malunions have major functional impairments. The correction of these misalignments must be made very precisely in several levels, so that the fingers do not cross over or diverge.

**Methods:** Since 2005, we have been using the rotation correction plate (Synthes) for these corrections, but have also used the plate primarily for fractures without anatomical evidence of correct torsion (eg, in replantation).

The plate was inserted 51 times, 38 times for the correction osteotomy of the metacarpals and 13 times for the primary fracture supply.

Case presentation of illustrative cases and eye openers.

**Results and Conclusions:** For the correction osteotomy, a 90° transverse osteotomy is created. The plate can then be steplessly rotated by a total of 36° and corrected several times intraoperatively, which considerably simplifies the exact setting. In debris fractures, the plate can be used by its angular stability as an internal fixator with fine adjustment options. For mid-range replacements, the position of the fingers can still be corrected when all fingers have received their osteosynthesis.

Complications: Only once after a correction osteotomy did a plate fracture occur. All other operations went without complications.

Operation time was very short.

The Rotation Correction Plate is a plate that have to be in the Armamentarium.

**Keywords:**
malunions metacarpal rotation correction plate finger
Palmar mutilation of the hand - a case report

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Objectives / Interrogation: The traumatic total and subtotal amputations of the upper extremity are those with a complex management of treatment, which can result in serious morbidities. The aim of this study was to present a rare case of coronal plan injury in the distal radius, ulna, as well as carpal bones extending from the middle arm of the forearm to the palm.

Methods: A 37-year-old male mechanic was admitted to the emergency department with a subtotal amputation of the right hand. The patient had an injury in the form of an open book in the frontal plane extending from the radial and ulnar side to the palm from the right forearm 1/3 middle distal junction. This injury was classified as IIC1 according to tic-tac-toe classification.
When exploration was performed, it was seen that radial artery princeps pollicis branch, all finger flexors, common digital artery and nerves were cut, radius of distal radius and ulna, all carpal bones and 1. metacarpal base were separated in coronal plane. After marking the nerve and artery ends under surgical microscope, osteosynthesis was performed with K-wires and headless cannulated compression screws. Following that, only deep flexor tendons and FPL tendon were repaired. Princeps pollicis and 2 common digital artery were repaired with vein grafts and all other arteries were repaired by end-to-end anastomosis. Digital nerves were also repaired. External fixator was used to bridge the wrist. The ulnar side was left open while closure sutures were placed on the radial side and one week later groin flap was performed to close the ulnar side defect.

**Results and Conclusions:** After 10 months of follow-up, pulp to palm gap was 2.5 cm. Grasp and pinch were less than 50% of the opposite side. The patient recovered a subnormal sensitivity of the hand especially in the territory of the median nerve and he had no cold intolerance. Protective sensation of the 2. finger, good sense of the 3., 4., 5. fingers is recovered. Wrist extension 30°, flexion 60, forearm supination 80° and forearm pronation were 60°. Days off from work was 4 months.

**Keywords:**
Advantages of Arthroplasty vs Trapeziectomy for the Treatment of Thumb Carpometacarpal Joint Osteoarthritis.

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Objectives / Interrogation: The gold standard operative procedure for treatment of thumb basal joint osteoarthritis is to perform a trapeziectomy. For OA at other sites, joint replacement is now the treatment of choice. Benefits of prosthetic replacement in the thumb have been overlooked due to fear of risk of dislocation, infection or implant failure. Advantages of prosthetic joint replacement surgery include comparable functional outcome, preserving range of motion and providing stability.

The aim of the study was to evaluate the advantages following trapezio-metacarpal joint replacement with an uncemented prosthesis, for patients beyond conservative treatment with splints or injections.

Methods: Over a 5 year period thumb CMCJ arthroplasty was evaluated in 150 patients using the ARPE prosthesis (Biomet), via a volar approach, in a NHS hospital by a single surgeon. Outcomes were measured using clinical and radiological assessment, with the use of functional scores and patient questionnaires. Follow up was conducted over a minimum of 2 years.

A similar cohort of patients who underwent a trapeziectomy were used as a control for comparison to gold standard treatment. All patients underwent a 6 week rehabilitation protocol with splinting and hand therapy.

Results and Conclusions: Both treatments resulted in significant improvements in functional scores. When matching patients according to pre-operative function, patients receiving ARPE arthroplasty had better post-operative function (Quick DASH). More patients receiving the ARPE arthroplasty were satisfied with their treatment and would have the same treatment again. The ARPE also resulted in less thumb shortening. It is associated with a higher complication rate (6% dislocation), but implant survival was 95%.

The majority requiring further surgery presented at initial follow-up within 2 weeks. Most reported an incident which may have predisposed to dislocation. All these patients underwent early surgery to relocate the prosthesis and the majority had a favourable outcome at 3 months.

There were no reported infections and the volar approach avoided any injury to the superficial radial nerve.

Trapezio-metacarpal arthroplasty is an effective treatment option for thumb CMCJ osteoarthritis. Arthroplasty may offer potential advantages in terms of post-operative function and patient satisfaction. The results allay the risk of complications, although requirement for further surgery is greater and must be carefully considered during patient selection and pre-operative counselling.

Keywords: Osteoarthritis, arthroplasty, thumb
Ultrasound in carpal tunnel syndrome - the inlet and outlet ratio

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Objectives / Interrogation: Carpal tunnel syndrome is the most prevalent nerve compression syndrome in the upper extremity. To confirm median nerve compression, sonographical and electrophysiologic examinations have been described. The cross-sectional area (CSA) at the inlet and outlet of the carpal tunnel are used as diagnostic markers. As CSA of the median nerve varies with gender and occupation, a wrist-to-forearm-ratio has been proposed. As diagnostic sensitivity is still limited, the goal of this study was to retrospectively analyse CSA measurements and compare associated ratios.

Methods: 33 patients (44 wrists) diagnosed with CTS between 06/2016 and 08/2018 were included in the study. 23 were female, 10 male. Mean Age was 51 (range 21-89) years. Diagnosis was confirmed by nerve conduction studies. Measurements of CSA were performed using the continuous tracing method and a 17 or 18.5 MHz Linear Array Transducer (Philips iU22 Medical system or Philips 70 Affinity, Bothell, WA, USA). The absolute values of CSAForearm, CSAInlet, CSATunnel and CSAOutlet and the ratios CSAI/CSAF (Rforearm), CSAI/CSAT (Rpre) and CSAO/CSAT (Rpost) were compared. Data were analyzed using Excel (descriptive) and GraphPad for unpaired student t-test.

Results and Conclusions: Mean CSAF was 12.816 (SD 2.801), CSAI was 14.970 mm² (SD 4.618), CSAT was 9.002 mm² (SD 2.664) and CSAO 13.798 mm² (SD 3.539). CSAF, CSAI and CSAO were significantly higher than CSAT (p< 0.0001). When referring to published cut-off values ( >12.6 mm² for CSAI and >13.2 for CSAO), only 29 (64.4%) respectively 22 (48.9%) of 45 pathologic wrists were identified. When only analyzing the 11 wrists that would have been missed with the cut-off CSA values, mean ratios were 1.508 for Rpre, 1.611 for Rpost, and only 0.914 for Rforearm.

Conclusion
In these 33 patients, CSA values before and after the carpal tunnel were significantly higher than under the retinaculum. Nevertheless, 25% of pathologic wrists would have been missed if using absolute CSA reference values. If comparing the ratios, Rpre and Rpost had higher mean values compared to Rforearm, suggesting a higher sensitivity. These measures merit further evaluation in a prospective randomized study with a control group.

Keywords: carpal tunnel syndrome, ultrasound, diagnostic criteria
Pediatric Median Nerve Neurofibroma

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Objectives / Interrogation: Neurofibromas are benign tumors which originates from neural fascicles. The peak age of presentation of solitary neurofibromas is between 20-40 age and they are rarely seen in childhood. Our case had a large solitary neurofibroma affecting the two fascicles of the median nerve.

Methods: A 15 years old male patient was admitted to our clinic with the complaint of numbness and weakness in the first, second and third fingers of the left hand for the last year. Sensory examination was normal. Left-hand grip strength decreased by 60% compared to the other side. Radiographic evaluation and EMG test were normal. In the MRI, the median nerve at the wrist level of the mass was 3 cm in diameter and 8 cm in length and within the fascicles, the continuity of the median nerve fiber was observed on the ulnar side of the tumor (Figure 1).

Incisional biopsy revealed neurofibroma and excision was performed. During the surgery, it was observed that the mass infiltrated two nerve fascicles and pushed other median nerve fibers. Existing motor branches were divided using nerve stimulator and the two fascicles passing through the mass was considered the cutaneous branch and were excised(Figure 2).
These two fibers were coapted as end-to-side fashion to the median nerve distally. In postoperative follow-up, muscle strength and grip strength were normal in first two lumbrical and thenar muscles. The physical examination of the patient revealed sensory deficits in 2nd ulnar side of the second finger and radial side of the third finger.

**Results and Conclusions:** Large solitary neurofibromas can also be seen in childhood. The tumoral mass can be removed without causing motor and sensory deficits.

**Keywords:**

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Identification of perforant to the realization of hypothenar fat flap in the management of the recidivant carpal tunnel syndrome

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Objectives / Interrogation: The release of the transverse carpal ligament as a management of the obstructive syndrome of the median nerve generally brings good results, however some patients persist with symptoms that are attributed to an incomplete release or a fibrous process in the periphery of the nerve, thus there are descriptions other surgical techniques whose purpose is to interpose tissue between the nerve and the scar as the hypothenar fat flap. The purpose of the article is to describe the results obtained with the identification of a preforant for the placement of the hypothenar fatty flap in the management of recurrent carpal tunnel syndrome.

Methods: We present the case of a 60-year-old female patient with a history of conventional release of the right-side carpal tunnel of 1 year of evolution, with persistence of paresthesias, allodynia, dysesthesia and decreased strength associated with alterations in postoperative electromyography and neuroconduction. So an incomplete release is interrogued. Surgical management with hipotenar fatty flap was decided, for which a perforator was marked at the level of the hypothenar region with the help of an 8Mhz Doppler

Results and Conclusions: The persistence of symptoms after the release of the carpal tunnel may be secondary to an incomplete release of the transverse carpal ligament, to scar compression or to both noxas. The literature indicates surgical management in which the use of hypotenar fat flap has given satisfactory results, in the patient also the use of Doppler was implemented as a guide evidencing safety, easiness and effectiveness in the procedure.

Keywords: hyotenar, fat flap, carpal tunnel, recidivant
Effects of Growth Hormone Therapy on Nerve Regeneration, Functional Recovery, and Allo-Immune Response in Vascularized Composite Allotransplantation

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Objectives / Interrogation: Functional recovery following upper extremity transplantation remains poor, primarily as a result of prolonged denervation and resultant muscle atrophy. Growth hormone (GH) has well-established trophic effects on neurons, myocytes, and Schwann cells and represents a promising therapeutic strategy to accelerate axonal regeneration and also maintain muscle and Schwann cells prior to reinnervation. The aims of this study were to confirm the positive effects of GH on nerve regeneration and functional recovery and to evaluate the effects of GH treatment on the immune response in the setting of vascularized composite allotransplantation.

Methods: Rats underwent orthotopic forelimb transplantation with full MHC-mismatch received either porcine-derived GH (0.6 mg/kg/day) or no treatment (n=10 per group). All animals received tacrolimus (2 mg/kg/day) for graft maintenance. Animals underwent functional assessments every four weeks using electrically-stimulated grip strength testing. Animals were monitored for clinical signs of rejection. Skin biopsies and serum cytokine levels were obtained at the mid- and end-point to evaluate for subclinical rejection. Animals were sacrificed at 16 weeks or if they demonstrated advanced rejection (grades III/IV). Quantitative histological assessments of axonal regeneration, neuromuscular junction reinnervation, muscle atrophy, and Schwann cell proliferation were performed on muscle and nerve specimens upon sacrifice.

Results and Conclusions: Grip strength was improved with GH-treatment as compared to the control group at weeks 4 and 16 (p=0.03 and p=0.05, respectively; Fig. 1). There was a greater number of regenerative axons and decreased muscle atrophy in the GH-treated group (p>0.05). Rates of clinical rejection did not significantly differ among groups. Remaining data is pending. In conclusion, GH treatment may allow for improved functional outcomes in VCA via accelerated axonal regeneration and maintenance of denervated muscle.
Figure 1: Post-transplantation functional recovery as measured by grip strength. Error bars depict standard error.
Cancellations in emergency plastic surgery: A three month experience in a tertiary referral centre.

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Objectives / Interrogation: Retrospective cohort study of emergency surgery cancellations in a busy tertiary plastic surgery centre. The primary objective was to calculate the cancellation rate. Further patient-specific data was extracted to evaluate for preventable cancellations and introduce departmental changes to improve the service.

Methods: Review of all cancellations in emergency plastic surgery over a three month period from May to August 2018. Data pertaining to patient demographics, proposed surgical procedure and reason for cancellation were extracted from both electronic and paper records. Both the cancellation rate and the average delay in surgical intervention as a result of the cancellation were calculated.

Results and Conclusions: 157 cancellations were identified. 67% of these were cancelled on the day of surgery and 33% were cancelled in advance via the phone and having the dates of their surgical appointments changed. The overall cancellation rate was 19.1%, with 13% of patients being cancelled on the day of their proposed operation. 5.4% of cases were cancelled on more than one occasion. More than half of all cancellations required further surgical appointments and their surgery was delayed by an average of 2.22 days as a result. The most common reasons for same day cancellations were as follows: operation not necessary, surgical list overbooking and patients not attending their appointments. A sub-analysis of operations cancelled on the grounds of not being clinically warranted revealed that infections, fractures and fingertip injuries were the most common. Patients who failed to attend their appointments were more frequently young males with small injuries and no functional deficit.

At 13%, our same day cancellation rates are in keeping with similar studies in the field. Our study also incorporated patients who were cancelled a few days in advance of their surgery and found that almost 20% of all patients who get scheduled to undergo emergency plastic surgery will have this appointment changed. A large proportion of cancellations were due to the operation being not necessary - we have addressed this issue by introducing formal teaching sessions and improving availability of senior clinicians in the decision making process. Furthermore, we have also optimised several administrative processes to further minimise cancellation rates.

Keywords: hand trauma, emergency surgery, emergency plastic surgery, emergency cancellation
Irreducible dislocations of the metacarpophalangeal joints - history and 24 cases

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Objectives / Interrogation: Irreducible dislocations of the metacarpophalangeal joints were described very early in the literature, as the therapy initially appeared simple, but then often ended in a disaster. Only about 400 cases of this dislocation could be found in the literature. Most affect the thumb and are dorsal dislocations. The palmar dislocations are also much more often in the fingers. Palmar dislocations are a great rarity.

Methods:
We report very inessential cases from 250 years of literature, a classification of irreproducible dislocations and our 24 cases, where we can present 2 palmar dislocations of the thumb and 2 palmar dislocations of the fingers with very interesting injury mechanisms.

Results and Conclusions: The opposing repositioning obstacle is very different on the thumb, while it is always the palmar plate on the fingers. A closed reduction is possible only after the Roser-Hey principle (1856) and Farabeuf (1878) principle. Operatively, dorsal dislocations are easiest after Farabeuf of posterior with cleavage of the palmar plate. In palmar dislocations both collateral ligaments are always torn and need a primary reconstruction. Nevertheless, the prognosis of palmar dislocations is poor.

Keywords:
irreducible dislocation metacarpophalangeal joint fingers thumb history
Section of 2nd to 5th flexor tendons in zone 2 of the hand with interdigital nerve injury: case report

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Objectives / Interrogation: Want to present the experience in restructuring medicine and advanced microsurgery, in a new center of traumatology and orthopedics

Methods: Case of male patient, 32 years old, without morbidities suffers cut with kitchen knife in zone 2 of flexor in hand, with interdigital nerve involvement from the 2nd to 5th finger of the right hand. Surgical wound dressing in the emergency room. It is performed 24 hours after the accident, definitive surgery, with primary tenorrhaphy with double kessler points. Under magnifying glasses and microscope Identification of interdigital nerve ends, primary epineurorrhaphy without tension is performed. Passive intraoperative passive mobility verification, closing of wounds and temporary immobilization for protection of surgery. Patient was sent home 24 hours after surgery, temporary immobilization in situ, 2 weeks later, withdrawal of points. is sent to therapy, for controlled early mobilization. Follow-up and therapy for 6 months. Progress is reintegrated into common life and work progressively. Full reintegration at 7 months.

Results and Conclusions: The performance of reconstructive medicine and microsurgery in highly complex wounds is challenging. Especially in areas where you do not have the necessary supplies for the correct execution. that is why we recommend the timely resolution of highly complex pathologies as long as you have the correct technology and instruments. We believe that a good planning should always be carried out, correct follow-up of the advice based on evidence on nerve and tendon repair, only with them is it possible to obtain good results. always thinking about the best for the patient and the total recovery of functionality.

Keywords: Hand, epineurorrhaphy, Microsurgery
Residual rotation of forearm amputation: Cadaveric study

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Objectives / Interrogation: The purpose of this study was to investigate the residual rotation of the patient with forearm amputation and the contribution of involved muscle to the residual rotation. Finally, we tried to determine the optimal amputation level for the forearm bionic arm.

Methods: Testing was performed using 5 fresh-frozen cadaveric specimens that were surgically prepared by isolating muscles involved in forearm rotation. Amputation was implemented at 25cm (wrist disarticulation), 18cm and 10 cm from tip of olecranon. The supination and pronation in the amputation stump was simulated with traction of involved muscle (supinator, biceps brachii, pronator teres, pronator quadratus) using an electric actuator. The degree of rotation was examined at 30°, 60°, 90° and 120° in flexion of elbow.

Results and Conclusions: Average rotation of 25 cm forearm stump was 148° (SD 23.1). The rotation was decreased to 117.5° (SD 26.6) at 18 cm forearm stump and to 63° (SD 31.5) at 10 cm forearm stump. Tendency of disorganized rotation was observed in close proximity of the amputation site to the elbow. Full residual pronation was achieved with traction of each pronator teres and pronator quadratus. Although traction of supinator could implement residual supination, the contribution of biceps brachii range from 4% to 88% according to the degree of flexion.

Close proximity of the amputation site to the elbow decreased the residual rotation significantly and the preservation of pronosupination was 80% at 18 cm forearm stump. Although the pronator teres and the pronator quadratus could make a full residual pronation separately, the supinator was essential to a residual supination.

Keywords: Forearm amputation, residual rotation
Outcome assessment of closed distal radius fracture and ulnar styloid fracture treatment with volar plate and screw fixation

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Objectives / Interrogation: Ulnar styloid fracture is very frequently associated with distal radius fractures. Nonetheless, its clinical impact and specially its treatment are still highly debatable. The main goal of this study is evaluating the clinical outcomes of patients submitted to volar plate fixation of the radius and screw fixation of the ulna styloid.

Methods: Retrospective study including all adult patient with closed distal radius fractures and ulnar styloid fractures operated in an orthopaedic department since June 2015 to June 2017 (2 years). Patients with concomitant hand fractures, with cognitive deficits or with a history of degenerative or traumatic wrist injuries were excluded from the study.

Variables studied included age, sex, associated injuries, dominant hand function, comorbidities as well as complications after surgery.

Preoperative radiographs were analysed and patients were operated by two senior surgeons using internal fixation with a volar locking plate for the radius and percutaneous/mini-open fixation with a screw for the ulna. In type B and C distal radius fractures (AO classification), arthroscopic assistance was used during the procedure.

To assess the clinical outcomes, DASH score, PRWE score and satisfaction and pain Visual Analog Scale (1-10) were completed 12 months after surgery. Radiographic assessment and range of motion measurement were also evaluated.

Results and Conclusions: A total of 26 patients were included in the study comprising 15 female and 11 male patients. Patients age varied from 30 to 68 years old.

Average Total DASH score was 20.46 points and total PRWE score was 23.33 points. These values are in accordance with most data found in the literature. Average Paint at rest VAS score was quite low, 1.66 points. The average satisfaction VAS score was 8.88.

Radiographic control showed good bone consolidation in all patients. All patients, except one, recovered complete mobility of the wrist. The only exception was a patient with flexor tenosynovitis that needed plate removal 10 months post-op.

Conclusion
Ulnar styloid fixation produces good clinical results, allowing complete recovery of wrist mobility and significantly reducing pain complaints with very few complications. In cases of distal radius fractures and ulnar styloid fracture it seems that fixing both fractures gives better results.

Keywords:
ulnar styloid; screw fixation; wrist
Radial Polydactyly: The not so innocent floating radial duplicate

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Objectives / Interrogation: In radial polydactyly radiological and clinical appearances can belie the underlying anatomical complexity. The floating radial duplicate we define as a radial duplicate with soft tissue attachment only to the ulnar duplicate. Such duplicates are often perceived to be straightforward, associated with a normal ulnar duplicate and suitable for management by simple excision. We report our experience of anatomical surgical management of radial polydactyly with floating radial duplicates.

Methods: Operative anatomical data was collected prospectively for 75 consecutive thumbs at primary surgery. Cases with floating radial duplicates were identified. Detailed schematics were constructed providing a highly visual representation of the anatomy.

Results and Conclusions: 19 thumbs with floating radial duplicates were identified. In 3 cases the ulnar duplicate was triphalangeal.

Thenar muscle:
In 4/19 thumbs abductor pollicis brevis(APB) inserted on both duplicates. Anomalies included: APB inserting on the radial duplicate solely; APB inserting into the flexor and extensor mechanism at IPJ level; APB inserting distal to IPJ of ulnar duplicate; hypoplastic APB inserting on the neck of 1st metacarpal.

Extensor:
8/19 thumbs demonstrated insertion on both duplicates. Anomalies included: interconnections extensor-flexor; atrophic EPL ulnar duplicate; hypoplastic EPB ulnar duplicate; EPB inserting radial duplicate only.

Flexor:
15/19 floating radial duplicates had no flexor tendons. FPL inserted on both duplicates in 4/19. Eccentric FPL insertion and deficient pulleys in the dominant ulnar duplicate were observed.

Surgical procedures:
The radial duplicate skeleton was excised in 14/19 cases. MCPjt instability in the ulnar duplicate was treated in 2 cases. 3 thumbs with a triphalangeal ulnar component underwent excision of middle phalanx. A new IP joint was formed. The radial collateral ligament of IPjt was reconstructed in 2 cases.

Tendon procedures included transfer of EPB to the dominant duplicate; division of anomalous interconnections; division of anomalous flexor slips; pulley reconstruction; division of anomalous APB insertions.

Discussion
Radial polydactyly cases with floating radial duplicates are often perceived as straightforward with “normal” ulnar duplicates. Our experience does not support this perception. We identified anomalous anatomy in both the floating radial duplicate and the dominant ulnar duplicate. A systematic anatomical approach to primary surgery is advocated.

Keywords:
radial polydactyly, congenital hand, triphalangeal
FESSH Travel Fellow Award: continued training in hand surgery.

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Objectives / Interrogation: To analyze the clinical and professional utility of the grant from the experience lived by the awardees, based on personal travel.

Methods: Professional opportunity to complete continuing education in hand surgery, based on the selection of a referenced center or surgeon from Europe, setting goals for the travel: to participate in outpatient clinic, to assist in surgery room, and to attend teaching sessions.

Results and Conclusions: In 2018, 10 scholarships were granted, with an average of 2 weeks of travel. The awardees achieve the initially proposed objectives: to expand our knowledge in hand surgery with a focus on wrist surgery and biomechanic, to observe different clinic's routine including rounds, clinic hours and surgeries and to learn new approaches to well established diagnosis.

This fellowship has motivated awardees to continue studying, and to strengthen arthroscopic and microsurgical skills. This fellowship contributes significantly to our development as a hand surgeons.

Keywords:
Hand surgery, Microsurgery, travel award, training
Surgically treated Closed Distal Radius Fractures in adult working patients - Outcome analysis in occupational vs nonoccupational injuries

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Objectives / Interrogation: Distal radius fractures (DRF) are one of the most common traumatic injuries worldwide. The main goal of this study is evaluating the clinical outcome of patients treated with internal fixation for an accidental DRF in comparison to an occupational injury. Secondary goals are identifying good/bad prognostic factors that impact the clinical outcomes.

Methods: Retrospective study including all adult patient (with less than 65 years old) with closed distal radius fractures operated in an orthopaedic department since June 2015 to June 2017 (2 years). Patients with concomitant ulnar or hand fractures, with cognitive deficits or with a history of degenerative or traumatic wrist injuries were excluded from the study.

Variables studied included age, sex, associated injuries, dominant hand function, comorbidities as well as complications after surgery.

Preoperative radiographs were analysed and patients were operated by two senior surgeons using internal fixation with a volar locking plate. In type B and C fractures (AO classification), arthroscopic assistance was used during the procedure.

To assess the clinical outcomes, DASH score, PRWE score and satisfaction and pain Visual Analog Scale were completed 12 months after surgery. Radiographic assessment and range of motion measurement were also evaluated.

Results and Conclusions: A total of 51 patients were included in the study comprising 28 female and 23 male patients. 19 cases were work related and 32 were caused by accidental injuries.

On average, all outcomes were worse in the occupational group. DASH score was 46,4 vs 15,8 (non-occupational group). PRWE score was 52,86 in the work-related group against 19,7 in the accidental group. Accordingly, the scores for pain at rest in the occupational group were also higher (4,14) against 1,45 in the other group. scores for patient satisfaction were very similar between the two groups (8,3 vs 8,5).

Conclusions/Discussion:
The surgical treatment of distal radius fractures with internal fixation seems to be highly effective and reliable. Nevertheless, it seems that patients injured in work-related activities have a worse result. Prospective studies are needed to confirm these results.

The main limitations of the study are the low number of cases, the multiple types and patterns of fractures analysed and its retrospective nature.

Keywords:
occupational; DASH; PRWE; volar plate
Do we need an opioid for the pain control after carpal tunnel release? : a randomized controlled study

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Objectives / Interrogation: Few studies have examined the appropriate pain control after carpal tunnel release (CTR). The goal of this study was to compare the effectiveness of paracetamol for the pain control with that of codeine analyzing patients' subjective perception.

Methods: A prospective comparison of consecutive patients' subjective perception for pain after outpatient CTR was conducted. Patients were randomized to receive either a codeine or a paracetamol for pain control after CTR. All operations were performed with the same mini-open CTR surgical technique. Visual analogue scale for pain of both groups was compared from the day of surgery to the 3rd day following the surgery.

Results and Conclusions: Mean VAS score at the day of surgery was 4.9 (range 2–8) and the score was decreased 3.8 (range 2–6) at the first day following the surgery, 2.4 (range 0–5) at the second day following the surgery, and 1.8 (range 0–5) at the 3rd day following the surgery in the codeine group. In the paracetamol group, the mean VAS score was 4.2 (range 0–8), 3.3 (range 0–6), 2.5 (range 0–5), and 2.2 (range 0–5) at the equivalent day of the codeine group. Mean VAS scores were not different significantly from the day of surgery to the 3rd day following the CTR (p=0.31 at POD 0, p=0.43 at POD 1, p=0.94 at POD 2, p=0.61 at POD 3).

Paracetamol was effective to relieve the pain after outpatient CTR comparing with the codeine. Our results suggest the clinicians might avoid unnecessary prescription of the opioid after outpatient CTR.

Keywords:
Carpal tunnel syndrome, opioid, randomized controlled study
The stability of intra-articular distal radius fractures using volar locking plate with unicortical and bicortical screws

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Objectives / Interrogation: OBJECTIVES: Evaluate the mechanical properties of unicortical and bicortical fixations in a model of intra-articular fracture of the distal end of the radius, classified as AO 23C3, under simulated physiological loads.

HYPOTHESES: 1- The mechanical behavior of the model using unicortical screws in the fixation of volar plates in intra-articular fractures of the distal end of the radius is equivalent to the model using bicortical screws.
2 - Cyclic loading, using a frequency of 1Hz per 1000 cycles, affects the mechanical behavior of volar plate fixation models in intra-articular fractures of the distal end of the radius using unicortical and bicortical screws.

Methods: Forty-four fourth-generation left-hand radius models (Sawbones; model 3407) were used in this study. In each model, a volar plate was used for variable angle distal radius (Matrix 54-25276; Stryker, Freiburg, Germany) in a systematic and reproducible way, ensuring distal screw placement in the subchondral bone. All bone models, in their proximal region, were included with JET® polymethylmethacrylate cement. After inclusion, the bones were sent to the Precision Office to perform cuts to simulate bone failure, characterizing a fracture of the distal radius in 4 parts with a wedge of dorsal metaphyseal resection. The 10 mm dorsal base wedge in the metaphyseal region was made to characterize instability. The models were divided into six groups, so that each model underwent only one type of test, thus it did not affect any of the overlapping tests. Three groups had unicortical assembling and three groups with bicortical assembling. Each of the groups received seven models. The mechanical tests were axial compression (AC), dorsal flexion (DF), and volar flexion (VF). After the first static test, the models underwent a cyclic loading to simulate the wrist movements during the six-week period after fracture. Then another static test. After tests in the elastic phase, the models underwent extreme loads until failure occurred, each group in its corresponding type of test.

Results and Conclusions: According to our results and comparing them to the literature, we agree that at least 75% length of the unicortical screw has mechanical properties similar to those of the bicortical screw in volar plate assembling of the distal radius, thus we recommend using unicortical screws in intra-articular fractures of the distal end of the radius.

Keywords: distal radius fractures, biomechanics, unicortical screw, bicortical screw
Locked metacarpophalangeal joint - a simple approach

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Objectives / Interrogation: Blocked MP joints have a poor prognosis in the shelf when operated on a palmar access. We report on the pathomechanism and a new simple method of surgery.

Methods: The MP joints, which are mostly blocked at 50 ° flexion, are band structures that stick to a spur of the metacarpal heads. Usually this spur is removed via a palmar access. Most patients treated in this way have a very long convalescence period and the results are only moderately good or bad.

Our dorsal access technique is simpler and involves a severing of the trailing fibers.

Results and Conclusions: 6 patients with entrapment MP-joints could be treated successfully. The convalescence period was very short.
Illustrative cases, literature review and surgical technique.

Keywords:
locked MP-joints technique history anatomy
Global First Web Release in Clasped Thumb - An Anatomical Approach to Treatment

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Objectives / Interrogation: Congenital clasped thumb is a thumb flexion adduction deformity that may present as an isolated anomaly or as part of a spectrum of complex congenital anomalies. First web release may be indicated in selected cases. We present experience of our surgical technique using a systematic anatomical approach to first web release.

Methods: A casenote based retrospective review of global first web release procedures undertaken to treat clasped thumb in our unit between 2013-2018 was performed.

Results and Conclusions: 16 first web releases were undertaken in 11 patients. 8/11 patients had a diagnosis of arthrogryposis. Three patients had a defined syndrome (1) Klinefelter's syndrome (2) Pena-Shokeir Syndrome (3) Freeman-Sheldon Syndrome. Associated congenital anomalies included gastroschisis and ventricular septal defects.

Mean age at primary surgery was 58 months. An anatomical approach to first web release was undertaken addressing sequentially skin, palmar fascia, flexor retinaculum, thenar muscle, adductor pollicis, first dorsal interosseous, flexor pollicis longus, joints. A curvilinear incision was made extending from the free margin of the first web to the wrist. Augmentation of palmar skin shortage was by transposition flap from the index finger (10/16), full thickness skin graft (12/16), Z-plasty (7/16). In cases with significant finger flexion deformity we inset the index finger flap transversely in the palm. Release of anomalous fascial bands was required in all hands. Release of flexor retinaculum (15/16) reduced the deforming force of tight thenar muscle. Additional release of thenar muscle origin was required in 4/16 hands. Adductor pollicis origin was released in 4/16 hands, intramuscular tenotomy of insertion in 7/16. 1st dorsal interosseous origin was released (2/16), tendon step-lengthened (1/16). Flexor pollicis longus intramuscular tenotomy was required in 3 cases. K-wires were used to temporarily stabilize the metacarpophalangeal joints/maintain 1st web in 6/16 webs. Concomitant procedures were undertaken for (i) finger flexion deformities (7/16), (ii) to augment extensor function (3/16).

Treatment of the first web in congenital clasped thumb can be challenging. The principles of surgical management - sequential release and augmentation of web structures can be achieved in different ways depending on operative findings. Here we demonstrate our anatomical technique and approach to the first web.

Keywords:
Arthrogryposis, clasped thumb, congenital hand deformity, web release
Versatility of medial femoral condyle flap for phalangeal and metacarpal bone reconstruction

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Objectives / Interrogation: The medial femoral condyle (MFC) flap has become a popular option for small bone defects or calcitrant nonunions. The potential of chimeric design also provides flexibility and versatility for bone reconstruction. We aim to describe outcomes after MFC flap treatment of phalangeal or metacarpal bone defects.

Methods: A retrospective chart review was performed on all patients undergoing Free MFC flaps by between March 2012 and August 2018. Patient demographic data intraoperative, and postoperative data were collected.

Results and Conclusions: We identified 12 patients for inclusion (8 phalangeal bone and 4 metacarpal reconstructions) treated with the MFC flap for diagnoses including bone defect (8) bone tumor (2), congenital deformity (1) and nonunion (1). There were 7 males and 5 females, aged from 4 to 54 y/o (28.8 years in average). Follow-up time was from 2 to 34 months (10.6 months in average). With regards to the flap design, there were 3 chimeric osteocutaneous flaps, 7 periosteocancellous flaps, 2 periosteal flaps. Bone union was achieved in all the patient at 5 to 18 weeks postoperatively (8.1 weeks in average). There were no intraoperative flap complications or donor site morbidity.

Conclusions: Phalangeal or metacarpal bone reconstruction using the MFC flap results in a fast bone regeneration and union with minimal donor morbidity.

Keywords:
medial femoral condyle flap, bone defect, bone reconstruction, phalangeal bone, metacarpal bone
Spare-part surgery for reconstructing a basic hand function

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Objectives / Interrogation: Spare-part surgery became widely known and recognized in the reconstruction of extremities after devastating injuries or illnesses. Despite the mutilating character of the surgical procedures, they still are of big importance. Sometimes they offer the surgeon and the patients an option for reconstructing basic functions. Because of the absence of standardized techniques, the surgical therapy must be customized for the patients. With this case we present a reconstruction of key grip hand function by using spare-part surgery.

Methods: Necrosis of both feet, the left forearm and the distal part of the right hand occurred in a patient due to high-dose catecholamine therapy and septic thrombo-embolization. We used the lower leg as a free osteocutaneous flap to reconstruct a basic hand function after amputation of nearly all extremities. Parts of the fibula were located alongside the remaining first metacarpal bone. Osteovascular on top-plasties were performed by docking two of the metacarpal stumps onto the remaining two metacarpals. Due to thrombosis of the princeps pollicis artery, a venous interposition graft from the right forearm was dissected and used. Furthermore, the flap was microsurgically anastomosed end-to-side to the ulnar artery which was the only remaining arterial supply to the hand. The size of the buried fibula was reduced to the necessary thumb length and fixed to the metacarpal I stump in a next step. Secondary procedures like z-plasties were performed optimize the results.

Results and Conclusions: After all the surgical procedures and fitting of the necessary prosthesis, the patient is now able to manage most of the daily life. The patient can grasp objects and even write, after fixing a pen in the first webspace. This is the first description of successful microvascular transfer of a wrap-around type osteocutaneous free flap from an amputated lower leg to our knowledge. This technique might be useful in similar cases in the future.

Keywords: spare-part surgery, reconstruction hand, microsurgery
Large Schwannoma of the Median Nerve at the Distal Third of the Forearm-Case Report

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Objectives / Interrogation: Schwannoma is a rare nerve benign tumour, called by a German physiologist Theodor Schwann. Tumour develops from the Schwann cells of the nerve sheath. There is also a malignant form of the schwannoma, but it is very rare (about 1%) Schwannoma can occur anywhere, but the most often it affects the vestibular nerve. Different sizes of the peripheral nerves schwannoma are described. So, the aim of this report is to present relatively rare and large form of this tumour at the median nerve.

We present the case of a 46 years old male patient with subcutaneous visible tuberous tumour of the anterior region on the lower border of the distal third of left forearm, which existed about one year. Tumour was round, well-defined, soft, non-pulsatile, painful on palpation. Ultrasound and MRI examinations were done. Under the tourniquet control, extirpation of the tumour was done with complete preservation of the median nerve. Dimensions of the tumour were 5.1x4.8x3.8cm. Pathological examination, including immunohistochemistry, showed benign schwannoma. One year after the surgery, there were no signs of recurrence, and hand function was normal.

Methods: Case report.

Results and Conclusions: Schwannoma, also known as neurilemmoma, is the most common peripheral nerve tumour. This tumour is seen in all ages, both sexes, and in all regions of the body. This is a solid tumour. Growth of the schwannoma is slow, and often painless. Median nerve is described as one of the localization of the schwannoma. Other tumours of this nerve are also possible. The term large tumour is usually used when it affects significant part of the organ or some region.

Every subcutaneous mass should be taken seriously, especially if it is long lasting, large, and located in some specific parts of the body. Besides careful physical examination, additional diagnostic procedures are sometimes necessary, such as ultrasound, CT and MRI. Distal forearm and hand are one of important regions because of the fact that many different structures are located on small areas. Proper diagnostic procedures, surgery under tourniquet control and trained surgeon for hand surgery, as well modern histopathological examination are mandatory. Despite the fact that many common subcutaneous masses in this regions, such as lipoma and ganglion are the more frequent, detailed examination should be done before surgery, as we can see from this relatively rare case.

Keywords:
tumor, Schwannoma, median nerve
Propionibacterium acnes infection: a first reported case in the native wrist joint

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**Objectives / Interrogation:** Propionibacterium acnes (P. acnes) is an anaerobic organism that commonly colonizes the human skin. It is the most prevalent organism associated with deep prosthetic shoulder joint infections. It has never been implicated in rapidly progressive arthritis of the native wrist joint.

**Methods:** A 59-year-old retired, right hand dominant office worker was referred with a 6-week history of progressive pain and swelling in her left wrist after multiple local healthcare visits. There was no history of preceding trauma, foreign travel and tuberculosis contacts. She was systemically well and denied any constitutional symptoms. Clinical examination found pain on palpation over the radiocarpal and distal radioulnar joints, with diffuse swelling over the dorsum of her wrist, and an exaggerated pain response to both active and passive range of movement.

Serial radiographs showed rapidly progressive degenerative changes within the wrist along with raised inflammatory markers suggesting possible underlying infection. She underwent urgent exploration, washout and bone/synovial biopsies for microbiology and histological analysis prior to administration of antibiotics. Prolonged enrichment culture specimens grew P. acnes. Fungal cultures, acid alcohol fast bacilli cultures and histopathology were all unremarkable. She was commenced on 6 weeks of oral co-trimoxazole. Her acute symptoms and inflammatory markers improved.

**Results and Conclusions:** We describe a case of rapidly progressive arthropathy of the native wrist secondary to infection with P. acnes. This is the first time this has been described in the literature. It is imperative to request and wait for prolonged enrichment cultures to aid microbiological diagnosis.

**Keywords:**
Propionibacterium acnes, anaerobes, septic arthritis, osteomyelitis, infection
Treatment of Distal Radius Fractures by Wrist Prosthesis

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Objectives / Interrogation: Management of distal radius fractures (DRF) by wrist prosthesis is a solution proposed by some French surgeons in cases of comminuted intra-articular fractures in the elderly. This concept has long been used successfully in the hip, shoulder, elbow. We report our experience with a replacement and resurfacing prosthesis of the distal radius.

Methods: Since 2005, 29 prostheses were implanted on 29 patients (27 women and 2 men), the mean age was 77 years old, from 38 to 102. 27 cases concerned elderly and osteoporotic women: 22 times for complex intra-articular fractures and 5 times for malunions. In 2 cases the procedure concerned men: a middle-age with low functional demand and complex intra-articular fracture, a young man with a pathologic fracture (Giant cell tumor).

Results and Conclusions: 25 patients were reviewed with one year follow-up. A 90 years old woman died 4 months after surgery, she retained a good result at the wrist. 3 patients have less than 1 year of follow-up. 20 patients were satisfied or very satisfied, 4 patients were moderately satisfied, 1 patient was dissatisfied. 16 patients had no pain (VAS=0), 8 patients complained of pain during strength activities or barometric pain, 1 patient was painfull with a CRPS. DASH score was 26. Mean mobilities were: extension 62°, flexion 37°, ulnar deviation 26°, radial deviation 21°, pronation 72°, supination 68°. Mean strength was 79 % of the controlateral strength. The implants were perfectly stable on the x-rays, in 16 cases we found peri-prosthetic ossifications. At the longer follow-up, none of the prosthesis needs a revision. A Darrach procedure was performed for a painful DRUJ, after 3 years of follow-up on a patient with rheumatoid arthritis.

The optimal treatment of complex DRF in elderly is controversial. Wrist hemi-arthroplasty is a simple solution particullary indicated when metaphyseal instability and intra-articular comminution are associated. The clinical results are obtained more quickly and with fewer complications than with ORIF. Other French surgeons have designed prostheses for DRF. These prostheses replace only the distal carpal facet and not the sigmoid notch, so a distal ulna resection must frequently be associated.

Management of DRF by a prosthesis is a solution we can now propose in elderly, particularly in cases of intra-articular comminution and metaphyseal instability. Our choice prosthesis is an hemi-arthroplasty resurfacing not only the carpal facet but also the sigmoid notch.

Keywords:
distal radius fracture wrist prosthesis
Dorsal wrist ganglion in teenager: what else is there?

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Objectives / Interrogation: Dorsal wrist ganglions may be related to underlying wrist pathology. They are not often described in paediatric population. The purpose of this study was to evaluate their clinical presentation, associated lesions and outcome.

Methods: We evaluated retrospectively the patients operated between April 2012 and June 2018, with a 15.6 months follow up. There were 8 patients, average age 15.6 (10 to 19), 5 female and 3 male. All had a ganglion cyst emerging from the scapho-lunate space and pain during activity. Four practiced sports regularly and 2 competition sports. These 6 reported relevant traumatic events as the origin of the ganglion cyst. Of these 3 had clicking while eliciting the Watson test, but not a clear positive test. There were no other signs of instability or ulnar border pathology. None had range of motion loss. Simple and stress x-rays were normal. Three had MRI which was negative for ligament injuries.

Results and Conclusions: The patients were submitted to wrist arthroscopy, dry technique, observing radio-carpal and mid-carpal compartments. In all cases the cyst was debrided through the mid carpal radial portal with a shaver. Four (50%) had luno-triquetral instability and were submitted to arthroscopic capsule-ligamentous repair though a volar portal, using 3-0 pds suture. One of these had a TFCC type IB distal tear (Atzei classification) repaired with suture. The other 4 had no wrist pathology other than the cyst. None had scapho-lunate instability. Post operative protocol was for those with instability 6 weeks in a short upper limb cast and physiotherapy and gradual increase in strength for the following 6 weeks. For the simple cysts was 3 weeks in a Robert-Jones bandage and gradual return to usual activity.

There was one recurrence in a simple cyst. There were no other complications. All were pain free and back to their previous activities, including sports, at 3 months time.

Symptomatic ganglion cysts in paediatric population may often have underlying pathology. All those with luno-triquetral instability reported sports practice and relevant trauma. Luno-triquetral tears may have unclear manifestations such as ganglion cyst and clicking while testing wrist stability. These injuries are often missed in dynamic x rays and MRI.

Keywords:
wrist ganglion cyst, paediatric, carpal instability
APPLICATION OF CURRENT CONCEPTS IN HANDLING EXPOSED FRACTURE OF THE HAND; EXPERIENCE AND LOCAL RESULTS

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Objectives / Interrogation: Fractures of the hands' fingers constitute the 1.5% of the urgent consultations, 5% of them correspond to exposed fractures, of predominance in masculine sex (70 - 90%), they present variable severity in function of multiple associated factors. In accordance to literature, there is enough evidence to demonstrate that the infection rate in these lesions is low, being the main factor, the early administration of antibiotics, showing no correlation between debridement time and infection rate.

The objective of this paper is to present the results obtained from the management of exposed hand fractures, performed by general doctors at a local hospital in the Araucanía region, Chile, during the year 2018, applying the classification of Tulipan and Iliyas

Methods: Thirty patients with exposed hand fractures admitted in 2018 were evaluated in the period from January to August of this year; 26 men and 4 women, within an average age of 43 years. All patients received antibiotic prophylaxis with cefazolin + tetanus vaccine, 10 of them classified as I / Ia were handled by general practitioners in a definitive way, patients with more complex lesions were referred to a more complex hospital for evaluation and management by a specialist, of which 6 required pavilion and 4 of them osteosynthesis

Results and Conclusions: During patients' evolution, only 1 of them presented signs of local infection, being managed promptly with ambulatory oral antibiotic scheme, presenting good response and without any surgical intervention needed. From the patients managed in emergency box and in ward, all were kept in serial clinical control, evolving favorably, without signs of infection of the operated site or other associated complications.

From the above, it can be concluded that exposed fractures classified as I-III without modifier, do not require emergency surgical treatment, and can be managed on an outpatient basis, with administration of antibiotic prophylaxis on time, associated with adequate debridement in emergency box.

The application of the new classification of Tulipan has shown promising and consistent results, since a large number of patients could be managed efficiently by general doctors with an adequate prior training, with good and excellent results, achieving the decrease in the need for pavilion and management by specialists, and hence optimize resources.

Keywords:
Open Fractures of the Hand:
Comparison of Isokinetic power between Pronator quadratus sparing technique and conventional technique in simple Distal radial fracture using Volar plate fixation

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Objectives / Interrogation: We compared the isokinetic power between the patients who had pronator quadratus sparing and conventional technique done when they went through internal fixation using volar plate after distal radial fracture.

Methods: The subjects were the patients who had internal fixation using volar plate done for simple distal radial fracture in our hospital from January 2014 to January 2016 and whose follow-up was available more than at least 6 months. The subjects were 34 patients whose muscle power was measured 6 months after the surgery. 16 patients who had pronator quadratus sparing technique done were classified into group 1, while 12 patients who had pronator quadratus excised as the conventional way were classified into group 2. We compared pronation, supination, grip strength which were measured at the time of 6 months after the surgery of both affected and unaffected sides in the two groups. We measured isokinetic power to check muscle power. For statistical management and analysis, comparative analysis was done with independent T-test.

Results and Conclusions: The average follow-up period was 21±4.2 months and the average age was 47.3 in group 1 and 50.4 in group 2. The patients were composed of 13 males and 21 females. There was no significant difference between the two groups regarding follow-up period, age and sex. The mean peak torque of pronation power was 84.4% in group 1, compared to the unaffected side, and 73.5% in group 2. The mean peak torque of supination power was 91.7% in group 1, compared to the unaffected side, and 90.8% in group 2, which showed no significant difference between the two groups. Grip strength was 85.3% in group 1 and 81.3% in group 2, which showed no statistically significant difference. Using pronator quadratus sparing technique in internal fixation with volar plate after radial fracture is considered to be able to preserve pronation power.

Keywords: distal radial fracture, volar plate, sthenometry
Is skyline view accurate for detecting protruded screw in volar plate fixation of distal radius fracture? : Compared with intraoperative mobile-mini CT

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Objectives / Interrogation: Our purpose is to compare and analyze intraoperative fluoroscopy (skyline view) and mobile-mini computed tomography (CT) for detecting protruded screw in volar locked plating of distal radius fracture.

Methods: We did a prospectively analysis on 20 patients (6 males and 14 females) who had both intraoperative fluoroscopy (skyline view) and mini CT taken, among the patients who had volar locking plate fixation for distal radial fracture at our institution from January 2017 to March. In all cases 4 to 5 locking screws were used at distal row to fix the plate, and skyline view and mobile-mini CT were undergone before pronator quadratus and skin suture. After axial view parallel to the screw was reconstructed on CT, distance between screw tip and dorsal cortex (STCD: screw tip cortex distance) was measured by saving the images on PACS. STCD measured by mobile-mini CT and skyline view were compared.

Results and Conclusions: In skyline view, STCD was 1.68mm, 2.08mm, 2.16mm, 2.84mm, 4.51mm from radial side, respectively. In mobile-mini CT, it was 1.79mm, 1.22mm, 1.20mm, 1.62mm, 5.79mm, respectively. Regarding the 2nd and 3rd screws, STCD measured by skyline view was significantly longer compared to that by mobile-mini CT (p value<0.05). 2 cases showed protruded 3rd screw in CT, while they did not seem so in skyline view. These screws were replaced with shorter ones. In our study, screws looked less protruded at skyline view compared with mobile-mini CT. Additional caution is needed especially when inserting 2nd and 3rd screw.

Keywords: distal radius fracture, volar locking plate, skyline view, mobile-mini CT
Cost Analysis of Trigger Finger Release Performed in Clinic versus in the Operating Room

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Objectives / Interrogation: Trigger finger release (TFR) is a simple hand procedure that has routinely been performed in the operating room (OR) under sedation but is now being more frequently done as wide-awake, local anesthetic, no tourniquet (WALANT) surgery. This study seeks to compare hospital and patient costs, as well as payer reimbursement for both single and multiple TFRs performed in the office versus in the OR.

Methods: We reviewed patients having received TFR by board-certified hand surgeons from January 1, 2015 to January 1, 2018. Cost data were compiled in the form of direct and indirect costs, and stratified according to the number of TFR each patient underwent. In addition, payer information and reimbursement rates were calculated.

Results and Conclusions: There were a total of 523 patients included: 477 in the OR and 46 in the clinic. Of the OR group, 359 (75%) underwent a single TFR that incurred an average cost of $997. The total average cost of 2 and 3 simultaneous TFR in the OR group was $1200 and $1558, respectively. The cost for single and multiple TFR in the clinic group is fixed between $111 and $115. Payer reimbursement for the OR group was between $778-$2293 (78-230% of cost) for one TFR, $600-$2676 (50-223% of cost) for two simultaneous TFR, and $0-$2726 (0-175% of cost) for three simultaneous TFR. For the clinic group, payer reimbursement was between $272-$895 (240-790% of cost).

TFR in the clinic compared to the OR had an overall cost reduction of $882 for a single finger and up to $1443 for three fingers. On average, reimbursement varied greatly depending on payer type (commercial, Medicaid, Medicare, self-pay, worker’s comp, and other). As a percentage of cost, payer reimbursement for clinic TFR was consistently greater than that for OR TFR independent of the number of fingers released. The higher payer reimbursement percentage in addition to lower overall cost for clinic TFR decreases the cost transferred to the patient. Overall, the office setting can provide a significant cost savings benefit to both hospital and patient, and should be considered for routine TFR procedures.

Keywords:
trigger finger release, WALANT, MAC, cost analysis
Harvesting the sural flap with covered pedicle: outcomes and advantages in 7 cases

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Objectives / Interrogation: To evaluate the feasibility of harvesting the sural flap with a skin extension covering the pedicle, analysing the flap survival rate and the potential benefits of this modification

Methods: A prospective cohort of 7 consecutive cases were evaluated in terms of flap viability and the amount of skin graft required to cover the pedicle or donor site of the flap. Of these patients six were male and one female. 01 flap was performed for a tumor lesion, 01 for post-operative coverage of achilles tenorrhaphy and 5 for post-traumatic lesions. Seven patients were treated for soft tissue defects located at the middle third of the tibia, ankle or hindfoot. The flap design was exactly the same as described by Masquelet (1992). The only modification was the inclusion of a strip of skin (1 to 2 cm in width) over entire length of the dissected the pedicle, so the final shape of the flap was similar to a long racquet. After the flap elevation, the intermediary skin between the donor site and the soft-tissue defect was incised and the skin was undermined to accommodate the pedicle without any undue compression or tension. The flap was inset and sutured at the defect and the skin over the pedicle was also suture to the undermined skin

Results and Conclusions: All cases had a satisfactory evolution, with adequate healing of the wounds and flaps' integration. The donor site was primarily closed in all cases and a minimal amount of skin graft was required in 2 cases, at the base of the pedicle. In one patient the flap developed a superficial epidermolysis in the distal tip that healed by secondary intention without need for further intervention. The inclusion of a strip of skin covering the pedicle of the sural flap was feasible, without any technical issues. This modification did not negatively impact the survival rate of the flaps and provided an easier and safer accommodation for the flaps' pedicles, since none of the pedicles were tunneled. It also diminished the necessity for skin graft at the pedicle

Keywords:
sural flap, soft-tissue defects, leg, pedicle coverage
Surgical Anatomy of Medial Femoral Based Vascularized Bone Graft Arterial Pedicle

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Objectives / Interrogation: The arterial anatomy of the medial femoral condyle (MFC) vascularized bone graft has been extensively studied in cadaveric specimens. Both the descending genicular and superomedial genicular vessels can be used as the dominant pedicle to the vascularized medial femoral condyle and trochlea grafts. A majority of cadaveric studies have limited numbers of specimens but data from these studies are extrapolated to the surgical environment. The purpose of this study is to evaluate the vascular anatomy of the medial femoral condyle to correlate surgical experience to cadaveric data.

Methods: A retrospective review of operative reports was conducted of medial femoral condyle and trochlea vascularized bone grafts performed by the senior two surgeons between 2005 to 2018 at the Mayo Clinic, Rochester. A total of 95 patients were included in the study. Operative reports were reviewed to determine arterial anatomy as well as dominant pedicle harvested. Demographic data, preoperative diagnosis and type of graft harvested were collected.

Results and Conclusions: The descending genicular artery off the superficial femoral artery was the dominant pedicle, encompassing 76.8% of all donor vessels. 77% of MFC cases (68 of 88 total) utilized the descending genicular. It was also dominant for medial femoral trochlea bone grafts with 5 out of the 7 (71.4%) cases. The superomedial genicular artery was the dominant pedicle in 23% (22 of 88 total) of all cases. Within this group, there were 6 patients who did not have a descending genicular branch thus necessitating the use of the alternate pedicle. The primary finding for all patients in whom the descending genicular was not utilized was inadequate vessel caliber. The superomedial genicular artery was absent in 2% (2 of 95 cases). Pedicle length was adequate for all cases.

Keywords:
Vascularized bone graft, medial femoral condyle, medial femoral trochlea
Arthroscopic reduction/Internal Fixation for common articular fractures of the Metacarpophalangeal joints

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Objectives / Interrogation: Fractures of the Metacarpophalangeal joints (MCP) are relatively common but frustrating fractures to address surgically. This can include Thumb bony skier’s thumb injuries, diepunch fractures of the proximal phalanx bases, or articular dome fractures of the metacarpal head amongst others. Lesser fractures, including ones with small fragments, are often treated conservatively with unpredictable clinical results, while more severe fractures are addressed via extensile open approaches where the treatment may be as deleterious as the fracture itself.

Methods: ARIF (arthroscopic assisted reduction/internal fixation) utilizes a minimally invasive approach via a 1.9 scope (Nexus Salt Lake City, UT) where visualization of the fracture site is superior to open means, associated soft tissue lesions and synovitis can be addressed, and anatomic reduction is superior due to direct observation of the articular surface at time of stabilization. Applying internal fixation via percutaneous technique, with arthroscopic visualization, also avoids the consequent stiffness that invariably results from violating the joint capsule/Sagittal hood in open surgery.

5 representative clinical cases will be presented to outline the basic principles of this methodology designed to leverage newer small joint technologies to encourage superior clinical outcomes.

Results and Conclusions: Arthroscopic reduction followed by internal fixation is a superior method for obtaining an anatomic reduction of a critical joint surface for hand function. Arthroscopy provides superior visualization, allows concomitant soft tissue injury management, synovectomy and better confirms the quality and accuracy of the articular reduction. Surgeons should begin to train in small joint arthroscopy methods in order to provide patients with the best option for these challenging fractures of the MCP.

Keywords:
arthroscopy, Articular fractures, trauma
Botulinum toxin injection as a prediction of surgical outcomes in cerebral palsy patients with upper limb deformities

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Objectives / Interrogation: Many studies report the outcome of hand function after treatment with botulinum toxin type A injection in the management of spastic CP deformities. Upper limb surgeries in carefully selected cerebral palsy patients as surgical interventions tend to improve their activities of daily living and quality of life. The aim of this study was to review our results of management of upper limb deformities in cerebral palsy patients with a view to using botulinum injections as a prediction of surgical outcomes.

Methods: This was a retrospective review of 25 consecutive CP patients who had intramuscular botulinum toxin type A injection (Botox® (BTX-A), Allergan, Ireland) or surgical correction or both for spastic deformities of the upper limbs from June, 1982 to October, 2010 at the Duchess of Kent Children Hospital (DKCH). There was no standardised management protocol as treatment was tailored to meet the specific needs of each patient in terms of dose of BTX-A injection, sites of intramuscular injection, interval between doses, number of injections, physical therapy sessions, types of splints used and required number and nature of surgical procedures needed.

Results and Conclusions: For group A (n=13), the mean increase in AROM of the wrist joint was 21.15 degrees while for group B (n=9), it was 60.56 degrees (t=2.850; p 0.010). In group A (n=15), the mean increase in the House score was 1.27 as against that of group B (n=10) which was 2.10 (t=1.287; p 0.211)

The use of BTX-A injection and surgical interventions are beneficial to CP patients with spastic upper limb deformities, when indicated, as evidenced by the improvement in the range of motion of a joint and functional outcome of the upper limbs using the HFCS.

The long term benefit of surgical correction (with BTX-A injection) in improving the AROM of the wrist joint is at least three times better than that obtained from BTX-A injection alone

Keywords:
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IFSSH19-1537

Does Ligament Reconstruction and Tendon Interposition (LRTI) destabilise the carpus?

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Objectives / Interrogation: Ligament Reconstruction and Tendon Interposition (LRTI) is a commonly performed surgical intervention for trapeziometacarpal osteoarthritis. It entails removal of the trapezium, thus damaging the scaphotrapeziotrapezoid (STT) ligamentous complex. Despite the common use of this intervention, little is known about its effects on carpal stability. Only one retrospective study has actively researched this subject, analysing 22 wrist undergoing trapeziectomy as part of a variety of procedures, with a follow-up of 8.5 months. Results showed significantly increased radiolunate (RL) angles and revised carpal height (RCH) ratio. No corrections for differences in wrist flexion between pre- and postoperative radiographs were made. We present the results of the first prospective study specifically analysing the effect of LRTI on carpal stability.

Methods: 58 patients were enrolled, of which 25 were excluded because of loss to follow-up or inadequate radiographs. Pre- and postoperative PA and lateral radiographs from 34 wrists with a follow-up of at least one year were analysed for radioscaphoid (RS), radiolunate (RL), and radio-third metacarpal (RMC3) angles, as well as the revised carpal height (RCH, Natras method). The effect of wrist flexion (as measured by the RMC3 angle) on the RL angle was corrected for by subtracting half of the difference in RMC3 angle from the RL angle. Statistical analysis of the change in SL angle, RL angle and RCH was done with the paired t-test.

Results and Conclusions: We found a change in SL angle from 56.3° preoperatively (SD 10.1) to 56.8° postoperatively (SD 11.1), p = 0.7. The change in RL angle (uncorrected for wrist flexion) was from 6.0° (SD 9.4) to 7.4° (SD 11.8), p=0.4. When correcting for wrist flexion, the change in RL angle was from 0.3° (SD 13.5) to 3.2° (SD 11.8), p 0.04. There was no significant change in RCH, as the ratio changed from 1.61 to 1.58; p=0.3).

In conclusion, we found no statistically significant changes in SL angle or RCH, and a statistically significant but clinically insignificant change of the RL angle. These results seem to suggest that the short-term development of carpal instability should not be a concern after LRTI. Limitations of this study are the relatively short follow-up time, small sample size and the variation in wrist flexion between pre- and postoperative radiographs.

Keywords:
LRTI, carpal, instability, STT, collaps
Capitellum fracture sequelae treatment

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Objectives / Interrogation: Treatment for the sequelae of capitellum fractures is not commonly described in the literature. Anconeus interposition arthroplasty has been described as a technique to treat radiocapitellar arthritis as well as joint replacement.

We present a unique case of a capitellum reconstruction with a vascularized osseous graft from the second metatarsal bone.

Methods: A woman of 53 years old fell down and presented a capitellum fracture that was fixed with two cannulated screws, after 6 months the radiograph showed signs of necrosis of the capitellum, the patient was disabled and a surgery was offered. We reconstructed her capitellum by means of a vascularized osteochondral flap from the second metatarsal bone, and end-to-side anastomosis to the radial artery was performed and two cannulated screws were used to fix the graft to the humeral lateral column. The patient required 2 operations after the reconstruction, one because of diastasis of the olecranon osteotomy, the second because of a superficial infection which was solved with local debridement and oral antibiotic.

Results and Conclusions: After one year the range of movement is -30°-110° with complete pronosupination, and no pain.
Anconeus interposition arthroplasty and joint replacement have been described as palliative methods for treating the radiocapitellar arthritis, however the new treatment we describe is based on microsurgery techniques and provides a more anatomical solution to this severe problem in a young, active patient.

**Keywords:**
microsurgery; osteochondral flap
Digit preservation treatment for type IIIB or IV hypoplastic thumb using a non-vascularized metatarsal transfer and staged reconstruction

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Objectives / Interrogation: The patients of severe types (Blauth type IIIB and IV) of hypoplastic thumb are classically treated by pollicization. However, pollicization is not equivocally acceptable due to differences in parents’ expectations. Furthermore, the concept of a 4-digit hand is culturally unfavorable, particularly in Asian countries. The objectives of this study was to introduce the method of digit preservation treatment for type IIIB or IV hypoplastic thumb using a non-vascularized metatarsal transfer and staged reconstruction and report the early results.

Methods: From June 2013 to June 2016, a digit preservation treatment method was performed for 42 type IIIB and IV hypoplastic thumbs using a non-vascularized metatarsal graft and staged functional and aesthetic reconstruction. The 4th metatarsal was transferred for the reconstruction of the 1st metacarpal and CMC joint. The iliac bone graft or half of the 3th metacarpal was used to reconstruct the donor metatarsal defect. The Huber procedure or the ring finger FDS transfer was performed at the second stage for opponensplasty. The free fat graft or local flap was performed to improve the cosmetic appearance of the reconstructed thumb as required.

Results and Conclusions: Thirty-three cases had complete follow up data. The average follow-up was of 27 months and the average age at operation was 19 months. All patients achieved reasonable hand function and all the parents were satisfied with the appearance of the 5-digit hand. There were 3 partial skin flap necrosis at the recipient site. There is one bony nonunion at the recipient site and healed with iliac bone graft. There was no obvious complication at donor site. The staged functional and aesthetic reconstruction is a feasible method for patients with type IIIB and IV hypoplastic thumb. It allows the preserving of a 5-digit hand with acceptable functional and cosmetic outcome.

Keywords:
hypoplastic thumb, congenital hand anomaly
Osteoid Osteoma of the Carpal bones

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Objectives / Interrogation: Osteoid osteoma predominantly develops in the cortex of long bones and the spine, but rarely in the carpal bones. We report two cases of osteoid osteoma in the carpal bones, one in the hamate and another in the capitate.

Methods: Case 1] A 10-year-old girl who danced hip-hop presented with pain and swelling in the back of the right hand 1 month earlier. The ROM associated with pain was 45° for dorsiflexion (DF) and 60° for palmar flexion (PF). X-ray revealed sclerosis in the hamate. CT revealed a concave area in the cortex of the articular surfaces of the hamate and triquetrum, with shadows indicating bone fragments. T1- and T2-weighted MRI revealed decreased intensity at the same site. As she reported that she often spun on her hands during dance performance, osteochondritis dissecans of the articular surfaces of the hamate and triquetrum was initially suspected; thus, conservative treatment was initiated. However, the pain did not improve after 6 months, and X-ray revealed bone atrophy. As aspirin was markedly effective, osteoid osteoma was suspected, but no tumor was detected in the CT-guided biopsy. One year after the initial visit, she underwent curettage of the hamate followed by iliac bone grafting, which improved the symptoms.

Case 2] A 29-year-old male firefighter presented with a chief complaint of pain in the left hand. Six months earlier, pain occurred on the ulnar side with no apparent cause, which made push-ups difficult and led to his visit to our hospital on referral by his local physician. The dorsum of his left hand was mildly swollen, with tenderness on the dorsal aspect of the capitate. The pain ROM as 80°/70° = DF/PF. The grip strength relative to the unaffected hand was reduced to 78%. Pain intensified at night but was alleviated by Bufferin. CT and contrast-enhanced MRI revealed a nidus in contact with the articular surfaces of the capitate and hamate. En bloc excision was performed via the dorsal side under conduction anesthesia, immediately followed by CT to confirm that the nidus had disappeared. The pathological examination results were assessed, and iliac bone grafting was later performed. On pathological examination, a newly formed osteoid was found. Complete bone healing was observed. At 13 months later, the pain had disappeared. The ROM was still mildly restricted, but the grip strength increased to 105%. Imaging results indicated no tumor recurrence and bone healing.

Results and Conclusions: Though rarely, an osteoid osteoma can be accompanied by pain and swelling in the hand.

Keywords:
Carpal bones, Hamate, Osteoid osteoma, Capitate
RegJoint disc spacer use in traumatic trans MCP joint amputation of index finger - CASE REPORT

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Objectives / Interrogation: RegJoint is an implant made of bio absorbable material. Indications for implantation is arthroplasty of small joints in hand and foot, following joint destruction because of rheumatoid arthritis or osteoarthritis. In our case 55-year-old patient was administrated after total trans-MCP joint amputation of the left index finger and loss of articular surface on the head of second metacarpal bone. RegJoint implant was used in primary reconstruction of the second MCP joint.

Methods: We performed replantation of left index finger. X-ray image made preoperatively, indicated in destruction of articular surface of the second metacarpal bone head, which was confirmed during operation. Plan was to keep some mobility in the injured MCP joint after replantation. Methods at our disposal were: interpositional arthroplasty with tendon spacer made of FCR or PL, Swanson finger joint implant and RegJoint disc spacer implant. We decided to use RegJoint implant for arthroplasty of the injured joint, because we wanted to avoid making an additional trauma to the hand, and because we have great results using it in threatening rizarthrosis. Postoperatively patient underwent through standard rehabilitation program. Progress was evaluated using VAS, ROM, TAM and QuickDASH score, 2-PD test and aesthetic aspect was observed. First evaluation was made after 12 weeks. 20 weeks after replantation tenolysis was performed due the lack of motion, it was discovered that adhesions between FDP and FDS formed and re-rupture of FDP occurred. Again patient went through rehabilitation program.

Results and Conclusions: Patient was followed throughout rehabilitation. After 12 weeks results were - TAM (5°), QuickDASH (54,5). 20 weeks after the tenolysis was performed. At the end of the rehabilitation program, 26 weeks after, patient was subjectively happy with the result and without pain. TAM (50°), QuickDASH (45,4), VAS (0).

RegJoint can be considered in primary reconstruction of the small joint after hand injury. In this case it is an option in threatening some kind of intraarticular fractures as an alternative to arthrodesis.

Keywords:
RegJoint, Amputation, Replantation, Casereport
Quantitative relationship between palmar contact forces and carpal tunnel pressure

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Objectives / Interrogation: Carpal tunnel syndrome is the most common entrapment neuropathy occurring in upper limbs. The etiology, however, has not been fully understood yet. The increase of carpal tunnel pressure is considered as the common pathophysiological pathway. It has been identified that forces applied to the palm would affect the carpal tunnel pressure. However, the quantitative relationship between the palmar contact force and carpal tunnel pressure is not well known. The purpose of this study was to quantitatively evaluate the relationship of palmar contact forces and carpal tunnel pressure.

Methods: Eight human cadaver hands were used. The carpal tunnel pressure was measured with a diagnostic catheter-based pressure transducer inserted into carpal tunnel. A custom made device was used to apply forces to the palm until the desired carpal tunnel pressure was attained. Palmar contact forces corresponding to the determined carpal tunnel pressure level were recorded respectively. The testing was repeated with different ranges of tension applied to the flexor digitorum superficialis tendon of the third finger. The tensions were constant at 50 gram for the other flexor tendons and median nerve. Statistically, two-way ANOVA of repeated measures were used to compare the palmar contact forces between tendon tensions as well as carpal tunnel pressures. Pair-wise comparison was conducted through post-hoc Bonferroni test. In addition, in order to build the quantitative relationship between palmar contact force and carpal tunnel pressure, linear fitting was implemented to find out the equation and coefficient of determination was also calculated to determine how fitted they were.

Results and Conclusions: The results showed that carpal tunnel pressure increased linearly with the force applied to the palm. However, no significant increase in applied forces was found when tendon tension increased. When carpal tunnel pressure was 30 mmHg, mean values of the contact force to the palm was 293 (SD: 15.2) gram-force including all tensions. These results would help to understand the effect of daily activities with hands on carpal tunnel pressure. Further evaluation in vivo study is aimed to realize in more detail the relationship between palmar contact forces and carpal tunnel pressure in the future.

Keywords: carpal tunnel syndrome, carpal tunnel pressure, palmar contact force
Excellent functional recovery of posterior interosseous nerve injury after periprosthetic radial fracture by using antebrachial cutaneous nerve graft

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Objectives / Interrogation: Background:
The early diagnosis of posterior interosseous nerve (PIN) injury is difficult if combined with bony fracture. Autologous nerve grafting is gold standard when a nerve gap exists, but the result is unpredictable. Aim and Objectives:
We reported a case of periprosthetic radial fracture leading to PIN gap which was reconstructed by ipsilateral antebrachial cutaneous nerve. Excellent functional recovery was achieved at 1-year follow-up.

Methods: A 16-year-old female patient suffered from periprosthetic radial fracture due to repeated trauma over left forearm. During exploration, a 2-cm gap was identified in PIN. Lateral antebrachial cutaneous nerve (LACN) in the same operation field was used to reconstruct the nerve defect by double cable nerve graft

Results and Conclusions: Results:
Comprehensive rehabilitation program and electrical nerve stimulation were initiated since post-operative 2 weeks. One year after operation, full functional recovery was achieved in all digits. No sensory deficit was observed over lateral forearm. Conclusion:
PIN injury in prosthetic radial fracture is rare but noteworthy issue. LACN is an ideal donor nerve with minimal sensory loss. Excellent functional recovery results from early diagnosis, suitable reconstruction, and comprehensive rehabilitation programs.

Keywords:
posterior interosseous nerve, PIN
Should we repair TFCC in distal radius fracture

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Objectives / Interrogation: Distal radius fractures are associated with a high incidence of triangular fibrocartilage complex (TFCC) tears. Healing of TFCC tears is postulated after anatomical fixation. This study aims to evaluate the status of TFCC after the union of distal radius fractures and to assess its functional outcomes.

Methods: 80 patients who were elected for the removal of implants after union of distal radius fractures were recruited. Concomitant wrist arthroscopy was performed to assess the status of TFCC. Repair of TFCC was attempted for patients with symptomatic distal radioulnar joint (DRUJ) instability. The follow-up period was at least 1 year post wrist arthroscopy.

Results and Conclusions: There were 18 extra-articular distal radius fractures out of 80 fractures. 45 patients had ulnar wrist pain and 54 were noted to have DRUJ instability on examinations. Their average DASH score was 39. The findings of wrist arthroscopies revealed 16 patients with intact TFCC. There were 64 complete tears and 26 incomplete tears showing signs of healing. Tears were significantly associated with DRUJ instability (p=0.02) on physical examination and the presence of ulnar styloid fracture but not with ulnar wrist pain (p=0.28). 32 tears were repaired and 32 were not repaired, based on patients’ symptoms and whether the tear was deemed repairable.

When we evaluated the 3 subgroups, i.e. intact TFCC, unrepaired TFCC tear and repaired TFCC, we found that there was no statistically difference in their pain score, range of movement, power grip and their DASH score prior to the removal of implants. At 12 months post wrist arthroscopy, all groups had significant improvement in pain score, ROM, power and the DASH score, when compared with pre-arthroscopy. In addition, the group with intact TFCC had a significant higher grip strength than the 2 TFCC tear groups, irrespective whether they have been repaired or not (102% vs 85% vs 86% p=0.015) at 12 months. There was no statistically difference in other parameters including pain, range of movement and DASH score.

A large majority of TFCC tears remained to be unhealed after fracture union. Yet their functional outcome may not differ from those with intact TFCC. Repair of all TFCC tears at the time of fracture may be overkill. A delayed repair for those with symptomatic instability appear to give satisfactory outcome.

Keywords:
TFCC, distal radius fracture, wrist arthroscopy, DRUJ instability, ulnar styloid fracture, ulnar wrist pain
Effects of Endoscopic Carpal Tunnel Release on Biomechanical Interactions between the Thenar Muscles and Transverse Carpal Ligament

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Objectives / Interrogation: The purpose of this study was to understand the biomechanical consequence of endoscopic carpal tunnel release (ECTR) on the interactions between the thenar muscles and transverse carpal ligament (TCL) in cadaveric hands. We hypothesized that ECTR would lead to greater changes in carpal arch height (CAH), width (CAW), and area (CAA) under thenar muscle loading compared to the intact condition.

Methods: Three female specimens (aged 60±1 years) without musculoskeletal pathology were dissected to expose the flexor pollicis brevis (FPB), the opponens pollicis (OPP), and the abductor pollicis brevis (APB) for loading. Magnitude for loading was set as 15% of each muscle's maximum physiological force production. Loading directions were determined by the muscle's anatomical orientation with the thumb placed in an abducted and pronated position. Loads on the individual and combined thenar muscles were applied in a randomized order with 30 sec ultrasound videos recording morphological changes at the distal TCL. After initial testing, each specimen underwent ECTR, and the same testing procedures were repeated. Custom LabVIEW programs were used to track carpal arch morphological changes.

Results and Conclusions: The FPB failed alone in one specimen and the FPB and the OPP failed in one specimen. For pre-release hands, APB loading generated a CAH increase of 0.049±0.046 mm, a CAW decrease of 0.23±0.31 mm, and a CAA increase of 0.32±0.24 mm². After ECTR, APB loading generated a CAH decrease of 0.041±0.21mm, CAW increase of 0.35±0.25 mm, and a CAA decrease of 0.53±1.58 mm².

Overall, our preliminary results showed APB loading generated small morphological changes in carpal arch for both the intact and released TCL, suggesting that ECTR may not affect the muscle-ligament biomechanics under low muscle contraction force. The small changes may be explained by the relatively low muscle force of a single muscle. It is likely that synergistic muscle contraction by all three thenar muscles with higher force magnitude would generate more appreciable carpal arch changes, allowing for better understanding of the biomechanical implications of carpal tunnel release. This data will be completed with additional specimens by the time of presentation.

Keywords: wrist surgery, transverse carpal ligament, thenar muscle
Arthroscopically assisted Sauvé-Kapandji procedure for distal radioulnar joint (DRUJ) disorders

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Objectives / Interrogation: The Sauvé-Kapandji procedure is useful for treatment of pathological conditions of DRUJ. The purpose of this study was to describe a novel technique of arthroscopically assisted Sauvé-Kapandji procedure. This procedure is many advantages compare with conventional Sauvé-Kapandji procedure.

Methods: The criteria for this procedure for DRUJ disorders were osteoarthritis, chronic instabilities of DRUJ except Rheumatoid arthritis with chronic pain, stiffness, and disability. Arthroscopies of the radiocarpal, midcarpal joint and DRUJ are performed. Make a longitudinal incision along ulnar border of distal ulnar. Exposed the distal ulnar in the interval between the extensor carpi ulnaris and flexor carpi ulnaris tendons. Resect a segment ulnar shaft, which leaves 15mm of ulnar styloid distal and removal of a 10-15mm cuff of ulnar shaft to create an ulnar neutral variance. The ulnar articulation with the sigmoid notch of the radius and articular surface of ulnar head are shaved off cartilage and expose the subchondral bone. If TFCC preserved, we perform using DRUJ approach not to excise from TFCC. After a through debridement of the DRUJ, a bone graft can be placed at the arthrodesis site arthroscopically. The cancellous bone graft can be harvested easily from the segment of ulnar shaft that we resected. The DRUJ is fixed using Kirschner wire (K wire) and cannulated screw. Finally, pronator quadratus interpose in the gap in the ulnar shaft to prevent reossification. Five patients treated with arthroscopically assisted Sauvé-Kapandji procedure reviewed retrospectively. We evaluated functional and radiological outcome. The parameters evaluated modified Inoue's clinical evaluation score included pain (wrist, ulnar stump), range of motion (pronation, supination), grip strength.

Results and Conclusions: Five patients (3 women, 2 men) who sustained DRUJ disorder were treated with a mean age of 60 years. At an average follow-up period 13.4 months, the functional results according to the criteria of modified Inoue's clinical evaluation score were excellent in 4 cases, good in 1 case. In all patients, bone union was obtained. Wrist arthroscopy has been recognized as one of the most effective diagnostic modalities for ulnar wrist pain. The advantages of this technique are exact diagnosis of ulnar wrist pain, its less invasive, preservation of soft tissues, faster rehabilitation, and a better cosmesis.

Keywords:
arthroscopy, Sauvé-Kapandji procedure, distal radioulnar joint
Treatment for iatrogenic spinal accessory nerve injury by a part of ipsilateral posterior C7 root transfer

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Objectives / Interrogation: Iatrogenic spinal accessory nerve (SAN) injury was one of serious operative complications of cervical lymph node biopsy, cystectomy or thyroid surgery. Comprehensive shoulder pain and weakness were common complaints, and even shoulder abduction paralysis. However, it was not always available to repair the SAN by nerve graft because of the proximal nerve retraction and local scar proliferation. Here an alternative method was introduced about a part of ipsilateral posterior C7 root transfer to repair SAN injury.

Methods: Six cases with iatrogenic SAN injury were included in this study. 4 cases were injured from cervical cystectomy, 1 case from neck lymph node biopsy and 1 case from thyroidectomy. According to the previous anatomic study, the available fascicle length of posterior part of C7 root was long enough to be transposition to the distal end of SAN at susceptible site of injury. Also, an optimal route was designed for part of posterior C7 root transfer. All the operations of 6 cases were performed successfully, and the distal end of SAN was repaired by the C7 fascicle transfer directly without nerve graft. The results of recovery were recorded.

Results and Conclusions: The mean available length of the donor C7 nerve fascicle was 4.3cm in 6 cases. Early signs of reinnervation of trapezius were observed by electrophysiological testing at 3 months after surgery in most cases, the latency was 7-8ms, and improved to 6ms at 6 months postoperatively. The results of electromyography(EMG) of the superior part of trapezius were a small number of nascent motor unit action potentials at 3 months postoperatively, which were about 3 months sooner than that in the middle and inferior parts of the muscle. Complex repetitive discharges were observed by EMG at 9months to 1 year after surgery in all cases. The atrophic trapezius muscle preoperatively had visible signs of improvement from grade M0 to grade M3 at 6 months postoperatively and M4 strength at 12 months after surgery. The comprehensive shoulder pain was reduced greatly at 3 months after surgery in all cases and disappeared by the time of 6 months to 1 year. The method of a part of ipsilateral posterior C7 root transfer to repair iatrogenic spinal accessory nerve injury was an effective alternative approach for those cases in which the proximal nerve of SAN could not be available duration operation.

Keywords:
spinal accessory nerve; Cervical 7 nerve; nerve transfer; iatrogenic nerve injury
ARTHROSCOPIC STT OSTEOARTHROSIS TREATMENT

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Objectives / Interrogation: STT osteoarthritis is the second most frequent localization of degenerative disease of the wrist. Open distal pole resection with or without interposition was the classical treatment. We introduce the STT osteoarthritis treatment performing an arthroscopic distal scaphoid resection.

Methods: From 2012 to 2016, 32 patients have been surgically treated by arthroscopic distal pole resection. Midcarpal radial, volar and dorsal STT portals have been used, age ranges from 42 to 75 yo, 4 males and 28 females. Three cases were associated with a volar cyst. Thumb traction was done in all cases, no tissue or tendon interposition was done. Midcarpal and SL instability was checked and treated when found. Three cases had previously been treated by complete trapecectomy but STrapezid remained clinically affected.

Results and Conclusions: All cases were completely done arthroscopically, mean time for surgery was 42 min. Mean follow up is 2.8 years. Three months postoperative pain relief was achieved in 71% of the cases. Pinch strength was restored between 120 and 80% compared to the contralateral hand in 87% of cases. Grade III and IV Geisler SL instability was surgically detected in 11 cases and shrinkage and cast immobilization was performed. Four cases had recurrences for impairment of SL instability and needed further treatment. Three cases needed secondary surgery because of incomplete volar pole resection.

CONCLUSIONS
STT osteoarthritis when is properly diagnosed it can be treated successfully by arthroscopic distal pole of the scaphoid resection. Better control for SL instability is a clear pearl and simultaneous treatment that can be done. Volar and complete distal pole resection is a challenge for successful results.

Keywords: carpo metacarpal, arthroscopy arthroplasty, osteoarthritis scaphotrapezium
Encapsulated Hematoma in hand secondary to cutting wound, in non-hemophilic patient

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Objectives / Interrogation: Background Encapsulated hematomas are also known as hemophilic cysts, because their presentation is more frequent in patients with this disease patients suffering from this disease. It is a complication that occurs in 1-2% of patients with severe cases of hemophilia, and its presentation in non-hemophilic patients is even more infrequent.

Methods: Materials and Methods An 18-year-old male patient with no relevant medical history, who consulted for presenting a rapid, painful, pulsating growth of a tumor in the palm of his right hand. He had suffered a sharp cut with a glass in the palm of his right hand 15 days before the consultation.

Results and Conclusions: Results The histological image was linked to an encapsulated hematoma. After 10 months from surgery, the functionality of the hand is preserved and painless.
Conclusion The descriptions in the literature are developed around hemophilic patients, and the cases are usually chronic and slow-growing, so the treatments are aimed at preventing this type of injury, and the reduction of its size by anticoagulants. Surgery is indicated only when they are large or aggressive. We consider it to be an infrequent complication of a cutting wound, however it should be considered as an option in persistent and rapidly growing hematomas.

Keywords:
tumor-hematoma-treatment
Outcomes of local bone graft and fixation of proximal pole scaphoid non-unions

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Objectives / Interrogation: Scaphoid fractures often present in delayed fashion as they are frequently perceived as minor wrist injuries. Proximal pole scaphoid fractures are thought to be at increased risk of nonunion due to the tenuous blood supply about this location. It is generally agreed upon that scaphoid waist nonunions are treated with screw fixation and bone graft; however, there are many proposed treatment options for proximal pole scaphoid fractures, and current literature has focused prevalently on vascularized bone grafts. The purpose of this study was to review a single surgeon's experience with proximal pole scaphoid nonunions that underwent surgical fixation with autogenous bone graft and screw fixation.

Methods: After obtaining IRB approval the EMR of one tertiary care center was queried for patients with the diagnosis of "proximal pole scaphoid fractures" over an 11-year period from 2006 through 2017 that underwent surgical fixation by a single surgeon (CSM). Fifteen patients met initial query criteria; upon review of records, 4 patients were excluded due to the acute nature of the fracture and 1 was excluded as surgical fixation included a vascularized bone graft.

Results and Conclusions: The final study cohort consisted of 10 patients with a total of 10 proximal pole scaphoid nonunions. Six patients underwent a pre-operative magnetic resonance imaging (MRI) and two patients were found to have signs of dysvascularity of the proximal pole on MRI. Volumetric measurements of the scaphoid fractures on CT were performed: average total volume of the fracture fragment was $2.4 \pm 0.48 \text{ cm}^3$ and the average volume of the proximal pole fragment was $0.38 \pm 0.15 \text{ cm}^3$. Eight patients underwent local bone grafting, and bone graft was inserted at the site of fracture in 7 patients and in the screw track in 1 patient. Union was documented by postoperative CT scan; seven showed signs of union at the time CT was obtained and three demonstrated partial union. None required additional procedures and there were no complications.

Proximal pole scaphoid fractures are thought to be at an increased risk of nonunion due to the tenuous blood supply. Current literature includes many proposed treatment options for proximal pole scaphoid fractures. The volume of the proximal pole fragment does not seem to correlate with increased risk of nonunion. Proximal pole scaphoid nonunions treated with surgical fixation and autogenous localized bone graft go on to union.

Keywords:
Proximal pole nonunion
Aesthetic reconstruction of fingers with re-shaped 2nd toe in one-stage operation

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Objectives / Interrogation: Although the 2nd toe-to-hand transfer has been the main choice of finger reconstruction since 1965, the reconstructed finger still results in a toe appearance when the 2nd toe was transferred to finger without any re-shape. Various technical refinements have been used to optimize the appearance of reconstructed fingers, but few attempts have been made to define the specific indications for these techniques or for considering which procedures are applicable in certain circumstance. This study was to provide useful guideline for selection of the proper one-stage re-shape procedures of 2nd toe and make the reconstructed fingers present a relatively-normal appearance and perform their functions.

Methods: The 2nd toe was classified, and then one-stage re-shape procedures were proposed for each classification. In total, Fifty-seven fingers with different levels of defects in 41 cases were reconstructed with 2nd toe transfer since 2007. Various surgical procedures were performed to re-shape 2nd toe according its type and the measured data.

Results and Conclusions: Twenty cases were lost to follow-up, and only 21 cases including 33 fingers attained 6 months to 9 years (averaged 4.2 years) follow-up, with 51.2% follow-up rate. We referred to the assessment criteria after toe-to-hand transfer issued by International Federation of Societies for Surgery of the Hand and Hand Surgery Association of China Medical Association, ATM:100°-215°, ADL:15-20 points, Static two-point discrimination: 4-10mm. Eight cases were “very satisfied” with the shape of fingers, and 13 cases were classified as “satisfied”. Twenty fingers out of 13 cases were excellently recovered, and 13 fingers out of 8 cases were acceptable recovered. Totally, 100% of fineness was reached. Conclusions: Therefore, it suggests that the classification and one-stage re-shape procedures of 2nd toe varying with each type are effective to reconstruct aesthetic fingers.

Keywords:
Toe-to-hand Transfer, Aesthetic Reconstruction, Classification, Re-shape Procedures
Validation of a Novel Rabbit Model of Compression Neuropathy in the Setting of Perineural Adhesion

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Objectives / Interrogation: Nerve injury initiates an inflammatory cascade that results in nerve scarring, fibrosis, and adhesions, leading to development of compression neuropathy. Rabbit nerve models more closely mimic human biology. This study sought to develop a novel, rabbit model to simulate compression neuropathy secondary to perineural adhesion.

Methods: Sciatic nerves of five adult, 3-4kg New Zealand White Rabbits were surgically-exposed. Left hindlimbs underwent sham surgery. Perineural adhesions were generated via bipolar electrocautery on 10 mm of the nerve bed, and the epineurium was fixed with microsuture to the cauterized wound bed (right). Rabbits were maintained for six weeks. Exposure of the sciatic nerve was performed bilaterally, with proximal and distal nerve transection, at which point peak pull-out force (N) required to break adhesions via pulley-mounting on a uniaxial biomechanical testing frame was measured.

Results and Conclusions: Scarred nerves required greater peak pull-out force than control nerves (2.51 N vs. 0.50 N, p=0.021).
Peak pull-out force for control and experimental scarred hindlimbs

TA muscle mass was significantly lower in the setting of induced neuropathy when compared to sham surgery (6.56 g vs. 8.52 g, p<0.001). We developed and validated a model to simulate compression neuropathy. Additionally, we created a novel means to measure peak pull-force required to break perineural adhesion as a quantitative surrogate for perineural scar. This model will provide surgeons a validated, animal model to pursue translational study of compression neuropathy.

Keywords:
compression neuropathy; animal model; rabbit; nerve; biomechanical; scar
Microsurgical Approach to the Management of Chronic Osteomyelitis

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Objectives / Interrogation: In this study, Microsurgical approach was utilized to manage chronic osteomyelitis in different parts of limbs, and optimal procedure and therapeutic effects were described and discussed.

Methods: During this treatment strategy, local blood supply of the infected skeletal tissues was taken into serious consideration before operation. Necrotic and infected skeletal tissues were debrided. Muscle flap or musculocutaneous flap were transferred to dead space to improve local blood supply. When no suitable muscle flap could be transferred from adjacent area, antibiotic bone cement blocks were filled in the dead space with following skin flap covering. They could provide a highly vascularized soft tissue bed, which can then be used as a future graft repository. Finally multiple modalities were successfully utilized to graft into the soft tissue bed. These measures included the use of autogenous cancellous bone graft, bone graft with vascular pedicle, bone graft with vascular anastomosis, and distraction osteogenesis bone transport techniques. In this study, 89 cases were treated with this approach.

Results and Conclusions: Chronic osteomyelitis of all cases have been successfully treated with this microsurgical approach in this study. With an advantage of improving local blood supply, microsurgical approach has unique superiority to treat chronic osteomyelitis.

Keywords:
Osteomyelitis, Flap, Microsurgery
Pyrocarbon Hemi- Wrist arthroplasty: 16 cases; Mean follow up two years.

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Objectives / Interrogation: To report our early experiences of a Pyrocarbon Hemi-Wrist prosthesis.

Methods: The RCPI pyrocarbon prosthesis was used for un-cemented hemi-wrist joint arthroplasty. Patients were evaluated pre- and postoperatively for ROM, grip strength and key-pinich. Visual Analogue Scales (0-100 mm) for pain and satisfaction, Quick-DASH and PRWE questionnaires were used as patient reported outcome measures. Radiographs were obtained pre-operatively and at latest follow-up. The procedure was performed in 16 patients (8 men and 8 women). Mean age was 50 years (range 20-68). Mean follow-up was 25 month (range 12-75). The rationale for the procedure was Kienboeck's disease in combination with degenerative arthritis (5 wrists) and posttraumatic arthritis (11 wrists). Five patients had previously undergone wrist surgery. Change between preoperative- and last follow-up measurements were analyzed with Wilcoxon signed rank test.

Results and Conclusions: Wrist extension and flexion were preop 45/40 degrees and at last follow-up (LFU) 40/30 (p=ns). Radial/ulnar deviation was 15/35 degrees versus 15/25 at LFU (p=ns). Grip strength, was preop 19 kgF (range 4-43) and at LFU 26 KgF (range 12-44, p=ns). VAS pain was preop at rest/activity; 55/75 and at LFU; 29/43 (p<.05). Quick DASH and PRWE scores were preop: 60 respectively 67 and at LFU: 38 respectively 32, (p<.05) respectively (p<.01). VAS for Patient's satisfaction were 66 mm (8-100).

No infections was encountered. Two prosthesis were revised, one to a total wrist arthroplasty because of persistent unexplained pain and one to an interposition arthroplasty because of ulnar dislocation of carpus. One patient underwent radial styloidectomy due to impingement. There were no loosening of any implant, but radiolucency in the capitate bone was detected for one patient. There were little change in ROM and Grip strength but significant improvements of pain, Quick DASH, PRWE scores. Patient's satisfaction was comparatively high and we found the complication rate to be acceptable. Our early results indicate that Pyrocarbon Hemi-Wrist arthroplasty could be a viable option in patients with selected types of wrist arthritis.

Keywords:
**Retrograde headless screw fixation for proximal scaphoid non-union with the guidance of preoperative 3D simulation**

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3 SOAI Orthopaedic Clinic (Takarazuka)

**Objectives / Interrogation:** Surgery of scaphoid nonunion is still challenging especially in case the nonunion site is proximal and wedge bone graft is needed. For proper fixation, we have tried preoperative simulation with 3D guidance obtained by CT. We report a case of retrograde fixation combined with wedge bone graft for proximal scaphoid nonunion with humpback deformity in which the target point is very restricted.

**Methods:** For a case of proximal small fragment of scaphoid non-union with humpback deformity, (Figure1-left, center)

![Figure 1: Preoperative CT and simulation of wedge bone graft](image)

we simulated correction of the deformity with use of contralateral 3D-CT images. We simulated two patterns of guide-pin insertion; After correction by wedge bone graft, 1) usual guide-pin insertion from the scaphoid tubercle and 2) trans-trapezium insertion. This simulation showed the target of the screw was strictly limited in the way of 1), although proper placement of the guide-pin centering both the wedge bone graft and tiny proximal fragment in the way of 2). (Figure1-right)

**Results and Conclusions:** At the operation, the guide-pin was inserted in the way of 2) from mid-trapezium according to the preoperative simulation and reproduced CAD models. (Figure2-left, center)
Figure 2: Simulation of 3D CAD and postoperative radiography

It was penetrated to dorsal wrist and a cannulated headless screw was inserted successfully in retrograde fashion. (Figure2-right) 3D simulation of guide-pin and screw placement simulated by preoperative CT was quite useful for such a difficult case in which the targeting fragment is small and bone graft insertion is also needed.

**Keywords:**
scaphoid nonunion, hump-back deformity, 3D simulation, retrograde screw fixation
Pyrocarbon disc interposition for CMC thumb joint osteoarthritis; Difference in use of the FCR or APL tendon?

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4 Jeroen Bosch Hospital (’s Hertogenbosch)

Objectives / Interrogation: For treatment of CMC thumb joint osteoarthritis, a pyrocarbon disc can be used after distal hemicapitatectomy as interposition arthroplasty. This disc can be secured with either a strip of the Flexor Carpi Radialis (FCR) or Abductor Pollicis Longus (APL) tendon. We analyzed outcomes after both techniques in a large cohort.

Methods: Out of 188 pyrocarbon disc interposition arthroplasties, we analyzed 30 discs secured with the FCR tendon and 76 discs secured with the APL tendon, operated between 2006 and 2011 by 2 independent surgeons. As primary outcome we used Patient Reported Outcome Measurements (PROMs); DASH, PRWHE, MHQ and satisfaction. As secondary outcome we analyzed hand measurements, such as power of grip (JAMAR dynamometer), power of pinch (pinchmeter) and range of motion (Kapandji and pollexograph).

Results and Conclusions: Baseline characteristics of both groups were quite similar. Difference in men and women in the groups was not significant (p=0.150). Mean follow up was 8.1 years for the APL group and 9.1 years for the FCR group. In the APL group 67 discs were in situ at time of follow up, in the FCR group 29 discs. In both groups 35% of the patients had bilateral complaints. Results are shown in image 1.

Table 1. Results for both groups for PROMs and hand measurements. Significant differences are highlighted with red stars.

<table>
<thead>
<tr>
<th></th>
<th>FCR-group (disc in situ)</th>
<th>APL-group (disc in situ)</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PROMS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DASH</td>
<td>9.2</td>
<td>18.3</td>
<td>0.179</td>
</tr>
<tr>
<td>PRWHE total</td>
<td>14.0</td>
<td>16.5</td>
<td>0.456</td>
</tr>
<tr>
<td>PRWHE pain</td>
<td>11.0</td>
<td>10.0</td>
<td>0.627</td>
</tr>
<tr>
<td>PRWHE function</td>
<td>6.3</td>
<td>6.5</td>
<td>0.221</td>
</tr>
<tr>
<td>MHQ</td>
<td>81.6</td>
<td>76.0</td>
<td>0.360</td>
</tr>
<tr>
<td>Satisfaction with operation (Likert scale 1-10)</td>
<td>9.0</td>
<td>10.0</td>
<td>0.523</td>
</tr>
<tr>
<td>Satisfaction with result (Likert scale 1-10)</td>
<td>9.0</td>
<td>9.0</td>
<td>0.834</td>
</tr>
<tr>
<td>Main reason for operation solved (Likert scale 1-10)</td>
<td>10.0</td>
<td>9.0</td>
<td>0.234</td>
</tr>
<tr>
<td>Undergo operation again</td>
<td>75.9%</td>
<td>73.1%</td>
<td>0.467</td>
</tr>
<tr>
<td>Advice to family and friends</td>
<td>82.8%</td>
<td>80.6%</td>
<td>0.449</td>
</tr>
<tr>
<td><strong>Hand measurements</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KEY pinch (in Kg)</td>
<td>4.0</td>
<td>5.0*</td>
<td>0.037</td>
</tr>
<tr>
<td>3P pinch (in Kg)</td>
<td>4.5</td>
<td>4.3</td>
<td>0.697</td>
</tr>
<tr>
<td>TIP pinch (in Kg)</td>
<td>5.0*</td>
<td>3.3</td>
<td>0.001</td>
</tr>
<tr>
<td>Opposition (with Kapandji)</td>
<td>9.0</td>
<td>9.5</td>
<td>0.117</td>
</tr>
<tr>
<td>Abduction (in degrees)</td>
<td>60*</td>
<td>44</td>
<td>0.000</td>
</tr>
</tbody>
</table>
Results for PROMs and hand measurements for both groups

For the primary outcomes, the PROMs questionnaires, there were no significant differences. For the secondary outcome, the different hand measurements, the FCR-group showed significant better JAMAR, tippinch and abduction, the APL group showed significant better keypinch.

Pyrocarbon disc interposition arthroplasty can be performed with an APL or FCR tendon, both with acceptable results. At long term follow up there were no significant differences in the different measured PROMs. For the hand measurements, grip power, tippench and abduction in range of motion were significant better in the FCR group, and keypinch was significant better in the APL group. When a patient specifically wishes more range of motion and grip power, the use of the FCR tendon can be recommended for pyrocarbon disc interposition arthroplasty.

Keywords:
basal thumb joint osteoarthritis, carpometacarpal thumb joint, pyrocarbon disc, interposition arthroplasty
Proximal Interphalangeal Joint (PIP) Arthroplasty for Osteoarthritis (OA) of the Index Finger

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Objectives / Interrogation: To determine the durability and functional outcome of PIPJ arthroplasty of the Index finger in patients with Osteoarthritis

Methods: Between 2005 & 2018 46 silastic PIPJ arthroplasties were undertaken in 38 patients at our Hand Unit. All were performed under local anaesthetic ring block. Eight patients underwent PIPJ arthroplasty in both Index fingers. Twenty six women and twelve men made up the cohort with a mean age of 62 years. Six patients had conversion from a previous arthrodesis to arthroplasty.

A retrospective analysis of all patients has been undertaken to determine the clinical results with particular reference to the development of angular deformity in an ulnar direction. Mean follow up was 8.2 years.

Results and Conclusions: Eight index fingers developed ulnar deviation greater than 10 degrees (2 in one patient) and there was one revision for a snapped prosthesis. There was a significant improvement in arc of movement from 10-35 degrees to 5-60 degrees with dramatic improvement in pain/VARs. All patients stated they would undergo their surgery again.

Silastic Interposition arthroplasty of the PIPJ of the Index finger is a durable procedure with excellent clinical outcomes. Our large study refutes the established technique of arthrodesis for Index finger OA with a low incidence of ulnar deviation and excellent patient satisfaction.

Keywords:
PIPJ, arthroplasty
Giant cell tumor of the tendon sheath on the digits - functional outcome in tumor recurrence

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Objectives / Interrogation: Giant cell tumor of tendon sheath (GCTTS) is a common benign soft tissue tumor in the hand. Its feature is a solid growth on both, the palmar and the dorsal aspect of the finger. High recurrence rates, reported up to 45% in the literature, associated with multiple excisions, and the close contact of GCTTS to valuable structures might provoke collateral damage and diminish finger function. The aim of our study was to evaluate functional outcome following recurrent GCTTS excision on the digits. Procedural risk factors in surgery were analyzed in our own patient collective.

Methods: Monocentric retrospective study with clinical follow up. Patients with GCTTS on the digits operated from 01/2009 to 12/2017 were screened for inclusion criteria. Patient specific and procedural parameters were analyzed. Functional outcome was evaluated with the Ten Test, the two-point discrimination, the range of motion, the DASH score, and VAS for pain. Tumor recurrence was evaluated by clinical and sonographic examination.

Results and Conclusions: A total of 21 patients were operated in our clinic. 20 patients (14 females, 6 males, mean age 56 [25 to 90] years) were included (13 primary tumors, 7 recurrent tumors [4x1st, 2x2nd, 1x6th recurrence]), 1 patient with a fresh injury caused by a slicer was excluded. Digital block anesthesia was used in 4 cases, brachial plexus block or general anesthesia in 16 cases. OP-time was on average 45 [7 to 90] minutes. 5 patients had revision surgery (25%) (3 recurrent tumors [15%, 1x1st, 1x3rd and 1x7th recurrence], 1 neuroma, 1 scar). The patient with 7th recurrence of GCTTS wished for amputation of the digit. The follow-up examination (mean 46 [12 to 112] months post-OP) highlighted a significantly (p<0.05) impaired functional outcome in patients with recurrence compared to primary tumor excisions. In recurrent tumor patients, sensitivity was diminished in 7 out of 8 patients (Ten test mean 5/10 [3/10 to 7/10], 1 amputation), movement was reduced in 6 out of 8 patients (max. deficit in extension 40° (2/8), max. deficit in flexion 50° (3/8), 1x ankylosis of the DIP joint, 1x amputation). In 12 patients with primary surgery, sensitivity was diminished in 1 patient (Ten test 5/10), movement in 2 patients (max. deficit in extension 30° (1/12), max. deficit in flexion 40° (1/12)). DASH score and pain on VAS were in normal range in all but one patient with finger amputation. Short operation time and digital block anesthesia were associated with high risk for revision surgery.

Keywords:
Giant cell tumor of the tendon sheath, recurrence, functional outcome
What is the role of psychological distress, pain catastrophizing and illness perceptions in pre-operative pain of CMC-1 patients?

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Objectives / Interrogation: In recent studies the role of psychology in hand surgery patients is being investigated, particularly in first carpometacarpal osteoarthritis (CMC-1). Several studies suggest an influence of psychological factors on pre-operative pain in CMC-1 patients. However, the role of illness perception - the set of beliefs that a patient holds about their illness - and its relative importance compared to other better studied psychological constructs in explaining pain has not been studied before. We aimed to assess the relative contribution of psychological distress, pain catastrophizing and illness perceptions in pre-operative pain of CMC-1 patients.

Methods: Between September 2017 and September 2018 patients with CMC-1 OA who were scheduled for surgery after at least three months of treatment with a hand orthosis and hand therapy were included. Patients were excluded from the analysis when they had not completed the Dutch translation of Michigan Hand Questionnaire before surgery and had not completed the psychological screening questionnaires before surgery. All measurements were part of routine outcome data collection. A hierarchical linear regression analysis was used to assess the relative contribution of patients' characteristics, psychological distress and pain catastrophizing and illness perceptions.

Results and Conclusions: 214 patients were included in the analysis, of which 59% female with an average age of 59 (7 SD). Patients mean (± SD) pain (0 = severe pain - 100 = no pain) was 35 ± 13. The hierarchical model showed that 8% of the variance in pain was explained by patient demographics, 21% was explained by psychological distress and pain catastrophizing and an additional 12% was explained by illness perceptions. In the final model, more pain was significantly associated with female sex, pain catastrophizing and more negative illness perceptions.

Conclusion
Modifiable psychological factors were independently associated with pre-operative pain in CMC-1 patients explaining considerably more variance than other nonmodifiable patient characteristics such as female sex. These outcomes suggest that psychological interventions targeting pain catastrophizing and illness perception may improve pre-operative pain.

Keywords:
CMC; psychology; surgery; thumb; pain
Costs of productivity loss after surgery for first carpometacarpal osteoarthritis (CMC-1 OA)

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Objectives / Interrogation: Recent studies on first carpometacarpal osteoarthritis (CMC-1 OA) have focused on establishing the optimal treatment and determining prognostic factors for this treatment. However, little is know about the cost that are associated with productivity loss after surgery. This study aim to determine the duration until patients returned to work and the associated costs in patients with CMC-1 OA.

Methods: We included all patients that were surgically treated for CMC-1 OA and had a paid job at the time of surgery. Return to work was measured by questionnaire that was administered as part of routine care. All patients that did not provide information on return to work were excluded. Cox analysis was used to calculate the time until patients returned to work. The human capital method was used to calculated the costs of productivity loss.

Results and Conclusions: 629 patients were included in the final analysis, their mean (±SD) age was 55 (±6). One year after surgery 79% of all patients had returned to performing their original work. The median time to return to work was 12 weeks (Q1 - Q3, 6 - 22). Median costs of productivity loss were 11.448 euro (Q1 - Q3, 5.724 euro - 21.000 euro). Performing physically heavy work was associated with a later return to work and thus with higher costs of productivity loss.

Conclusion
Surgical treatment of CMC-1 OA results in a long period of absenteeism and thus high indirect costs of the treatment. Additional interventions in the follow-up of the surgery designed to expedite the return to work may therefore be considered to reduce the indirect costs of surgery.

Keywords:
return to work; CMC; surgery; costs
Burn depth determination by Hyperspectral Imaging

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Objectives / Interrogation: The most common diagnostic method for the evaluation of burn depth is the clinical inspection and the tactile examination. The conventional histological analysis is still considered the gold standard, but due to its invasiveness and time expenses it is not suitable in acute diagnostics. Currently, Hyperspectral Cameras with specially programmed software are occasionally used to support the burn depth evaluation. It needs to be determined to what extent these devices can facilitate and objectify the assessment of burn depth, especially in hand burns.

Methods: The physical measurement principle of the so-called remissions spectroscopy is to irradiate the burn wound with white light and to evaluate the reflected light with a special spectral camera unit. In the superficial wound layers (up to 6 mm deep), the light is reflected differently due to the inhomogeneity of the tissue. Remitted light contains information about tissue structures and especially tissue damage. Using a proprietary software, the parameters tissue oxygenation (sO2), tissue hemoglobin index (THI) and near-infrared perfusion (NIR perfusion) are recorded. A recently available advanced software is able to extract even more accurate data from the recorded spectra. The procedure is non-contact, unburdening for the patient and in the current implementation quickly and easily applicable.

Results and Conclusions: In selected cases, the spectral camera is used to aid in the evaluation of burn wounds. With ongoing data acquisition and now extended software, certain correlations can already be deduced from the recordings and linked to a “burn index”.
Burns of a deeper degree clearly show lower levels in the superficial and in the deep blood circulation.

Ideally, the use of these spectral cameras should not only make it possible to objectify the evaluation, but in addition, the deeper wound layers can also be assessed. This is particularly important in the differentiation of deeper burns and differently affected burn degrees, so that sufficient surgical treatment can be initiated early on. Currently, it is important to optimize the respective reference values of the individual burn degrees for an objectified assessment.

Keywords:
burn innovation hyperspectral imaging diagnostic
Use and Advantages Of An Anticoagulation Therapy Based In Non-Fractioned Heparin In A Case Series Of Extremity Reconstruction With Free Flaps

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Objectives / Interrogation: Local thrombosis is one of the most frequent causes of failure of flaps and one of the main causes of total or partial loss. Surgery causes hemostatic changes which trigger the coagulation cascade, leading to a hypercoagulable state characterized by increased platelet activity, decreased levels of endogenous anticoagulation factors and diminished fibrinolysis all leading to a pro-thrombotic state.

Based on the forth mentioned and given that there is no consensus in the literature on how to safely use anticoagulation in microvascular surgery, it was evident that there was a need to ensure that properly made anastomosis would not fail by a physiological problem preventable through the use of thromboprophylaxis.

The objective is to evaluate how the implementation of a non-fractioned heparin based protocol directed toward preventing small vessel thrombosis without increasing the risk of hematoma formation.

Methods: All patients in which a free flap was done to reconstruct an extremity since 2005 were identified and included in the database. Information regarding the type of flap, age, risk factors, indication, time of ischemia, the anticoagulation protocol used, and complications was taken.

The cases were divided between non-fractioned heparin scheme used and others anticoagulation systems, and we reported the differences in complications between the groups.

Results and Conclusions: After evaluating the medical charts we found that we could intervene ensuring prevention in the formation of thrombi in a well-done anastomosis without increasing the risk of bleeding by implementing the presented protocol.

Most of the patients involved in this protocol did not have thrombosis or bleeding complications. Patients who required surgery to revise the anastomosis were studied independently, and factors that could have favored complications were identified. There were no cases of thrombocytopenia caused by heparin.

By establishing this protocol we did not find the formation of hematomas and thrombus. This led to a decrease in the ratio of total and partial loss of free flaps at our center. As a result, we recommend that in centers where reconstruction with the microvascular technique is performed, an anticoagulation protocol should be established.

Keywords:
Anticoagulation Therapy, microvascular surgery, flaps
The Pennington's modification of the Kessler repair: unexpected observations through 3-D modelling

List of authors:
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³ Central Hospital Central Finland (Jyväskylä)

Objectives / Interrogation: The modified Kessler repair as described by Pennington is possibly the most widely used method for tendon repair.

In his original paper, Pennington used a 'finger and twine' model to demonstrate this concept. He observed that in this configuration the longitudinal part of the string was superficial to the transverse part. He translated this configuration to his tendon suture technique and stated that "placement of the transverse part of the suture superficial to the longitudinal part would result in such a loop configuration".

However, on dynamic fluoroscopic studies we observed that in the suture configuration obtained using the Pennington's technique did not reveal the expected behaviour.

The suture was seen to fail without demonstrating the grasping effect of the loops around the tendon substance. Our aim was to perform a detailed analysis of the suture configuration and its behaviour under traction.

Methods: We recreated three models

1. The finger and twine model described in Pennington's original paper.

2. Tendon suture configuration described by Pennington on a transparent silicone cylinder in his original paper.

3. Three-dimensional computer generated of the suture configurations of the finger and twine model and the Pennington's suture technique to analyse the differences.

4. Solid models of the two configurations using malleable material

Based on these models we qualitatively analysed the fundamental topological differences between the loop configuration seen in the finger and twine model and the actual configuration produced by the suturing technique.

Results and Conclusions: We found that the suture configuration described by Pennington although resembled the loop configuration seen in the 'finger and twine' model, there were some marked differences.

The ‘finger and twine’ model demonstrated the topological properties which allowed the twine to tighten around the fingers, however when it was translated on to the tendon, the intended configuration was lost.

The sole condition of placement of transverse part of the suture superficial to the longitudinal part, as stated by Pennington, was not sufficient for formation of true loops, resulting in the observed behaviour of the repair under longitudinal strain.

Through the use of computer modelling, we were able to analyse and point out the fundamental topological conditions that were necessary for effective loop configurations.

Keywords: Kessler, Tendon, Pennington, locking, configuration
Ligament constraint of the first carpometacarpal joint

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Objectives / Interrogation: The objective was to determine the role of the ligaments surrounding the first carpometacarpal (CMC) joint in maintaining stability of the joint.

Methods: Eleven specimens (mean = 49.2 years; 5 right hands and 6 left hands) were used in this study. The first and second metacarpals, trapezium and trapezoid were removed from each specimen, taking care not to violate the first CMC joint capsule. Each of the first CMC joints was oriented in neutral using a personalised 3D-printed jig. The distal end of the first metacarpal was fixed in a specimen holder using polymethylmethacrylate. Trapezium, trapezoid and the proximal end of the second metacarpal were fixed in the similar manner. An Instron testing machine equipped with a customised jig was used to apply external loads to the specimen. Translation of the first CMC joint was measured using linear variable differential transformers. Each specimen was tested during intact and ligament sectioning conditions. Four ligaments were included in the sequential sectioning - anterior oblique ligament (AOL), ulnar collateral ligament (UCL), intermetacarpal ligament (IML) and dorsal radial ligament (DRL). For each condition, load was applied to the specimen in four different directions - volar-dorsal (VD), dorsal-volar (DV), radial-ulnar (RU) and ulnar-radial (UR) - while the joint was compressed with 10N to maintain contact of the articular surfaces. The position of the joint in the intact state was taken as the baseline.

Results and Conclusions: Friedman tests indicated significant differences in the translation of the first CMC joint after the ligaments were sectioned, except in the dorsovolar direction when load was applied in both VD and UR directions. Post-hoc analysis showed that when load was applied in the VD, DV and RU directions, there were significant differences (p<0.008) in the translation of the joint after each of the ligaments were cut (Figure 1).

The absence of the DRL can cause instability of the first CMC joint in the dorsovolar direction. This can cause high stress at the interface between the volar beak of the first metacarpal and trapezium.

Keywords:
first carpometacarpal joint, ligament, stability
Aspects of toe to hand transfers in children with the macrodactyly of the hand

List of authors:
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Objectives / Interrogation: Purpose of the study is to determine the role of microsurgical toe to hand transfer in the treatment of children with isolated macrodactyly, based on a comparative analysis of various types of surgical interventions

Methods: In the department of reconstructive microsurgery from 2013 to 2017, 25 children with congenital macrodactyly of the hand were examined and surgically treated. Out of 25 patients, in 13 there was a macrodactyly of the 2nd, 3rd fingers, which was 52%. At the same time, of the total number of hyperplastic hand segments (n = 45), 17 rays had hyperplasia greater than 25%.

Results and Conclusions: Stage-by-stage modeling resections of enlarged segments were performed in all children with hyperplasia of the ray of about 25% of the size of intact fingers, in 4 cases excision of soft tissues was combined with marginal resection of phalanges. When hyperplasia of the segment reached up to 10% of macrodactyly, it was performed in the child the single isolated modeling resections of soft tissues and bones. Repeated modeling operation in 16% (n = 4) children were accompanied by the formation of gross postoperative scars with the development of secondary angular deformities and loss of functions of interphalangeal joints.

9 patients (n = 14) underwent amputation of hyperplastic fingers followed by microsurgical reconstruction of rays by the method of autografting of the toes. In 4 cases, the first finger was reconstructed. In other 5 cases, two toes of both feet were transplanted to the position of 2, 3 (n = 4) and to the position of 3, 4 fingers (n = 1). It was revealed that with a significant hyperplasia of the affected segments of the hand (1.5 - 2 times), the method of microsurgical autografting of the toes is more effective and acceptable compared to the method of bone and soft tissue resections.

With segment hyperplasia less than a quarter of the normal size, the optimal surgical interventions are stage by stage modeling resections;

An alternative method of surgical treatment of children with hyperplasia of more than 25% is microsurgical transplantation of the toes into the position of the involved into process rays of the hand, which allows obtaining good cosmetic and functional results in these patients.

Keywords:
microsurgery, toe to hand transfer, macrodactyly
Pediatric fingertip replantation: minimum 10-year follow-up

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Objectives / Interrogation: Pediatric fingertip replantation is a challenge microsurgery for finger replantation. Reported results at a long time (under 10 years) follow-up of children digital replantation consistently show surprised good sensation, poor cosmetic, and satisfaction with good growth rate with good blood circulation. We hypothesized that children fingertip replantation would provide a high level of satisfaction and function at a minimum of 10 years.

Methods: Twenty-five digits in 20 patients, including 3 infants, underwent fingertip replantation for traumatic injury at an average age of 7 years. Patients returned for radiographic and clinical evaluation, and the cosmetic evaluation (pulp atrophy & nailbed deformity) and sensory function (2PD test) were used. Follow-up was a minimum of 10 years (average, 15 years).

Results and Conclusions: Results Nineteen digits (80%) underwent no further surgery at a minimum 10-year follow-up. The average time to undergo additional procedures to improve function, was 0.4 procedures. Fifteen of 20 patients who continued to be satisfied, with minimal pulp atrophy and minimal decrease in pulp sensation compared the contralateral digits. Average 2PD test was 6.8mm. The nailbed deformity was six digits, and severe pulp atrophy was three digits. The DIP joints flexion-extension arc was 35 degrees, and pinch strength was 87% of the contralateral side. All patients returned to their original life. There was significant correlation between good fingertip blood circulation and satisfaction level. The additional procedure revealed high risk of growth plate injury and epidermis injury in patients who undergone fingertip replantation.

Conclusion Pediatric fingertip replantation provides satisfaction at a minimum of 10 years. Whereas we recommend no severe growth plate and nail epidermis injury for fingertip replantation, crushed and avulsion injury should not be excluded as children fingertip replantation candidates; these patients should undergo appropriate preoperative counseling of their fingertip replantation and the increased additional procedures after replantation.

Keywords:
Fingertip Replantation, Pediatric, Follow-up
Distal Radius Nonunion: Subjective Hand Functional Impairment and Mid term Results after Radial Consolidation

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Objectives / Interrogation: To evaluate repercussion on the hand of Distal Radial Fracture Nonunion and analyze hand functional improvement after Radius stabilization.

Methods: 15 patients with Distal Radius NonUnion were treated between 2005 and 2012. Inclusion criteria were: distal radius established non union; preoperative clinical and functional evaluation from patients' charts; surgical fixation-stabilization of the Nonunion and minimum follow up of 3 years. Initial X rays were AP and lateral. CT scan was taken in those cases with articular fracture or for distal radial fragment size evaluation. Final X rays evaluated consolidation. Preoperative and final evaluation data included: DASH score, Visual Analogic Scale (VAS) both for pain and function and Swanson Scale for pain; Signs of Complex Regional Pain Syndrome (CRPS) - pain at rest and finger stiffness. The possibility of closing the fist was recorded before surgery and at final follow up.

Results and Conclusions: 10 patients met inclusion criteria: 7 were female and 3 male. The average age was 65 years-old (52-85). Preoperative results: pain was VAS 7.2 (8 of 10 patients had VAS 7 or higher). Four had pain at rest, 2 with light tasks, 3 with moderate efforts and 1 with strong efforts. 3 of 10 patients could make a fist reaching the palm of their hand with the tip of the fingers. Six had signs of CRPS. DASH averaged 62 (22-89). In six cases radius non union was treated with radial reconstruction. Four cases had a salvage procedure: two Radio-Lunate-Scaphoid arthrodesis and two Total Wrist Arthrodesis. Final follow up was 75 months (43 to 125). Pain resulted in VAS 0.3 (0 to 1). Five patients had no pain at all, and 5 had light pain with great efforts. All could make a complete fist touching the palm with all the finger pulps and no one had signs of CRPS. Final DASH averaged 11 (0 to 20). Final functional VAS averaged 8 (5 to 10). Three patients complicated and had a second surgery to obtain bone fusion. Finally, all nonunions and arthrodesis consolidated.

Conclusion: Distal Radius Non Union carries a significant functional impairment, not only in the wrist itself but even more in the affected hand: pain, stiffness, subjective dysfunction, and Complex Regional Pain Syndrome affecting activities of daily living. Achieving Radius stabilization, either by Radius reconstruction or by partial or total wrist arthrodesis, resulted in significant improvement in hand function and in pain relief.

Keywords: Distal Radius Nonunion, Distal Radius Fractures, Total wrist arthrodesis, Complex Regional Pain Syndrome, Stiff fingers
Comparison of surviving rates of digital replantation after more than 10 hours of delay versus immediate replantation

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Objectives / Interrogation: The purpose of this study was to analyze the surviving rates of digital replantation after over 10 hours of intentional delay versus immediate replantation.

Methods: We reviewed the patients with digital replantation in our department treated between December 2017 and May 2018. These fingers were classified into three groups according to the time between injury and beginning of replantation: (1) within 5 hours after amputation; and (2) more than 10 hours. The fingers with delay of more than 10 hours were those of intentional delay for surgical replantation because operational rooms or surgical team were not available for earlier replantation surgery. The severed fingers were preserved in low temperature (about 4 degrees centigrade) for delayed replantation. We compared surviving rate of finger replantation in the two surgical groups.

Results and Conclusions: Results: There were 15 fingers (13 patients) with immediate replantation within 5 hours after amputation. There were 37 fingers (30 patients) with intentional delay of finger replantation. The survival rate of the 15 fingers with immediate replantation was 93% with failure of one finger. The survival rate of the 37 fingers with intentional delay of finger replantation was 94.6% with failure in two fingers. Statistically, the difference in surviving rate not statistically significant (p < 0.05, Chi-square test).
Conclusions: We conclude from our data that intentional delay of finger replantation over 10 hours does not affect the surviving rate of digital replantation provided that the amputated parts were kept in low temperature. We suggest that replantation surgery can be routinely delayed without adverse influence to survival of the replantation when the surgical team or operation room are not readily available.

Keywords:
delayed finger replantation; finger amputation; microsurgery; surviving rate
COMPLICATIONS IN PATIENTS WITH FRACTURES OF THE DISTAL RADIUS

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Objectives / Interrogation: Identify the complications that occur in patients with fractures of the radius during the first year of follow-up

Describe the epidemiological characteristics
Estimation of the incidence of complications
Determine the factors related

Methods: Study Descriptive, cross-sectional

All patients with diagnosis of fracture of the distal radius from January 1 2010 to December 31 2015

Patients older than 18 years
Patients with treatment and follow-up by one of the 4 hand's surgeons

Results and Conclusions: 745 patients with 758 fractures were included in the study. Our patients range from 18 to 95 years, 61% (456 patients) of the population is female and 39% male (289 patients), the majority of our patients perform activities of low demand were housewives or pensioners (41%). The most affected side was the left with 53%, and in 1% the patients presented bilateral fractures. The mechanism of the injury in 459 fractures (61%) was low energy being the most frequent falls. In our 745 patients, with 758 fractures evaluated over 6 years, different complications were identified which are detailed below: 129 patients reported 142 complications, the most frequent being those related to tendons with 37 patients (4.8%), related to nerves (paresthesia) 26 patients (3.4%), Scar problems 16 patients (2.1%), Carpal tunnel syndrome 9 patients (1.18%), Surface infection 6 patients (0.79%), complex Regional Pain Syndrome 7 patients (0.9%), NO radio union 3 patients (0.3%), Mal union 23 patients (3%), then we found some less frequent complications.

The majority of complications occurred in patients older than 50 years (92 patients representing 12% of 17% of total complications). There are not relationship between the incidence of complications and the presence of a medical history of Diabetes Mellitus, Hypothyroidism, Inflammatory Diseases, Neoplasms, Osteoporosis and the use of non-steroidal anti-inflammatories.

CONCLUSIONS
In our Hospital, 17% of complications are reported in patients with distal radius fractures.

Most complications are associated with tendons and nerves.

Most complications occur in patients older than 50 years and female patients.

The relationship between the incidence of complications and the presence of a medical history of Diabetes Mellitus, Hypothyroidism, Inflammatory Diseases, Neoplasms, Osteoporosis and the use of non-steroidal anti-inflammatories, was not confirmed.

Keywords:
COMPLICATIONS, FRACTURES DISTAL RADIUS,

22. August 2019, 11:37 CEST
Repair of injuries of the triangular Fibrocartilage complex with foveal avulsion by transosseous tunnels

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Objectives / Interrogation: The objective of this study was to investigate the clinical results and functional outcomes of the patients with Triangular fibrocartilage Complex (TFCC) foveal tears with were repaired by arthroscopy and transosseous tunnel.

Methods: We retrospectively rewind the result of five patient (5 men) who underwent a surgical procedure for the treatment of TFCC foveal avulsion at our clinic. The patient's progress was followed up for a mean 8 months. The average age was 31 years. Postoperative clinical and functional outcomes, grips strength, mobility of the wrist, the Modified Mayo Wrist Score, were quantitatively evaluated. The Disabilities of the arm, shoulder and hand questionnaire served to assess each patient's subjective outcomes.

Results and Conclusions: Results
At the mean follow-up of 8 months, all patients had a significant reduction in wrist pain. The average grip strength at 44. The mean modified Mayo Wrist Score was 85. The Disabilities of the arm, Shoulder and Hand Score came out at 24,16. All patients were able return to work.

Conclusion
Arthroscopic reattachment of avulsed TFCC to the ulnar foveal by the described technique is a vacuum alternative for treating avulsion of the foveal TFCC insertion.

Keywords:
Arthroscopy, TFCC, Transosseous tunnel,
Surgical technique of the trapeziometacarpal and scapho-trapezoid-trapezoidal pyrocarbon "burger arthroplasty"

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Objectives / Interrogation: Trapezo-metacarpal and scapho-trapezotrapezoid arthroplasty based on pyrocarbon resurfacing implants is known as "burger arthroplasty". This technique was proposed in 2014 for the treatment of early stages of symptomatic and debilitating peritrapezial osteoarthritis.
This presentation exposes a video of the detailed the surgical technique.

Methods: A double approach is required. A dorsal approach to access the base of the carpo-metacarpal joint and a palmar approach to access the scapho-trapezoid-trapezoidal joint.

Through the dorsal approach, the extensor pollicis longus and brevis are dissected and protected. The articular capsule is opened, and the proximal base of the metacarpal is prepared.
Medial and lateral osteophytic metacarpal horns are resected. The metacarpal articular surface is prepared in a "champagne cork" shape.
Trapezial horns are resected. Both surfaces are gently blurred in order to homogenize the surfaces.
At this point the trial implant are tested for size and stability and the final implant is selected.

Through the palmar approach the scapho-trapezoid-trapezoidal joint is accessed. Scapho-trapezoid surface is prepared by resecting the subchondral surfaces and the surfaces are gently blurred to assure homogeneity. At this point the trial implant is tested for stability and size.
Preoperative fluoroscopy confirms the stability of the trial implants and the final implants are interposed between the surfaces. The articular capsules are sutured, and the carpo-metacarpal capsule is reinforced by an anchor fixed on the dorsal aspect of the first metacarpal.

Results and Conclusions: The trapezo-metacarpal and scapho-trapezotrapezoid arthroplasty based on pyrocarbon resurfacing implants is known as "burger arthroplasty" is a new technique to treat early stages of symptomatic and debilitating peritrapezial osteoarthritis.
This technique offers a new therapeutic tool to hand surgeons that aim to propose a more conservative procedure compared to trapeziectomy or arthroplasties.

Keywords:
video ; surgical technique ; peritrapezial ; osteoarthritis ; thumb ; trapeziectomy ; scapho-trapezotrapezoid ; trapezo-metacarpal
THORACIC OUTLET AND INTERSCALENE TRIANGLE VARIATIONS - ANATOMIC RESEARCH

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Objectives / Interrogation: Thoracic Outlet Syndrome (TOS) remains controversial. Pathologic fibrous bands as well as a Scalene Minimus muscle have been advocated as causes. However, many authors deny its existence in the absence of a cervical rib.
Are there anatomic variations at the interscalene triangle (IST) that may explain this entity? Fibrous bands may be normal variations? How often can these possible variations produce symptoms?

Methods: 50 Supraclavicular unembalmed regions were dissected. Number, origin & insertion of scalene muscles were recorded. Interscalene (IS) distance on the 1st rib was measured and correlated with subclavian artery height over the rib. Insertion, tendon shape & relationship with the trunks of the brachial plexus were registered. Narrow passageways between scalene muscles were defined. Potential compression and/or impingement sites were described.

Results and Conclusions: The scalene muscles originate as a single mass (SM) extending from the cervical spine to the 1st. rib and the suprapleural membrane. This SM becomes fragmented by the growth and distal migration of the hand & upper limb bud. The subclavian vein passes in front of this mass, while the subclavian artery & brachial plexus pass through it. The remnant muscle in front of the neurovascular bundle (NVB) become the Anterior Scalene (AS); and that behind the NVB become Middle (MS) and Posterior Scalene.

Muscle remnants of the intermediate part of the SM were identified as: a) The Superior Intermediate Scalene (SIS) = 18%, extending from the C-VI vertebra to join the AS; b) The Inferior Intermediate Scalene (IIS = Scalene Minimus) = 50%, running from C-VII to the 1st rib & suprapleural membrane.

This arrangement divides the IST into several passageways, reducing its size and potentially compressing the NVB. In 6%, the IS distance at the level of the 1st rib is 0. (Mean = 9.76mm, range 0-18.2mm) This arrangement lifts the artery and the lower trunk. Also, the MS tendon often displays a concave sharp edge which impinges on the lower trunk.

The IIS is sometimes replaced by a transverse-septo-costal ligament which is not a pathologic fibrous band. As these are normal anatomic variations; therefore we feel that number, size and shape of the scalene muscles should be associated with extreme sustained positions of the upper limb (e.g. Hyperelevation or shoulder girdle descent) in order to produce NVB symptomatic compressions. We present surgical examples of these symptomatic variations mimicking cubital tunnel or carpal tunnel syndromes.

Keywords:
thoracic outlet, anatomic variations, intermediate scalenes, fibrous bands
The Importance of the Distal Oblique Band in Forearm Longitudinal Stability: A Biomechanical Comparative study

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Objectives / Interrogation: Recent attention has been paid to the carpus-forearm-elbow as a functional unit for longitudinal stability of the forearm. We know the radial head plays an important role, and Essex Lopresti described its fracture associated with DRUJ dislocation. The TFCC and the Interosseous Membrane (IOM) are also key components, and their rupture disrupts the vectors of load and forearm stability. The main focus of IOM reconstructions has centered to restoration of the central band. Recent studies have shown the importance of the Distal Oblique Band (DOB) both for DRUJ and forearm longitudinal stability. We present the strengths and load to failure results when biomechanically comparing a standard central band vs central band plus distal oblique band reconstructions.

Methods: Three pairs of matched fresh frozen cadaver specimens were utilized for our biomechanical testing. We performed a central band (CB) reconstruction with Palmaris Longus graft and FiberTape (Arthrex, Inc. Naples, FL) augmentation on 3 specimens (Group 1), and a central + distal oblique band reconstruction with Palmaris Longus graft and FiberTape augmentation on the other 3 specimens (Group 2). BioComposite 4 x 10 Tenodesis screws (Arthrex, Inc. - Naples, FL) were used for construct fixation. Once the constructs were performed, we proceeded to transect the entirety of the IOM, TFCC, DRUJ, and annular ligaments to isolate the bands we wanted to test. Axial load was applied to the sample at a rate of 20mm/min using an INSTRON® ElectroPuls Dynamic Testing System (INSTRON, Canton, MA). A t-test was performed to identify any statistically significant differences in maximum load and load at clinical failure between the groups, (###=0.05). Clinical failure was defined as the load corresponding to 10 mm of longitudinal displacement.

Results and Conclusions: The average maximum load to failure for the Group 1 was 266.81 N (127.7 - 365.07 N) and for Group 2 was 377.8 N (279.37 - 495.82 N). The mechanism of failure was by screw pull out; only one specimen displayed graft stretching. The results of the t-tests indicated that the maximum load and load at clinical failure were both significantly higher for CB + DOB reconstructions (p=0.002, for both comparisons). These results might have clinical relevance when deciding the type of reconstruction when dealing with acute and/or chronic longitudinal forearm instability. We also noticed that as opposed to a pure tendon reconstruction, the Internal Brace augmentation prevented graft stretching.

Keywords:
1015 peripheral nerve injuries of the upper extremity - Epidemiology and Cost analysis

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Objectives / Interrogation: Nerve injuries are considered to be highly cost intensive due to the specialized therapy, rehabilitation and long healing processes. So far only few European cost analyses are available from small Swedish and Swiss collectives (<100 patients) and none for the German collective. Therefore, even the international treatment guidelines have no strong data to refer to. This study evaluates for the first time the epidemiology and costs of peripheral nerve lesions within the German health system of more than 1000 patients.

Methods: All patients who were treated with a peripheral nerve lesion of the upper extremity between 01/2012 and 12/2017 were retrospectively analyzed for epidemiological and economical aspects. For cost analysis patients were divided into work-related and private causes due to the different insurance covering. Within this period, the costs of inpatient treatment (diagnostics, operation, ward days) and rehabilitation were calculated.

Results and Conclusions: A total of 1015 patients were identified, of which 556 (55%) were work related and 431 private injuries. Mean age of patients was 39.9 yrs, 85.2% were male, mean hospital stay was 7.03 days. 47% of patients had a median nerve injury, 32.1% an ulnar nerve injury and 20.5% a radial nerve injury. 40.8% of patients had a combined injury of two nerves. 66.8% were sensory finger nerve injuries, 78% were complete transections, 11.6% partial and 10.4% were lesions in continuity. In 40.8% 1-3 tendons were additionally injured, in 45.2% 1 artery was additionally injured. 82.8% of cases were operated within 24 hrs, main treatment was primary coaptation. 16% required inpatient rehabilitation, mean absence from work were 166.79 days. Mean costs of sensory nerve lesions (finger level) were 2.673,15E and increased in combined motor and sensory nerve injuries (arm level) up to 10.822,14E. Median nerve injury resulted in mean costs of 4.526,56E, radial nerve injury in mean costs of 6.861,47E and single ulnar nerve injury revealed 6.253,67E. Combined injury with tendon or artery lesions increased the costs significantly. Mean inpatient rehabilitation costs were 5.842,35E.

Injury to the peripheral nerves has a major impact on the function of the arm and hand, the patient's life and employment. With the analysis of more than 1000 cases we answered the need to obtain objective and reliable data on the epidemiological and economical structure of these injuries.

Keywords:
peripheral nerve injuries, epidemiology, cost analysis
Fifth Metacarpal Neck Fractures in the United States: Trends in Current Management

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Objectives / Interrogation: Management of fifth metacarpal neck fractures lacks consensus and is highly variable throughout the available literature. Our study aims to examine patterns and trends in nonoperative treatment, surgical indications, and surgical techniques for fifth metacarpal neck fractures amongst hand surgeons of different demographic backgrounds within the US.

Methods: A survey consisting of 18 questions was hosted online and distributed to the members of the American Society for Surgery of the Hand (ASSH) via email. Questions sought to determine the demographics of the surgeon, preferred initial treatment for metacarpal fractures of varying degrees of angulation, preferred immobilization technique, factors leading to surgical intervention, and preferred technique for surgical intervention. Responses were analyzed for significant patterns and trends.

Results and Conclusions: A total of 581 responses were received (17% response rate). The majority of respondents utilize intramedullary lines on lateral radiographs to measure fracture angulation, prefer splinting in the intrinsic-plus position for fracture immobilization, and prefer closed reduction and percutaneous pinning for surgical management. Average measurements to indicate patients for surgery were 9.2° of rotation, 41.6° of sagittal malalignment, 20.2° of coronal malalignment, or 6.1 mm of shortening. On average, orthopaedic surgeons tolerated greater degrees of volar angulation (43.8°) than general surgeons (30.7°) or plastic surgeons (27.9°).

Our study reveals several significant differences regarding the management of fifth metacarpal neck fractures between hand surgeons with different residency backgrounds, variable years of experience, and in different practice settings. Geographic region of practice and primary consultant were less impactful. Ultimately, management decisions appear to be a result of patient-specific factors as well as surgeon preference.

Keywords:
fifth metacarpal neck, metacarpal fracture, boxer's fracture, little finger, survey
Intraneural hemangioma of a digital nerve: a case report

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Objectives / Interrogation: We report a very rare case of intraneural hemangioma of a digital nerve reconstructed using a collagen artificial nerve conduit after segmental nerve resection of hemangioma because complete excision was considered difficult without sacrificing the nerve fascicles, even with microsurgical technique.

Methods: A healthy 30-year-old right-handed male presented with a palpable mass on the radial side of his left index finger noticed a few years ago. His medical history was unremarkable with no previous trauma. The mass was red, bean-sized, mobile, and independent of the adjoining tendons. Although tenderness was positive, Tinel's sign was negative, and no sensory deficits were detected. An ultrasound examination revealed a well-defined, oval, hypoechoic subcutaneous lesion in continuity with the digital artery and digital nerve. Magnetic resonance imaging revealed a subcutaneous small lesion that was nonspecific hypointense on T1-weighted images and heterogeneous hyperintense internally. After administration of an intravenous contrast agent, the lesion showed no enhancement.

Results and Conclusions: Exploration revealed a dark blue tumor originating from the radial digital nerve. Because the tumor was strongly adhesive to fascicles, it could not be resected without sacrificing a nerve segment. The tumor with the involved part of the digital nerve was resected, and the 15-mm nerve defect was bridged by a collagen artificial nerve conduit. Histopathological examination revealed thin-walled dilated capillaries embedded in the fibroadipose stroma with peripheral nerve fibers, consistent with the hemangioma and intraneural extension. Postoperatively, sensibility of the radial aspect of the index finger could be completely restored, as confirmed by normal Semmes-Weinstein test results. Notably, there was no recurrence of the lesion during the 1-year follow-up.

Some reports have stated that intraneural hemangioma can be excised microsurgically, but complete excision of lesions is not always possible, and incomplete resection carries a high risk of recurrence. In such cases, an artificial nerve conduit can provide an alternative to an autologous nerve for treatment of peripheral nerve defects. Although the collagen artificial nerve conduit is considered to have some limitations for application, it facilitated a shorter surgical time and showed no unfavorable donor site morbidity, no uncomfortable feeling even in the fingers, no painful neuroma and good sensory recovery.

Keywords:
Intraneural hemangioma, Digital nerve, Collagen artificial nerve conduit
**hand burns in Austere environment**

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**Objectives / Interrogation:** Abstract:
Hand burns in austere environment can cause contractures, joint dislocations, deformities and loss of the function of fingers.

**Introduction:**
Deep hand burns (including 3rd degree and deep 2nd degree) might lead to loss of function of the hand, unless these burns are treated properly. Early identification of the burn degree, correct dressings in functional position, early debridement of deep burns and covering the defect with flaps or skin graft followed by physiotherapy are necessary to promote early healing, reduce infections, shorten hospitalization, prevent contractures and maintain hand function. Inadequate treatment of deep hand burns may end with infections, dislocated joints and contracture of the fingers and may lead to amputations of parts of the hand.

**Objective:**
In austere environment with limited access to trained hand surgeons we could prevent hand contractures, deformities and preserve hand function by proper treatment of deep burn followed by physiotherapy.

**Methods:** Methods:
Case report of 5 cases of deep hand burns in austere environment context.

**Discussion:**
In order to obtain better results, the degree of the burn should be determined early. It is essential that burn debridement is performed early, dressings are done regularly and physiotherapy should be provided for a long period. If the treatment is not started early, the fibrosis will occur in the site of the burn and contractures will be formed, dislocation of the joints and adhesions of the fingers may happen. The end result will be loss of function of the hand.

**Results and Conclusions:** Results:
One patient with incorrect initial treatment of hand burns ended with amputation of fingers.
Two patients have received early skin grafting with physiotherapy, followed up for two months and have got good results.
Two cases had contractures in the hands and fingers, although there have been good initial treatment, but had no physiotherapy follow-up.

**Conclusion:**
In spite of lack of advanced medical equipment, unavailability of hand surgeon, and lack of specialized physiotherapy proper treatment at early phase after the hand burns followed by physiotherapy could maintain hand function and prevent contractures or deformities of the hand.

**Keywords:**
Management of scaphoid fractures in the skeletally immature age 10: Case series and literature review test

**List of authors:**
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**Objectives / Interrogation:** Scaphoid fractures are relatively uncommon in children, even more so in children in the first decade. The average age group for the ossification of the scaphoid bone to start is 4-6 years which goes through until 13-15 years of age. Due to the ongoing ossification of the carpal bones, diagnosing scaphoid fractures is challenging. The aim of our study was to report our experience with managing scaphoid fracture from a tertiary paediatric hand and upper limb trauma centre comprising of age group till ten years.

**Methods:** An analysis of prospectively collected data was done. The cases of scaphoid fractures in children up to the age of 10 years, treated in our hospital from January 2014 to June 2018 were included in the study. Parameters studied were patient demographics, clinical presentation, mechanism of injury, investigations, type of fracture, associated injuries, treatment offered, outcomes and complications if any were documented.

**Results and Conclusions:** RESULTS: Total 24 patients with documented scaphoid fractures in children up to the age of 10 years were included. The mean age was 9.79 years, with female preponderance. The most common cause of injury was accidental fall on outstretched hand, followed by sport activities and road traffic accidents. The most common location of fracture was the distal pole (10 patients) and waist (9 patients). Four patients had associated injury of capitate bone. None of the patients needed surgery; all of them were managed conservatively. No major complications noticed. The patients had to make an average of 4.33 visits for consultation and review before discharge. The average time of immobilisation was 6.67 weeks (Range: 4-10 weeks).

CONCLUSION: The incidence of scaphoid fractures in the skeletally immature age is relatively low however it is increasing due to active contact sport activities in children. The early detection and low threshold of high resolution of imaging makes detection of these fractures easier. In the very young age group of up to 10 years, when the cartilaginous portion of the scaphoid dominates, majority fractures healed well with plain immobilisation with minimal to no complications. Surgery is rarely required.

**Keywords:**
scaphoid fracture, paediatric, trauma, paediatric fractures
Unidirectional porous beta-tricalcium phosphate: a new bone filling substitute for treatment of distal radius fracture in the elderly population

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Objectives / Interrogation: The distal radius is the most common fracture site in the upper extremity, especially in elderly patients. Dorsally displaced fractures are often treated by open reduction and internal fixation using the volar approach. The bony defect can be filled with bone graft substitute in order to increase the mechanical strength of the subchondral bone. A new beta-tricalcium phosphate with unidirectional pore structure (UDPTCP), Affinos® (Kurray, Okayama, Japan), has been in clinical use since 2015. To date, there have been only a few clinical studies using this material. We report here the first clinical study for distal radial fracture in the elderly population treated with UDPTCP.

Methods: Consecutive patients aged 65 years or older with dorsally displaced unstable fracture of the distal radius (n=36) were treated operatively in our department. Following reduction of the fracture site, a 7 mm size cube of UDPTCP was placed in the gap of the bony defect and the fracture stabilized with mono-axial or poly-axial type locking plates and screws. The evaluation of all cases was based on clinical examination at the final follow up as well as serial radiography. Resorption and remodeling of UDPTCP were assessed radiologically by measuring the area of filled UDPTCP and the density at their center.

Results and Conclusions: The clinical outcome in all cases was excellent. No serious complications were observed in the post-operative period. Significant correction loss of radial alignment was seen in patients stabilized with poly-axial locking plate. The area of filled UDPTCP and the density at their center was significantly reduced at 2 months after surgery. These results indicate that resorption and remodeling of UDPTCP starts peripherally and centrally at the same time. The resorption of UDPTCP and the formation of new bone were well balanced in our patient cohort.

Conclusion: Block UDPTCP is a safe and convenient material for the treatment of distal radius fracture and is replaced within a suitable time period after grafting into the fracture site. Additional stability can be expected by using block UDPTCP as a bone filler. UDPTCP and stable internal fixation is therefore a reliable strategy for restoring and preserving anatomical position, especially in the elderly population.

Keywords:
distal radius fracture, beta-tricalcium phosphate, unidirectional pore structure, locking plate,
A Study of Impact of Prolonged Repetitive Training on Microsurgical Skills of Residents in a Laboratory Setting

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Objectives / Interrogation: Microsurgery is an intricate surgical skill that requires fine movements with a high level of hand-eye coordination. Residents in hand surgery must successfully acquire microsurgical skills via repeated practice in order to attain skills that will enable them to achieve vascular patency in patients. As residents, few have the opportunity during their training duration to perform microsurgery in patients on a regular basis as a primary surgeon. There is hence a need for residents to practice in a non-clinical setting in order to improve their skills. However, there is scarce literature that objectively tracks a resident’s improvement in microsurgical skills with practice outside a clinical setting. Our hypothesis is that the microsurgical skills of residents will improve with regular practice over time, in terms of ability to place sutures accurately, consistency of suturing and duration taken.

Methods: 4 residents at different stages of training in the Hand Surgery Residency Program at National University Hospital participated in the study, which spanned across 18 sessions with the residents being evaluated in each session. The task set in each session was to place 9 sutures in a prefabricated 4mm elastic strip under the microscope. A previously validated computer program from Digital Surgicals was used to objectively assess the strips - the spacing between the sutures placed (band score); and the spacing between each suture and wound (deviation score) were measured to give a total score out of 35. The duration taken to place 9 sutures in each strip was also recorded.

Results and Conclusions: Not only did all residents demonstrated improvement in their total scores over 18 sessions, their scores also showed increased consistency, reduced variability and the residents all took a shorter duration to carry out the same task at the end of the 18 sessions. Residents who are more advanced in their training, with more years of microsurgical exposure, attained higher mean scores with reduced variability.

This study is the first of its kind to objectively track improvements of microsurgical skills in residents at regular intervals over a prolonged period of time, with the use of a validated computer program. The findings of this study hence justifies the need for regular microsurgical practice outside of a clinical setting.

Keywords:
microsurgical training
Arthroscopic Treatment of Scaphoid Non-union: A Case Report

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Objectives / Interrogation: Scaphoid fractures are one of the most common carpal bone fractures, with a higher incidence occurring in young men. Due to its tenuous blood supply, the scaphoid is at risk for avascular necrosis after a fracture. The primary risk factor for scaphoid non-union is fracture displacement; other risk factors are delayed diagnosis, inadequate immobilization, fracture location, and poor blood supply. The open approach using corticocancellous bone grafts, either vascularized or non-vascularized, has been the gold standard in the treatment of scaphoid non-union. The arthroscopic technique for the treatment of scaphoid non-unions is challenging, and requires extensive experience. However, the advantage of the arthroscopic technique as a minimally invasive technique continues to evolve. The goal of arthroscopic-assisted surgery of scaphoid fractures is to reduce displaced fractures without an open incision and to allow stable fixation for early range of motion until union is achieved.

Methods: This is a case of a 22-year-old male, right-handed, collegiate basketball varsity player who had a history of fall on his outstretched left hand that resulted to a fracture of the proximal pole of the scaphoid. The patient was advised surgery but was lost to follow-up until 3 years after when he presented with chronic wrist pain due to non-union of the scaphoid fracture.

Results and Conclusions: To the authors' knowledge, this is the first case of scaphoid non-union managed arthroscopically in the Philippines. The summary of the results showed radiographic union at day 50 post-surgery and 0-65 degrees range of motion for both wrist flexion and extension with grip strength at 24 kilograms force.

Keywords:
scaphoid, scaphoid fracture, scaphoid nonunion, arthroscopy and scaphoid, arthroscopy and scaphoid nonunion
Immediate controlled active motion following Zone 5-7 Extensor Tendon Repair

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Objectives / Interrogation: Recent literature suggests dynamic follow-up treatment after extensor-tendon repair. In these patients improved range of motion is reported especially in the first three months after the accident. Additionally, no increased risk of adverse events or secondary tendon rupture is reported. We started using an immediate controlled active motion orthosis (Yoke Orthosis) after extensor-tendon repair in the Zones 5 to 7. The aim of this study is to evaluate the results of this follow-up treatment.

Methods: We reviewed 42 patients who had an extensor tendon repair from 2016 to 2018. A modified Zechner suture und a running epitendinous suture was performed within 6 hours after the accident. The controlled active motion orthosis was applied the first day after surgery for 3 weeks day and night and another 3 weeks during heavy manual activities. Range of motion was measured 3 weeks after the tendon suture in the MCP, PIP and DIP joint.

Results and Conclusions: In total 29 patients were male and in 22 cases the right side was affected. The mean age was 33 ± 14 years, mean follow-up was 38 ± 20 days, mean sick leave was 37 ± 11 days. In 24 cases the middle finger was affected in 5, 7 and 6 cases the index, ring, and small finger, respectively. 37 injuries were in Zone 5 and 5 in Zone 6. After 3 weeks 40 patients (95,2%) showed full range of motion in the MCP, PIP and DIP joint. One patient (2,4%) presented with a 20°, and one patient (2,4%) with a 10° extension deficit in the MCP joint. No flexion deficit was reported. No adverse events were noticed.
In conclusion, a controlled active motion orthosis provides excellent results 3 weeks after the accident. No increased risk of secondary tendon rupture is observed.

Keywords:
extensor tendon, tendon repair, extensor tendon repair, controlled active motion orthosis
Deltoid to triceps transfer in tetraplegic patients: The Stoke Mandeville experience

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Objectives / Interrogation: More than 50% of spinal cord injuries occur at the cervical level, leading to tetraplegia. Surgical restoration of upper limb function has the ability to improve patient autonomy and self-esteem[1]. However, these operations are underutilised in the United Kingdom and elsewhere. The authors describe a 15-year experience of deltoid to triceps transfer - using different types of interconnecting grafts - to restore elbow extension, one of the key functions to improve reaching capability and hand function.

Methods: A retrospective review of all tetraplegic patients who were considered for deltoid to triceps transfer between the years 2003 to 2017 was performed using clinical records. Pre-operative evaluation included sensory and motor testing for ICSHT (International Classification for Surgery of the Hand in Tetraplegia) grading. Patients who were offered deltoid to triceps transfer but declined the procedure were noted, with their reasons for declining where recorded.

Operation notes and follow-up records were reviewed to determine the types of grafts used, and the outcome, including early and late complications, and elbow extension power.

Results and Conclusions: We identified 26 patients who underwent deltoid to triceps transfer, 21 male and 5 female, with a mean age at the time of operation of 37 years (range 21 - 66). A total of 32 reconstructions were carried out, 20 unilateral and 6 bilateral (not simultaneous), with one late revision procedure to shorten a graft that had stretched. Thirteen were performed with the sole aim of restoring elbow extension, and 19 were combined with additional tendon transfer procedures to restore grip.

During our 15-year experience, the graft types changed from synthetic to fascia lata and most recently to tibialis anterior, respectively 18, 5, and 9 grafts, and the reasons for these changes are discussed. Early complications included haematoma, seroma, and superficial wound infection, and late problems included 2 suture granulomas and one case of graft stretching. There were no ruptures.

All but two patients achieved useful and measurable elbow extension power of MRC 3/5 or better. The two failures were both due to insufficient strength in the donor deltoid muscle, although one of the two patients felt that he had better control of his upper limb.

Keywords:
Spinal cord injury; tetraplegia; upper limb reconstruction; tendon transfer

References:
Herbert ulnar head implant arthroplasty: 47 cases; mean follow-up 6.5 years

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Objectives / Interrogation: To report clinical and radiographic outcomes for the Herbert Ulnar head prosthesis.

Methods: We reviewed all Herbert ulnar head arthroplasties performed at our department between March 2000 and September 2017. Fifty-one arthroplasties were performed in 50 patients. 47 cases had a minimum follow-up of one year. Five patients were lost to follow-up; two deceased unrelated to the operation, one due to unrelated illness and two implants were revised. The 42 remaining implants had a mean follow-up of 6.5 years (range 1-17 years). The rationale for the procedure were; Rheumatoid arthritis (n=12), Osteoarthritis (10), secondary Osteoarthritis (11), painful instability after previous resection arthroplasty (8) and failed implant arthroplasty (1). Assessment included Disability of the Arm, Shoulder and Hand (DASH) and Patient Rated Wrist Evaluation (PRWE) questionnaires, 100 mm Visual analogue scales (VAS) for pain and satisfaction, measurements of range of motion, grip, lifting, and forearm rotational strength. For 17 of the cases full preoperative assessments, including strength measurements were available. The change in preoperative and last follow-up measurements for these patients was analyzed with Wilcoxon sign rank test.

Results and Conclusions: Data for patient reported outcomes and strength measurements at final follow-up visits are summarized in table 1.

<table>
<thead>
<tr>
<th></th>
<th>Affected, Mean</th>
<th>Non-Affected</th>
<th>Ratio</th>
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<tbody>
<tr>
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<tr>
<td>PRWE score</td>
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<tr>
<td>VAS Pain-rest, mm (100)</td>
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<tr>
<td>VAS Pain-activity, mm (100)</td>
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<td>8.6</td>
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<tr>
<td>Torque-Pronation direction, Kg</td>
<td>3.2</td>
<td>3.9</td>
<td>.82</td>
</tr>
</tbody>
</table>

Table 1. Patient reported outcomes and Strength measurements at latest follow-up, 42 patients.

For the subgroup with full preoperative assessment there were significant improvements in DASH, PRWE, VAS for pain with activity and strength for grip and lifting with neutral forearm rotation. We did not detect radiographic signs of implant loosening except for one patient whose implant was revised. Another patient had the implant removed due to recalcitrant pain and one patient underwent successful secondary surgery due to persistent painful DRUJ instability.

In a selected group of patients the Herbert implant produced favorable outcome with a low complication rate.

Keywords:
Distal radioulnar joint, ulnar head replacement, ulnar head prosthesis, wrist arthroplasty.
Impact of Plate Design on Contact Force Between Flexor Tendons and Distal Radius Volar Plates

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Objectives / Interrogation: The purpose of this study is to determine whether the design of distal radius volar plates impact the amount of force exerted on the flexor digitorum profundus (FDP) and flexor pollicis longus (FPL) tendons when the plates are placed proximal and distal to the watershed line.

Methods: Three commercially available plates were applied to ten fresh, matched-pair upper extremity specimens. External cyclical loading was applied to the tendons, and the force generated between tendon and plate was measured. Linear mixed effect models were used to evaluate differences in log-transformed values of maximum and mean force by plate position, plate design and the interaction between position and design.

Results and Conclusions: Results: The forces on the tendons differed significantly by position, as measured by Soong grade, but were not significantly different for plate design. For the FPL tendon, the average maximum force with a plate in Soong 2 was 4.50 [95% CI: 2.8, 7.3] times higher than when the plate was in a Soong 0 placement, and 4.63 [95% CI: 2.82, 7.61] times higher for the FDP tendon. While not statistically significant, lower observed force values with thinner plates when plates were placed distal to the watershed line suggest that plate thickness could also be a critical plate characteristic for distally placed plates.

Conclusions: Despite differences in plate design, the main determinant of plate prominence and therefore flexor tendon injury potential is placement in relation to the watershed line. This study may help guide surgeon implant selection and volar plate design.

Keywords:
Distal radius fracture, Plate design, Tendon injury
Effect of proximal interphalangeal (PIP) joint fusion on grip force and load distribution of the hand

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Objectives / Interrogation: This study investigates in vivo if an isolated fusion of a single PIP joint influences the grip force and the load distribution of the hand when gripping a cylindrical object.

Methods: Ten patients, who had one single PIP joint fused due to posttraumatic joint destruction (4 x index, 4 x middle, 2 x ring finger), but without other structural lesions of the hands were included in this study. On average 59 (17-121) months p.o., patients returned for a manugraphy analysis. Patients performed grip force tests, using three cylinders (100mm, 150mm and 200mm circumference) covered with a pressure sensor matrix to measure the total grip force and load distribution pattern of both hands. Grip force and the load applied by each of the four fingers were compared for the affected and the healthy hand. The fusion-angle was determined by x-ray, which also confirmed the bony healing of the fusion. Due to the small number of patients, only descriptive statistics were provided.

Results and Conclusions: Results: The total grip force of the affected compared to the healthy hand was reduced after PIP-joint fusion of middle- and ring finger for all cylinder sizes (PIP III 56%/88%/91%, PIP IV 76%/105%/91%). After PIP-joint fusion of the index finger grip force was only reduced at the smallest cylinder (91%), while it was increased to 120% at the middle and 139% at the large cylinder. Compared to the opposite side, the load applied exclusively by each affected finger was always reduced, except for the large cylinder, where even the fused index-fingers exerted more strength than the healthy side. The loss of strength by the fused finger was partially compensated through a gain of strength of the other fingers of the affected hand. So, 5/10 patients showed a higher grip strength than the opposite side using the middle cylinder, 6/10 using the large cylinder.

Conclusion: After PIP-joint-fusion grip force is severely impaired when gripping small cylindrical objects, but less affected when gripping larger objects. The load applied by the fused finger is always reduced, but for the total grip force this can often be compensated by the other fingers of the affected hand, especially while gripping large objects.

Keywords:
Arthrodesis, PIP-joints, grip-force
Title: Wide awake local anaesthesia no tourniquet technique (WALANT) for hand surgery: an observational study for patient agreement

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Objectives / Interrogation: Hand surgery with Walant becomes more popular for surgeon and a new strategy for hospital. Few data are available for patient agreement and comfort.

Methods: After IRB approval, patients scheduled for Walant hand surgery were prospectively enrolled and evaluated. Surgery was performed in the ambulatory unit using a standard Walant surgery without premedication, monitoring nor intravenous line. Before surgery, evaluations were performed using APAIS score (pre operative anxiety) and Likert scale (for comfort and stress). After surgery, perioperative procedure quality (primary end point) was evaluated using EVAN G scores (at discharge) by an independent evaluator. Times and pain scores (0-10) at each time were recorded (0 to 10). Statistical analyses using SAS software.

Results and Conclusions: Results : 31 patients (12 males, 62±15 years, 56±6 kg, ASA 2±1) were prospectively included. Before procedure, pain score at surgical site was 4±3 with an APAIS score at 9±5 (=very low stress level). Only one patients reported personal high stress level. Pain at infiltration was 2±1. At incision, only 1 patient required more infiltration and 1 patient required a general anesthesia due to surgical complication: WALANT success without anaesthesit rescue was 97 %. Duration of surgery was 11±10 min, no adverse effect was recorded in PACU. Total intra hospital (including infiltration and surgery) stay was 63±29 min. At discharge, EVAN score (median, IQ) for global satisfaction (1 scale: 0-5) was 5 (5-5), comfort (3 scales:0-15) was 15 (12-15), adverse event (10 scales :10-50) was 10 (10-14), pain (scales 7 :7-35) was 7 ( 7-9) No side effect was recorded at discharge, with a mean pain score at 0 (no nausea or vomiting). Chung score at discharge was 12/12 for all patients.

Conclusion

This study demonstrated a very high level of agreement and satisfaction for Walant surgery for the patient (primary end point) and high benefit for the surgeon and hospital, regarding time per procedure.

Keywords: Walant objective assessment
Training in microsurgery.

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2 Medical School of Athens (ATHENS)

Objectives / Interrogation: Microsurgery is defined as the type of surgical operation performed with the assistance of microscope. It has been proven that training in microsurgical techniques can improve the abilities of the residents mostly, after the attendance of at least 8 weeks intense seminars, in such a way that it has affection even at macrosurgical skills.

Methods: At the Laboratory of Research of the Musculoskeletal System a 3 - month training seminar in microsurgical techniques regarding the repair of arteries, veins and nerves is provided for 30 years continuously. The seminar includes 5 gradual stages of training in latex frames, rabbits and rats.

We performed a prospective study regarding the surgical abilities of participants during the years of 2017 and 2018, at the end of every training session. Also the research analyzed the correlation of success at every session to speciality, gender, year of residency and previous experience.

Results and Conclusions: Results: During a period of two years 40 persons (30 men, 10 women) participated, 30 of whom were orthopedic residents with a mean age of 33 years old. With only two specialists taking the microsurgery seminar, the rest were residents at their fourth (15 residents, 37,5%), fifth (9 residents, 22,5%) and second (8 residents, 20%) year of residency, while other 6 residents (15%) cover the rest. Previous experience on microsurgery had only 3 participants (7,5%). There was significant relationship between gender and successful suturing and functionality of a small vein in rats(p value=0,042), as well as the year of residency in the total number of sutures performed in 15 minutes on a latex frame (p value=0,007).

Conclusions: The microsurgery seminar provides the participant surgeons with the ability to better understand the shape and structure of tissues, while gaining a gentle approach across them. It contributes in improving surgical skills, strengthening coordination between brain and hands, as well as sight on three dimensions. Lastly it increases concentration in very narrow surgical fields.

Keywords:
microsurgery, training, statistical analysis, seminar
nterosseous SL Reconstruction for Chronic Scapholunate Dissociation augmented DIC stabilized by RASL vs SwiveLock as internal splint

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Objectives / Interrogation: Staged 3 or 4 of Scapholunate (= SL) dissociation according to 5 questions by Garcia is good candidate for reconstruction. How long should we need to keep K-wire after any ligament reconstruction? When can we achieve successful engraftment? Internal splint such as RASL or SwiveLock fixation would be hypothesized to maintain SL reduction and achieve engraftment and analyzed their results.

Methods: Berger’s approach was applied for all cases. Partial DIC was transferred to dorsal portion of SL ligament. 12 patients of SL were fixed by RASL using double thread screw, and 6 patients were fixed using fiber tape with SwiveLock system as internal fixation. 12 cases of RASL were analyzed averaged followed up for 32.4 months. 6 cases of SwiveLock system were analyzed averaged followed up for 15 months. The three dimensional kinematic analysis was performed after operation for each methods.

Results and Conclusions: 10/12 of RASL patients returned to previous occupation. 2 cases were converted to SwiveLock system because of screw loosening. Breakage of double thread screw was occurred in 1 case. Postoperatively SL angle is reduced from 69 degrees to 40 degrees. SL gap is also reduced from 4.1 to 1.8 mm. There was no carpal collapse or progression to SLAC. 6/6 of SwiveLock system patients returned to previous occupation. There was no progression of SL gap except for 1 case. Result showed almost normal motion during flexion and extension. Postoperatively SL angle is reduced from 72 degrees to 40 degrees. SL gap is also reduced from 5.3 to 1.2 mm. According to 3D analysis, normal scaphoid motion center axis is dorsal scaphoid. Distance between scaphoid apex and motion axis are different among normal, RASL, SwiveLock system. Kinematics of SwiveLock system was closer to that of normal compared to RASL. (fig 1) Fiber tape with SwiveLock system was closer to normal compared to RASL, and better clinical results were obtained compared to RASL as internal splint.

Keywords:
Scapholunate dissociation  Reconstruction
Treatment of osteoarthritis of the carpometacarpal joint of the thumb with trapeziectomy and tendon allograft interposition.

List of authors:
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Objectives / Interrogation: One of the surgical treatment options for osteoarthritis of the carpometacarpal (CMC) joint of the thumb is tendon interposition after partial or total trapeziectomy, with or without ligament reconstruction. Usually a tendon autograft is used. The advantage of a tendon allograft is shorter operation time. The aim of the study was to evaluate patients who were treated with tendon allografts.

Methods: Forty-eight patients (56 hands) were operated on between 2006 and 2015 with tendon allografts for osteoarthritis of the CMC joint of the thumb. Thirty-four patients (41 hands) were included in the study. Ten patients were male and 20 female. Mean age was 59 years. In 11 hands partial trapeziectomy with tendon interposition was done, in 20 partial trapeziectomy with tendon interposition and ligament reconstruction, in 1 total trapeziectomy with tendon interposition and in 9 total trapeziectomy with tendon interposition and ligament reconstruction. Patients were evaluated with the disabilities of hand and shoulder (DASH) and visual analogue scale (VAS) for pain. Patients were also asked if they were satisfied. In 23 patients (29 hands) clinical evaluation was done (Kapandji score, thumb abduction, key pinch). Eleven patients (12 hands) could not come to the hospital and the questionnaires were sent to their homes. Mean follow-up was 57 months (range: 15-124).

Results and Conclusions: Mean DASH score was 19 and mean VAS for pain 1.3. Eighty-three percent of patients were satisfied. Mean Kapandji score was 9.3, mean abduction measured 56° and mean key pinch 5.1 kg. Four patients needed a surgical revision procedure (9.8%). In one the tendon graft was removed because of infection, in another a partial trapeziectomy was converted into a total trapeziectomy, one had an additional interposition of the scaphotrapezoidal joint and in another patient with spasticity an arthrodesis was performed because of adduction contracture of the thumb.

Conclusion and discussion: Trapeziectomy with donor tendon interposition is one of the treatment options for CMC joint osteoarthritis of the thumb. Good results can be obtained in about 80% of patients which is similar to other treatment options such as total joint arthroplasty.

Keywords:
osteoarthritis carpometacarpal joint thumb tendon allograft trapeziectomy
Spread of hand infections: A Retrospective trial single center study

List of authors:
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Objectives / Interrogation: Owing to its function, the hand is predisposed to be injured or infected in daily work in many different ways. Hand infections present due to the complex anatomy of the hand, various causes and broad germ spectrum as heterogeneous and complex diseases. They can lead to severe disabilities and reduce drastically the quality of life. Early diagnosis and therapy prevent severe morbidities. Specific knowledge of trauma mechanism, pathogens and especially the spread of hand infection are necessary for adequate and early treatments.

The aim of this study was to evaluate systematically the spread of hand infections according to injury mechanism, pathogens and its entry area.

Methods: Retrospectively, all data of 519 patients with hand infections, who admitted from 2007 to 2014 our department of Hand Surgery, were generated from electronic hospital information system (SAP) and medical records. Patient's demographics and clinical data were recorded and analyzed for age, gender, pre-existing illnesses, course of treatment, the microbiology, C-RP, leukocyte number, the pathogen entry area and spread of infection.

Results and Conclusions: Our study revealed that, compared to other known factors for the spread and severity of hand infections such as germ spectrum, cause and individual risk, the localization of the portal of entry on the hand has a significant influence on the tendency to spread and the risk of a correspondingly severe infection.

Due to the different spread of infections depending on the localization of infection entry, finger infections in particular should not be trivialized, but should be judiciously closely assessed and treated by hand surgeons.

Keywords:
Hand infections, spread, germ entry
Impact of delayed presentation of patients with hand infections to hand surgeons: A retrospective study with 379 patients

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Khaled Dastagir¹, Peter M. Vogt², Sören Könneker¹
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Objectives / Interrogation: Due to the special anatomy of the hand, hand infections present as heterogeneous and complex clinical illness. An early and professional treatment is essential to avoid complications. The aim of our study was to investigate the impact of the presentation time of patients with hand infections to hand surgeons on hospital stay and the frequency of necessary operations.

Methods: Retrospectively, 379 Patients with hand infections, who were treated in our clinic were evaluated for a time of presentation to hand surgeon, time of trauma, length of stay, and frequency of necessary operations.

Results and Conclusions: On average, more than one-day delayed surgical presentation led to a longer hospital stay of 1.22 days (KHVD) (95% CI: 1.20-1.25, p <0.001). Also, the odds of being operated every day increased by 13.59% (95% CI 4.01%-25.43%, p <0.001). KHVD also increased by a factor of 1.09 (95% CI: 1.03-1.15, p <0.001) with delayed antibiotic challenge. However, the time of antibiotics did not correlate with the decision to undergo surgery (yes / no) (p = 0.11).

The present retrospective study shows that a late presentation of patients with hand infections leads to a longer inpatient length of stay as well as to a higher number of necessary surgeries. An early surgical presentation of hand infections to an experienced hand surgeon is important to avoid complicated patient pathways that add costs to the healthcare system.

Keywords:
hand infections, complications, hand surgeons
Dynamic Carpal Tunnel. Association of the incursion of the lumbrical muscles in the carpal tunnel as an etiological factor

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Objectives / Interrogation: The carpal tunnel syndrome is the most common peripheral nerve entrapment pathology. But there is a group of patients where, at the time of the examination, their clinical signs are not clear enough for diagnosis and the tests and exams cannot confirm it. patients can be part of the group of manual workers of repetitive activities. The worker is sent to medical control, usually with temporary suspension of their routine activities. This means that when assessed by the doctor, there will be no clear signs of compression of the median nerve. Is there any relation to the incursion of the lumbrical muscles in the carpal tunnel as a dynamic etiological effect of this?

Methods: A study, using ultrasound, was made in workers between 20 and 60 years of age, and had no previous pathologies. The workers consulted a carpal tunnel clinic and were evaluated by the clinical signs.

They underwent an ultrasound examination (Siemens, sonoline-versa with a 10Mhz transducer) in three planes like this:
1 level of the carpal radio joint
2 transverse plane on the body of the lunate
3 transverse plane at the level of the hook of the Hamate

And each of these was taken at two different times:
A-Carpal tunnel with neutral wrist and extended fingers
B-Carpal tunnel with neutral wrist and fingers in forced flexion

Results and Conclusions: Findings: A study was made of 118 wrists into two groups: first group of 59 wrists with carpal tunnel symptoms and a second group of 59 wrists in workers without carpal tunnel symptoms. The ultrasonography study was done to each one of them in three levels and in two positions and it was reported as negative positive in each level of the observation.

In the first group: level I all negative, level II 22 positive (37.28%), level III 38 positive (64.4%).
In the second group: level I all negative, Level II 5 positive (8.47%), level III 15 positive (25.4%)

Discussion: the low insertion of the lumbrical muscles, which can be the etiological factor for a dynamic carpal tunnel. We recommend a study with ultrasound in those patients who have an evident symptomatology but is not clearly verifiable by conventional methods. The study with ultrasound should be of great importance.

Keywords:
carpal tunnel, dynamic, ultrasounds, lumbrical
Acquired hemophilia A as a rare cause of nontraumatic compartment syndrome and hematoma formation

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Objectives / Interrogation: Acquired factor VIII inhibitor (hemophilia A) is a very rare, often idiopathic disease that can lead to diffuse bleeding, with a high rate of morbidity and mortality. We present two patients with first-time diagnosed acquired hemophilia A who were treated at our clinic within 2 months.

Methods: The first patient was an 83-year-old woman who presented with atraumatic compartment syndrome of the right hand which required fasciotomy. The compartment syndrome was due to spontaneous bleeding. Only after several revision surgeries and a complicated course, the resulting defects could be closed by secondary sutures and skin grafting. The second patient was an 85-year-old man who was admitted with multiple hematomas on both upper extremities, which were treated nonoperatively. The two patients received interdisciplinary care, involving early initiation of clotting factor replacement and immunosuppressive therapy, which were necessary to control the bleeding.

Results and Conclusions: Acquired hemophilia A must be considered as a very rare but important life-threatening differential diagnosis in multiple hematomas, especially in atraumatic compartment syndrome. Early diagnosis with immediate start of replacement therapy to correct coagulation and initialization of immunosuppressive therapy are crucial for successful treatment.

Keywords:
Hemophilia A, acquired factor VIII inhibitor, compartment syndrome
Volar plate buttress on bended Kirschner wire fixation for the displaced volar rim fragment of distal radius comminuted fracture

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Objectives / Interrogation: Volar rim fragment of distal radius fracture supports the carpal bones and is challenging for the rigid fixation. We investigated the outcome of volar plate buttress on the bended Kirschner wire fixation for the displaced volar rim fragment of distal radius comminuted fracture.

Methods: 2 cases with the volar rim fragment of distal radius fracture, which displaced after the initial surgery, were enrolled in this study.
Case 1 was 51-year-old woman and sustained volar Barton fracture. 6 months after the initial surgery with volar locking plate, she had the plate removal. However, the fragment got displaced. Case 2 was 73-year-old woman and had comminuted Smith fracture. 1 week after the initial surgeries with volar locking plate, Plain radiography showed displaced volar rim fragment (Figure 1).
In the surgery, the volar rim fragment was reduced and fixed with titanium Kirschner wires. The wires were bended to fit the volar cortex of the radius. Volar locking plate applied on the wires and was fixed with screws to buttress the wires and the fragment (Figure 2).
**Results and Conclusions:** At the final follow-up, they had no pain. Flexion/extension recovered into 50/60 and 40/50 respectively. Bone union of the fragment was confirmed by plain radiography and CT. This method used the standard instrument without special plate and complex technique. The volar rim fragment could be fixed rigidly by buttressing the wires with the plate, and favorable outcome was obtained. Thus, this method is an option for the fixation of the volar rim fragment.

**Keywords:**
distal radius fracture; volar rim fragment; Kirshner wire
Is there a correlation between duration of scaphoid fracture non-union and degenerative changes of the wrist?

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Objectives / Interrogation: The primary aim of this study was to identify the rate of osteoarthritis in scaphoid fracture non-union. The secondary objectives were to investigate whether the incidence of degenerative changes correlates with the duration of non-union(interval) and the site of fracture,and to identify the variables that influence the primary outcome.

Methods: We conducted a retrospective review of 273 consecutive cases with scaphoid fracture non-union presenting to our hand surgery unit from 2007-2016. Data included patient demographics, the duration of non-union (interval), anatomical location of fracture (distal, middle, and proximal), anatomical area of scaphoid non-union advanced collapse (SNAC areas 1-3), and the presence of dorsal intercalated segmental deformity (DISI). Overall health-related quality of life were assessed using EuroQol five-dimensional questionnaire (EQ-5D). Data was retrieved from case notes, Patient Archiving and Communication System (PACS), postal and telephone follow-up using a designated case report form. Patients were divided into two groups (SNAC vs. Non-SNAC). Group differences were analysed by the Mann-Whitney U test and association between scales with Pearson’s correlations. A two-sided p-value of <0.05 was assumed as significant.

Results and Conclusions: We identified 273 cases with scaphoid fracture non-union confirmed on CT scans (n=250) and plain radiographs (n=23). The subjects consisted of 33 males and 240 females with the mean age of 34.3 years (SD, 13.2). Degenerative changes occurred in 49% (n=135) of non-unions (SNAC group), and 51% (n=141) had no degenerative changes (non-SNAC group). In overall, the average interval was 3.1 years (range, 0-45 years) in those with known date of initial injury (n=221). The fracture location in SNAC group included 3.3% of distal 20%, 41% of middle 60% (distal to ridge), 29% of middle 60% (at ridge), 88% of middle 60% (proximal to ridge), and 100% of proximal 20% fracture non-unions. Of these, 67% had SNAC 1, 14% with SNAC 2, and 21% presented with SNAC 3. The mean interval in the SNAC 1, 2, and 3 were 4.3, 4.9, and 5.5 years, respectively. An overall incidence of DISI deformity of the wrist was 86%. The average summary index between SNAC and non-SNAC groups was 0.803 and 0.819, respectively. Our results demonstrate that advanced osteoarthritis was seen more in the proximal fracture non-unions (P<0.05). There was no clear correlation between the interval and the progression of osteoarthritis. SNAC occurred in fractures aged 4 years or older.

Keywords: Scaphoid fracture non-union, SNAC, Osteoarthritis, Interval, EQ-5D
Rupture rate, functional outcome and patient satisfaction after primary flexor tendon repair using the Arthrex FiberLoop® and Tsuge suture technique with early active motion rehabilitation

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Objectives / Interrogation: While the current literature in flexor tendon repair primarily supports a 4-strand locking core suture and epitendinous repair, the optimal suture material remains unclear. Identifying the ideal suture material could help provide sufficient stability for early dynamic splint therapy and thus improve total active motion (TAM), grip strength and daily activities. We hypothesize the rupture rate after flexor tendon repair with the Arthrex FiberLoop® (Arthrex, Munich, Germany) is lower than other suture materials and functional outcome and patient satisfaction are superior compared to the current literature.

Methods: A 2-stage retrospective, randomized follow-up study of 143 patients treated with the Arthrex FiberLoop® after flexor tendon injury in zones 2 or 3 from May 2013 - May 2017 was performed. In the 1st stage, the rupture rate in all patients was assessed after a follow-up of >1 year to exclude revision surgery. In the 2nd stage, 20% patients (29 patients) were randomly clinically examined. Functional parameters, such as finger and wrist mobility measured with a goniometer, grip strength measured with a Jamar dynamometer, patient satisfaction measured using school grades (1-6), pain-levels measured using visual analogue scales (0-10), and DASH-score were assessed. The Buck-Gramcko and Strickland scores were calculated to compare our results to the current literature.

Results and Conclusions: A rupture rate of 2.1% was recorded. A postoperative complication was reduced TAM. 29 patients (20% of all patients) were examined at a mean of 34 ± 7.5 months postoperatively. 10.3% of these patients had an incomplete fingertip palmar distance. Postoperative grip strength was on average 24 ± 3.1 kg. 93.0% of these patients were very satisfied with treatment. No patient complained of pain postoperatively. The mean postoperative DASH score was 6.7 ± 2.8 points. The mean Buck-Gramcko score was 14 ± 0.2 points. According to the Strickland score, 93.0% patients had excellent and 6.99% good results. Patients returned to work at a mean of 4 ± 0.7 months postoperatively.

Keywords:
Flexor tendon repair, FiberLoop®, rupture rate
Phalangeal neck fractures with volar displacement: description of the injury, and open reduction and internal fixation with interfragmentary screws

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Objectives / Interrogation: Phalangeal fractures are among the most frequent fractures of the skeleton. Lesions at the proximal phalanx are considered challenging because of the complexity of the anatomy in the region. The extensor tendon is a delicate structure that at the distal portion of the proximal phalanx spreads like a sheet, surrounding the bone surface with close contact. Commonly seen in children and seldom in adults, fractures of the phalangeal neck occur mostly at the proximal phalanx of the thumb and at the medial phalanx of the long fingers in adult patients. In nearly all cases described, the fracture shows dorsal displacement and is treated with K-wires fixation.

In the only study that specifically described proximal phalangeal neck fractures, Al Qattan reported on ten patients treated with non-displaced or dorsally-displaced fractures. In addition, that author employed the same classification to differentiate phalangeal fractures in adults and children, but it has neither mention of soft-tissue injury (extensor tendon injury) nor direction of fracture displacement.

There are no previous publications describing the treatment of choice for proximal phalangeal neck fractures with volar displacement.

Methods: We described the lesion and the treatment of two patients with proximal phalangeal neck fractures and severe volar displacement. We highlight that this type of deformity can cause a boutonniere-like lesion of the extensor tendon, with the distal stump of the central extensor tendon trapped at the fracture site.

Results and Conclusions: We propose to add a division in the classification of Al Qattan for type II fractures in adults (displaced and with bone contact), in which IIA fractures show dorsal displacement (more common), and IIB fractures have palmar displacement (rarer and unstable).

Keywords: -

Phalangeal neck fractures with volar displacement

We propose an open reduction and internal fixation of the fracture with two 1.5-mm interfragmentary screws.

Phalangeal neck fractures with volar displacement

We propose an open reduction and internal fixation of the fracture with two 1.5-mm interfragmentary screws.

Results and Conclusions: We propose to add a division in the classification of Al Qattan for type II fractures in adults (displaced and with bone contact), in which IIA fractures show dorsal displacement (more common), and IIB fractures have palmar displacement (rarer and unstable).

Keywords: -
Jeffery type II radial neck fracture in a child: lesion description and method for closed reduction

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Objectives / Interrogation: Radial neck fractures in children (RNFC) are rare; represent approximately 1% of all pediatric fractures, and 10% of elbow fractures in childhood. Jeffery et al. described in 1950 the most common mechanism of RNFC as a fall onto an outstretched hand with valgus force, causing compression of the radial head against the capitellum. This laterally angulated radial head fracture was called a type I lesion. The type II lesion, which is rarer, occurs in association with posterior elbow dislocation. In these cases, either with spontaneous or provoked closed reduction of the dislocation, there is an impaction fracture of the anterior lip of the radial head caused by the capitellum, which gets trapped between the proximal radial metaphysis and the head fragment, that is rotated in 90°.
Open reduction has always been the treatment of choice. Furthermore, closed reduction was believed to be impossible and was classically contra-indicated due to the risk of fracture displacement and vascular compromise of the proximal radial epiphysis. There are less than 30 cases of type II Jeffery fractures described in literature, and only Chotel et al. had percutaneously treated those lesions, by means of a varus lateral space opening, manipulation of the fracture, conveying an easier reduction of the radial head to its anatomic site.

Methods: We describe a closed reduction technique of type II Jeffery fracture with the use of two K-wires, being the first inserted at the fracture site and working as guide and fulcrum to the fragment, so that it pushes the head towards its anatomic position.
Method for closed reduction Jeffery type II radial neck fracture.

Results and Conclusions: We reckon this maneuver to be effective, reproducible, and less aggressive, thus decreasing the risk of iatrogenic chondral and ligament injuries. We also highlight that there is a risk of displacement and fragmentation of the head fragment after multiple attempts of reduction; therefore, we recommend proceeding to an open reduction after initial failure of the closed method.

Keywords: Children; Jeffery type II, percutaneous treatment, radial neck fracture, elbow dislocation
Nerve transfer for recovery of protective sensitivity in the radial aspect of the hand.

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Objectives / Interrogation: In the management of the sequelae of the brachial plexus lesions, motor and sensory recovery is sought, in order to preserve the greatest possible functionality and to reduce the complications derived from anesthetic zones, thus sensitive transfers have gained greater importance within the surgical techniques. The objective of the study is the identification of the innervation patterns of the first interdigital space, as well as to propose a surgical technique for the sensitive recovery of the radial edge of the hand in the first and second ray. For this purpose, the dissection of 20 cadaverous specimens was performed, seeking to describe the anatomical variants of the branch of the sensitive branch of the median and carry out the nerve transfer in the palm of the hand or in the distal third of the forearm.

Methods: descriptive study, dissection in cadaveres

Results and Conclusions: Regarding the anatomical variants, it was found that the sensory branch of the median nerve branches within the carpal tunnel in 40% of the specimens, distally in 40% and proximally in 20%. With these findings, it is proposed to perform two sensitive transfers (terminal-terminal techniques): 1. of the digital nerve of the 4 finger and of the radial digital nerve of the 5 finger to the trunk of the sensory nerve of the first space or one to the common digital nerve of the thumb and the other to the radial sensory nerve of the second finger; 2. the proximal sensory transfer of the dorso-ulnar sensory branch of the ulnar nerve to the common sensory trunk for the first space, in this technique a carpal tunnel approach is necessary, since the sensory branch of the ulnar nerve is not of sufficient length as to make a distal transfer to this and therefore it is necessary to identify the receiver trunk distal to the tunnel and dissect it to the distal forearm to perform the transfer. This last technique would require a greater surgical exposure, greater dissection and manipulation of the receptor nerve without improving the expected results, for which reason the transfer at the level of the palm of the hand is recommended.

Keywords:
radial nerve
Nerve transfer for recovery of protective sensitivity in the ulnar aspect of the hand.

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Objectives / Interrogation: Preserving the distal sensitivity of the upper limb is one of the fundamental objectives that should be sought when focusing and managing a patient who has a brachial plexus or peripheral nerve lesion; since this type of alteration increases the morbidity and the risk of suffering injuries such as burns, cuts, compression ischemia among others. Sensory transfers have become more important in the current management of brachial plexus injuries as they positively impact functional scales. The objective of the study is the identification of the innervation patterns of the ulnar ridge of the fifth finger and the digital ulnar sensory branch of the 3 finger, as well as surgical techniques for the sensitive recovery of the ulnar border of the hand.

Methods: descriptive study, dissection in cadaveres

Results and Conclusions: For this purpose, 20 cadaverous specimens were dissected and two techniques (end-terminal) are described: 1. the ulnar sensory branch of the third finger is taken as a donor and is transferred by subcutaneous tunnel to the recipient in the ulnar sensory branch of the 5 finger in the palm of the hand. 2. The ulnar sensory branch of the 5 finger is identified before the Guyon canal and the cutaneous palmar branch or the sensory branch for the third space is used as a donor at the proximal level. The cutaneous palmar was inconsistent in 50% of the components and in those that it was found, it had a caliber 50% lower than that of the receptor nerve. Given this finding, it was preferred to use the branch of the common digital nerve of the third space in the transfer at the level of the distal third of the forearm, but for this purpose it is necessary to identify it distal to the carpal tunnel and dissect it proximal to the wrist crease. to transfer it to the recipient, this second technique involves a greater dissection, longer surgical time and greater manipulation of the donor nerve, which is why we recommend carrying out the transfer at the level of the palm of the hand which has lower morbidity and meets the same objectives as the proximal transfer in terms of the expected results.

Keywords:
**Functional muscle transfer of the low trapezius portion for paralytic shoulder, ipsilateral and contralateral**

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**Objectives / Interrogation:** Functional muscle transfers (FMT) are an option for the management of the paralytic shoulder in brachial plexus lesions that are not candidates for nerve transfers. FMT can be associated with other muscle or nerve transfers in the upper limb to improve the overall function of the upper extremity. Given that in different biomechanical studies the theoretical advantage of the lower trapezius muscle has been demonstrated with respect to the latissimus dorsi as a donor, the objective of this work is to know the surgical anatomy of the dynamic transfer of the ipsilateral and contralateral lower trapezius, and to identify advantages and disadvantages of these two techniques.

**Methods:** Descriptive study, dissection in cadaveres

**Results and Conclusions:** A descriptive anatomical study was performed on 20 cadaveric specimens with the transfer of the lower trapezius to the contralateral shoulder (10 specimens) and ipsilateral (10 specimens). The contralateral transfer is indicated when there is paralysis of the ipsilateral trapezius muscle in the paralyzed shoulder or when the function or power of the ipsilateral trapezius it’s not enough to be transfer, in the other hand the ipsilateral transfer does not compromise the healthy upper limb of the patient. It was found that in the ipsilateral FMT the spinal accessory nerve should always be visualized and protected during the procedure; as well as performing augmentation with allograft of the Achilles tendon to reach the necessary length when performing posterior or posterosuperior tenodesis to the rotator cuff, this is not necessary in the contralateral technique, since with the extension towards the lumbar fascia that is performed in the dissection as described in the art, sufficient length is achieved to perform the tenodesis. Both techniques allow transfer at the posterior (infraspinatus) or posterosuperior (between supraspinatus and infraspinatus) level of the shoulder. During the dissections, infraspinatus and supraspinatus tendons were always found to perform tenodesis, however in vivo, given the atrophy that the rotator cuff may have, we recommend having anchoring sutures at hand to reinsert the donor tendon directly to the humeral head in case of be necessary. It becomes very important to achieve an adequate tension and tenodesis effect, the position of the shoulder in external rotation and abduction.

**Keywords:**
Midcarpal instability after hemitrapeziectomy, total trapeziectomy and distal resection of the scaphoid pole

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Objectives / Interrogation: Non-dissociative carpal instability (CIND) is a challenging pathology that can lead to severe functional impairment of the wrist. Removal of the distal scaphoid pole or trapeziectomy in patients with advanced osteoarthritis of the thumb were identified as possible causes of midcarpal instability and even symptomatic carpal collapse. Destabilization of the scapho-trapezial-trapezoidal (STT) ligament complex seems to lead to a CIND in certain circumstances. In a biomechanical study, the behaviour of the carpus after trapeziectomy and resection of distal scaphoid pole will be investigated for a better understanding of the importance of the involved ligaments.

Methods: 16 cadaver arms were randomly divided into two groups. In the first group distal scaphoid pole was resected with the adjacent ligaments, in the other group hemitrapeziectomy was performed followed by total trapeziectomy. Before and after the resection, a CT scan was performed in wrist extension, flexion, fist, radial and ulnar deviation with standardized load from 5 to 10kg. The three series were then reconstructed using a 3D model and the positional changes of scaphoid, lunate and capitate were measured in comparison to the non-operated wrists.

Results and Conclusions: After trapeziectomy the scaphoid, lunate and capitate rotate dorsally in wrist extension (capitate: -2.9° ±0.7), at fist closure (-17.9° ±9.9) and during radial deviation (-3.0° ±1.4). In wrist flexion, the proximal carpal row remains unchanged, while the distal row tilts palmarly (2.7° ±1.0). In ulnar deviation, both the proximal and distal row experience a palmar torque. Dissociation of the rows is most obvious at fist closure (capitolunar angle: 12.9° ±4.9).

Conclusion
Destabilization of the STT ligament complex by total trapeziectomy or scaphoid pole resection leads in this cadaver model to dissociation of the proximal and distal carpal row during fist closure and wrist flexion, but without instability within the proximal or distal row corresponding to a CIND.

The clearest destabilization of the carpus is seen at fist closure, with the highest axial load. Scaphoid pole resection may have some influence on SL instability.

Keywords:
carpal instability, trapeziectomy, hemitrapeziectomy, scaphoid pole resection
Quantitative Analysis of Surface Contouring with bipolar Radiofrequency on chondromalacic cartilage

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Objectives / Interrogation: Over the last years treatment of cartilage degeneration with radiofrequency energy (RFE) has been still a controversy. Many experimental studies have been shown, that using RFE can lead to a severe damage to chondrocytes, which may be critical in the wrist and MCP-Joints, where the cartilage layer is extremely thin compared to other joints. The goal and the positive effect using RFE instead of a mechanical debriding is the so called "sealing effect" of the cartilage layer, which has been proved histological and morphological to stabilize the damaged cartilage.

Methods: This experiment was conducted on fresh osteochondral sections from the tibia plateau of slaughtered 6 month old pigs, where the thickness of the cartilage is similar to the wrist. An area of 1 cm² was first treated with emery paper to simulate the chondromalacic cartilage. Than the treatment with RFE followed in 6 different pattern. The osteochondral section were post processed with Live/Dead staining, caspase staining and a quantitative analysis by confocal laser scanning microscopy (CLSM). For quantitative characterization of the surfaces various roughness parameters were measured using the Olympus LEXT OLS 4000 3D CLSM. To describe the roughness the Root-Mean-Square parameter Sq was registered.

Results and Conclusions: Results
A smoothing effect of the cartilage surface was detectable
The smoothing effect was depended of the number passes of the RFE over the cartilage surface. The better the smoothing effect was, it was unfortunately correlated with an increasing rate of death chondrocytes up to 99%.

Conclusion
Using RFE treatment in arthroscopy in small joints like the wrist or MCP joints should be only used under great care, especially when a chondroplasty is performed.
There is a likely high chance to destroy the joint.

Keywords:
Arthroscopy, RFE, Osteoarthritis
The ageement rate and accuracy of classification of distal radius fracture by plain roentgenography.

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Objectives / Interrogation: Plain roentgenography is primarily used to classify fracture types of distal radius fractures. Although the AO classification is also frequently used to classify distal radius fractures, many reports have pointed out that the AO classification is not reproducible. We examined the following two points regarding distal radius fractures: how far the results of plain roentgenography diverge from those of CT scan, and how similar the interpretations of plain roentgenography are among doctors.

Methods: We examined 113 patients with distal radius fractures (115 wrists) who had visited our hospital and undergone both plain roentgenography and CT scan between 2012 and 2014. Three orthopedic surgeons interpreted biplanar plain X-ray images and evaluated them by the AO classification. Classification methods for the CT images were discussed by the concerned doctors to standardize the results. The agreement rates among the doctors who had classified the plain X-ray images were calculated using the Kappa coefficient between every two doctors.

Results and Conclusions: The correct answer rates of plain X-ray diagnoses according to the AO classification when considering CT diagnoses as correct answers were as follows: The correct answer rates according to the Type classification (A, B, and C) were high (66%-75%). The correct answer rates according to the Group classification (A2, A3, B1, B3, C1, C2, and C3) were lower (33%-52%). The correct answer rates according to the subgroup classification were very low (24%-38%). When analyzing the correct answer rates of each group, we found out that those of the type C Subgroups were lower and that those of C1 and C2 were especially low (27% and 25% respectively). In particular, 25% of the fractures diagnosed as type C by CT scan were misclassified as Type A by plain roentgenography. The agreement rates between the examiners using the Kappa coefficient were moderate for the type classification and poor for the Group classification.

Many reports have pointed out that the agreement rates of X-ray diagnoses among examiners are low. Our investigation also revealed that the agreement rates among the doctors who had classified the plain X-ray images were low. In addition, 25% of the type C fractures were misclassified as type A, resulting in overlooks of intraarticular fractures. We thus concluded that combined adoption of CT scan and roentgenography is desirable when deciding on treatment methods for distal radius fractures.

Keywords:
AO classification, distal radius fracture
Our experience of surgical treatment of old instability of finger joints

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Objectives / Interrogation: Old instability of finger joints is a common problem in trauma region due to the diagnostic and treatment tactic problems. Examination and treatment results of 17 patients with lateral instability of metacarpal-phalanx thumb joint and 1 patient with front-back instability of proximal interphalangeal joint of index finger were presented. The indication to operation and technique of surgical intervention in dependence on the terms from injury moment, presence or absence of instability, value of passive lateral deviation angle were detected. Surgical technique for the treatment of complete tears of collateral ligaments of metacarpal-phalanx thumb joint was perfected.

Methods: Surgical technique for the treatment of complete tears of collateral ligaments of metacarpal-phalanx thumb joint was perfected. We performed intraosseal reinsertion with anchor and screw fixation, ligament reconstruction with palmaris muscle tendon free grafts. We used additional transarticular fixation by single K-wire in cases with lateral instability.

Results and Conclusions: Follow up period ranged from 6 to 12 months. Excellent results were achieved in 3 (11,1%), good - in 14 (51,9%), satisfactory - in 10 (37%) patients.

Keywords: stener lesion, skyers thumb, gamekeeper’s thumb, ligament reconstruction
**Prognostic Factors Affecting Clinical Outcomes of Arthroscopic Assisted Reduction and Volar Plating Through Pronator Quadratus Preservation for Intra-Articular Distal Radius Fracture**

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**Objectives / Interrogation:**
The purpose of this study was to evaluate the clinical and radiological outcomes of arthroscopic reduction and volar plating (AR-VP) through pronator quadratus (PQ) preservation for the treatment of intra-articular distal radius fracture (DRF) and to assess prognostic factors that affect its functional outcomes.

**Methods:**
Between March 2014 to February 2017, a total of 54 patients who had intra-articular DRF (AO/OTA classification C-type), and underwent AR-VP through PQ preservation technique, and completed 1-year follow-up were enrolled. They were 23 males and 31 females with an average of 50.9 years old (ranges, 17 to 73 years). Clinical outcome data including visual analogue scale (VAS) score, disabilities of arm, shoulder, and hand (DASH) questionnaire, Patient-Rated Wrist Evaluation (PRWE) questionnaire, range of motion, grip strength, and radiographic parameters were collected at 3, 6, and 12 months after surgery. We conducted a simple and multiple linear regression analysis to identify clinical and radiologic factors affecting clinical outcomes based on the modified Mayo wrist scoring system (MMWS) at 1-year follow-up: satisfactory group (excellent and good results) versus unsatisfactory group (fair and poor results).

**Results and Conclusions:**
All clinical outcome measures significantly improved at 12 month follow-ups. The MMWS were 10 excellent, 22 good, 14 fair, and 8 poor. According to univariate analysis, all radiographic parameters at injury, sex, and a presence of intra-articular comminution show a significant difference between the groups (p < 0.05). In the multivariate analysis, female gender, a presence of intra-articular comminution, and the difference of dorsal or palmar tilt more than 20.1º compared to uninjured wrist at initial injury were considered as significant poor prognostic factors of functional outcome.

In conclusion, AR-VP through PQ preservation for intra-articular DRF provides reliable clinical and radiological outcomes. However, female gender, a presence of intra-articular comminution, and the difference of palmar or dorsal tilt more than 20.1º compared to uninjured wrist at initial injury are considered as poor prognostic factors of AR-VP through PQ preservation for intra-articular DRF.

**Keywords:**
Factor, Distal radius fracture, Volar plating, Pronator quadratus, Arthroscopy
Association between radiological results and functional long-term (6.8 years) outcome in conservatively treated AO Type-C distal radius fractures

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Objectives / Interrogation: Objective: Our aim was to explore association between the radiological result and functional long-term outcome of conservatively treated distal radius fractures (AO type-C).

Methods: Methods: Sixty-three consecutive AO type-C distal radius fractures treated with reduction and cast immobilization were retrospectively collected from the trauma hospital database. Thirty-nine patients (mean age 53, 59% female) came for the clinical and radiological control visit mean 6.8 years after the treatment. Mean immobilization time was 5 weeks. The QDash-score and PRWE (Patient Rated Wrist Evaluation) served as functional outcome measures. Radius shortening, possible step-off in radius articular surface, and the dorsal tilt of distal radius were measured. The data was analyzed with Mann-Whitney U-test.

Results and Conclusions: Results: In all wrists, the primary reduction result was considered acceptable according to the National Current Care Guidelines. After mean 6.8 years, exact anatomical result was only seen in 7 wrists (18%). According to the National guidelines in 24 wrists (62 %). Radius shortening of 2mm or more was found in 19 wrists with no association to PRWE (7.3 vs 4.8, p= 0.92) or QDash (11.4 vs 4.9, p =0.65). Only 3 patients had step-off on joint surface. Twelve wrists had dorsal tilt of 10° or more (one volar tilt of 24°) with no effect on PRWE or QDash (6.8 vs 5.6, p=0.63 and 11.4 vs 6.6, p=0.89). Together patients with dorsal tilt, step-off or shortening had worse PRWE compared to those with none (PRWE 6.3 vs 1.2, p=0.040), but no difference on QDash (8.4 vs 6.1, P= 0.157). Six complications emerged: four medianus entrapments, one EPL rupture, and one very stiff and painful wrist. These complications together showed no difference to PRWE (11.7 vs 4.6, p=0.64) or QDash (11.9 vs 6.7, p= 0.66). Neither did a fracture of ulnar styloid.

Conclusions: Most of the AO type-C distal radius fractures lost once gained posture during conservative treatment. Still in long-term follow up mere dorsal tilt or shortening of radius showed no association to functional outcome. Overall worsening of radiological parameters associated with worse PRWE but not QDASH. We acknowledge the small population size sets limitations and recommend further, larger controlled trials.

Keywords:
distal radius fracture, long term outcome, conservative treatment,PRWE,QDash
Effect of discontinuous low dose FK506 administration on motor recovery after cryopreserved nerve allograft

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Objectives / Interrogation: Cryopreservation and controlled freezing of the allograft nerve can decrease the immune response and graft rejection. Nerve allografts following discontinuous immunosuppression with FK506 also induced successful neuroregeneration with motor recovery following slight rejection and functional loss.
The purpose of this study was to evaluate efficacy of discontinuous FK506 administration on the axonal regeneration in a rat model after sciatic nerve reconstruction with allograft nerve pretreated with a cryopreservation.

Methods: Forty-eight Sprague-Dawledy rats were randomized into four groups (twelve rats per each group). In each group, had a unilateral 10-mm sciatic nerve gap repaired with an ipsilateral autologous graft (group I) and a cryo-preserved nerve allograft from 18 Lewis rat in the other three groups followed with low dose (0.1mg/kg) FK506 administration for 4 weeks (group II), 8 weeks (group III), and until sacrifice (group IV). At 12 weeks, motor nerve regeneration was evaluated on the basis of the ankle contracture, compound muscle action potential (CMAP), maximal isometric tetanic force (MITF), wet muscle weight of the tibialis anterior (TA) as well as histomorphometry and immunohistochemistry of the allograft nerve.

Results and Conclusions: MITF showed significantly lower functional recovery in Groups II and III treated with discontinuous FK506 administration after cryo-preserved nerve allograft compared Group I: 52.3 ± 10.3% for Group I, 31.7 ± 9.6% for Group II, 35.6 ± 8.6% for Group III, and 41.7 ± 6.7% for Group IV compared to the contralateral side. Groups II and III were inferior to Group I regarding CMAP and the TA muscle weight (p < 0.05). There was no significant difference between the Group I and IV in terms of MITF and TA weight (p > 0.05). Histomorphometric analysis revealed that Groups II and III were inferior to Group I regarding Axon area, axon number, nerve fiber density (p < 0.05) and to Group IV regarding axon number (p = 0.001) (Table 2). Immunohistochemistry demonstrated that the morphology and distribution patterns of the axons in Group II and III showed less densely packed and little disorganized than Group I and IV.
In conclusion, withdrawal of immunosuppression resulted in graft rejection, a marked deterioration in function, and loss of generating fibers. A using cryo-preserved allograft nerves from cadaveric donors requires permanent immunomodulation for a valid surgical strategy to restore motor function of the damaged peripheral nerve.

Keywords: Cryo-preservation, Allograft, Immunosuppression, FK 506, Neuroregeneration
**Very distal sensory nerve transfers in high median nerve lesions**

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**Objectives / Interrogation:** We report the results of reconstruction of fingertip sensation of thumb and index by modified distal sensory nerve transfer of superficial branch of radial nerve or dorsal branch of ulnar nerve in 6 patients with high median nerve lesions.

**Methods:** The 6 patients in this group are those with high median nerve lesions which could not repaired directly for some reasons. All had surgery during 7-14 months of trauma. For isolated nerve lesions, branches of the radial nerve on the proximal phalanx of the index and thumb were sutured to the ulnar proper digital nerve of thumb and radial proper digital nerve of the index finger in 3 patients. Whereas part of dorsal cutaneous ulnar nerve is transferred to fascicular group of median nerve including the radial digital nerve of index and both sides digital nerves of thumb at the wrist in those 3 patients with concomitant radial nerve palsy. Patients were followed up for at least 12 mouths.

**Results and Conclusions:** Either sensory nerve transfer restored protective or better sensation to the fingertips in all patients. Better locognosia was acquired in all thumbs whatever the transfer is. Good results were observed in patients who had undergone surgery later than 12 months after injury. Little paraesthesia of corresponding area of donor nerve is presented without trouble in either transfer. Fingertip sensation of thumb and index finger could be effectively restored by sensory transfer of either radial nerve branches to palmar nerves at the level of the proximal phalanx or partial ulnar dorsal cutaneous branches to fascicular group of median nerve at wrist in high median nerve lesions. These two transfer maybe also be suitable for chronic low median nerve lesions or lesions in older patients, as a adjunct to nerve grafting.

**Keywords:**
sensory nerve transfer, high median nerve injury, distal nerve transfer
A Single Score as a Comprehensive Outcome Measure for the Wrist

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Objectives / Interrogation: There has been an effort in medicine in general, and in hand surgery specifically to focus on a unified approach to outcome measures. The ability to analytically evaluate outcomes in hand surgery is critical for the understanding and sharing of results. It is fundamental to improvement and optimal tailoring of treatment regimens, personalizing treatment and ultimately to the advancement of the field. Despite its evident importance, the ability to do so has remained incomplete. This is due to the complexity of hand and wrist anatomy, mechanics, function, and individual functional requirements and expectations as well as a range of treatment options including conservative and surgical options.

Methods: Currently utilized evaluations are constrained in their ability to determine exact function, and thus have limited capacity to identify specific functional deficits and personal needs. The availability of multiple functional tests, each addressing a specific function and rarely standardized, further complicates outcomes evaluation. Existing measures allow us to evaluate and compare a specific outcome such as grip strength, motion, or the patient's perception of his or her function, but a global picture of the outcome that combines these factors and incorporates a functional measure remains elusive.

Results and Conclusions: We are in the process of utilizing a multidisciplinary approach that includes hand surgeons, hand therapists and clinical trial specialists to determine predefined outcome measures that can be combined and weighted into a single score for the evaluation of wrist conditions. An international forum of experts in this field has been assembled and will meet on the 21st of November 2018 in Switzerland with the aim of establishing a comprehensive single scoring system for wrist outcomes. Further plans include clinical trials utilizing this "consensus tool" and refinement of the tool as we accumulate experience with it. Ultimately, it is our aim to have a tool that will allow comparison of outcomes for both surgical procedures and therapeutic interventions for wrist conditions. We believe it is important to promote awareness of the challenge in creating and implementing consistent evaluation measures and the efforts to address it in our respective societies (hand surgeons and hand therapists).

Keywords:
wrist score for functional assessment
Radial longitudinal deficiency. Analysis of clinical and radiological results

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Objectives / Interrogation: Radial longitudinal deficiency (RLD) includes bone, musculotendinous and neurovascular abnormalities of multifactorial etiology of the radial side of the upper extremity. Treatment includes improving the length of the limb, the appearance and functioning of the hand. The aim of the work is to show the experience in a series of patients attended in the last 15 years and describe clinical and radiological results.

Methods: Retrospective study of patients with RLD between 2000 and 2016. Variables were analyzed and age associations were identified at the time of surgery, sex, laterality, type of deformity according to the modified Bayne-Klug classification, surgical technique, physis damage, associated diseases, functional and radiological results with degree of satisfaction, clinical position and radiological hand forearm angle.

Results and Conclusions: Results: 47 cases of 65 met the inclusion criteria. The average age of surgery was 19 months, 61% female, 64% right hand. According to classification, type IV was 60%, type III 19%, type 0 in 17% and type I in 4%. 11% VACTERL association. The intervention performed was centralization 72.3%, radialization 8.5% and one case of lengthening. Ulna osteotomy was performed in 55.3%. There was damage of the physis in 31%. The postoperative radiological position was neutral in 48.9%. Conclusions: In patients with centralization at 1 year, a good clinical and radiological correction were observed, however the result worsened in some patients with longer follow-up.
Radial longitudinal deficiency. Preoperative, one and five years follow-up

The management of soft tissues prior to centralization is believed to give better results. The use of intramedullary nail from the ulna to the carpus could be associated with damage of the distal ulna.

**Keywords:**
radius; congenital abnormalities; congenital hand deformities, radial longitudinal deficiency

**References:**
Long-term Patient Reported Functional Outcomes following Bennett’s Fracture Repair

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Objectives / Interrogation: Optimal management of Bennett’s fractures of the thumb are important for long term hand function. The current evidence base on the management of Bennett’s fractures is limited due to the infrequency of this fracture. We present an 11-year retrospective analysis of Bennett’s fracture fixation and patient reported outcome measures to identify long term functional outcomes and risk factors for suboptimal recovery.

Methods: We conducted a retrospective analysis of our centre’s trauma database over an 11-year period to identify all patients with a Bennett’s fracture who underwent surgical intervention. Electronic medical records were analysed to extract mechanism of injury, smoking status, comorbidities, complications, time to surgery, surgical fixation method and post-operative hand function. Patients were invited to complete a Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire to assess long term functional outcomes. Descriptive statistics were applied to characterise the patient cohort. Statistical analyses were conducted to identify risk factors for suboptimal functional recovery.

Results and Conclusions: A total 79 patients were identified over a 11-year period with a mean age of 31.7 years at time of injury (13 to 74), 18 were excluded. Mechanisms of injury reported were: sports injuries (31.1%), violence (24.6%), falls (18%), road traffic accidents (16.4%), occupational (4.9%) and other accidents (4.9%).

Of the 61 patients, 71% returned to unrestricted range of movement during hand therapy. 95% of cases were managed with K-wire insertion. 85% of cases were closed reduction. The post-operative complication rate was 14%. Of the 61 patients asked to complete a DASH questionnaire, 21 patients did not respond and 40 patients responded. The mean time since injury was 5.1 years (0.8 to 11.6 years). Of the 40 responders, the mean DASH score was 9.1 (1.7 to 69.2).

Long term patient reported functional outcomes in patients with Bennett’s fractures requiring K-wire fixation are excellent. Post-operative complication rates are low and wound infections are uncommon. Age at time of fracture, smoking status and open fixation were not associated with inferior long term patient reported outcomes.

Keywords:
Hand; Fracture; Function; Bennett; Trauma; Patient reported outcome.
Arthroscopic reconstruction of chronic unstable scaphoid nonunion

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Objectives / Interrogation: To present our experience of arthroscopic assisted reconstruction in patients with unstable scaphoid non-union using cancellous non-structural graft and internal fixation with headless screw.

Methods: A case series of patients with chronic unstable scaphoid non-union treated with dry arthroscopic reconstruction using two midcarpal portals. DISI was corrected with a temporary Kw through the dorsal radius. Scaphoid defect was packed with cancellous bone graft from the distal radius across the radial-midcarpal portal. Internal fixation was performed using a mini-Acutrak or HCS headless screw. Fusion rates, radiographic and clinical evaluation was performed, with a mean prospective follow-up of 16.8 (12-36) months. All patients were treated by the same surgeon.

Results and Conclusions: 32 patients with 26 (18-45) years mean age were treated. All cases showed “humpback deformity” in preoperative radiological/TC scan study. Consolidation rate was 95% (30/32) at mean 7 (4-10) weeks. Range of flexo-extension arc improved after surgery, from 138.4º to 165º. Scapholunate angle (SLA) and radio-lunate angle (RLA) was significantly improved: SLA 67.7º to 47º; RLA 30.8º to 4º. Functional postoperative evaluation: mean DASH-questionnaire was 8 and VAS (0-10) 0.7. Two cases were reoperated due to non-union: 1 case using arthroscopic cancellous bone graft again and the other patient using a 1,2 ICSRA vascularised bone graft. All cases consolidated and no reoperations was needed after the second surgical technique.

Conclusions: Arthroscopic reconstruction can be a useful alternative for chronic unstable scaphoid nonunion. In our experience presents good clinical and radiological results in scaphoid non-union with humpback deformity using a non-structural bone graft. Probably is limited for restoration of the normal carpal alignment but has positive effects on clinical wrist function recovery with comparable results to open techniques

Keywords:
Scaphoid, nonunion, cancellous graft, arthroscopy
**Treatment of scapholunate dissociation with arthroscopic ligamentoplasty reconstruction**

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**Objectives / Interrogation:** To evaluate the results of the arthroscopic reconstruction for the treatment of the scapholunate instability of the wrist

**Methods:** 31 patients were treated, with a mean age of 39.9 (22-51) years old. The mean time of symptoms before surgery was 6.9 (1-18) months. All patients were operated using the arthroscopic ligamentoplasty technique according to Corella. Only the dorsal escafolunate ligament was reconstructed. Kirschner wires fixation was not used. The wrist was immobilized for 2 weeks, followed by a progressive rehabilitation protocol. Preoperative and postoperative clinical and radiological parameters were evaluated. The mean follow-up was 16.2 (8-24) months.

**Results and Conclusions:** 4 patients had an Outbridge grade IV chondral lesion greater than 5 mm and the reconstruction was not performed. The ligamentoplasty was performed in 27 cases. 6 patients (22.2%) had associated lesions: 3 TFCC lesions and 2 LT instability. The range of flexo-extension was 141.6° before surgery and 127.4° in the post-operative period. Watson test was positive in 93% pre-operative period and only in 8% at the end of FU. Pain (EVA 0-10) decreased from 5.5 (3-7) to 1.9 (0-8). Scapholunate angle decreased from 73.8° (60-90°) to 64° (35-90°), DISI deformity was present in 100% before surgery and only in 46% at the end of FU. The Scapholunate gap decreased from 3.8 to 2.3 mm. All patients returned to their previous sports activity. There were no reoperations. 2 patients has complications at the end of FU: 1 median nerve injury by the volar approach and 1 persistent ulnar border pain.

Conclusion: The treatment of scapholunate instability with arthroscopic assisted repair presents good clinical and radiological results with a short period of recovery.

**Keywords:**
Scapholunate dissociation, ligamentoplasty, arthroscopy
Clinical Outcomes of Zone 1 Flexor Tendon Injuries Treated With Bone Anchor

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Objectives / Interrogation: Objectives
Surgical repair of Zone 1 flexor tendon injuries is associated with significant complications depending on the fixation methods. Some studies have reported a complication rate as high as 65% and there is no consensus on optimal fixation technique. We report our results of treating Zone 1 FDP injuries at tertiary referral Hand Unit.

Methods: All Zone 1 FDP injuries between January 2012 to December 2017 were retrieved from our in-house bespoke electronic database, the eHands. Relevant patient demographics, mechanism of injury, type of injury classified according to Leddy and Packer classification, intra-operative findings, rehabilitation protocol and functional assessment as per modified Strickland criteria were recorded.

Results and Conclusions: Results
A total of 68 Zone 1 FDP injuries with a mean follow-up of 72 months (range 9-56m) were included in the study. The average age of the patients was 21y (range 18-54), majority being men(n=41). Time from injury to surgery was at a mean of 5 days (range 3-8d). Contact sports were the major cause of the injury(n=21). Majority of the injuries were Leddy Parker type 2(n=18) and type 1(n=32). Only 3 patients had type 4 injury and the remaining patients has type 4 injury. A significant proportion of Zone 1 injuries were treated by Mitek micro bone anchor (DePuy Mitek Inc., MA, USA): n=48. All patients underwent rehabilitation as per the Belfast controlled active movement (CAM) regime. 6 patients underwent surgery for subsequent complications, two directly related to the failure of the bone anchor. According to the modified Strickland criteria 18 patients had excellent, 13 had fair and the remaining had poor outcome.

Conclusions
The current study is the largest series reporting the use of bone anchors in Zone 1 FDP tendon injuries. These injuries when treated with bone anchors although have a low complication rate, are not necessarily associated with excellent outcomes.

Keywords:
FDP, Leddy and Packer, Bone anchor
Comparison between supercharged ulnar nerve repair by anterior interosseous nerve transfer and isolated ulnar nerve repair in proximal ulnar nerve injuries: A pilot study

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Objectives / Interrogation: To compare combined ulnar nerve repair with supercharged end to side anterior interosseous nerve to ulnar motor nerve transfer (UR+SETS) to conventional isolated ulnar repair (IUR) techniques in proximal ulnar nerve transection

Methods: A comparative randomized trial was conducted prospectively on 30 patients with proximal ulnar nerve transection injury. Fifteen patients were managed by UR+SETS. Fifteen patients were managed by IUR. The level of injury was classified into 1-3 according to Post et al.[1]

Results and Conclusions:
Results: Only 13 patients in both groups completed their 18 months follow up. At the 3-month follow up, the results showed no statistically significant difference in outcomes between the two groups. At the 6-month follow up, the Birch's score was statistically insignificant. The Brand's score was better in the UR+SETS group, possibly indicating early return of function. At 12-18 months, there was a statistically significant difference in the outcomes in favour of UR+SETS group. On comparing the outcome according to the level of injury: At level 1 injuries, UR+SETS group showed statistically significant higher Birch and Brand's scores. Although the sample size was small to be statistically analysed, the UR+SETS group showed better results than the IUR group in level 2 injuries. The preliminary results indicate that the 2 groups were comparable in level 3 injuries indicating that UR+SETS transfer may be of no value at that level of injury.

Conclusions: At the short term, UR+SETS transfer results in better intrinsic muscle re-innervation and clawing deformity correction following proximal ulna nerve transection injury

Keywords: Direct repair; End to Side repair; Proximal ulnar nerve lesion; Supercharged repair; Transection injuries

References:
Post-traumatic deformities around wrist: two-stage treatment

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Objectives / Interrogation: Treatment of bone and joint deformities is a challenge for surgeons. Correction of old deformities is associated with the risk of damage of peripheral nerves and blood vessels with subsequent ischemic disorders. In case of severe deformity two-stage treatment with slow distraction using external fixator on the first stage can be an available alternative to acute deformity's elimination.

The purpose of study - to analyze the efficacy and safety of two-stage treatment for the correction of post-traumatic deformities around the wrist with the aid of external fixator at the first stage.

Methods: We analyzed the treatment of 10 patients (from 24 to 42 years) Two-stage treatment was applied for correction of chronic perilunate dislocation (3) and chronic trans-scaphoid perilunate fracture-dislocation (3). Two-stage treatment was applied for correction of severe deformities after distal radius fracture (malunion - 1 patient, nonunion - 3 patients) with ulna head dislocation. Period of time following after trauma varied from 1,5 months to 4 years. Ilizarov apparatus was used at the first stage in all cases. Standard Ilizarov frame with 130-140 mm in diameter rings was used. The rate of distraction was 1 mm per day. Distraction period continued for 3-4 weeks. The second stage surgery procedures included: open reduction of perilunate dislocation (6), screw fixation and bone grafting of scaphoid (3); ORIF and bone grafting of radius (4).

Results and Conclusions: In all cases, severe deformities were corrected with the aid of distraction. Slow distraction provided a gradual lengthening of the skin, muscle, joint capsule, nerves and blood vessels without ischemic and neurological destruction. After the second stage of surgery, perilunate dislocations were reduced in all cases, bone deformities were eliminated in all cases, and bone healing was achieved in all cases. Function was improved in 9 cases, and recovered fully in 1 case. There was a complication after osteosynthesis in one case - K-wire's broken and loosening. Previous "stage I" surgical procedure facilitated the ability to perform "stage II" surgical procedure significantly.

Conclusion. Two-stage treatment of severe post-traumatic deformities around wrist is effective and safe. Pre distraction at the first stage makes it easier to do the second stage surgical procedure.

Keywords:
IFSSH19-1652

Efficiency, setup, impact and distribution of the procedures in a wide-awake surgical theater built within the department ward: a review of surgical procedures in a year period

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Objectives / Interrogation: Objectives The wide-awake hand operations have not typically performed in a minor procedure room in our hospital. This study is to report the surgical procedures that were performed in the wide-awake surgical theater inside the department ward over a year period and its impact to surgeons' efficiency and quality of life.

Methods: Methods In our unit, a wide-awake hand surgery theater was built outside of the main operating rooms of the hospital, but inside a hand surgery ward, which is entirely managed by the Department of Hand Surgery without anesthesiologists involved. It is very close to surgeons' offices within 5-20 meters. The regulations of this wide-awake theater of the department are less stringent than those for hospital operating rooms because the operations are only for appropriate hand related patients without complex reconstruction. The surgeons have no restriction in deciding the time of surgery. Any surgery, whether outpatient or inpatient, can be performed whenever the room is available. Inside the operating room, patients usually enjoy watching movies or listening to music stored in hard drives or iPads with earphones during surgery. Questionnaires were sent to surgeons to assess the efficiency of workflow and improvement of quality of life of surgeons by this new setting.

Results and Conclusions: Results This operating room provides easy access and simplified workflow for both patients and surgeons and a more pleasant patient experience. From September 2017 to August 2018, a variety of wide-awake surgical procedures were performed in 613 patients in this theater. The number of patients underwent surgery include excision of soft tissue 143, carpal tunnel release 73, trigger finger release 76, hand fracture internal fixation/removal 62, flap transfer 50, tendon repair 25, tenolysis 8, cubital tunnel release 9, nerve repair 5, tendon transfer 4, collateral ligament repair of joints 5, release of finger joint contracture 4, wound debridement, skin graft, foreign body removal in 149 patients. There was no waiting time for these patients and questionnaire sent to surgeons indicate very favorable response from surgeons who all reported improvement of work efficiency and improvement of quality of life of surgeons.

Conclusions Our experience indicates that such a specialized operating room improves efficiency in hand surgeons' workflow, improves quality of life of the surgeons, and decreases waiting time for the patients and surgeons.

Keywords:
Wide-awake surgical theater; Wide-awake hand surgery
Correction of Radially Deviated Wassel Type III Thumb Polydactyly using Modified Open-Wedge Osteotomy vs Conventional Closed-Wedge Osteotomy in 51 Children

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Objectives / Interrogation: To report a novel modified technique used to correct radially deviated Wassel type III thumb polydactyly by using open-wedge osteotomy (OWO) to restore the normal length of the thumb and to compare the technique with the conventional closed-wedge osteotomy (CWO).

Methods: 30 children suffered unilaterally from radially deviated Wassel type III polydactyly and the radial deviation of the interphalangeal joint of unlar main thumbs ranged from 15° to 45°. After removal of the radial hypoplastic thumb, the ulnar thumb was corrected by modified OWO. The wedge-shaped bone defect was reconstructed with a bone graft taken from the resected thumb, and the soft tissue flap of the resected thumb was merged to preserved thumb. The length of the thumb, radial deviation and range of motion of the interphalangeal (IP) joint were assessed. For comparison, we also retrospectively collected another group of 21 children treated with conventional CWO. Significant difference was set at p<0.05.

Results and Conclusions: The average age at surgery was 1.5 years (range, 1-2.3 years). At the final follow-up of 3.4 years (range, 2-5.4 years), the mean length of the affected thumbs reached 96% (range, 92%-100%) of the opposite thumbs. The mean radial deviation of IP joints was 6° (range, 0°-15°). The average functional point was 12 points (range, 10-14 points), and the mean cosmetic score was 3.7 (range, 3-4 points). In comparison group, The average age at surgery was 1.7 years (range, 1-2.8 years). At the final follow-up of 4.6 years (range, 3-5.2 years), the mean length of the affected thumbs reached 83% (range, 75%-92%) of the opposite thumbs. The mean radial deviation of IP joints was 7° (range, 0°-14°). The average functional point was 10 points (range, 9-12 points), and the mean cosmetic score was 2.4 (range, 2-3 points). Bone healing was achieved in both groups, and slightly small nails were deemed acceptable. Stability of IP joint was archived in all children, and no revision surgery was required. There were significant differences with regard to the length of thumb, functional and cosmetic scores (p<0.05). For the correction of radially deviated Wassel Type III thumb polydactyly, the modified OWO can more effectively restore the normal length of thumb comparing with the conventional CWO, and the rebalance of the flexor pollicis longus could prevent radial deviation recurring and the flap transfer could achieve better contour of the thumb.

Keywords:
Wassel Type III Thumb Polydactyly; Open-Wedge Osteotomy; Closed-Wedge Osteotomy
Implementation of a finger stump database after traumatic finger amputation - Concept evaluation and clinical consequences

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Objectives / Interrogation: Aim of the current study is to evaluate risk factors, treatment strategies and outcome evaluation after traumatic finger amputation

Replantation is still the gold standard for treatment of traumatic finder amputation. However, if replantation is not feasible or not preferable, generation of a stabile and sensible stump is mandatory. Although this is a straight-forward procedure, clinical outcome is not always predictable and neuroma and chronic pain pose significant challenges for patients, physicians and therapists. Still today, a precise analysis of the treatment and outcome after finger stump amputation is lacking.

Methods: In our retrospective analysis, we performed a chart review of finger stump amputation in 2007-2017. During this period, 1187 patients have been admitted to the study. Patients comorbidities, operation techniques, and especially postoperative treatment strategies, as well as the need for long-term rehabilitation, are reviewed and analyzed.

Results and Conclusions: Benefits and the potential of the implementation of a finger stump database for clinical usage will be considered. Furthermore, the resulting clinical adjustments following the implementation of the database are presented and discussed. Focussing on the short- and long-term complications, the kind of trauma, anatomical localization and the operative treatment applied are related. Moreover, comorbidities and social factors have an impact on rehabilitation time and functional outcome after traumatic finger amputation. Adjusted treatment plans and algorithm will be presented based on the data gathered in the study.

Functional impairment and rehabilitation times are influenced by multiple factors considering the applied operative treatment, comorbidities of the patient and the kind of trauma. The collected experience can be used for standardized treatment protocol after traumatic finger amputation.

Keywords:
nerve, neuroma, clinical treatment
Traumatic Subluxation of Extensor Carpi Ulnaris System

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Objectives / Interrogation: Extensor carpi ulnaris (ECU) subluxation at the wrist joint can be a disabling condition. We present our experience with this problem.

Methods: From 2012 to 2017, we evaluated 21 patients with a diagnosis of ECU as subluxation, tenosynovitis and longitudinal fissuring. The cohort included 8 women and 13 men (average age 32 years). Timing of presentation: 11 acute trauma and 10 chronic post traumatic (from 6 months to 2 years post trauma). None of the patients had pain or instability of the distal radioulnar joint; 7 patients (33%) play tennis golf or sport activity with bats.

All patients underwent splinting and physiotherapy. Patients who failed conservative treatment were indicated for surgical stabilization of the ECU tendon. Post-operatively patients were placed in a sugar tongue splint day and night for 6 weeks and then a forearm splint at night for an additional 2 months. Return to sports and heavy work was allowed at 6 months.

Results and Conclusions: All patients with an acute trauma had resolution of symptoms with therapy and splinting and returned to work and sports uneventfully. All patients with a chronic injury ended up requiring surgery. In 8 patients we performed a Graham ulnar retinacular flap with augmentation on the 4/5 septum; in 2 patients we performed a Garcia Elias ulnar retinacular flap, capsular flap and periosteum flap. After the Graham flap 6 patients had a good result with regard to return to work and/or return to sports; 1 patient had continued symptoms that subsequently resolved at the 1 year mark; and the final patient (tennis player) had persistent pain and recurrent tenosynovitis after the surgery but actually after PRP injection she is getting better. In 2 patients operated with Garcia Elias technique we had good results with regard to return to sports and work. No statistically significant differences as result between sport and labour patients. No more ECU subluxation/luxation in all patients operated. No pain (except one patient); complete wrist range of motion in all patients; no complications during and after surgery.

A careful evaluation for ECU subluxation should be performed when dealing with ulnar-sided wrist pain.

Keywords:
ECU-Wrist-Subluxation
All-Inside Arthroscopic Dermal Allograft Reconstruction of Massive TFCC Tears

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Objectives / Interrogation: The TFCC stabilizes the DRUJ, provides a cushion between the ulnar head and the lunate with axial loading and ulnar deviation of the wrist, and it is an efficient ulnar-side restrain to the carpus. Extensive radial side tears and combined massive radial and central tears without DRUJ instability are still a challenge to treat. We describe an all-inside arthroscopic dermal allograft reconstruction that restores the radial insertion, the central disk (meniscus homologue) while enhancing the support for the dorsal and volar radioulnar ligaments.

Methods: The concept of this technique is based on the optimal results obtained with the SCR (Superior Capsular Reconstruction) for massive rotator cuff substance loss in the shoulder. Biomechanical and prospective clinical studies have demonstrated the benefits of this reconstruction in the subacromial space. We used the standard 3-4, 4-5 and 6R portals for this reconstruction. The massive radial and central tears with significant substance loss are debrided, and DRUJ stability is assessed. A knotless reconstruction is then accomplished by inserting FiberWire (Arthrex, Inc. - Naples, FL) preloaded SutureTak anchors (Arthrex, Inc. - Naples, FL) on the dorsal and volar corners of the radial wall. Intra-articular measures are taken from volar to dorsal and from radial to ulnar to determine the perfect size for the allograft. The allograft is tagged and brought inside the joint. A tight knotless radial fixation is completed, the new meniscus homologue covers the ulnar head and peripheral fixation is finalized via a standard ulnar tunnel foveal technique. The specimens were tested for axial load, ulnar deviation, and forearm pronation.

Results and Conclusions: This is the first study looking into an all-arthroscopic allograft TFCC reconstruction. The dermal allograft did not get displaced or got torn when the wrist was taken from radial to ulnar deviation, forearm rotation, or when axial load was applied from the carpus down to the ulna. This type of reconstruction could also be combined with an arthroscopic wafer when ulnocarpal abutment is present. The combination of these two procedures might expedite the recovery time and return to previous activities when compared to an ulnar shortening osteotomy. The results of the on-going high repetition cyclic load will be presented as well. We believe this is a minimally and very reproducible technique, which might extend the bridge between reconstructive and salvage wrist procedures.

Keywords:
Arthroscopy; TFCC; Allograft; Reconstruction
The effect of articular tilt on carpal alignment in acute distal radius fractures

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Objectives / Interrogation: Carpal malalignment is thought to be an important influence on functional outcome following distal radius fracture. The aim of this study was to investigate the relationship between tilt of the articular surface of the radius and measures of carpal malalignment in patients with an acute distal radius fracture.

Methods: Radiographs of 249 consecutive distal radius fractures were prospectively analysed. Distal radius articular tilt, scapholunate angle, radiolunate angle, capitolunate angle and capitate shift were measured. Patient demographics, wrist position, radiograph quality and fracture type were recorded. 184 patients underwent manipulation under anaesthetic and all measurements were repeated after manipulation. One independent observer carried out all measurements which were then checked by the senior author. Linear regression modelling was used to investigate the relationship between tilt and the carpal parameters. Models were tested using forward selection to identify if other parameters affected the association.

Results and Conclusions: A significant, linear relationship was seen between scapholunate angle (p<0.005, R²=0.20), radiolunate angle (p<0.005, R²=0.35), capitolunate angle (p<0.005, R²=0.33), capitate shift (p<0.005, R²=0.82) and tilt. This relationship was consistent irrespective of whether the fracture was displaced volarly or dorsally. A similar, proportionate change in alignment was seen with reduction of the fracture. Initial malalignment increases with age. Capitate shift occurs independently of wrist position.

Carpal malalignment frequently occurs following distal radius fracture. Reduction of the fracture will reliably reduce the malalignment. Capitate shift appears to be the most useful measurement of carpal malalignment as it is not affected by the position of the wrist when the radiograph is taken. We would recommend capitate shift is routinely measured by clinicians on initial radiographs, following manipulation and during long term follow up.

Keywords:
wrist fracture; distal radius fracture; carpal malalignment
Tetraplegic and Spastic Posterior deltoid to triceps transfer to restore active elbow extension in tetraplegic patients

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Objectives / Interrogation: Evaluate functional results, after a surgical reconstruction of elbow extension with deltoid to triceps transfer.

Methods: Prospective cohort study of 10 tetraplegic patients (11 elbows). 6 men and 4 women, between 17 and 29 years of age, 1 patient from group 1 of ICSHT, 8 from group 2 and 1 from group 3. The patients were evaluated by a multidisciplinary team. To restore the active elbow extension we used the posterior deltoid to triceps transfer whit anterior tibial tendon graft. Elbow extension strength was measured according to BMRC 1-5. Performance and satisfaction was assessed by the Canadian Occupational Personal Measure (COPM), which rates patient individual goals, and activities of daily living with the WeeFIM scale. Follow up was performed at 6 and 12 months postoperatively. Surgeries were carried out between May 2013 and July 2017. Reconstruction of elbow extension was done with posterior deltoid to triceps transfer using anterior tibialis tendon graft. Patients were discharged home the day after surgery, and entered a rehabilitation protocol that included immobilization in elbow extension and shoulder abduction for 3 weeks, and then progressive elbow flexion was encouraged but protected with an articulated elbow brace. After 3 month free elbow motion was allowed.
The statistical analysis was performed using SPSS v17.0 software, summary measures were calculated and the comparison was made through nonparametric Friedman and Wilcoxon statistics, all with p <0.05.

Results and Conclusions: All patients improve elbow extension strength from a median of M2 strength to M3 at 6 months and M4 at 12 months (p 0,0004) . There was a significant improvement in each individual goals measured by the COMP from a median of 2 points of performance at preoperative assessment to 4 points at 6 months and 7 points at 12 months after surgery. Satisfaction improved from a median of 2 points to 5 points at 6 months and 8 points at 12 months after surgery (p 0.033). WeeFIM scale improved in many activities such as self-care (p 0.034) bathing (p 0.033), dressing (p 0,02), self- catheterization (p 0.042), and use of wheelchair (p 0.08). There was one early postoperative complication consisting of pain that required hospitalization in 3 patients.

Conclusion
Restoration of elbow extension with deltoid to triceps transfer in patients with tetraplegia results in a significant improvement in their own perception of gain in activities that are meaningful in their daily living.

Keywords:
Tendon transfer Elbow Tetraplegic
Outcomes of Endoscopic release for Patients with de Quervain’s Tenosynovitis: Retrospective Review of 181 cases

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Objectives / Interrogation: De Quervain's tenosynovitis is one of the common causes of radial wrist pain resulting from thickening of the fibro-osseous sheath of the first extensor compartment. Surgical release of the compartment is indicated when non-operative treatment fails. We have reported earlier improvement and less complications after endoscopic release of the compartment in patients with de Quervain's disease, when compared with open release. However, there are lack of evidences of benefits and risks of the endoscopic technique for de Quervain's disease over the open technique. Thus, we have retrospectively reviewed patients who underwent endoscopic release for de Quervain's disease with minimum follow-up of 12 months.

Methods: Between Apr 2009 and Jan 2017, this retrospective study enrolled consecutive patients with de Quervain's tenosynovitis who underwent endoscopic release of first extensor compartment and followed-up minimum of 1 year. Patients fulfilling the following criteria were excluded: (1) concomitant osteoarthritis of TM joint or STT joint, (2) concomitant Wartenberg syndrome, (3) underlying chronic inflammatory disease like rheumatoid arthritis or gouty arthritis, and (4) inadequate follow-up. For clinical assessment, VAS pain score, pinch strength and DASH score were assessed preoperatively and postoperatively, and VAS satisfaction score for postoperative scar was also evaluated. Complications were reviewed such as neurovascular injury, postoperative infection, unrelieved pain, and redo surgery.

Results and Conclusions: One hundred sixty eight patients (181 wrists) were included and their mean age was 49.2±14.3 years. Among them, 96.4%(162 patients) were female. Dominant wrist was involved in 67.4%(122 wrists). The mean follow-up period after surgery was 17.6 months. The mean VAS pain score and DASH score improved from 7.1±1.7 to 1.2±1.3 and from 52.4±21.5 to 5.6±4.7. The mean pinch strength improved from 5.0±2.4 kg to 6.6±2.5 kg. The mean VAS satisfaction score for postoperative scar was 8.2±1.2(higher score representing greater satisfaction). Twelve patients had transient superficial radial nerve symptom(5.49%) postoperatively and resolved spontaneously within 6 weeks in all patients. One patient underwent open tenolysis due to unrelieved pain after endoscopic release.

This study showed that the endoscopic release for the first extensor compartment seems to be effective and safe procedure for patients with de Quervain's tenosynovitis when conservative treatment fails.

Keywords:
de Quervain's tenosynovitis, endoscopic release
Wide-Awake versus General Anesthesia Results in Patients with Dupuytren's Disease Surgery: Preliminary Results

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Objectives / Interrogation: Wide-awake local anesthesia with no tourniquet (WALANT) has an increasing popularity in Dupuytren's disease surgery as it eliminates adverse effects of general anesthesia and the need for hospitalization. Moreover, in Dupuytren's surgery, controlling active movement during the surgery is the foremost advantage of WALANT besides providing a bloodless area for the fine surgical intervention. For this reason, we hypothesized that the WALANT technique would improve the clinical outcomes in patients that were operated for Dupuytren's contracture. Therefore, the aim of this study was to present our preliminary results in patients who underwent open partial fasciectomy under WALANT and compare their results with those that had GA.

Methods: Nineteen patients were called up who were operated between January 2017- June 2018 and 12 of them were reached. One patient was excluded due to cardiac surgery during follow-up. Five patients were operated under WALANT and 6 of them had GA. Range of total active flexion motion and residual extension deficit were measured and pain, satisfaction level, post-operative analgesic use, follow-up period since surgery and any recurrence were recorded. Results of the patients in the WALANT and GA groups were compared.

Results and Conclusions: The mean age of the patients were 60 years in GA and 67 years in WALANT group. Patients were operated on their 4th or 5th digits. Mean follow-up was 13 months in the GA group and 6 months in the WALANT group (p>0.05). Total range of active flexion motion was 264±13° in the WALANT group and 252±32° in the GA group. Moreover, no residual extension deficit was seen in the WALANT group while it was 8±11° in the GA group. However, the differences were not statistically significant. Pain level, post-operative analgesic use and patient satisfaction were similar across the groups.

In this preliminary study, although not being statistically significant, WALANT technique seems to provide improvements in the total active motion and residual extension deficit in patients who underwent surgery for Dupuytren's contracture. However, as a limitation, we have to declare that present extension deficit in GA group may result from mild recurrence due to longer follow-up period. Studies with large samples and long-term follow-up will provide evidence for clinical outcomes and especially recurrence rates.

Keywords:
Dupuytren's contracture, WALANT, wide-awake
Long-term Outcomes of Surgically Treated Metacarpal Fractures Using Bioabsorbable Plates.

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Objectives / Interrogation: Osteosynthetic bone fixation implants made from composites of unsintered hydroxyapatite (u-HA) and Poly-L-lactide (PLLA) with bioabsorbability and osteoconductive properties are widely used in orthopaedic surgery. In oral and maxillofacial surgery, it has been reported that the plate was absorbed in about 6 years after surgery, but in our orthopaedic fields, long-term outcomes have not been reported yet. We report long-term outcomes of 8 fingers of 6 patients surgically treated metacarpal fractures using bioabsorbable plates (Super-Fixsorb® & #65038; MX40 mesh) for more than 5 years after surgery in our hospital.

Methods: This study included 8 fingers of 6 patients surgically treated metacarpal fractures with bioabsorbable plates (Super-Fixsorb® & #65038; MX40 mesh) for more than 5 years after surgery in our hospital between March 2009 and September 2017. The average age at the injury was 29.5 years (16-54 years), and the average follow-up period was 6 years and 9 months (5 years and 8 months-8 years and 5 months). Open reduction was performed, and the fracture was temporarily fixed with 1.0 mm-diameter Kirschner wires. We used surgical scissors to cut the bioabsorbable mesh sheet appropriately shape for fixation of the metacarpal fracture and then bent it in hot water bath (68 degrees) to make a one-third or semi-tubular plate. It was placed on the metacarpal bone surface and was fixed with eight to sten bioabsorbable 2.0 mm-diameter cortical screws totally. Clinical endpoints were range of motion for wrist and forearm, grip strength ratio (percentage of the unaffected side), Quick-Disabilities of the Arm, Shoulder, and Hand (Q-DASH) score, bone union on plain X-ray, and resorption status on plain CT.

Results and Conclusions: In all cases, bone unions were achieved without displacement. There were no complications such as infections and aseptic swelling and necrosis in all cases. Q-DASH scores were almost good except for two cases because of the limitation of the range of motion and poor recovery of the grip strength ratio. The plate and screws still remained in 7 years and 2 months after surgery, but, in 8 years and 5 months after surgery, the plate was completely absorbed, and the screws slightly remained in the bone. This study suggests that the process of bioabsorption in metacarpal fractures may take at least about 8 years after surgery, and the absorption rates in the bone may differ from outside the bone.

Keywords:
metacarpal fracture, bioabsorbable plate
Arthroscopic-assisted capsuloplasty in scapholunate tears: The role of the dorsal capsulo-scapholunate septum

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Objectives / Interrogation: Carpal instabilities and in particular the complex consequences of scapholunate (SL-) dissociation are still subject to investigation. Recent biomechanical findings (Elsaidi et al., 2004) suggest that a new found anatomical structure - the Dorsal Capsulo-Scapholunate Septum (DCSS) - stabilizes the scapholunate complex and thus makes an important contribution to this already complex biomechanical system (Overstraeten et al., 2013). In the past, suture of the SL-ligament with an open approach showed mediocre results as well as soft tissue procedures, which were insufficient due to a SL-ligament avulsion. To address the Dorsal Capsulo-Scapholunate Septum and to avoid soft-tissue problems we refined the arthroscopic technique: by using diverging needles instead of converging needles, we attempt to suture the remaining attachments of the Dorsal Capsulo-Scapholunate Septum.

Methods: Our prospective follow-up study was carried out as a bicenter study. Patients were stratified into groups of acute and chronic SL-lesions, dynamic or static SL instabilities and according to Messina-EWAS classification. Between 2009 and 2015 we performed 63 arthroscopically assisted dorsal SL-capsuloplasties. The clinical follow-up included an assessment to pain level, range of motion (ROM) and grip-strength. The radiographic follow-up was performed in terms of SL gap and SL angle.

Results and Conclusions: The radiographic 3.5-year mean follow-up showed a significant decreased SL-gap in the group of dynamic instabilities regardless of whether they were acute or chronic. Even for Messina-EWAS IIIB and IIIC stages we could show a significant decreased SL-gap. We found no significant impairment for range of motion. VAS at rest declined by 90%, under load by 70%. Regarding the Mayo Wrist Score the result were good with an average score of 83 points. Regarding the DASH score we achieved a mean of 12.7 points.

Our modified arthroscopic assisted SL-capsuloplasty is an effective and due to its nature as an minimal invasive approach less traumatic technique to stabilize the scapholunate complex. The results were better in dynamic than in static SL-lesions regardless if they have a acute or chronic entity. The DCSS seems to heal regardless of the lesions age but longer follow-up is necessary.

Keywords:
Arthroscopy, SL, Ligament, Capsulodesis, Capsuloplasty, Scapholunate, Tears, capsulo-scapholunate septum,
Wide-Awake Local Anesthesia No Tourniquet (WALANT) Versus Local or Intravenous Regional Anesthesia with Tourniquet in Elective Hand Surgeries: A Systematic Review And Meta-Analysis

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Objectives / Interrogation: The WALANT technique is gaining popularity over the use of tourniquets in elective orthopaedic hand surgeries as it eliminates the complications associated with general or intravenous regional anaesthesia and the discomfort associated with tourniquets.

The objective of this study is to compare the efficacy, safety and patient satisfaction of the WALANT procedure versus local or intravenous regional anaesthesia with tourniquet in atraumatic hand surgeries.

Methods: We conducted a comprehensive literature search using PubMed, MEDLINE, Embase, and the Cochrane Library from inception to October 2018. All randomized or quasi-randomized trials and cohort studies comparing WALANT procedure versus local anaesthesia or intravenous regional anaesthesia with tourniquet among atraumatic, elective hand surgeries such as carpal tunnel release, tendon sheath incision, and excision of baker’s cyst were included. Methodological quality, risk of bias, and GRADE of the eligible studies were assessed by three independent reviewers. The random effects model was used due to both statistical and clinical heterogeneity of the studies.

Results and Conclusions: The search yielded 70 records, of which 9 studies were included in the systematic review. In our interim analysis, we were able to pool findings for operative time, post-operative pain scores, patient satisfaction, and complication rates. On the average, the WALANT group had longer operative times by 2.06 minutes (pooled mean difference, random effects, 95% CI 0.46 to 3.67 mins, p = 0.01, I² 0%, p = 0.66). The post-operative pain scores were lower in the WALANT group by an average of two VAS points (random effects, pooled mean difference -2.40, 95% CI -3.41 to -1.38, p < 0.00001; I² 0% p = 0.99). We had insufficient evidence to demonstrate a difference in terms of patient satisfaction (random effects, pooled RR 0.98, 95% CI 0.93 to 1.03, p = 0.36, I² 0%, p = 0.64) and complication rates (random effects, pooled RR 0.40, 95% CI 0.07 to 2.18, p = 0.29, I² 60% p = 0.08) between WALANT versus conventional methods.

The WALANT group reported lower post-operative pain scores, but had slightly longer operative times. There are no significant differences between WALANT and conventional methods in terms of patient satisfaction and complication rates.

Keywords:
Wide-awake surgery, Adrenaline, Epinephrine, Local anaesthesia, Carpal tunnel syndrome, Trigger finger, De Quervain’s tenosynovitis, Baker’s cyst
New method for operative treatment of bony mallet fractures without transfixation of the distal interphalangeal joint - a biomechanical study

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Objectives / Interrogation: Several surgical methods are described for the treatment of the mallet fracture. Most closed techniques use a K-wire fixation through the distal interphalangeal (DIP) joint for temporary transfixation. Multiple tries to achieve an acceptable K-wire position may cause cartilage damage and increase the risk of a joint infection. Based on the Ishiguru technique, we describe a new method, using a single K-wire, without transfixation of the DIP joint. The purpose of the study is a biomechanical comparison of the new surgical technique to the proven technique according to Ishiguru.

Methods: 32 fingers (Digit 2-5) from 4 freshly frozen hand pairs were disarticulated at the PIP joint and fixed in PMMA. Exclusion criteria were previous soft tissue injuries, fractures and loose fingernails. The hands were randomized to have a donor’s hand in each group. The fractures were created with a flat chisel under fluoroscopic control. Including criteria were fractures up to 30% of the articular surface and subluxation of the distal phalanx. One group was treated using the Ishiguru method and the other group using the new fixation method. We use single K-wire which enables indirect fracture fragment fixation, as described in the original Ishiguru technique. The same K-wire is bent distally over the fingernail and is fixed with a special device without intra-articular K-wire transfixation of the DIP joint. The fingers underwent a cyclic load test consisting of 2000 cycles with a load between 1N and 7N. After this cyclic test, a load to failure test was performed. The load applicator was applied to the finger nail. X-rays were taken every 500 cycles, and again after the load to check the reduction and the plastic deformation.

Results and Conclusions: So far, 14 fingers have been tested. All fingers in the fixator group were superior in both maximum load and stiffness (max. load mean 29N and 19N, p=0.0014, stiffness mean 4N/mm and 8N/mm, p=0.0086). There was no significant difference in the plastic deformation and loss of reduction after the cyclic load test. The first fingers were tested with a force of 10N. The Ishiguru group failed immediately in the first cycles; therefore the cycling load was reduced to 7N. The remaining test results are pending. The initial biomechanical test results demonstrated superiority to an already established method. We could demonstrate higher biomechanical stiffness without intra-articular K-wire placement avoiding cartilage damage. Further applications are being tested.

Keywords:
Mallet fracture, Extension block, Finger, single K-wire
Myo electricity and 3D printing: a resource for revolutionary hand prosthetics

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Objectives / Interrogation: Upper limb amputations can strongly limit the quality of life of a person. The most advanced dexterous prosthetic hands have remarkable mechanical features. However, in most cases, the costs are often prohibitive for most patients and the control systems are often rudimental. 3D printing and open source software can allow to solve this problem in the future. Publicly available 3D models of hand prostheses are increasingly being released, as well as open source control algorithms, that can strongly improve the state of the art. This paper aims at testing current state of the art in this revolutionary field, by testing in real life settings one of the most advanced 3D printed robotic hand prostheses, which is used in combination with a low cost myoelectric armband.

Methods: Several subjects with transradial amputation wore the Thalmic Labs Myo armband and an adaptive socket that was connected to an HANDi Hand. The control of the hand was multi function and involved four different hand and wrist movements. The subjects tested the system in real time while grasping several objects, performing movements that were selected according the usefulness for activities of daily living. The time required to complete the movement and movement performance were evaluated.

Results and Conclusions: The 3D printed prosthetic hand was successfully controlled by the classifier provided with the low-cost Myo armband and used for daily life activities by 2 subjects with hand amputation. The gesture recognition approach implemented in the control system used in this study allowed the automatic identification of the desired grasp quickly. The system allowing the subjects to control up to 3 hand grasps in addition to the gesture used to open the prosthetic hand. Factors like the level of the amputation, neuromuscular fatigue and mechanical limitations of the 3D printed hand prosthesis can influence the performance of the setup. Furthermore, practical aspects still need to be improved to reach performances that can be applied to real life settings. The results show that multi-function control of dexterous 3D printed hand prostheses can be performed, also using low-cost setups. Future assistive and rehabilitative devices will probably be revolutionized by publicly available software, additive manufacturing and low cost sensors. Scientific research in this innovative field can allow patients to benefit of such change and surgeons to develop surgical procedures that can integrate better with such innovative approaches.

Keywords: transradial amputation, hand prosthetics, Myo electricity, 3D printing
Patient specific surgical implants and prosthesis made of 3D printed PEEK

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Objectives / Interrogation: Additive Manufacturing (AM) is rapidly gaining acceptance in the healthcare sector. Three-dimensional (3D) virtual surgical planning, fabrication of anatomical models and patient specific implants (PSI) are well-established processes in the surgical fields. Poly-ether-ether-ketone (PEEK) has been used, mainly in reconstructive surgeries as a reliable alternative to other alloplastic materials for the fabrication of PSI. Recently, it has become possible to fabricate PEEK PSI with Fused Filament Fabrication (FFF) technology. 3D printing of PEEK using FFF allows construction of almost any complex design geometries in a cost-effective manner, within a short time-frame, even in an in-house 3D printing setup.

Methods: The FFF 3D printer used in our research is a prototype of the Apium P220 (Apium Additive Technologies GmbH, Karlsruhe, Germany). Patient's data in DICOM format is processed in a medical modeling software program and a virtual 3D anatomical model is created. With further processing & designing, the PSI is constructed and exported as an STL file which is sent to the 3D printer for fabrication of PSI.

Results and Conclusions: 3D printed PEEK PSI have a smooth finish and were without any irregularities. No black-specks formation nor discoloration (improper crystallization) were detected in the test parts. All of the 3D printed parts passed a certified sterilization test without any deformation. The preliminary tests confirmed the feasibility of fabricating 3D printed PEEK PSI by FFF.

Keywords:
Patient specific implants, prosthetics, 3D print, PEEK
Long Term Results of First Major Upper Extremity Replantations In Turkey: A Replantation Under Direct Vision of 42 Years versus Another With Microsurgery of 37 Years

List of authors:
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Objectives / Interrogation: The long term results of major upper extremity replantations are evaluated with the functionality of the extremity and the occupational and biopsychosocial status of the patient. In this study, we aimed to compare the long term functionality of a case with replantation under direct vision with another case with replantation by microsurgery.

Methods: Two seventeen year old male patients were referred with above elbow, clean cut amputations at their non-dominant left hands. The pressman (#1) had a guillotine type accident whereas the carpenter (#2) had a saw trauma. The ischemia times were less than 5 hours for both patients. The radial and ulnar arteries of the #1 was operated under direct vision whereas standard microsurgical anastamoses were performed for the #2. The bones were stabilized with intramedullary nailing for both cases. The median and ulnar nerves were coapted in both cases. In the #1, the nerves were repaired with non-absorbable 6/0 sutures epineurally whereas they were repaired with non-absorbable 9/0 sutures epiperineurally in the #2. Both of the patients received standard hand physiotherapy.

The following tests and evaluations were done for 37 and 42 years: Semmes - Weinstein monofilament test, vibration test, 2 point discrimination test, localisation test, grip and pinch strength measurements, motor evaluation, Chen criteria, DASH and ADL.

Results and Conclusions: During the early postoperative period, distal necrosis was seen at the tip of the fourth finger of the #1, requiring a revision amputation. Early complications were not seen in the #2. Total osseous union was achieved in both patients. Both patients returned to their occupations two years after the surgery, and the #2 completed his military service four years after the surgery. The Semmes - Weinstein test was 2.83 for both of the patients and two point discrimination at all the fingers were 4 millimeters for the #1 and 3 millimeters for the #2. In both patients, the grip and pinch strengths were comparable with the unaffected dominant hand. The thenar and intrinsic muscle functions were satisfactory in both cases. The recovery of both patients were found to be Chen Class I. The cases have the longest followup period after major upper extremity replantations with satisfactory function in Turkey.

Keywords:
Basic operative informations in three main aetiological causes which necessitate tendon transfers in upper extremity

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Objectives / Interrogation: Tendon transfers (TTs) are the last treatment options indicated in patients with three main aetiologies. These are peripheral nerve palsies (PNP), local loss of muscle-tendon units without nerve injuries (LLMTU) and muscle imbalances due to central nervous system dysfunctions (MICNSD). In this study we aimed to analyse timing, number of transferred tendons and need of additional surgical procedures (ASPs) in patients who underwent TTs on the base of their aetiologies.

Methods: Digital archive of the university hospital between May 2007 and September 2018 was searched. Informative data required by the aims of the study were compiled.

Results and Conclusions: There were 112, 53 and 24 patients in each group of PNP, LLMTU and MICNSD, respectively. The most frequent diagnosis, transferred tendon and additional procedure in PNP was Brachial plexus palsy(n=39), PL-EPL(n=29) and nerve release(n=12); in LLMTU was Closed EPL rupture(n=19), EIP-EPL(n=19) and Tendon release or plication(n=4); and in MICNSD was Cerebral palsy(n=20), PT rerouting and FCU-EDC(n=6 in each) and Muscle-tendon fractional release(n=16), orderly and respectively. Other findings are given below. Findings in each line are belonging to PNP, LLMTU and MICNSD groups respectively. Time data is given as "mean(min,max)". PNPs include both neonatal and adult type brachial plexus palsies.

Gender(men/Women): 87/25, 37/16, 15/9
Age at 1.surgery(year): 26(3-70), 37(8-74), 19(7-44)
Onset-1.surgery interval(month): 58(1-300), 24(1-228), 202(24-444)
Total n of TTs: 193, 68, 46
n of TTs/patient: (1,7), (1,3), (1,9)
n of operations/patient: (1,1), (1,05), (1,08)
Field of the most frequent ASP and its n:
ASP-Nerve: 32, 0, 0
ASP-Muscle-tendon-pulley: 35, 4, 17
ASP-Bone-joint: 8, 2, 2
ASP-Skin (1.webplasty): 3, 2, 3
Total ASPs & n/patient: 78(0,7), 8(0,15), 22(0,92)

Conclusions: Tendon transfers can be successful when it is well-planned on the base of patient's physical resources, goals, and expectations. For these aims, patients should be adequately informed about the timing, probability of additional procedures, necessity for further operation sessions and possible complications. We think that informations provided by this study can be useful while informing patients on the base of their three main etiological problems.

Keywords:
tendon transfer, aethiology, timing, need of additional procedures
Bilateral idiopathic radioulnar synostosis

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Objectives / Interrogation: We would like to report on a 31-year-old otherwise healthy male with a limitation of rotation to the left forearm. He complained of increasing pain at night and progressively decreasing range of motion for one year. There was no previous trauma to the limb. Radiographs showed bridging bone formation. Contralateral radiographs were obtained and showed a similar process, although less pronounced. A resection of the bony mass without interposition of soft tissues was performed. Histological examination confirmed the resected specimen to be made up of bony tissue without cellular abnormalities.

Methods: A resection of the bony mass without interposition of soft tissues was performed. Histological examination confirmed the resected specimen to be made up of bony tissue without cellular abnormalities. Postoperatively there was a restored range of motion, which remained stable 6 months later. Preoperative pain also disappeared.

Results and Conclusions: Radioulnar synostosis has traditionally been classified into 2 groups: congenital and post-traumatic. The congenital form is thought to be a developmental error occurring in utero, when the proximal ends of the radius and ulna are covered by a common perichondrium. Only proximal congenital fusions have been reported. The diagnosis is usually made between 2.5 and 6 years of age, as patients usually have little complaints. Secondely, posttraumatic radioulnar synostosis is described as a complication occurring following osteosynthesis of fractures of one or both forearm bones. It has also been reported after stab wounds and other soft-tissue injuries. The synostosis may develop anywhere along the intraosseous membrane.

This case does not seem to fit in to either of these categories. The patient presented because of progressively decreasing pro-supination, previously having symmetrical motion. Also, the location of the synostosis was not proximal. Both arguments favour against a congenital synostosis. On the other hand, there is no recollection of any trauma, and the contralateral forearm showed a similar problem, excluding a posttraumatic synostosis.

Review of the literature yielded one case report documenting an 18-year-old man with progressively decreasing motion, without previous trauma. Radiographs showed a distal synostosis, which was resected with good results. The authors termed this condition 'idiopathic radioulnar synostosis'. This is, to the best of our knowledge, the first report of a diaphyseal, bilateral idiopathic radioulnar synostosis.

Keywords: -
Use of giant-sized flow-through venous flap for simultaneous reconstruction of dual or multiple major arteries in salvage therapy for complex upper limb traumatic injury

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Objectives / Interrogation: Salvage repair after complex upper limb traumatic injury is surgically challenging due to underlying major arterial impairment with complicating a large-sized soft tissue defect. The purpose of this study was to evaluate the effectiveness and safety of using a giant-sized (larger than 100 cm²) flow through venous flap for reconstruction of dual or multiple forearm, metacarpal, or digital arteries after complex upper limb traumatic injury.

Methods: Seven patients were consecutively hospitalized for emergency salvage repair after complex upper limb traumatic injury between March 2012 and May 2014. The forearm and palmar artery defects were repaired using the calf great saphenous vein flap and the volar forearm venous flap, respectively.

Results and Conclusions: The flow-through venous flap ranged from 9.5 cm × 12.0 cm to 12.0 cm × 20.0 cm (mean, 158.4 cm²) in size. The flaps and affected limbs survived uneventfully in five patients, with one patient experiencing distal flap marginal necrosis and a second patient requiring amputation of the affected limb. Computed tomography angiography showed patent vessels in all patients. The mean total active motion of the repaired fingers was 199.5° versus 258.8° for the contralateral counterpart (77.1%). The sensory return was determined to be S2 in 2 patients, S3 in 3 patients and S3+ in 1 patient. The disability scores for the arm, shoulder, and hand ranged from 4.6-18.2 (mean, 11.3), and the mean Michigan hand outcomes questionnaire score was 7.8 ± 0.9.

The flow-through venous flap is an effective and safe treatment alternative for salvage therapy of a larger than 100 cm² complex upper limb traumatic injury with dual or multiple major arterial impairment. This technique allows simultaneous reconstruction of dual or multiple artery injuries and an extensive soft tissue defect. Serious surgical site infection remains a major safety concern and necessitates radical debridement in complicating cases.

Keywords:
flow-through venous flap; complex upper limb injury; salvage therapy; psychometric outcome
Trigger finger at the distal A2 pulley with extension locking of proximal interphalangeal joint: category of the idiopathic trigger finger

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Objectives / Interrogation: Trigger fingers are known to be caused by volume mismatching of the A1 pulley and flexor tendon. We experienced a A2 trigger finger with extension locking of the proximal interphalangeal joint.

Methods: A 44 year old man came to our hand clinic because of the triggering of the right ring finger, which began five years ago. Except triggering, the patient could not fully extension of the proximal interphalangeal joint, and flexion contracture of about five degrees was observed. On physical examination, the nodule was not obvious on the A1 pulley, but there was tenderness. We planned A1 pulley release. After axillary brachial plexus block, a tourniquet was applied and a 2 cm longitudinal skin incision was made on the A1 pulley area. Degenerative changes and abnormal findings of the A1 pulley, abnormal findings of the flexor tendon like nodule were not evident. Despite performing A1 pulley release, the flexion contracture was still observed. Full extension was possible only after giving excessive force, and it was kept locked in a state of hyperextension of two to three degrees of the proximal interphalangeal joint. When compressing the musculotendinous junction of the forearm, other fingers were naturally flexed, but the metacarpophalangeal joint of ring finger was flexed with locking on the proximal interphalangeal joint. In the hyperextension state, the proximal interphalangeal joint was manually flexed, and locking was released with snapping at about 90 degrees. Hyperextension locking was reproduced without improvement. In the operating room, we found a nodule like lesion moving along the flexor tendon during flexion-extension on the A2 pulley area. We explained to the patient that there may be a cause other than A1 pulley like A2 pulley or proximal interphalangeal joint problems. Additional incision was performed on the proximal interphalangeal joint area. When passive flexion of hyperextended finger was performed, the flexor digitorum profundus did not glide into the pulley at distal part of the A2 pulley and became bulged. We concluded that the triggering occur between the both slips of flexor digitorum superficialis and the flexor digitorum profundus exiting the Camper's chiasm at the distal part of the A2 pulley.

Results and Conclusions:
The hyperextension locking of proximal interphalangeal joint was disappeared after releasing distal 4mm of A2 pulley. There were no significant enlargement of flexor tendons and inflammatory findings around A2 pulley.

Keywords:
Trigger finger, A2 pulley, extension locking
Use of a Distal Ulnar Artery Perforator-Based Bilobed Free Flap for Repairing Complex Digital Defects

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Objectives / Interrogation: To retrospectively evaluate the effectiveness and safety of using a distal ulnar artery perforator (DUAP)-based bilobed free flap (BFF) for the repair of complex digital defects in the hand.

Methods: We retrospectively studied 15 patients who sustained traumatic digital defects with complicating tendon and phalanx exposure and were hospitalized for repair using a DUAP-based BFF. Main outcome measures included patients’ self-assessed physical appearance, total active motion, and 2-point discrimination.

Results and Conclusions: The flaps survived and the wounds healed with primary intention in all patients except one who experienced partial necrosis of the distal margin and required treatment with a second skin graft. Patients were observed for a mean of 13 months. The physical appearance and texture of the repaired fingers were assessed as good with minimal scarring. Total active motion and 2-point discrimination were 113° to 255° (contralateral, 255° to 275°) and 6 to 11 mm (contralateral, 5 to 8 mm), respectively.

Use of the DUAP-based BFF is a feasible, effective, and safe treatment alternative for repairing complex digital defects with favorable aesthetic and sensorimotor outcomes.

Keywords: Free flap; Ulnar artery; Perforator; Complex digital defect; Repair
Posteromedial dislocation of the elbow with lateral humeral condyle fracture in children; Arthrography is useful for distinguishing between dislocation or epiphyseal separation

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Objectives / Interrogation: Posteromedial dislocation of the elbow with lateral humeral condyle fracture is rare in pediatric elbow injury. It is often difficult to distinguish between elbow dislocation with lateral condyle fracture and epiphyseal separation of the distal humerus, especially in younger infants whose ossification centers are not yet apparent. We report 6 cases of the posteromedial shift of the forearm with the distal humeral fractures and discuss the importance of the diagnosis of the fracture patterns.

Methods: Retrospective data were collected for the cases of distal humeral fractures with posteromedial shift of the forearm treated at our hospital.

Results and Conclusions: There were six cases of these fractures, which five were boys and one was a girl. Mean age at the injury was 7.5 years, ranging from 0 to 12 years. Four cases were elbow dislocation with lateral humeral condyle fracture and two were epiphyseal separation of the distal humerus. All four cases of lateral humeral condyle fractures had an appearance of an ossification center of the lateral condyle, hence were easily diagnosed. However, trochlear of these three cases hadn't been fully ossified and were difficult to categorize according to Milch's classification. Three cases were treated by fixation with tension band wiring (TBW), and one was with TBW and K-wire. Two of the epiphyseal separation of the distal humerus were diagnosed by arthrography because their ossification centers didn't appear. One case underwent surgical treatment by pinning and one was treated by closed reduction and casting. One postoperative patient had painless flexion of elbow motion to 120 degree, but others had no clinical symptom after all.

The epiphyseal separation of the distal humerus is difficult to diagnose when the ossification center is not yet apparent and is radiographically assessed by the alignment of the radial axis and the capitulum of the humerus. The injury is likely to be an elbow dislocation with lateral condyle fracture if the reduction position is kept, but we should confirm the fracture pattern by arthrography before the treatment. The lateral condyle fracture is Salter-Harris type 4 epiphyseal separation and some report shows the importance of the Milch’s classification. One of our cases needed arthrography for the assessment of elbow joint at the removal of wires. We should evaluate the posteromedial shift with the humeral fracture by arthrography at the time of reduction or before the operation.

Keywords:
distal humeral fracture, children, arthrography
Bizarre Parosteal Osteochondromatous Proliferation: a serie of cases.

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Objectives / Interrogation: We report on a serie of cases of Bizarre Parosteal Osteochondromatous Proliferation (BPOP).

Methods: Case 1:
A 63-year-old woman presented with right thumb pain since November 2017. Radiographs and an ultrasound demonstrated findings suggestive of osteomyelitis.
MRI Findings remained suggestive for terminal tuft right thumb osteomyelitis and small palmar phlegmon/collection.
Surgical excision was performed and no evidence of necrotic, inflammatory or infective tissue was found.
BPOP was reported by the pathology department.

Case 2:
A 76-year-old, right-handed man presented with a growing solid lump over the last 8 months on his right ring finger.
MRI scan reported an osteochondroma with features suspicious for sarcomatous degeneration to chondrosarcoma.
CT guided biopsy followed by surgical excision were consistent with BPOP.

Case 3:
55 year-old, female, presented with a reasonably painful lump in her right wrist with constant growth in the last 2 years and ulnar nerve symptoms.
CT scan reported bony exostosis from the volar and radial aspect of the distal ulna (20 x 16 x 15mm).
Surgical excision was performed with ulnar nerve release and the specimen reported as BPOP.

Results and Conclusions: Bizarre parosteal osteochondromatous proliferation was first described by Nora et al. in 1983. It is an extremely rare lesion (less than 200 cases reported in the literature), with reported age onset as being anywhere between 5 months to 74 years old, absolutely benign and without sex predilection.
Clinically, presents as a slowly growing hard protuberance, painless in most cases, unless due to mass effect.
The classical radiographic pattern consisted of a pedunculated or broad-based osseous protuberance along the cortical surface of the bone, mostly seen in tubular small bones metaphysis.
Typical MRI features of BPOP are low signal intensity on T1-weighted sequences, high signal intensity on fast spinecho T2-weighted and short inversion time inversion recovery sequences with a normal cortex, medullary cavity, and adjacent soft tissues.
Histologically, BPOP presents as a cartilage-capped exostosis. The cap is cellular with focal atypia. The subchondral area is composed of fibrovascular tissue. The presence of calcified cartilage that stains blue on hematoxylin and eosin (H & E) stain is characteristic.
Generally, BPOP does not induce metastatic lesions and the most effective and safe treatment is radical excision surgery, including the fibrous pseudo-capsule and part of the compromised cortical bone.

Keywords:
bizarre parosteal osteochondromatous proliferation, bone tumor
Effects of hand amputation surgery procedures on phantom limb sensation

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Objectives / Interrogation: Phantom limb syndrome refers to afferent and efferent sensations and perceptions of a missing limb following its amputation. Non-painful phantom limb sensations (nPPLS) and phantom limb pain (PLP) are distinguished in literature. The theories proposed to explain the etiopathogenetic mechanisms show the importance of both peripheral and central phenomena. The presence of neuromas, high levels of amputation and psychological factors contribute to the onset of the syndrome. The objective of this study is to search for relationships between different surgical techniques used in the amputation surgery and phantom limb sensation phenomena.

Methods: 11 patients who had undergone a transradial amputation of the hand between 1999 and 2017 were included in the study. Phenomenal characteristics of individual phantom limb sensations are quantitatively assessed by structured interviews such as the interview on phantom sensations (RAM SIPS) and the phantom and stump phenomena interview. The surgical procedures performed on the patients (such as cutaneous flaps, nerve treatment and amputation packing techniques) are assessed from the surgical reports. The statistical techniques used for data analysis are the Mann-Whitney test for the comparison between two groups of independent samples and the descriptive analysis of the graphs (box plots).

Results and Conclusions: Mean values for nPPLS are lower in patients in whom cutaneous flaps have been used. The stratification of patients according to demographic, clinical and biometric criteria seems to show how the techniques applied on the severed nerve ends have a greater weight in determining the sensations of phantom limb. The techniques for packing the amputation abutment appear to be also important for phantom limb sensations. The study allows to infer how the transradial amputation intervention must be performed: from the correct approach to nerve injury to the appropriate choice and realization of soft tissue covering techniques and remodeling of the extremity. The different surgical procedures considered in this study can be important for the characteristics of the phantom limb syndrome. Despite the limits of the retrospective study and the low number of population, the study is innovative and useful to prevent the development of PLP. The study is currently being improved by taking into consideration the most innovative and recent surgical techniques, increasing the number of subjects and reducing confounding factors.

Keywords:
transradial amputation, surgery procedures, phantom limb sensation
Effects of hand amputation surgery procedures on sEMG activity to control robotic hand prostheses

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Objectives / Interrogation: Amputation is both an ablative and reconstructive surgical procedure. It consists in the partial or complete removal of the limb. Currently amputations are aimed at creating stable stumps for prosthetic sockets, but they are quickly evolving to functional procedures that can allow amputees to better control robotic dexterous prosthetic hands with electromyography. This technique promises a high capacity for movement but require high patient compliance. At the moment there are no appropriate studies that have tried to identify the relationship between surgical techniques used in the amputation surgery, control of prosthetic movements and phantom phenomena. The purpose of the study is thus to analyze the effects that different surgical procedures have on the control of myoelectric prostheses.

Methods: 11 patients who had undergone a transradial amputation of the hand between 1999 and 2017 were included in the study. Muscular activity is measured using 12 double differential sEMG electrodes (Delsys Trigno Wireless System). The subjects were asked to imitate hand movement movies with the missing limb as naturally as possible. Machine Learning and Artificial Intelligence techniques were used to understand the muscular movements performed by patients through recorded data. The surgical procedures performed on the patients (such as cutaneous flaps, nerve treatment and amputation packing techniques) were assessed from the surgical reports. The statistical techniques used for data analysis are the Mann-Whitney test for the comparison between two groups of independent samples and the descriptive analysis of the graphs.

Results and Conclusions: The techniques for packing the amputation abutment appear to have a similar weight on prosthetic control and phantom limb sensations. Among patients less than 40 years old, it appears that the use of the fasciocutaneous flap is better compared to skin grafts. The use of myocutaneous flap and lipofilling shows lower values of classification accuracy of the movements. Despite the limits of the retrospective study and the low number of population, the study is certainly innovative and useful to define optimal amputation strategies. All the different surgical procedures taken into consideration can have a determining role for the control of myoelectric prosthesis. Currently, the surgeon goal should include patient's future need to use functional prostheses. This must be done taking into consideration even the most innovative and recent surgical techniques.

Keywords:
transradial amputation, surgery procedures, sEMG activity, robotic hand prostheses
Surgical technique to improve the reduction of fractures of distal radius by "Screw Post". Technique and patient follow-up

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Objectives / Interrogation: The reduction of the fractures of the distal radius are of great importance to the evolution of this type of fracture, once the decision to make a surgical management is made, our goal is to achieve a reduction as anatomical as possible. In some cases, this reduction is not achieved in an appropriate form and that is when the surgical technique of the post screw is applied.

Methods: Through a geometric quantification the reduction of the fracture can be improved by using a screw locked in the same plate. The screw is placed and its length is decided according to the pre-established table and depending on the reduction deficit. The corresponding hole is also made according to the table. The screws of the distal branch are fixed first to the epiphysis then the post screw is removed. The correction of the missing angle on the radio's face is made by bringing the proximal branch of the plate to the surface of the radio.

The formula - Ang Tang (a / b) = Alpha
Where it is known, a = known leg (length of the screw), b = known leg (length on plate) and angle a / b known = 90 °
A calculation can be made and recorded in an Excel table to make the correction of the missing angle in each case according to the intra-operative and / or pre-operative images. Through a follow-up of 31 patients with the post screw technique their radiological and clinical studies are monitored, obtaining very good results.

Results and Conclusions: Discussion: we recommend the application of the post screw technique. The safety of the procedure, the correction achieved by this technique, and the advantage of not needing another device other than the same plate and its screw system, gives a good result and does not increase the costs.

Keywords:
Cosmetic appearance of congenital upper extremity anomalies

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Objectives / Interrogation: Cosmetic disability of congenital hand anomalies is unknown. The purpose of this study was to determine the general opinion about how different congenitally malformed hands look.

Methods: We developed a questionnaire in a game format to evaluate the appearance of different hands. Altogether 1450 (954 females) 4-84-year-old residents (296 children) of two European and one Asian (n=102) country were asked to rate the appearance of hands on a 1-5 scale using emoticons. Standardized photographs of the dorsal aspect of 17 different congenitally malformed hands and a normal hand were presented to respondents. All 18 photographs were shown twice in a random order. For intrarater reliability ICC (A,1) and for interrater reliability ICC (C,1) estimates and their 95% CI were calculated. Significance of age, gender and nationality of the respondents was assessed using Mann-Whitney U test. Hands were divided into three subgroups according to the respondent's evaluations using Latent profile analysis.

Results and Conclusions: The normal hand and clinodactyly were perceived to have the best appearance. Symbrachydactyly and radial club hand received the lowest scores. Intrarater reliability was good (ICC=0.862, 95% CI 0.859-0.865, p<0.001) and interrater was moderate (ICC=0.621, 95% CI 0.479-0.786, p<0.001). Adults rated the appearance of all hands higher than children (p<0.05 in 14/18 hands), females regarded all hands better looking than men (p<0.05 in 15/18 hands) and Europeans gave higher scores (p<0.05 in 4/18) to all hands compared to Asians, with one exception. Europeans rated four-finger hand (mean=3.21, SD=1.18) better looking than six-finger hand (mean=2.92, SD=1.18), p<0.005), whereas Asians scored six-finger hand (mean=2.66, SD=1.26) higher than four-finger hand (mean=2.51, SD=1.14). The respondents' ranking order of the hands was consistent, except in the intermediate group (Table 1).

Despite age, gender and nationality the appearance of different congenital upper limb anomalies is rated very similarly. Asians prefer an additional digit to a four-finger hand.

Keywords:
congenital hand malformation esthetics
The Cone Beam Computed Tomography: An alternative imaging modality for the hand surgery

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Objectives / Interrogation: Objectives/Interrogation
The Cone Beam Computed Tomography (CBCT) is already an established standard procedure in imaging of head and neck. In comparison with Multidetector Computed Tomography (MDCT), the CBCT seems to have a lower radiation dose. Since 5 years we use the CBCT routinely for handsurgical questions in our clinic.

We compared the diagnostic accuracy of CBCT with MDCT pictures in protocols and radiation dose, which are equivalent to the projection radiography in two layers. In addition we compared in a phantom study the diagnostic accuracy of both section diagram methods (CBCT and MDCT) at the identification of fractures, cortical defects and material of osteosynthesis.

Methods: Methods
As study subjects we obtained 10 cadaveric human hands from body donors. Distal radius, distal ulna and carpal bones (n = 100) were artificially fractured in random order in a controlled experimental setting.

We performed radiation dose equivalent radiography (settings as in standard clinical care), MDCT in a 320 row with single shot mode and CBCT in a device dedicated to musculoskeletal imaging.

The results of fractures and the level of confidence for each finding were evaluated by three raters independendly. Gold standard was evaluated by consensus reading of a high-dose MDCT.

In addition 18 feet of European roe deer were fractured in a universal testing machine. Another 3 feet were prepared with cortical defects and screws, or both combined.

Six observers rated the scans according to number of fragments, size of defects, size of defects opposite orthopedic screws, and the length of different screws. The image quality regarding depiction of the cortical bone was assessed. The gold standard (real number of fragments) was evaluated by autopsy.

Results and Conclusions: Results
On the cadaveric human hands, the section diagram methods showed at same radiation dose better sensitivity in fracture detectionning compared to radiography.
(MDCT: 0.89; CBCT: 0.81; projection radiography: 0.54 [P = < ,004])

Between both section diagram methods there was no significant difference.

In the phantom study of European deer feet both modalities proved to be comparable regarding the visualisation.

Conclusions
Clinical and experimental experience showed that CBCT has he potential to replace the convential radiography in different areas. Most beneficial is the high quality of imaging with excellent spatial resolution and the minor radiation dose.

Keywords:
Fractures, CT Scan, Bone/diagnostic imaging, X-ray diagnostic
Volar Locking Plate for AO Classification Type C Distal radius Fracture in the Elderly

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Objectives / Interrogation: Even though the conservative treatment for distal radius fracture in the elderly is relatively common, but which is hardly accepted in AO Type C. We treated AO type C distal radius fractures with volar locking plate and checked up clinical outcomes with considering patients daily motion returning time.

Methods: We treated total 118 cases of AO type C distal radius fractures with distal radius locking plates from 2011 to 2017. Among those patients, 73 cases could be followed up more than 4 months; 12 cases of C1, 32 cases of C2, 29 case of C3. All patients treated with volar locking plate, and ulnar side fractures treated with fixation for only ulnar head and neck fracture, and ulnar distal shaft fracture. After surgical treatment, short arm splint period didn't exceed more than 3 weeks. The clinical results evaluated by radiologic profiles, VAS, and functional evaluation criteria.

Results and Conclusions: Ulnar side involvement rate, including styloid process fracture, head and neck fracture, and distal shaft fracture is 33.3% in C1, 72.3% in C2, 75% in C3. The functionally excellent results are 91.6% in C1, 96.8% in C2, 68.9% in C3. The radiologic profile changes rate is 41.6% in C1, 28.1% in C2, 58.6% in C3, but the radiologic change rate reaching to malunion criteria is 0% in C1, 3.1% in C2, 13.8% in C3. The rate of daily motion returning within 6 weeks is 100% C1, 100% C2, and 86.2% in C3. The early firm fixation method is beneficial for AO type C distal radius fractures in Elderly in viewpoints of early returning daily motion.

Keywords:
Distal radius fracture, elderly patient, volar plate fixation
Technique for Intramedullary Stabilization of Ulnar Neck Fractures with Headless Compression Screw

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Objectives / Interrogation: Distal ulnar neck fracture is commonly accompanied with distal radius fractures, and there are multiple treatment options like splinting, percutaneous pinning, intramedullary pinning, and plating. Each method of above mentioned treatment options is useful according to the fracture condition of ulnar neck and patients. We present a new percutaneous intramedullary fixation method for the ulnar neck fracture in concomitant with distal radius fracture.

Methods: We underwent percutaneous intramedullary fixation with Depuy-Synthes 4.5mm headless compression screw for distal ulnar neck fractures of ten cases. A focal stab skin incision is made on dorsal side near ulnar head with wrist flexion. A guide pin is inserted from ulnar head crossing ulnar neck fracture to distal ulnar shaft. And the intramedullary canal is drilled with 4.0 mm cannulated drill bit. Then we decide optimal 4.5 mm headless screw. The selected headless screw is inserted to ulnar intramedullary space following guide pin. We maintained splint short arm splint 2 weeks and then permitted active wrist motion with discarding the splint.

Results and Conclusions: We followed the 10 cases patients after fixation with above mentioned method for more than 4 months. All ten cases showed more than good results in radiologic and functional evaluation without special ulnar side problems. This technique uses minimal invasive approach, it is very simple and reliable to produce constant results for ulnar neck fracture in concomitant with distal radius fracture.

Keywords:
Ulnar neck fracture, intramedullary fixation, Headless screw
A new type of silicone implant for the thumb CMC joint osteoarthritis in grade III and IV. Four years follow-up.

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Objectives / Interrogation: PURPOSE:
To investigate the short-term functional outcomes of arthroplasty for osteoarthritis of the basal joint of the thumb using our new type of silicone prosthesis. The indications were osteoarthritis in grade III and IV, unsuccessful conservative treatment, elderly patient, and no requirements for manual work.

Methods: METHODS:
We observed 82 patients, operated in the years 2014-2016 who received basal joint resection arthroplasty with our new type of silicone replacement. Subjective outcome measures included patient satisfaction scores, and Disabilities of the Arm, Shoulder and Hand (DASH) scores.

Results and Conclusions: RESULTS:
At an average follow-up of 4 years, majority of the patients subjectively scored the procedure as good or excellent and reported improvement in activities of daily living. No intraoperative complications were reported. Only 7 early postoperative complications were reported for incorrect indication.
CONCLUSIONS:
Basal joint arthroplasty using our new type of silicon implant provides very good short-term results for carpometacarpal thumb osteoarthritis. The procedure is safe, with a low complication rate. Evaluation of the results after four years with measured by patient satisfaction and functional outcome is encouraging.

Keywords:
silicone implant, osteoarthritis, CMC joint
Satisfaction with collagenase for Dupuytren contracture disease: A patient related outcome analysis

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Objectives / Interrogation: Collagenase of clostridium histolyticum (CCH) is a therapeutic alternative for Dupuytren disease. Although his efficacy and safety are well established, few data exist about patient satisfaction.

Objectives
Stabilize patient satisfaction with CCH treatment.
Compare patient satisfaction with efficacy and complications appeared.

Methods: Prospective nonrandomized single center cohort study.
Inclusion criteria: passive extension deficit at metacarpophalangeal (MCP) joint > 20º or proximal interphalangeal (PIP) joint > 15º treated with CCH between 2012 and 2017.
Extension deficit and complications were registered at manipulation day, 1st month, 3-6 months, 12 months and discharge. Satisfaction was evaluated using the Southampton Dupuytren scoring scheme at the end of follow up.
Clinical success when flexion contracture was < 5º in day 30 post injection.
Clinically acceptable when passive extension was less than 20º in MCP joint or 10º of the PIP joint in day 30 post injection.
Recurrence when global contracture was > 20º after clinical success.
P values below 0.05 were considered significant.

Results and Conclusions: 159 collagenase injections performed in 137 patients.
For joints, baseline extension deficit at MCP affected joints (40,9%) was 37,6º(SD±17,7), at PIP joints (17%) was 56,9º(SD±25,5) and at MCP+PIP joints (42.1%) was 75,3º(DS±36,1).
5th finger was the most common affected in 48,4% cases.
Globally mean total extension deficit decreased 90% after manipulation.
Global Clinical success was achieved at 68.02 % of cases.
Global Clinically acceptable results were achieved at 7.54 % of cases.
Global Recurrence at 12 months appeared in 9.4% of cases.
After asking the patients about CCH treatment, 69.6% declared to be satisfied.
76.1% of patients reported to have had problems with the treatment, but 72.4% of them, referred none or minor concerns when complications appeared.
The satisfaction analysis revealed that when success was achieved, satisfaction was higher (74% vs 40% satisfied) p=0.02 and patients would repeat treatment (70.7% vs 16.2%) p=0.04.
There were no significant differences in global satisfaction related to occurrence of complications (73.9% vs 68.5% satisfied) p=0.695.
When recurrence appeared 57.1% vs 78.5% of patients declared to be satisfied/very satisfied. P=0.1 but only 52.4 vs 75.6 % would repeat treatment with CCH. p= 0.007

Conclusion
Patient satisfaction with Collagenase injection procedure is high.
Complications appeared with the treatment does not change patient satisfaction.

Keywords:
Dupuytren, Collagenase, Complications, Satisfaction, Southampton
Comfortable Cast to restrict pronation and supination. Is it possible?

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Objectives / Interrogation: After TFCC Refixation limitation of pronation and supination (P/S) is necessary. About 7 years ago we switched from the upper arm splint or cast to the muenster cast. In this time we did 207 TFCC refixations, afterwards a muenster cast was applied. The exact application of this cast is not clearly described or varies in the literature. We optimized this cast concerning stability and comfort over the years. The aim of this study was to compare "our" muenster cast (MUC) with the upper arm cast (UAC) and upper arm splint (UAS).

Methods: 12 healthy volunteers were enrolled in the study. Each person obtained an upper arm cast, upper arm splint and a muenster cast. They had to wear the cast for one hour, doing activities of daily life and afterwards evaluate the cast with a questionnaire, which included: cast comfort, adaption to the cast, weight, keyboard use, drinking/eating, personal hygiene, overall satisfaction. Range of motion of elbow, wrist and forarm was measured before and with all of the three casts.

Results and Conclusions: On average test persons ranked the muenster cast first (23,8 points out of 35), the upper arm brace second (23,3 points) and the upper arm cast third (20,1 points). Advantage of the upper arm cast was adaption to the cast, the upper arm splint was best rated in weight, keyboard use, the muenster cast in drinking/eating, overall satisfaction. Measurement of range of motion showed, that the upper arm cast limits P/S slightly better than the muenster cast (27,78° SD 6,71 versus 36,11° SD 6,57). The upper arm splint does not limit P/S sufficient (98,89° SD 14,49). Elbow flexion is limited in the UAC to 17,78° (SD 6,28), in the UAS to 40,00° (SD 15,09) and in the MUC it is little limited, range of motion was measured with 99,44° (SD 11,65). Wrist extension and flexion results were: UAC 5,56° (SD 6,85), UAS 41,67° (SD 10,8), MUC 12,78° (SD 6,29). The main technique of our muenster cast is to reinforce the cast at some important spots, this can be explained in demonstrating a video. If the cast has to be split, the split has to be stabilized with a special plaster technique. Overall "our" muenster cast offers a very good patient comfort an satisfaction and limits P/S to a satisfying amount compared to the other cast or splints. The main advantage is the elbow extension and flexion which is nearly not compromised by this cast.

Keywords:
munster cast tfcc refixation pronation supination
Medial femoral condyle to reconstruct the scaphoid: Did we improve in 8 years of experience? Comparison of our first and last 20 cases

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Objectives / Interrogation: Since 2009 we are using the technique of reconstruction of the scaphoid bone with a vascularized bone graft of the medial femoral condyle. The aim of this study was to compare the results of the first 20 (n1) and the last 20 (n2) cases. We wanted to figure out, if results of the last ones are better than the first ones, in detail if we improved over the years.

Methods: In our prospective study of scaphoid non-union the patients numbers 1-20 and 94-113 were selected. We compared the results concerning healing rate, complication rate, revision surgeries, donor side morbidity, pain, range of motion, grip strength, krimmer score and surgery time. All surgeons (3) were interviewed to emphasize their tips and tricks and experience.

Results and Conclusions: We could not find any statistic differences in healing rate, range of motion, grip strength, pain reduction and krimmer score. Complication rate was significant lower in the second group (n1=5 versus n2=0), also number of unplanned revision surgery (n1=8 versus n2=1). Donor site morbidity is equal in both groups, only the amount of sensibility disorder was reduced in the second group (n1=13, n2=8). Mean surgery time was 3:22 hours in the first group and 2:44 hours in the second group.

As tips and tricks we revealed:
- take the most possible distal donor site at the femur,
- reduce the transplant size by maintaining the periosteum,
- more resection of scaphoid and a bigger transplant makes surgery easier,
- dorsal and volar approach for osteochondral transplants ist the securest option to receive an accurate proximal pol reconstruction,
- use of linscheid wire/maneuer,
- use two different incisions (one for scaphoid, one for the anastomosis).

In our institution we invented this procedure about 8 years ago and we could optimize the surgery technique, to minimize surgery time, complication rate and rate of revision surgery. One must take care of the infrapatellar nerve, but still nerve disorders are common. Data of patient's outcome did not significantly improve over the years, but this also relies to the small number of patients and divergent data. Healing rate stays at a high level of more than 85% in both groups.

Keywords:
medial femoral condyle scaphoid non union
Painful end-neuromas of the upper limb treatment with fat graft. Evidences from an Italian multicentric study

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Objectives / Interrogation: A number of techniques have been proposed for treatment of painful neuromas, but the results still remain poor in up to 67-75 percent of cases. Fat grafting has proven to effectively contrast post-traumatic adherences and painful scars. In this multicentric Italian study, the efficacy of fat grafting in treatment of painful upper limb neuromas is presented.

Methods: Since 2012 to 2018, 37 (20 female and 17 male, mean age 49 y) patients were treated in Messina, Milan, Ancona, Turin, Modena, Padua, Palermo and Catania. The affected nerves were 6 sensate radial, 1 medial antebrachial cutaneous, 6 median, 5 ulnar, 2 digital common trunks, 18 digital collateral nerves. Terminal neuromas or neuromas in continuity causing persistent pain, unresponsive to conservative and surgical treatments, were ruled in. Before surgery, the nerve was assessed by clinical examination. Preoperatively, the patient gave an evaluation of pain at rest about the neuroma with a visual acuity scale. Limb functionality was evaluated with the "Disabilities of the Arm, Shoulder, and Hand" score. The same variables were collected at day 30, 60, 90; 1, 2 and 6 years after surgery. At surgery, proper skin incisions were placed to minimize adherences and scar tissue near the nerve. Both neuroma and nerve trunk were exposed, with a complete visualization of neuroma and an accurate proximal dissection, to find healthy proximal nerve. The neuroma was resected and the adipose tissue harvested from the abdominal region with tumescent technique. The adipose tissue was injected with fine-gauge cannulas around the proximal nerve stump. Depending on the involved segment, an early gentle range of motion was allowed.

Results and Conclusions: DASH score recorded a mean decrease of 10.7 points, from 48.3 to 37.6 (22.2% of the initial value), whereas VAS decreased from 7.6 to 5.2 (31.5%). Analgesic medications were stopped.

The positive effect of fat on painful neuromas can be explained as a gliding soft fat envelope isolating the stump, allowing a normal excursion and modulating inflammatory response, creating neoangiogenesis and paracrine production of signals, interrupting local triggering for pain (1). Fat grafting is easy to perform, does not require infusion of local anesthetic nor immobilization, is repeatable without reduction of effectiveness, and can be applied virtually for every nerve. The Authors recommend its use to treat painful neuromas of the upper limb, even if further biological and instrumental/functional studies are needed.

Keywords: fat grafting; regenerative surgery; pain; peripheral nerve repair, neuroma; upper limb

References:
Volar fracture subluxation of PIP joint: A rare injury with a novel technique for treatment

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Objectives / Interrogation: The volar fracture-dislocations of the proximal phalangeal joint (PIP) of the fingers, the so-called "central slip fractures", are both rare and challenging. They are treated operatively by using either k wires, mini - screws, miniplates, external fixators or anchors. Sometimes open reduction and fixation is technically demanding because of the small size of the fragment or due to its comminuted nature. We introduce a novel technique in treating volar fracture subluxation/dislocation of the PIP joints. We used a 2mm mini-plate as a blocking plate to wedge the central avulsion fragment back to its position till union. We hypothesized that this technique would simplify the surgery and yield favorable functional and radiographic results.

Methods: We present a prospective case series comprised of 8 patients (5 females and 3 males) with volar fracture dislocation/subluxation of the PIP joint. The patients were managed by the index technique within an average of 15.4 days following the injury (range, 1-27 days). Clinical outcome measurements included assessment of pain (visual analog score) and range of motion. Radiographic outcome measurements included reduction of subluxation/dislocation, articular congruity, and occurrence of arthritic changes.

Results and Conclusions: Results:

The length of the follow up averaged 15 months (range, 8-24 months). Union was obtained in all cases in an average of 4.2 weeks (range, 3-5 weeks). The visual analog score was 1.6 (range, 0-3). Postoperative proximal interphalangeal motion averaged 74 degrees (range, 55-90 degrees). Reduction of the subluxation/dislocation was obtained in all cases. There was articular incongruity in one patient. No arthritic changes were noticed during the whole follow up period. Complications included superficial infection of the wound (one case), limited flexion of distal interphalangeal joint (DIP) (3 cases), and mild extension lag of DIP (10-20 degrees) was noticed in 6 patients.

Conclusion:
The index technique yields satisfactory outcome at the short term. The technique is simple and straightforward. It can be an addition in treating these challenging cases.

Keywords:
central slip fracture; volar PIP fracture dislocation, blocking plate
Delayed nerve repair: experimental treatment with chitosan tubes enriched by fresh skeletal muscle fibers

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Objectives / Interrogation: Nerve regeneration after delayed nerve repair is often unsuccessful. Indeed, the expression of genes associated with regeneration, including neurotrophic and gliotrophic factors, is drastically reduced in the distal stump of chronically transected nerves; moreover, Schwann cells undergo atrophy, losing their ability to sustain regeneration. In the present study, to provide a three-dimensional environment and trophic factors supporting Schwann cell activity and axon re-growth, we combined the use of an effective conduit (a chitosan made tube) with a promising intraluminal structure (fresh longitudinal skeletal muscle fibers). In particular in this study was evaluated the efficacy of muscle in tube as a support of nerve regeneration after a delayed surgical nerve reconstruction (secondary repair).

Methods: 15 female adult Wistar rats were used. The first surgical procedure consisted in denervation of median nerve (10mm) for 3 months. Afterwards the nerve was reconstructed with a) empty chitosan tube b) enriched conduit c) autograft. The nerve gap was of 10mm. Functional and morphometrical analyses were performed 4 months after nerve repair.

Results and Conclusions: Our data show that the enriched chitosan conduit is as effective as the hollow chitosan conduit in promoting nerve regeneration, and its efficacy is not statistically different from the autograft, that is the "gold standard" technique for nerve reconstruction. We hypothesize that the use of fresh muscle fibers to fill the chitosan conduits could be a promising strategy to repair longer gaps because fresh muscle fibers release factors inducing nerve regeneration especially within the first few days. Moreover muscle fibers create a favorable three-dimensional environment provided by their basal lamina useful for Schwann cell migration and axonal regrowth.

Keywords:
Knife Crime-related Injuries: Clinical, Operational and Financial Impact

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Objectives / Interrogation:
Knife assaults in England and Wales have risen by 16% according to latest figures this year. This study aims to evaluate the incidence of knife-related assault injuries, their clinical outcomes and operational and financial impact.

Methods:
A retrospective analysis of knife assault injuries admitted with subsequent surgical episode in a single major trauma center between May 2015 and April 2018 was performed. Data was collected on demographics, injury patterns, treatment, complications, as well as operational and financial outcomes.

Results and Conclusions:
Results:
A total of 228 patients were identified in the study period. Of these, 140 (60%) required plastic surgery input. The majority of patients were young (mean age 27.7 years; 71% of patients aged <30 years) and male (Male to female ratio 12:1). 42% of these patients sustained injuries in multiple anatomical regions, the upper limb being the most commonly injured site (72%). 30% (n=42) of patients required input from other specialties, especially Orthopedics (10%). Structures most commonly requiring repair were tendons (178 repairs in 52 cases), followed by muscle (73 repairs/51 cases) and nerves (70 repairs in 55 cases). 21 patients required vessel repairs with 4 requiring vein grafts. Mean operating time was 192 minutes and mean hospital stay was 3.5 days. The most common complications were neurological: 21% sensation deficit, 9% nerve palsy with an infection rate of 2%. Tariffs for the 140 cases totaled £732,136.

Conclusion:
This study represents the first series from a major trauma center in West Midlands, United Kingdom. Knife-related violence and the resulted injury is not only a significant operational and financial burden to the NHS but can also have long-term functional consequences for patients.

Keywords:
Knife assaults, penetrating injuries, Stab injuries, Knife crimes.
MANAGEMENT OF ANTERIOR CONMINUTION OF A DISTAL RADIO FRACTURE WITH A SCREW BAR FOR PALMAR FIXING: A CASE REPORT

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Objectives / Interrogation: INTRODUCTION: Distal radius fractures, occasionally present with comminution in the palmar side and are a challenge for the hand surgeon. Some fractures have an important anterior comminution that makes it difficult to have sufficient bone contact with the plate. Fixation can be made with a "bar" support screw. It is a screw placed from radial to ulnar in a transversal way and over the metaphysis of the distal radius. This will generate a support to the entire distal row of the plate, functioning as a transverse bar and the palmar plate have anti-shear support and not only depend on the locked screws. In addition, it will also close the joint gap by making compression.

Methods: OBJECTIVE: technique of osteosynthesis the application of a screw as a substitute anterior cortical metaphyseal anti-shear, when it is not possible to perform a fixation with the palmar plate of the radius given the comminution of the fracture.

METHODOLOGY: clinical case of a male patient, a 50 years old, with a Fernández V ,type fracture with anterior comminution, an intraarticular involvement in two planes and a metaphyseal fracture line with impaction and loss of radial height and carpal subluxation. The "bar" screw technique was used to control shear and achieve anterior cortical augmentation of the fixation to decrease the risk of failure.

Results and Conclusions: RESULTS: Patient with follow-up at 6 months with complete mobility arches, with restitution of the articular surface, with QuickDASH of 6.81%, analogous visual scale of pain of 1. Postoperative radiographs with consolidation without failure of osteosynthesis material. With return to work activity within the month of the procedure.

CONCLUSION: When the traces of comminution are multiple and small, and there is no space to place the fixation screws through the holes in the plate because the screws have an insufficient bone segment for their fixation or because the screw is directed through the vertical line of the fracture, the “bar screw” gives the transverse support so that, with the plate support effect, it is possible to contain in its place the palmar edge distal of the fracture of the radius. In clinical cases where palmar comminution is severe and does not allow an adequate fixation of the plate, a screw can be used as a “bar” or support in the distal metaphyseal part so that it allows to control the shearing forces.

Keywords:
radial fracture, screw bar, shearing, conminutions
TENSIL RESISTANCE IN A TENORRHAPHY OF FLEXORS OF THE HAND ACCORDING TO THE DISTANCE OF THE GRIP: Pilot study in pigs

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Objectives / Interrogation: When reviewing the literature on the flexor tenorrhaphy techniques, it is not easy to determine in the study the distance of the fixation strand from the central point of each suture. We considered that this distance can be determined by the diameter of the tendon

The purpose of this study is to make a quantification based on the diameter of each tendon
Experimental question: What is the ideal length of the core suture purchase in the surgical repair of flexor tendon, in an experimental test carried out on the tendons of pigs?

Methods: 40 tendons of the front limb of adult pigs (Yorshire) were taken. Four groups were taken to perform in a controlled manner. The cuts, measurement and sutures were made by the researchers.
The variable in distance of the locking loop depending on the diameter of each tendon of the study was determined as follows:

I-Fixation of the point at ¼ of the diameter
II-Fixation of the point a ½ of the diameter
III-Fixation of the point to a 1 diameter
IV-Fixation of the point at 1 1/2 of the diameter

The tenorrhaphy was done with a Prolene 4-0 AT 957 suture, and the distance was quantified with a gauge. Then, the resistance was measured until failure in an Instrom 3367 machine and associated software from CITEC (Technological Research Center from the University of the Andes)

Results and Conclusions: In group I, the load at the moment of failure is at a maximum of 25,419N, with a standard deviation of 7,151N; in group II, the load at the time of failure is a maximum of 41.762 N, with a standard deviation of 8.525N; in group III, the load at the time of failure is a maximum of 43,699N, with a standard deviation of 7,835N; in group IV the load at the maximum moment of failure is 46,497N, with a standard deviation of 4,943N.

Discussion: With this experimental study, it can be determined that the longer the length of the core suture purchase (distance between locking loop and lesion), the greater the resistance to the suture tension. However, in the experiment it was observed that when it is done at a distance of 1 ½ of the diameter when making the adjustment of the knot, the tendon widens by the traction of the fixed segment and this considerably increases the diameter of the repaired area, which would be an inconvenience for the good sliding of the tendon in its flexor sheath. For this reason we can recommend that the site of better resistance behavior and conservation of the anatomical feature be a diameter from the tendon.

Keywords:
tendon, core suture, diameter, tenorrhaphy
Comparing Functional Outcomes of Endoscopic and Open Carpal Tunnel Release from the Patient's Perspective

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Objectives / Interrogation: Endoscopic carpal tunnel release (CTR) is an established and popular treatment for carpal tunnel syndrome (CTS), however there remains little patient reported experience comparing the post-operative outcome of the endoscopic approach with that of the open approach. Based on patient-reported data within 2 to 4 years post-CTR, this study investigated the hypothesis that endoscopic CTR would result in better functional outcome and patient-reported experience as compared to open CTR.

Methods: All patients fulfilling the following criteria at one urban hospital were included in the study: i) documented physician's diagnosis of CTS with NCS validation; ii) underwent unilateral CTR from the period of 2014 to 2016 with at least 2 years of post surgery review. Data collection was through review of medical records and telephone interview of patients: the patients' post-operative function was assessed using a validated questionnaire, which consisted of 28 questions pertaining to the following categories - demography, occupational history, subjective symptoms and patient satisfaction.[01] The QuickDASH tool was also used to evaluate the patient's physical function and symptoms of musculoskeletal disorders of the upper limb. Comparisons made between patients who underwent endoscopic and open surgery within the same year were analysed with chi square calculations to determine statistical significance.

Results and Conclusions: Two hundred and thirty-two patients were identified for data collection (79 males, 153 females), of which 51 (22.0%) underwent endoscopic CTR and 181 (78.0%) underwent open CTR. The proportion of patients opting for endoscopic CTR increased from 17.1% (2014) to 26.4% (2016), indicating an increasing preference for endoscopic CTR over open CTR. Right hand CTR was slightly more common than the left (92 versus 89 open cases and 43 versus 27 endoscopic cases respectively), and the average age of the patients was 57.8 (SD = 10.8). Details of the results and multi-variate analysis will be presented.

Conclusion: Endoscopic CTR has superior functional outcome from the patient's perspective as compared to open carpal tunnel release, using post-operative pain and rate of return to pre-morbid function as key indicators of recovery. Overall patient satisfaction and experience with CTR was good, and there was no significant superiority of the endoscopic approach over open surgery in terms of patient experience measures.

Keywords:
Carpal tunnel syndrome, carpal tunnel release, endoscopic surgery, open surgery, wrist, functional outcome

References:
FIBULO SCAPHO LUNATE ARTHRODESIS: an option in case of important loss of substance of the distal radius.

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Objectives / Interrogation: In case of radius trauma, infection or tumour resection, free micro-vascular fibula transfer is considered the established method for the reconstruction. There are different possibilities to reconstruct the radius defect: arthrodesis, this solution provides a good strength and stability but even a complete loss of motion; an alternative could be harvesting the head of the fibula to restore articular surface of the RC joint, this technique is more demanding and it's not able to restore joint stability; the objective is to evaluate the fibula scapho-lunate arthrodesis to understand if it could be a good solution to restore stability and a partial range of motion.

Methods: we used this technique in one case of forearm osteosarcoma, and in three cases of giant cell-tumors showed Campanacci grade 3 lesions, in all patients the fibular graft was based on peroneal artery and vein, the average length was 14,3 cm.  
In all cases before positioning the locking plate, we stabilised the scaphoid and the lunate in a correct position compared to the capitate surface using a k-wire, a slot has been created to allow the placement of the fibula between the two carpal bones. After surgery patients were protected in a cast including elbow for 6 weeks and for 2 weeks in a palmar forearm cast.
An x-ray has been performed at 40 days from surgery and after 2 months and 6 months. We evaluated the radiological healing and the ROM at 1 year follow-up.

Results and Conclusions: In literature are reported 16 cases, of these 14 TGC and 2 sarcoma, the mean length of the fibula is 10 cm, the mean ROM is 70 degrees flexion-extension; 130 prono-supination, 6 months to obtain healing at x-ray.
In our patients at 1 year follow-up the mean range of motion was 65° in flexion extension and 120° in prono-supination, the time of healing at x-ray was 6 months from surgery, the mean length of the fibula is 14 cm.
No case of instability. Our results are similar to the one referred in literature. The goal of the treatment in case of tumour reconstruction is a one stage procedure that provides secure bony consolidation and allows early physical therapy and further adjuvant therapeutic procedures. We think that the vascularized fibula scapho lunate arthrodesis is a good solution to give stability to the wrist avoiding the complete loss of range of motion. In our experience this procedure is able to restore an adequate function for daily activities, with a high stability associated to a radical wide resection in order to prevent recurrence.

Keywords: -
Ulnar carpometacarpal dislocations and fracture-dislocations. Surgery may not be always required.

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Objectives / Interrogation: Carpometacarpal (CMC) joint dislocations and fracture-dislocations are uncommon injuries and, initially, they may be often overlooked because of the diffuse hand swelling and misinterpretation of subtle radiographic features as normal. Surgical stabilization is recommended by most authors in order to prevent a secondary dislocation assuming that these injuries are inherently unstable. We hypothesized that when the diagnosis is early and a closed concentric and initially stable reduction is achieved, the surgical treatment may be unnecessary.

Methods: Prospective series of five consecutive cases. In all cases, a closed reduction was performed by traction after an ulnar nerve block of the wrist at the level of the patient. Joint stability was assessed by active motion of the wrist and metacarpophalangeal joints by the patient. An ulnar splint leaving the MP joint free + buddy-tape was placed in 3 cases and a cast + buddy-tape was used in two. Demographic data, immobilization time, time until reincorporation to previous activities, range of motion, pain and DASH questionnaire were registered.

Results and Conclusions: Five males. Average age of 24 (range, 20-28) years. Minimum follow-up was 12 months. Pure CMC joint dislocation of 4th and 5th radius in 2 cases and fracture-dislocations in 3. In all cases a concentric and stable reduction was achieved. Splint was maintained for 4 weeks and active motion started immediately. No physical therapy was required in any case. Time to reincorporation to previous activities was 11 (range 8-13) weeks. At final follow-up the ROM was complete with pulp-to-palm distance of 0mm in all cases; VAS for pain was 0 at rest, 0 in daily-life activities and 1.6 in physical effort activities; and DASH score was 2.27 (range 0-4.5) points.

We believe that, if the diagnosis of CMC joint dislocation is early and a closed, concentric and stable reduction is initially achieved, the conservative treatment may be a good choice obtaining good functional results and a quick recovery.

Keywords:
Carpal; CMC; Dislocation; Joint; Fracture; Metacarpal
NERVE DECELLULARIZATION: LOOKING FOR THE MORE RELIABLE METHOD

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Objectives / Interrogation: In the case of large defects, end to end suture is not possible and conduit is not enough to obtain good results, thus the gold standard is the autograft, however this solution presents disadvantages: donor site morbility and longer surgery time. Allograft could be another alternative but nerves from donors frequently cause immunogenic response. Starting from 1980, several authors are looking for the correct way to decellularize nerves preserving both the extracellular matrix and basal lamina to improve nerve regeneration. In Italy, a recent law prohibits to commercialize human tissue for profit, thus the use of marketed human-derived devices is forbidden in the case of nerve injuries that need a graft. The purpose of this study is to find an easy, cost effective, standardized and reliable protocol for the allogeneic nerve decellularization to be stored in a nerve bank.

Methods: From a literature review, we concluded that the best method to eliminate cells and to remove cell debris is the chemical one. This method is able to maintain preserved basal lamina and collagen that are indispensable for nerve regeneration. In our study, we propose two chemical-based protocols for the nerve decellularization: one chemical (TritonX100 + sodium dodecyl sulphate- SDS- detergent) in association to sonication cycles, the other also chemical (phosphate-buffered saline- TBP-detergent) in association to a DNase. According to these protocols, we decellularized human (median and ulnar) and rat (sciatic) nerves. We processed and evaluated samples by means of histology and electron microscopy compared to commercial decellularized allografts.

Results and Conclusions: The results showed that both of them could remove immunogenic components maintaining the basal lamina to improve nerve regeneration. nerves decellularized with the chemical and sonication protocol showed a good tissue organization with oriented and intact collagen, but still present axons within the extracellular matrix. The best results were obtained by the chemical and DNase protocol in which a rich matched connective matrix was maintained and no integral axons were present. The purpose of this study is to identify an accessible method of decellularization that is also cost-effective, standardized and permits to obtain a complete removal of immunogenic elements maintaining an intact basal lamina to help axon regeneration.

Keywords:
The outcome of bone graft surgery for non-union of fractures of the scaphoid

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Objectives / Interrogation: Previous studies have suggested that outcomes following scaphoid non-union surgery are affected by factors including smoking, fracture location or chronicity, and graft donor site or vascularity. These studies are limited by low numbers, differing definitions of non-union, and variable follow up. This study investigates the outcome of scaphoid non-union surgery with bone graft across 19 United Kingdom centres.

Methods: This study was defined as a multicentre retrospective evaluation of service. Non-union was defined as a failure to unite within 12 weeks of acute injury. The minimal interval between surgery and data collection was 2 years with a minimum of 12 weeks radiological follow up following non-union surgery. The outcome of the "non-union" surgery was union status. Descriptive statistics are provided as frequencies with percentages (%). Proportional differences were examined using the Chi squared or Fisher’s exact tests as appropriate. Logistic regression was used to estimate the odds ratio (OR) and 95% CI for persistent non-union following surgery. To adjust for known confounders, multivariable logistic regression was used with pre-selected co-variables.

Results and Conclusions: Results
Data was collected for 806 individuals (n=462 following exclusions). 93% of patients were male with a mean age of 27yr (SD 10). Overall union rate was 69%. The choice of bone graft differed significantly depending on the fracture site (p<0.001). Smoking at the time of surgery doubled the odds of non-union (adjusted OR 1.8, 95% CI 1.0, 3.1). Separate analysis of proximal pole and waist fractures suggested that smoking may particularly affect the outcome of proximal pole fracture non-unions (union rates for non-smokers v smokers = 77% v 43%; p=0.01); Surgical delay of 1 or 2 years was independently associated with 40% (adjusted OR 1.4 (0.7, 2.8)) and 140% (2.4 (1.2, 4.8)) higher odds of non-union respectively. Age, graft vascularity, and fixation method had no association with outcome. Comparison of assessments of union by the treating surgical team and the investigators showed excellent agreement (90%, k=0.8, p< 0.001).

Conclusions
This study suggests that in the United Kingdom healing rates following surgery are less than previously published ( >80%). Our findings support the hypotheses that smoking and the time interval between acute fracture and non-union surgery influence the outcome of bone graft surgery.

Keywords:
scaphoid, Non-union, scaphoid non-union, bone graft
Toe to hand transfer for five digit hand reconstruction in congenital thumb's hypoplasia

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Objectives / Interrogation: A stable 1st CMCJ has been considered a mandatory factor for a successful toe to hand transplantation. The base of metacarpal bone is absent for hypoplasia type IIb - V, therefore, toe to hand transplantation is not recommended. Tan and Tu 2013 described a technique for toe-to hand transplantation for thumb hypoplasia patients IIb-V but overall results were not better than pollicization. The aim of this study is to describe a new technique for thumb reconstruction with a second toe transfer with metatarsophalangeal joint arthrodesis, which can provide a 5-digit hand and restore the functionality of the thumb for thumb hypoplasia IIb - V.

Methods: A total of five patients with thumb hypoplasia stage IIb V were included in study. All patients underwent long-term (3-5 years) follow-up evaluation. VAS was used for an aesthetic evaluation, patients and their parents were asked to give a score from 1 to 10 (more is better) points to two questions, "Does the transplanted toe look like a thumb?" and "Does the transplanted toe work like a thumb?". To establish functionality patients were asked to complete the DASH survey, objectively ROM in 3 thumb's joints, the strength of the grasp and pinch grip were measured, and two-point discrimination test was performed. To find out overall population's perspective on aesthetic outcomes between a 4-digit hand after the pollicization and a 5-digit hand with a transplanted thumb internet survey was created. The survey to evaluate aesthetical outcome for transplantation method and pollicization method was completed by 290 respondents. Statistical evaluation was performed using the Student's t-test and Wilcoxon-Mann-Whitney test.

Results and Conclusions: Patients with toe-to hand transplantation scored average DASH 9,35 (8,0-10,7) points. Patients who had pollicization procedure gave average DASH 19,8 (6-26,7) points. The aesthetical survey was completed by 290 respondents. VAS for the toe transplantation was 7,04 (3-10), whereas for the pollicization - 5,84 (1-10).
Stable and long 1st metacarpal bone created using MTPJ arthrodesis is an option provided by our technique. Then PIPJ and DIPJ of transplanted toe becomes IPJ and MCPJ of new thumb what works similar to pollicization technique. Overall population rates transplantation's aesthetic outcomes higher than pollicization's (the scores is statistically significant (p<0.0001).

Keywords:
toe-to hand transplantation, thumb hypoplasia, pollicization
Progressive palmar contracture of Dupuytren in a 6-year-old boy.

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Objectives / Interrogation: Dupuytren's disease is a benign fibromatosis of the palmar and digital fascia of the hand. It is well known in adults with an overall incidence of 3-6%. To the best of our known, there are only 13 cases documented in the English bibliography in children under 13 and only seven cases histologically confirmed in children under 10 years. Our goal is to present the case report of a 6-year-old boy with histologically confirmed Dupuytren's disease.

Methods: 6 years-old male referred to our consultation by retraction of his fourth finger in his left hand. When he was 14 months, a longitudinal congenital cutaneous scar was operated on the ulnar side of his fifth finger and, at 3 years-old, a zeta-plasty was performed also on his fifth finger. Currently he presents a nodule and a palmar and ulnar cord in his fourth finger that conditions an irreducible flexion of DIP joint in 80° and a clinodactyly of 15° towards ulnar. His mother reports that this deformity began two years ago (when he was 4 years old) as a bulge and it has been subsequently retracting the finger.

Surgery was performed on an outpatient basis. A palmar-ulnar hemi-Bruner incision was made on the fourth finger, identifying a subcutaneous scar that did not invade the skin and that was extended from the PIP joint, displacing the digital neurovascular bundle, to the ulnar side of the DIP joint where it was attached to the ulnar collateral ligament and the joint capsule. A complete resection of the flange was achieved with a complete intraoperative range of motion and correcting clinodactyly. A proximal advance-rotation flap and a V-Y cutaneous plasty for cutaneous closure were performed. A splint was place to keep the interphalangeal joints in extension for 3 weeks.

Results and Conclusions: The wounds healed without incident. At 5 weeks, ROM was complete and the child had been returned to his daily-activities. One year after surgery there were no signs of recurrence or involvement in another location.

Dupuytren's disease in the child is exceptional. The differential diagnosis should include camptodactyly, sequelae of burn, extraperitoneal fibromatosis, epithelioid sarcoma, giant cell tumor or fibrous hamartoma among others. Therefore, the surgical treatment is not only functional but it also must confirm the diagnosis histologically. The risk of recurrence of the disease in the pediatric age and the optimal time for surgery are still uncertain due to the limited bibliography available.

Keywords:
Child, Congenital, Dupuytren, Pediatric, Retraction
Which are the Limits Nowadays for Indication to Replantation?

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Objectives / Interrogation: Over the years upper limb replantation of small and large segments has experienced a progressive widening of indications because of the improvements in reconstructive techniques. While there are clear indications for replantation or amputation (general and local conditions of the patient and of the amputated segment, timing, etc.), there is on the other hand a "gray area" in which indications tend to depend on the skill, experience and creativity of the surgeon. This is true in the emergency setting, and for patients undergoing secondary reconstructive surgery.

Methods: Over the past 10 years we have collected 17 cases of consecutive cases of "borderline indications" that in the past would not have been considered for replantation: double level reimplantations, avulsion injuries, patients over 75 years of age, significant degloving injuries, longer than suggested revascularization time, etc. The minimum follow-up was 1 year and each case has been analyzed using Chen's criteria for assessment of residual function. All secondary procedures are pointed out. Failures are also reported.

Results and Conclusions: RESULTS
In all the cases presented, the replanted segment survived. There were no major complications in the survived segment. Reoperation was necessary in 20% of cases (tendon transfer, tenolysis, etc.). All patients said they were satisfied with the treatment.

CONCLUSIONS
This case series suggests how to deal with special cases and will stimulate the use of imagination in this kind of surgery in extreme conditions. The goal of reconstruction should be restoration of function that is better than prosthetic replacement. It is clear that this type of surgery can only be performed as long as the patient's life is not in danger.

Keywords:
Replantation, exception replantations
“Spare parts surgery” - functional saving for long segmental defects. A ten years long follow up study for the cross hand replantation.

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Objectives / Interrogation: “Spare parts surgery” is well-described in the plastic surgery literature. In the setting of trauma, otherwise discarded parts can be utilized for reconstruction resulting in a superior functional and aesthetic outcome for the patient.

Methods: Cross arm replantation was done for 26 years of age patient in 2008 who had train injury. Patient has both hand damages - right hand damage distally to wrist joint and left hand damage at level of the elbow joint. Left elbow joint and right palm were not be able to reconstruct. Therefore left hand (at distal forearm level) was transplanted to right forearm in mirror shape. ALT flap was used to cover soft tissue defect and late wrist arthrodesis was done to improve functional outcome. Functional evaluation as DASH and ROM scores were calculated in the ten year's long term follow up study.

Results and Conclusions: Cross hand replant get good sensation and good grasp and he use hand more than left prosthetic hand. Patient use replanted hand in daily activities and has no complains about thumb's mirror like position. Train injuries are becoming less common in Latvia. But is very hard to manage as patients usually have shock, all extremities had sever damaged tissues. Very important is to evaluate amputated segment and usually you can find replantable part but as these patients are critically ill you have to work and think very fast therefore short-time replantation can be done. Hand allotransplantation can be as an alternative method but patient have to use immunosuppression for all life. The prosthetic hand has been other option to reconstruct functionality for the hand but it is hard to manage sensation therefore replantation or as this cross hand replantation still have a place in era of modern microsurgery.

Keywords:
cross hand replantation, microsurgery, hand amputation, spare part surgery
Median-to-radial nerve transfer - our experiences

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Objectives / Interrogation: To provide New modality for radial nerve palsy, we provide our experience on median-to-radial nerve transfer, especial the indication, choice of donor motor branch, technique tips.

Methods: We choose the patients of severe radial nerve palsy as the candidates for median-to-radial nerve transfer, including 1) proximal injury; 2) long nerve defect more than 8~10cm; 3) severe soft tissue injury. We treated 6 patients during 2008 to 2017, two proximal injuries and 4 long nerve defect. We transfered branch of Pronator teres (PR) to branch of extensor carpi radialis brevis (ECRB) and branch of flexor digitorum superficialis (FDS) of middle or ring finger to posterior interosseous nerve (PIN) in the first case, then changed the strategy into FDS-to-ECRB and flexor carpi radialis (FCR)-to-PIN. In operation, after identifying the main trunk and branches of median and radial nerve, the donor and receipt branches were indentified and freed as long as possible. Confirming again, the PIN and ECRB nerves were divided well proximally and FDS and FDS or PR as distal as possible, then coapted ends without tension. Positive exercises of joints were initiated 3 days postoperatively. Synergic exercises were started 3 mouths later. Once synergic movements achieved, independent movements were started.

Results and Conclusions: 2 patients reported numb in index and middle fingers and resolved within 4 weeks. The strength of FPS of middle or/and ring fingers were 4- in 3 patients and recovered to normal within 12 w. The strength of FCR decreased to 2 in 5 patients, 4- in 1 patient, which recovered to normal in 3 patients, and 4 degree in 1 patient within 6 m, and no recovery in 1 patient. The extensors regained their strength 3~6 m gradually, and achieved biggest strength 12~18 m. The strength of recovered muscles are 3+~5. The patients orderly regained their movements. The patients can extend their thumb, index and little fingers independently. The excursion of wrist and fingers were comparable to contralateral side, to gain full excursion, 3 patients had to finish the movement along with the corresponding donor movement. In conclusion, median-to-radial transfer is an effective to restore the motor function of radial nerve. We recommend using the synergic motor nerve for transfer. It will take long to achieve these functions and need effective rehabilitation to finish the cortical plasticity, but the patients can gain more independent and flexible movement and larger excursion compared to tendon transfer.

Keywords: motor nerve transfer, radial nerve injury, median nerve
Bilateral bipartite carpal scaphoid: a case report and comparison with bilateral scaphoid nonunion found on incidental radiography.

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Objectives / Interrogation: Bipartite carpal scaphoid is a rare congenital anomaly of carpal bones. The scaphoid usually has one ossification center. We present a case of bilateral division of the carpal scaphoid in a 57-year-old man.

Methods: He presented to our outpatient clinic with acute pain and swelling in his right wrist without a history of trauma. Physical examination showed tenderness, heating sense, and mild redness in the dorsum of the entire wrist. The patient had an elevated white blood cell (WBC) count with left shift, an erythrocyte sedimentation rate (ESR) and a C-reactive protein (CRP). A diagnosis of cellulitis was made. Plain radiographs of bilateral wrist were obtained for routine evaluation, and incidentally noted the scaphoid bone composed of two ossicles separated at the waist with smooth margins in his bilateral wrist. He had no previous history of wrist trauma and a normal developmental history. Magnetic resonance imaging (MRI) revealed bilateral bipartite scaphoids with cartilaginous tissue evident between the two ossicles. The symptom resolved after intravenous antibiotic therapy.

Congenital bipartite carpal scaphoid was first described by Gruber in 1877, and Bunnel and Boys proposed the criteria of bipartite scaphoid in 1970. Several factors were considered to be supportive of the diagnosis of congenital bipartite scaphoid rather than traumatic non-union in this patient. These included bilateral scaphoid bipartition, clear space between the two components with smooth edges at the joint surfaces, equal size and density of each part, and no history or signs of wrist injury. In this case, there were a few degenerative changes in the articulation between the distal ossicle and the radial styloid. However, several reports suggest that degenerative change developed due to abnormally biomechanics incurred by a bipartite scaphoid. The authors concluded that the case presented is bilateral bipartite carpal scaphoid and the patient discharged without further treatment. After our first experience, a 51-year-old man with a distal radio-ulnar fracture presented to the emergency department and unrecognized bilateral scaphoid fracture nonunion was found on radiography. This patient did not fulfill the five established criteria.

Results and Conclusions: Differential diagnosis of bipartite carpal scaphoid and non-union is difficult, but knowledge of congenital bipartite scaphoid is important to avoid unnecessary treatment.

Keywords:
Carpal scaphoid; Bipartite; Non-union
A TRIAL COMPARING PAIN DURING LOCAL TUMESCENT INJECTION IN FINGERS USING DIFFERENT SYRINGE-NEEDLE COMBINATIONS

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Objectives / Interrogation: This study aims to obtain the most favorable syringe and needle combination, which causes the least pain during local anesthesia tumescent injection in the simulation of fully awake hand surgery.

Methods: A randomized single-blinded controlled trial is designed for 30 adult male healthy subjects to compare the pain from injection using syringe and needle combination i.e. 1) 1 cc syringe with 26G needle, 2) 3 cc syringe with 26 G needle, and 3) 5 cc needle with 26 G needle. The injection will be performed in any of at the second, third and fourth fingers of either subject’s hand randomly. The injection will be SIMPLE block technique using 1 cc of NaCl 0.9% solution under the injection speed of 30 seconds/cc. Subjects are required to rate three check-point of VAS at the timing of needle puncture, initial tumescent solution injection and just right after the completion of the infiltration. Upon the completion of each finger, the subject is also asked to give a response to a series of questions regarding the procedures. At the end of all injections, the subject is asked to rate his preference of syringe and needle combination.

Results and Conclusions: 90 fingers were randomized, we assume no differences between all finger that were tested. No adverse events were noted. The mean VAS score at the timing of needle puncture for 1 cc syringe with 26G needle, 3 cc syringe with 26 G needle, and 5 cc needle with 26 G needle are 0.76, 0.72 and 0.63 respectively. The mean VAS score at the initial tumescent solution injection for 1 cc syringe with 26G needle, 3 cc syringe with 26 G needle, and 5 cc needle with 26 G needle are 0.88, 0.75 and 0.74 respectively. The mean VAS score right after the completion of the infiltration or 1 cc syringe with 26G needle, 3 cc syringe with 26 G needle, and 5 cc needle with 26 G needle are 0.85, 0.87 and 0.71 respectively. We found no correlation between syringe-needle combinations to VAS Score at three different checkpoints and patient preferences (p<0.05). In our knowledge, this the first study to translate the variance in Initial Force and Maintenance Force of a syringe-needle combination into a subjective perceptible pain in the clinical setting. We postulate that the difference of forces among combinations in this study is too small to be recognized by VAS Score. The findings in this study have promoted the equal safety, usability and comfort of either 1, 3 and 5 cc syringe with 26 G needle combinations for local tumescent injection in fully awake hand surgery.

Keywords:
tumescent, injection, syringe, pain, fully awake, local anesthesia
Treatment of length discrepancy after posttraumatic radial growth arrest

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Objectives / Interrogation: Posttraumatic growth disturbances after radial physeal fractures occur in about 4%. Depending on the children's age a partial or complete growth arrest of the distal radial physis leads to progressive shortening of the radius with radioulnar length discrepancy and/or deformation of the distal radius with functional limitation, disturbance of the DRUJ, pain and cosmetic impairment. A variety of different procedures are performed for correction: callus distraction of the radius, osteotomy of the radius with or without bone graft, ulna shortening osteotomy, ulnar physiodesis. Factors influencing treatment and results are children's age at trauma, amount of radius shortening/radioulnar length discrepancy, uniplanar or two-dimensional deformity of the distal radius, and remaining growth potential. It is not proven which correction at which age ends up with the best functional results.

Methods: Retrospectively we analysed the demographic data and x-rays of 13 cases treated in 3 hand centers with distraction of the radius for:
- age at trauma (mean age at trauma 9.3 yrs; range 4-14 yrs.)
- age at 1st operative correction of length discrepancy (mean age at 1st operative correction 14.5 yrs, range 9-18 yrs.)
- amount of radius shortening at the 1st operative intervention (mean 19.3 mm, range 9-30 mm)
- performed operative technique: callus distraction radius 5, distraction radius with secondary internal plate fixation: without bone graft 4 - with iliac bone graft 4
- additional correction of the ulna: in no case an additional intervention of the ulna was performed at the 1st operative correction.
- recurrence of length discrepancy with need of second intervention: 2 cases (1 treated with callus distraction, 1 case with ulna-shortening).
- secondary operative intervention due to complications: 3 cases (2 non-union in the group with plating with iliac bone graft, 1 pin-site-infection of the distraction fixator)

Results and Conclusions: Collected data show different approaches of adjusting the radioulnar length discrepancy by lengthening the radius. In younger patients the remaining growth potential of the distal ulna may lead to recurrence of length discrepancy after correction. Therefore an additional physiodesis of the distal ulna may be advisable in the growing child. A comparing further study at the end of growth is planned to compare functional results, final forearm length and radioulnar position and satisfaction of patients to decide about the best treatment age and technique.

Keywords:
distal radius, physeal arrest
Isolated dorsal radiocarpal dislocation with volar opening treated with external fixator and percutaneous pinning

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Objectives / Interrogation: Dislocations of radiocarpal joint represent rare, high-energy injuries that make up to 0.2% of all dislocations. Usually, dislocations are associated with serious soft tissue lesions, open fractures with volar or dorsal destruction and possible vascular or neurologic deficit.

Methods: Authors report a case of isolated dorsal radiocarpal dislocation (Dumontier type I, Moneim type I) with volar opening (Gustillo II) and partial lesion of muscle tissue of flexor digitorum muscles of the 4th and 5th finger, of the right, dominant arm, in an adult, after fall from a height. The treatment consisted of open reduction and temporary arthrodesis with bridging external fixator and two parallel K wires placed percutaneously in a radiocarpal direction. After 8 and half weeks external fixator and K wires were removed and active rehabilitation was started. The rehabilitation lasted for 3 months.

Results and Conclusions: Early results after 6 months showed the range of motion (dorsal flexion 30°, palmar flexion 45°, radial abduction 15°, ulnar abduction 20°). Also, at the same time VAS score measured 1.4/10 and Quick DASH Score 56.81/100. Radiocarpal dislocations are demanding injuries since residual radiocarpal instability, pain, stiffness and early posttraumatic wrist degeneration are common outcomes.

Keywords:
radiocarpal, open, dislocation
Deep Lipomas of the Elbow

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Objectives / Interrogation: Lipoma is the most common soft tissue tumor occurring anywhere in the body, and is generally regarded harmless. Most of them arise superficially, and deep lipomas are far rare. Lipoma seldom affects peripheral nerve function, but deep lipoma arising in the elbow may cause disturbances due to its proximity to radial nerve. We have experienced four cases of lipoma around the elbow, and here we reported the results with thorough literature review.

Methods: All four patients were middle-aged females, and their age ranged from 57 to 68 years. All tumors located at radial side of the elbow, and were deep-seated. One patient did not complain any symptom other than soft tissue mass. In the remaining three patients, one complained of inability to extend her left ring and little fingers, and the other two noticed pain or numbness. All tumors were pathologically confirmed as benign lipoma after surgical resection.

Postoperative follow-up period ranged from one to 12 months.

Results and Conclusions: The patient with posterior interosseous nerve palsy, complete recovery was obtained 6 months after surgery. In three patients with or without symptoms, superficial branch of radial nerve run over the tumor, attaching the capsule, and posterior interosseous nerve was involved by the tumor in one of them. Meticulous dissection was undertaken during surgery.

During resection of lipoma in the upper extremity, peripheral nerves sometimes exist besides the tumor. White & Hanna reported a series of lipomata arising in the upper extremity, half of which were called as “troublesome lipoma”, presenting with nerve palsy, pain or discomfort. Typical troublesome lipoma is the case arising around the radial neck with posterior interosseous nerve palsy, approximately 30 cases of which have been reported. It is important to carefully evaluate patients with lipoma in the elbow region, and atraumatic dissection is required to avoid postoperative nerve complication.

Keywords:
Deep lipoma, Elbow, PIN palsy
Distal radius decompression osteotomy for ulnar impingement syndrome

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Objectives / Interrogation: Severe ulna minus variance caused by congenital ulna minus variance can lead to a painful DRUJ. Clinically compression at the DRUJ leads to increasing pain at forearm rotation. Radiologically incongruence at the DRUJ with malformation is noticed

Methods: Based on the clinical experience in a young female athlete where painful ulnar minus variance of about 5mm following excessive ulnar shortening was solved by correction osteotomy with shortening and radial shift of the radius we treated meanwhile 32 patients with congenital ulnar minus and painful DRUJ in the same way. Depending on the amount of malformation an oblique closing wedge osteotomy is performed. It is important that the distal part of the osteotomy is done at the proximal border of the sigmoid notch and the proximal part beneath the joint surface of the ulnar head. The amount of shortening depends on the preoperative situation. The distal part is shifted radially and fixation is done with a fixed angle plate. Due to the wedge osteotomy the increased angle of the sigmoid notch is reduced leading to reshaping of the DRUJ.

Results and Conclusions: All osteotomies showed primary healing. 30 patients reported significant pain relief and no restriction of forearm rotation. One patient who was satisfied on his right side suffered continuous pain after correction on the opposite side and was converted into hemiresection of the ulna head. The second patient got instability of the DRUJ after correction where ligamentous reconstruction with distally attached brachioradialis tendon was done. By corrective osteotomy with shortening of the radius and radial shift reshaping of the DRUJ can be observed. The key point of this procedure seems the decompression at the DRUJ by reducing the tension of the distal interosseous membrane which is gained by radius shortening and additional ulnar shift of the radius shaft. Preoperative instability at the DRUJ should be respected as contraindication for this procedure.

Keywords: DRUJ, Ulnar minus, Impingement, corrective osteotomy
A rare cause for distal bone resorption of the fingers and drumstick deformity. The Hajdu-Cheney syndrome.

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Objectives / Interrogation: Hajdu-Cheney syndrome is an extremely rare hereditary connective tissue disease described in 1948. It is characterized by craniofacial deformities, dental deformity, hyperlaxity, osteoporosis, and acro-osteolysis. The importance from the Orthopedic and Hand Surgeon view lies in the fact that the main cause of consultation usually is a progressive digital shortening, so that the knowledge of the disease can help to avoid complications derived from osteoporosis and to adequately refer the patient for treatment of other systemic injuries that may be present. We report a family in which three members of three successive generations are affected by the disease.

Methods: A 64-year-old woman was referred for consultation due to progressive shortening of the fingers and wrinkling of the skin. She measures 139 cm and weighs 43 kg. She has a widened face, micrognathia, thin lips, low set ears and a short neck. Her fingers are short, with drumstick appearance and there seems to be skin left over mainly on the dorsum. X-rays showed normal metacarpals, normal proximal phalanges in long fingers but with osteolytic lesions in the thumbs, middle phalanges reduced to the proximal third (except in the fourth finger of her left hand) and distal phalanges reduced to a small distal bone stump. Her 35-year-old daughter presents distal bone resorption in the distal phalanx of all the long fingers and the distal phalanx of the thumbs. And the 6-year-old grandson already has a mild bone resorption of distal phalanges of all the fingers.

Results and Conclusions: In this case, a decrease in bone mass was confirmed by bone densitometry and antiresorptive treatment was established with adequate evolution. In conclusion, Hajdu-Cheney syndrome does not seem to diminish life expectancy, although it is associated with renal, cardiac and neurological complications. Preventive treatment of bone lesions is not known and its treatment is symptomatic trying to avoid the complications derived from the loss of bone mass. We believe that knowing the disease may be useful for the differential diagnosis of acro-osteoysis and for its multidisciplinary approach.

Keywords: Acro-osteolysis, Bone mass loss, Deformity, Drumstick, Osteoporosis
Corrective osteotomy at the distal radius without bone graft for Madelung deformity

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Objectives / Interrogation: The malformation of the wrist joint in case of Madelung deformity is characterized by shortening of the ulnar part of the radius with increased palmar shift and angulation leading to increased radial inclination and incongruency at the DRUJ with dorsal displacement of the ulnar head. Usually the patients if symptomatic are seen in young age with painful restricted forearm rotation. Indication for correction is based on complaints of the patient and the goal to prevent rapid osteoarthritic changes. Additionally the deformed wrist joint with the prominent ulnar head should be corrected from patients point of view for aesthetic reasons.

Methods: Corrective osteotomy was performed in 24 patients by an oblique open wedge osteotomy at the ulnar side. An open book technique was used leaving the radial cortex intact. The ulnar part was lifted to the level of the ulnar head. By bending a fixed angle corrective plate straight the palmar shift was corrected by plate fixation. The osteotomy gap was left open. In 2 cases due to significant bending of the radius shaft double osteotomy was done distal and at the radius shaft.

Results and Conclusions: All osteotomies showed primary healing without loss of reduction. 22 patients would have the procedure again. Significant pain relief was seen in 18 patients. ROM showed no significant change. From aesthetic point of view 23 patients were satisfied and felt real improvement. One patient where due to severe malformation a second correction was done remained still unhappy with the result.

Corrective osteotomy at the distal radius lead to improvement of the malformed wrist joint in Madelung deformity. With fixed angele plates there is no more need for bonegraft. If arthritic changes can be decreased or even prevented will be examined by longtime follow-up.

Keywords:
Madelung deformity, corrective osteotomy, bone graft, fixed angle plate
Volar approach of "On-Top Plasty" for reconstruction of radial polydactyly

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Objectives / Interrogation: To report our volar approach of "on-top plasty" technique in reconstruction of radial polydactyly.

Methods: We evaluated 20 thumbs in 20 patients who underwent radial polydactyly reconstruction using the "on-top plasty" technique between 2009 and 2016. This technique was used when neither thumb possessed adequate proximal and distal structures to provide a functional and aesthetic thumb. The average age at time of surgery was 1.2 years and the mean follow-up time was 4.5 years. Subjective patient evaluation, objective outcomes values, and validated patient-oriented outcome measures were obtained.

Results and Conclusions: There was no soft tissue loss and union was achieved in all thumbs. Mean flexion-extension arc for the metacarpophalangeal joint was 62 degrees (range, 5 degrees extension to 72 degrees flexion) and at the interphalangeal joint was 18 degrees (range, 20 degrees extension to 30 degrees flexion). Mean percentage of age-matched norms for lateral, tripod, and tip pinch were 51%, 45%, and 49%, respectively. Mean grip strength was 56% of age-matched norm. The mean Pediatric Quality of Life Inventory (PedsQL) score for parent questionnaires was 92 and for teen/child questionnaires was 85. In conclusion, for patients with radial polydactyly in which neither thumb possesses adequate distal and proximal components, volar approach of "on-top plasty" is a reliable method which can reconstruct nice web and relatively lengthen the digit.

Keywords:
radial polydactyly, thumb duplication, reconstruction, outcome
A comparison of functional outcomes of conservatively and surgically treated metacarpal neck fractures with angulation greater than 50 degrees

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Objectives / Interrogation: Metacarpal neck fractures are frequent injuries in the young male working population and controversy between surgical and conservative management exists for severely angulated fractures. The aim of this retrospective case series is to compare the functional outcomes of conservative and surgical treatment of closed metacarpal neck fractures with more than 50 degree angulation.

Methods: We reviewed 135 consecutive metacarpal neck fractures that were managed at our center over a 2-year period (2016-2017). 28 closed fractures showing more than 50 degree angulation in oblique x-ray view were retrospectively reviewed. A demographic and clinical comparison was made between fractures managed conservatively (group A) vs surgically (group B). Clinical outcome was determined measuring grip strength and metacarpophalangeal joint active range of motion.

Results and Conclusions: Results: Of the 28 fractures reviewed, 3 were work related injuries, of which 1 was high energy impact, 27 patients were male with mean age of 34.5 years. Most common metacarpal bone affected was 5th (25 fractures) followed by 4th (3 fractures). Patients were classified into two groups: group A was treated with splint (ulnar gutter splint) or cast immobilization and group B was managed surgically with percutaneous pinning (4 fractures) or ORIF (6 fractures). Mean difference between grip strength for group A was 10.7kg and 7.8kg for group B. Range of motion in group A was 0-69 degrees and 0-65 degrees for group B. Only one complication was noted in conservative group (nonunion).

Conclusion: Conservative management in terms of splinting of metacarpal neck fractures with angulation greater than 50 degrees has a functional outcome comparable to those managed surgically with a low rate of complications.

Keywords:
metacarpal neck fracture conservative
Functioning lymphatics transfer for treatment of severe upperarm lymphedema

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Objectives / Interrogation: Lymphaticovenular anastomosis (LVA) can reduce compression therapy, the incidence of cellulitis and end with a mild infection. However, there are cases in which progression after LVA in the long term and cases where exacerbation cannot be suppressed in severe cases. Since 2004, we have been attempting to transfer of lymphatic vessels with reflux function from normal parts with vascular pedicle and simultaneous multiple LVA (combined surgical treatment) on affected limbs. In this report, the progress so far will be presented.

Methods: We have performed LVA for about 300 upper limb lymphedema since 1990, but we undertook joint surgical treatment for 14 cases of severe (LVA ineffective) upper limb edema after 2013. The breakdown was 46 to 76 (average 61.4) years old, male 1, female 13 cases, right 6, left 8 cases. Edema progressed or unchanged despite compression therapy and LVA before and after surgery between 2 months and 20 years after edema occurred. Radiotherapy 8 cases, cellulitis 4 cases occurred. Combined surgical treatment was done from 4 months to 5 years and 3 months after the initial LVA. The donors of the flaps were taken from the first web space with the first dorsal metatarsal artery perforator (4 cases). Alternatively, lymphatic channels with SCIP were collected from the groin (11 cases), and divided into 1-2 (5 cases) pieces, transplanted into single or multiple parts in the arm, and vascular anastomosis (& LVA) was performed.

Results and Conclusions: In 13 cases, postoperative follow-up observation was possible. The period was from 2 months to 3 years 2 months (average 11.3 months). The results after surgery at the present time were: compression unnecessary 1, improvement 11, invariant 1, exacerbation 1 case. From the searches so far, there are individual differences in the effect of LVA, and it is presumed that degeneration / regeneration of smooth muscle cells within lymph vessel affect the postoperative course. Combined surgical treatment using LVA and functional lymphatics transfer requires supermicrosurgical dissection of the lymphatic system, but severe cases of upper and lower limbs where improvement could not be obtained with LVA seems to be indicated. In cases where postoperative compression became unnecessary, we believe that functional recovery of the transplanted lymphatic channels is occurring.

Keywords: severe upperarm lymphedema, Lymphaticovenular anastomosis (LVA), functional lymphatics transfer
Arthroscopic distal scaphoid resection for STT arthritis

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Objectives / Interrogation: To describe the technique of the arthroscopic resection of the head of the scaphoid and evaluate the clinical and radiographic results of scapho-trapezium-trapezoid osteoarthritis cases.

Methods: Seventeen cases (13 males and 4 females) with a mean age of 57 years old (24-74 years old) were operated from 2002 to 2015. Inclusion criteria were non-traumatic radial wrist side pain without improvement after 4 months of conservative treatment and positive x-ray images to osteoarthritis. All cases were evaluated preoperatively and postoperatively with pain level, wrist ROM, grip strength and work status (Mayo Wrist Score). DASH and PRWE questionnaires were also given. The technique consisted in the 3-4 mm rounded shape arthroscopic resection of the head of the scaphoid preserving the scapho-trapezial and scapho-capitate ligaments insertion.

Results and Conclusions: At an average follow-up of 24 months all the patients were satisfied. The results showed significant statistical improvement for pain at rest (p=0.001), under maximal load (p=0.0001) and Mayo Wrist Score (p=0.0001). Wrist ROM, grip strength, DASH and PRWE showed an improvement without reaching statistical significance. At x-ray the preoperative mean radio-lunate (RL) angle was 17° (-10° to 35°). The postoperative mean value was 25° (0° to 45°). In the preoperative x-ray evaluation the “critical” RL angle of 15° exceeded in 11 cases. At follow-up, the RL angle increased in 10 cases, unchanged in 7 cases. No one of these cases became symptomatic. Transitory neuroapraxia of the DSBRN was observed in one case. Damage of the DBRA was immediately tied.
Conclusion: The technique of the arthroscopic resection of the distal part of the scaphoid for the STT osteoarthritis demonstrated to be effective and safe with less complications than open surgery.

Keywords:
STT arthroscopy, STT arthritis, STT resection, STT arthroscopic resection, Wrist arthroscopy
Dorsal hand coverage. Aesthetic and functional outcome.

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Objectives / Interrogation: The dorsum of the hand is a specialized region with thin and fragile skin characterized by poor subcutaneous tissue. The dorsal aspect of the hand is frequently prone to different types of injuries that result in exposed tendon and bone. The treatment of cutaneous defects may be achieved with local pedicle flaps, distant pedicle flaps, or free flaps. The purpose of this study is to review the patients with dorsal soft tissue defects treated with different pedicle flap or free tissue transfer and to determine the best flap for dorsal hand coverage in terms of aesthetic appearance and donor site morbidity and to define an algorithm of treatment of this type of injury.

Methods: A retrospective study of all flaps used for dorsal hand coverage was done. Between 1990-2016, 67 patients (mean age, 37 years; range 16 to 79 years) were treated for large soft tissue defects located on the dorsum of the hand. 22 patients with composite tissue loss of tendon and skin on the dorsum of the hand were treated employing a completely vascularized single-stage reconstruction (the cutaneo tendinous dorsalis pedis and the radial tendinous island flap were used). In 4 cases ALT and Gracilis Flap were employed in conjunction with tendon grafts. The management of pure cutaneous defects (41 cases) includes different type of pedicle fascial cutaneous flaps (radial forearm flap with different modifications, posterior interosseous flap and groin flap), or using a free tissue transfer (LAF, ALT).

Results and Conclusions: Results
All flaps survived completely. Tendon-cutaneous flap required tenolysis in two cases. Fasciocutaneous flap required debulking procedures in 7 cases. Fascio-cutaneous flaps had the highest need for skin grafting at the donor site.

Conclusions
The approach to the patient with a dorsal hand injury requires the surgeon to be aware of a variety of treatment options. Techniques that most closely replace that which has been injured are the most successfully. Flap selection must be individualized to the specific patient and defect. Cutaneous and fascial flap showed good functional and aesthetic results, donor site was better in fascial flaps. The replacement of combined loss of skin and tendons in only one stage gives the best opportunity for functional recovery, and can allows patients a relatively rapid return to a productive life. The dorsalis pedis flap and radial forearm flap are less often used now because of the donor site morbidity. The ALT represents a good choice in case of extensive defect.

Keywords:
flap, dorsal hand defect, tendon graft
Arthroscopic assisted tendon reconstruction for TFCC irreparable tears

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Objectives / Interrogation: To report our 11-year experience performing arthroscopically assisted anatomical TFCC reconstruction in the treatment of chronic DRUJ instability resulting from irreparable TFCC injuries.

Methods: Eleven patients were submitted to reconstruction. Three skin incisions were made in order to create a radial and ulna tunnel for passage of the graft which is used to reconstruct the dorsal and palmar radio-ulnar ligament under fluoroscopic and arthroscopic guidance.

Results and Conclusions: Seven patients were affected by severe chronic DRUJ instability following distal radius fracture, 3 cases of DRUJ instability due to simple wrist sprain and one patient had instability due to TFCC wear following chronic calcium deposits. The ulnar styloid was un-united in two patients. All patients were classified arthroscopically as Palmer Type 1B, Atzei class 4; in two cases the avulsion was not reducible and in the other cases the patients had poor TFCC quality and poor healing potential. Two cases had instability recurrence after TFCC bone repair. One patient had associated luno-triquetral instability. Pre-operative evaluation demonstrated that prono-supination ROM was almost complete in all patients but one (this patient had supination limited at 60°), all patients had evident and painful DRUJ instability, and grip strength was half of the contralateral side.

All patients (6 females and 5 male) with mean age 37 years, were evaluated at a mean follow-up of 68 months (range from 9 to 120 months).
At follow-up, DRUJ stability was restored in all but one patient, who was re-operated on using the Moritomo technique of open palmar tendon graft reconstruction. Pain decreased from 4 to 2 at rest and from 9 to 4 under stress according with the 0 to 10-points Visual Analogue Scale. Wrist ROM did not demonstrate significant modifications, but only a minimal decrease for pronation, flexion and extension. Grip strength increased from 54% to 96%. Modified Mayo Wrist Score was excellent in 4 patients and good in 5. Eight patients were satisfied with the results of the procedure: DASH and PRWHE scores improved (Table 2). Eight patients resumed previous manual activities (1 student), 3 patients changed work due to unrelated reasons.

Conclusions: Arthroscopic assisted approach for TFCC reconstruction is safe and produces comparable results as the standard technique.

Keywords:
TFCC reconstruction, Arthroscopic TFCC reconstruction, Anatomical TFCC reconstruction, Arthroscopically anatomic TFCC reconstruction
ARPE-prosthesis: Clinical and radiographic relevance of intra-operative fluoroscopy guided orientation of the cup. Comparison to retrospective data with a minimal follow-up of ten years.

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Objectives / Interrogation: It is known that cup placement is considered important to minimize the risk of complications. Up until now, it was based on experience. A study of Duerinckx et al, suggested that there is a fixed relationship between the centre of range of motion and the proximal articular surface of the trapezium (PAST-line).

Primary endpoint in this study is comparing cup inclination and positioning with respect to the PAST-line with and without the PAST-technique. Secondary endpoint in this study is to evaluate clinical outcomes and complications of prostheses with a minimal follow-up of ten years (without the PAST-technique) and compare it to the results of recently placed prostheses (with the PAST-technique) with a follow-up of 12 months.

Methods: We looked for patients meeting the inclusion criteria with trapeziometacarpal arthritis that underwent primary arthroplasty with an ARPE-prosthesis for the retrospective part and the prospective part, between 2002 and 2007 and between 2016 and 2017 respectively. For the retrospective part, the PAST-technique was not used in contrast to the prospective part where intra-operative fluoroscopy for cup placement was used. The same inclusion- and exclusion criteria for both parts of the study were used. Patients got a PA and a lateral Kapandji view postoperatively.

Patients were assessed at follow-up for clinical outcome parameters.

Results and Conclusions: Between 2002 and 2007, 89 patients were enrolled in the study and eventually 37 patients remained for retrospective data collection. Furthermore, prospective data collection occurred for 25 patients, operated on with the use of the PAST-technique.

We intend to obtain demographic data as well as pre- and postoperative mean strength, ROM, Kapandji-, DASH- and VAS scores. Radiographic parameters regarding cup placement such as inclination and the centre of the cup were measured. Finally complications will be notified for the group with a follow-up of more than 10 years which will help us to get insight long-term survival rates.

The survivorship rate of these prostheses is proven in various studies. The clinical results of our patients regarding strength, pain relief and range of motion are promising. Cup placement is of utmost importance to minimize complications such as dislocation and wear but further studies and a longer follow-up with a larger group of patients are needed to detect significant changes regarding the usage of the PAST-technique.

Keywords:
ARPE-prosthesis, PAST-technique, arthroplasty
Reinsertion of distal biceps tendon through a mini invasive anterior approach: our experience

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Objectives / Interrogation: Distal ruptures of the biceps often occur in men during eccentric contraction of the biceps or after overload with flexed elbow. Usually, surgical treatment is the best choice. The aim of our work is to evaluate the mid term results of a mini invasive anterior approach for the reinsertion of distal biceps tendon using a reabsorbable anchor.

Methods: A retrospective analysis was performed on prospectively collected data from 15 patients treated for total distal biceps tendon rupture in 15 months from 2017 to 2018. We included all male patients, mean age 40 years (35-55) who underwent distal biceps tendon rupture after sport injuries. Clinical and radiological diagnosis was made through Magnetic Resonance performed a few days after the trauma. The tendon was anatomically repaired through a single anterior mini open approach (2.5 cm incision) using a reabsorbable anchor (2.9mm) inserted into the biceps radial tuberosity.
After the surgical procedure, elbow brace set at 90° flexion was maintained for two weeks, then rehabilitation started. The average follow-up of our study was 12 months.

**Results and Conclusions:** 12 months after the surgical procedure, patients satisfaction was good. The mini invasive anterior approach has a minimal aesthetic impact and it allows a good functional outcome, without nerve damage or infections. We reported a single case of fibrotic scar. On a functional point of view, the anchored tendon allows the complete range of motion of the elbow after five weeks. In four months patients were completely back to their previous sport activities. In our experience, this surgical procedure is a valid option with a very low rate of complications.

**Keywords:**
distal biceps tendon, mini invasive approach, reinsertion, anchor
The postoperative dressing regime in congenital hand surgery - Is frequent dressing change necessary?

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Objectives / Interrogation: In hand surgery, efficient and effective wound management is important, because rapid wound healing results in fast remobilization of the hand, which is significant for effective rehabilitation of the hand function. Factors that can influence wound healing are postoperative wound infections and ineffective immobilization of the hand. In pediatric hand surgery, creating a safe healing environment is even more challenging, because children are more active and therefore the dressing is easily damaged. To avoid pain and stress of the child and parents during wound care and to optimize the postoperative care in congenital hand surgery, we changed the wound management at our institution to a regime where the post-operative dressing stays six weeks in place before removing. We hypothesized that frequent dressing changes are unnecessary and wound inspections after two or three weeks will not prevent wound infections.

Methods: Patients between the age of 0 and 18 years old that received elective hand surgery for their congenital hand malformation were enrolled in this retrospective study. Patients that received desyndactylisation, correction osteotomy, pollicisation, opposition plasty, ray amputation, or chondrodesis/arthrodesis surgery, or a combination of these, were included. The total amount of adverse events and post-operative hospital visits between the dressing regimes were compared with the use of a Chi-square test or Fisher's exact test.

Results and Conclusions: A total of 551 hands were included with 272 hands for the long term and 279 hands in the short term group. Significantly more hand infections were reported in the short term group (42 vs 1) treated with antibiotics. Problems with the dressing were comparable for both (40 versus 43). The same amount of unplanned hospital visits were reported (12.3% vs 12.7%).

In our opinion, frequent dressing changes in elective congenital hand surgery is often unnecessary and asks a lot of effort from children and their parents. Furthermore, infection might be overdiagnosed with an increase in the prescription of antibiotics. Subgroup analyses of patients with syndactyly and Apert syndrome, showed more infections in the short term group. Considering our results, it seems that when using a FTG, it is also safe to use a long term dressing. Therefore, this study shows that long term dressing in elective congenital hand surgery is safe, without increased risk on adverse events.

Keywords: pediatric, congenital, dressing
Surgical Treatment of congenital camptodactyly, multicenter study

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Objectives / Interrogation: Camptodactyly is a congenital deformity that appears as a contracture in flexion of the proximal interphalangeal (PIP) joint. Mostly involves the lesser fingers, mono or bilateral. There isn't any consensus about the pathogenesis but the literature reports specific modifications in the soft tissues that bring to an impairment of flexion and extension strength acting on PIP joint. These imbalances cause also a deformity of the bony shape of the PIP. The contracture worsts during the growth sprout periods. Surgical treatment is for patients with a contracture over 40° who conservative treatment failed. In this presentation will be described the pathologic steps, the author’s preferred surgical procedure and long term results.

Methods: From 2010 to 2018, 45 patients have been surgically treated; 56% male and 44% female, for 52 fingers at all. The mostly involved fingers are the ulnar (84%), 27% bilateral. Almost The 70% of the patients started with a contracture over 60°. Every patient has been studied with a preoperative AP an LL Xray and a clinical examination of the degree of contracture and PROM. Only the patient with a mild or moderate bone degeneration have been included. All the patients have been approached through a Malek surgical technique, consisting in a volar incision on the PIP, the detachment of FSD distal insertion, the release of the volar plate, skin graft from the volar wrist crease and arthrorisis in extention for 4 weeks, after surgery the same splinting and rehabilitation protocol. We have recently checked 45 patients with a AP and LL Xray view and a clinical evaluation of the residual contracture and the PROM using the Siegert scale, with an average follow up of 52 months (97-6).

Results and Conclusions: About postoperative results 60.7% are Excellent (complete extention, < 15° loss of flexion), 28.5% are Good (gain of extention >40°, loss of flexion < 20°), 11.8% are Fairy (gain of extention >20°, loss of flexion <45°). No case of a Poor result have been detected. No progression of the bone deformity at the postoperative Xray check has been observed. Camptodactyly is a common (1% of population) congenital pathology. Surgical treatment is considered for patients for whom the conservative treatment failed or for those with a real severe contracture. About our casistic almost 90% of the patient have a Excellent or Good result after surgery (sec. Siegert). The radiological pattern of the PIP bones shows no progression of the deformity from the preoperative stage.

Keywords: camptodactyly
**Secondary dislocation after osteosynthesis of first metacarpal fractures - A retrospective analysis**

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**Objectives / Interrogation:** In order to restore the anatomy after a fracture and ensure complete biomechanical functionality of the thumb, osteosynthesis (ORIF) of the fractured first metacarpal bone is advised. Nonetheless, secondary displacement regularly occurs despite the use of variable angle locking plates, screws and k-wires. The objective of this retrospective study was to assess the anatomical and functional outcome of secondary displaced fractures after ORIF.

**Methods:** Between January 2013 and December 2017 65 patients were diagnosed with a fracture of the first metacarpal bone which was subsequently reduced and fixed with locking plates, screws or k-wires in our clinic. 12 (18%) of 65 patients developed a secondary displacement. We analysed the radiological and clinical records in terms of malpositioning, treatment and functional outcome.

**Results and Conclusions:** The majority (10/12) of malpositions included a volar dislocation (mean 34.4°) after using a T-shaped locking plate (TLP). One patient of the TLP-group (1/10) had to undergo revision with a corrective osteotomy and a change to a double-row locking plate. Additional six patients from the entire cohort (8/12 or 66%) underwent metal removal after a healed fracture. For the other 6 patients no metal removal was performed. Range of motion (ROM) and pinch strength (PS) was comparable to the contralateral side in all analysed patients. Secondary displacement of ORIF of first metacarpal fractures is probably more frequent than desired despite variable angle locking plates. Despite secondary displacement of fractures of the first metacarpal bone, there was no significant impairment of the ROM and PS. However, we suspect that using TLPs might bear an increased risk for secondary displacements especially in intraarticular fractures of the first metacarpal bone. Depending on the type of fracture grid plates or double plating, bone graft and adjustment screws should be considered.

**Keywords:**
secondary dislocation, Metacarpal I fracture
Vascularized versus non-vascularized bone grafts for scaphoid non-union: evidence and new findings

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Objectives / Interrogation: The main risk factors for a scaphoid non-union (SNU) are fracture displacement, location and vascular supply. The treatment with vascularized (VBGs) or non-vascularized bone grafts (NVGBs) is a debated issue. In clinical practice VBGs are indicated in cases of avascular necrosis (AVN) of the proximal pole and when previous surgery has failed. However, there is no high-level evidence, the role of vascularity as indicator for SNU healing is unclear and little is known about the biology of bone healing.

Methods: Based on a literature review we analyzed evidence of VBG versus NVBG treatment. Union rates were compared and the quality of evidence was evaluated.
In a study with 68 patients (42 fractures, 26 SNUs) we compared how well the different imaging modalities can display fracture patterns, stability and vitality.
In a second study we assessed the bone healing capacity (BHC) of SNUs in 33 patients by histological analyses. We compared these results to CT parameters of fracture location and bone structure.

Results and Conclusions: Most of the studies found are case series with retrospective, non-randomized designs and a high risk of bias. Higher union rates are usually obtained in the absence of AVN, however the use of a wide range of definitions and assessment methods make a valid comparison difficult and the role of vascularity in SNU healing unclear.
Our study regarding imaging modalities showed that the 3D analysis provides complementary information in comparison to two-dimensional imaging. Fracture location and extension of fracture lines can be best analyzed by 3D imaging and give important information about stability and potential vascularity.
The second study showed a correlation of bone healing capacity and 2D CT parameters, with higher BHC in cases with normal trabecular structure and lower BHC in cases with fragmentation. The 3D CT fracture location showed lower BHC in completely intraarticular proximal pole non-unions.
The choice of bone grafting cannot be based on evidence and further studies are necessary to determine and precise the indications of VBG treatment.
CT parameters of bone structure and fracture location can predict bone healing and are helpful to choose the appropriate SNU treatment in clinical practice.

Keywords: scaphoid, non-union, bone graft, vascularized, non-vascularized, histology, CT
Proximal phalangeal fractures - Is it worth fixing them?

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Objectives / Interrogation: Management of proximal phalanx fractures has been a subject of debate for a long time. Conservative methods are popular as they obviate the risk of interference with the delicate soft tissue balance around the bone. However, internal fixation methods can provide skeletal rigidity, thereby allowing immediate mobilisation. Recent systematic reviews published by the European Hand Society (2017) show no clear evidence of the superiority of any one treatment method. However, it has been noted that there is a paucity of published literature on this very commonly treated injury. The purpose of this study was to review the results of open reduction and internal fixation of proximal phalangeal fractures at our Unit.

Methods: We reviewed outcomes of patients that underwent internal fixation of proximal phalangeal fractures at our Unit between October 2016 and March 2018. The information was collected retrospectively from case notes. K wire fixation and simple manipulations were excluded for the purpose of this review. Information collected included patient and injury demographics, method of internal fixation, union rates, range of movement, functional recovery, complications and secondary procedures, if any.

Results and Conclusions: We found that 102 patients underwent internal fixation with plates and/or screws. The mean age of patients was 38 years old with a fairly even split between left (52) and right (50) hand injuries. All fractures healed with no incidence of nonunion. One patient, with severe crush injury and composite tissue loss, developed infection that required metalwork removal. One patient required metalwork removal due to breakage of implant. 13 other patients required metalwork removal and tenolysis due to tendon adhesions and stiffness. There was a significantly increased correlation between joint stiffness and severity of injury. The remaining patients had excellent recovery and returned to full functional activity.

We present one of the largest series in the literature regarding outcomes of surgical fixation of proximal phalanx fractures. Unlike previous reports, our experience shows good outcomes with few complications. Internal fixation provides rigid stabilization, thereby improving rehabilitation without cumbersome splintage. Comparison with conservative methods is difficult due to the inherent bias in the severity of injury chosen for this treatment modality. Internal fixation remains the method of choice for severe, comminuted and open injuries of the proximal phalanx of hand.

Keywords:
Proximal phalanx, fracture, ORIF, P1, outcomes, tenolysis, surgical fixation,
Decellularized vascularized nerve scaffolds for the reconstruction of large peripheral nerve defects

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Objectives / Interrogation: Peripheral nerve injuries are devastating, life-altering injuries. Decellularized scaffolds, which act as guide-conduits for the regenerating nerves, represent a promising approach to increase availability of nerve grafts and effective nerve reconstruction when used as vascularized grafts. Here we report the development of a vascularized nerve scaffold in which the preserved vascular tree can be used for perfusion and recellularization in order to improve cell engraftment, supply of nutrient and, thus, regeneration and functional recovery.

Methods: Seven vascularized porcine sciatic nerve scaffolds (VPNS) were retrieved and perfusion-decellularization was applied using a SDS/Triton X detergent protocol. Decellularized VPNS were characterized analyzing cell and DNA content and preservation of extracellular matrix (ECM), vascular tree and cytokine content. Reendothelialization of decellularized scaffolds was conducted with porcine-aorta endothelial cells (PAEC) in a perfusion-bioreactor.

Results and Conclusions: Scaffold vascularization was confirmed by angiography before and after decellularization. Morphologic examination of decellularized VPNS and analysis of the DNA content demonstrated cell and antigen clearance. ECM content and structures of the nerve fascicles were preserved. Detailed 3D characterization of the VPNS’s vasculature was conducted using micro-computed tomography (microCT)-based imaging approach and showed optimal vasculature preservation down to the capillary level. Cytokines quantification demonstrated a strong preservation of growth factors and reduced preservation of pro-inflammatory cytokines. Reendothelialization experiments showed PAEC viability and engraftment with repopulation of the scaffold’s vessels.

This study shows that perfusion-decellularization can be used to generate vascularized nerve scaffolds with preserved ECM structure and a functional vascular tree, which can be reendothelialized in vitro. As compared to non-vascularized conduits, vascularized engineered nerve scaffolds may represent an ideal approach for promoting better nerve regeneration in larger nerve defect reconstructions.

Keywords:
decellularized tissue, nerve reconstruction, vascularized nerves
Triangular fibrocartilage complex repair in pediatric patients

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Objectives / Interrogation: Introduction: Triangular fibrocartilage complex (TFCC) injury is a common cause of ulnar-sided wrist pain in pediatric patients and can be difficult to identify. In the pediatric population, patients often present with TFCC pathology secondary to acute trauma, physeal arrest, or chronic, repetitive damage. Although some patients respond to conservative therapy, TFCC repair (arthroscopic or open) can be definitive treatment for those with persistent pain and functional limitations.

Objective: To report the outcomes following surgical TFCC repair in pediatric patients.

Methods: Methods: Medical records of pediatric patients who underwent TFCC repair at an academic pediatric hospital between 2004-2018 were reviewed for demographics, operative reports, clinical/occupational therapy notes and imaging reports. Inclusion criteria included 1 month minimum follow-up and confirmed TFCC injury. Patient outcomes were analyzed according to Palmer classification, ROM, grip strength, and PODCI scores.

Results and Conclusions: Results: 89 patients (40:49, 14.6(9.5-28.7); M:F, age(range)) diagnosed with TFCC injury and underwent 88 arthroscopic and 7 open surgical operations. The mean follow-up time was 16.5 months (1-68 months). 38 children (43%) had distal radius and/or ulna fractures prior to diagnosis of TFCC injury. The most common cause of injury was sport (31%). 82 patients (92%) had diagnostic MRI prior to surgery with 75 patients having positive pathologic imaging findings confirmed by arthroscopy, while 7 patients (8.5%) had false negative MRI findings with pathology later identified at time of arthroscopy. Palmer classification 1B (67%) and 1D (11%) were most commonly seen on arthroscopy. 32 patients (36%) were simultaneously treated for ulnar impaction/abutment and/or distal radial growth arrest at the time of TFCC repair. Following surgery, mean grip strength increased 21.2 kg on average (p<0.05). 74 patients (83%) recovered full ROM. Patients with available goniometric data, wrist flexion improved 13.92% (p<0.05). PODCI Upper Extremity function & pain scores increased 30 and 42 points following surgery, respectively (p<0.05).

Conclusion: MRI imaging was a useful diagnostic tool in identifying TFCC pathology (91.4% sensitivity). Palmer Classification 1B (67%) and 1D (11%) were the most common TFCC injuries encountered. Surgical TFCC treatment (arthroscopic and/or open) led to significant increases in PODCI function & pain scores, ROM, and grip strength.

Keywords:
Wrist Arthroscopy, TFCC repair, pediatric, functional outcomes
Pain as the main predictor of the one-year outcome in distal radius fractures

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Objectives / Interrogation: For most patients with distal radial fracture (DRF), the outcome is good but 15-20 % have suboptimal subjective results one year after the injury (Landgren 2018). Previous long term studies have focused mainly on radiographic appearances as predictors of inferior subjective outcome but personal factors like pain coping strategies and pain behaviour may play a similar or even larger role. The aim of this study was to identify such factors which may predict poor outcome, thereby providing us with instruments to identify and treat complications before they become manifest.

Methods: 1045 patients, 18-65 years with a distal radius fracture 2003-2012 were sent a "yellow flags" questionnaire regarding general health, socioeconomic background, previous pain experience and coping of the present injury. One year after the injury, quick-DASH, a validated subjective outcome questionnaire was distributed. The two questionnaires were merged and analyzed using Matlab and SPSS. Linear regression was used to evaluate correlation between the information from the initial treatment and the qDASH-evaluated outcome. The included cases were then analyzed using SPSS automatic linear modeling to identify the most important predictors of a patient's one-year qDASH outcome.

Results and Conclusions: 645 patients had full data from both the early yellow flags questionnaire and the 12-month DASH. Using the automated linear model, approximately 30 % of the 12-month DASH outcome was explained by the first week yellow flags predictors. The self-evaluated pain level at the time of injury was by far the single best predictor of the one-year qDASH outcome. Other factors such as comorbidities and education level had minor impact on the outcome.

Conclusion: The level of pain as experienced by the patient during the first weeks after the fracture seems to be the most important factor to predict a high one year qDASH-score. Increased efforts to help the patient control/cope with the initial pain after the fracture are therefore important and controlled, prospective preferably randomized studies necessary. With the present tragic opioid crisis in mind, it is important not only to focus on pharmacological treatment. We must carefully identify other factors causing excessive pain experience, like, massive edema, inability to adhere to rehab protocol, fear of movement or suboptimal coping mechanisms.

Keywords:
wrist fracture, radius fracture, pain, predictor, subjective outcome, DASH
Carpal tunnel syndrome: Recurrence Assessment SCORE (RASc)

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Objectives / Interrogation: The current literature of carpal tunnel syndrome lacks appropriate distinction or definition of persistence (e.g., due to incomplete release) vs. recurrence following a primary surgical intervention of carpal tunnel release. The aim of our work is to propose a novel methodology to clearly define recurrence based on parameters from a literature review and own clinical data.

Methods: Following ethical board approval, we analysed the medical literature (Medline, Embase) for definitions of recurrence, and reviewed our own retrospective cohort from 2005 to 2015. To objectify clinical decision making, we summarized parameters of symptoms, signs, neurophysiological- and imaging studies in a combined point-based score. A 50 percent reuptake of symptoms following a three-month symptom-free interval was defined as recurrence.

Results and Conclusions: In our cohort of 1094 carpal tunnel syndrome patients, 67 interventions were documented in operative reports as recurrence. Following review of these, we excluded 10 incorrectly classified cases, and patients with comorbidities related to the cervical spine nerve roots. 35 of 57 cases presented without a symptom free interval in the mean 10.1 month follow-up and were classified as persistent carpal tunnel syndrome. Using the above SCORE requirements, 16 cases fit the criteria for recurrence, of which 13 were previously operated on in other hospitals. Intraoperative documentation revealed residual scar tethering in proximity to the median nerve in 15 cases and incomplete release in one.

On mean 7.8 month follow-up of the recurrent cases, 2 cases were entirely free of symptoms, in 10 cases, symptoms had improved and one case worsened, and received additional surgery. 2 cases were lost to follow-up.

While carpal tunnel syndrome recurrence is rare, differences in characteristics of symptoms, signs and electrophysiological studies may explain its causes and should be differentiated from persistent carpal tunnel syndrome following surgery. Our suggested score is quick and easily applicable in daily practice for future use in clinical research focusing on recurrent carpal tunnel syndrome.

Keywords:
The role of arthroscopy in the treatment of a fracture of the body of the hamate

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Objectives / Interrogation: Fractures of the body of the hamate are rare and difficult to diagnose and treat surgically. The radiographic evaluation of the hamate-metacarpal joint is difficult, making its evaluation with a CT Scan necessary. In this kind of fractures it is necessary to reconstruct the articular surface of the joint to minimize the post-traumatic complications like painful posttraumatic osteoarthritis.

Methods: The authors present a clinical case of a fracture of the body of the hamate treated surgically with an arthroscopic approach.

Results and Conclusions: Case report:
We present a case of a 36 year-old male with a complex fracture of the body of the hamate (Type II of Milch's classification) after a high energy fall. The articular CT Scan revealed an impacted osteochondral fragment and one dorsal fragment. According to the characteristics of the fracture (that presented a split depression fragment) we opted to do the fracture fixation with an arthroscopic approach. We used the vertical traction tower and two dorsal arthroscopic portals that allowed the elevation of the osteochondral fragment with the arthroscopic probe. We opted to stabilize the small dimension fragments with two percutaneous K wires with the aid of fluoroscopy. The patient used a splint for 5 weeks and was then assigned a specific physical rehabilitation program. At this moment, 6 months after surgery, the patient is completely recovered, having no limitations in its physical activity. He has a Visual Analogue Scale score of 0 and recovered is grip strength completely.

Conclusion:
The arthroscopic approach in this complex fracture of the body of the hamate was an excellent option to avoid the surgical aggression and the complications of an open procedure while allowing a good reduction of the osteochondral fragment with a magnified view.

Keywords:
Hamate Body, Fracture, Arthroscopy
All-through 6R single portal repair of superficial TFCC tear

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Objectives / Interrogation: Many repair techniques were described for the traumatic superficial peripheral TFCC tear (Palmer type 1B or European Wrist Arthroscopy Society (EWAS) Atzei type 1). Most outside in techniques report 6U or DRUJ portal in addition to the 6R portal as working portals to achieve a secure repair. We used the 6R as a single portal for repairing such tears and evaluated the results of this technique in 28 patients.

Methods: We repaired the TFCC in 28 patients following arthroscopic confirmation of the tear using two or three vertical mattress 2/0 PDS sutures tied through 6R portal after its hypodermic insertion 1 cm proximal to it. We included patients with traumatic ulnar side wrist pain with positive foveal sign who failed conservative management and rehabilitation for at least three months. We excluded patients with previous distal radius fracture, DRUJ instability, radiographic ulna plus variance, arthroscopic diffuse synovitis, cartilage degeneration or complex TFCC tear. The mean age of the patients was 32y (range from 18 to 45). They were 26 males and 2 females. Dominant side was affected in 19 patients. Sixteen patients only reported traumatic event with acute pain due to twisting injury (n=6) or a fall on a pronated hand (n=10) while the other 12 reported gradual onset of the pain with no considerable trauma.

Results and Conclusions: The mean follow up period was 39 months (16-66). There was statistically significant (p < 0.05) improvement of the mean post-operative VAS for pain from 4.8 (3.5-6) to 1.3 (0-4.5) and QDASH from 31.5 (27.3-40.9) to 9.2(6.8-15.9). Twenty-six patients returned to their pre injury level of activity, one patient needed revision surgery after 12 months pain free period and found to have complex tear and the last patient stopped his recreational activity because of post activity pain. No irritation of superficial nerves reported and we did not need to remove the PDS stitches in any patient.

In conclusion: Single 6R portal repair of the traumatic superficial TFCC tear is possible and effective method of management.

Keywords:
writ arthroscopy TFCC tear 6R
10-year-follow-up after implantation of a custom made wrist prosthesis in a patient with giant cell tumor of the distal radius

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Objectives / Interrogation: In contrast to implants of large joints, there is no standardized procedure for wrist implants in hand surgery, with the method being considerably newer. Over the years, the design of the implants has been changed due to the problems observed during their use. In case of total destruction of the wrist, complete arthrodesis usually is the method of choice. However, patients’ desire to preserve at least residual motion is becoming more and more crucial. Although long-term results for current wrist implants are still missing, a wrist implant is an alternative option to arthrodesis in the opinion of the authors. The case presented describes the use of a tumor wrist prosthesis based on the “Universal2©” model (KMI) in a patient with tumor destruction of the distal radius by a giant cell tumor.

Methods: After resection of the tumor there was a defect of the distal radius over a length of more than 6.5 cm. The 36 year old patient urgently demanded to preserve function and refused free fibular graft and arthrodesis whenever possible. Due to the good results experienced with the Uni2 implant, the idea to design a tumor prosthesis based on this device was born. The tumor implant was manufactured according to the patient’s x-ray images in cooperation with ArgoMedical Company. After cost approval by the patient’s health insurance a custom made device could be manufactured and implanted. So we could do the implantation in April 2009. The patient has returned to work after 6 months.

At the international congress we will present the ten year follow-up of this case. At the moment there is still good function with extension/flexion 30-0-20, ulnar/radial abduction 10-0-5 and pronation/supination of 80-0-80. During this time the patient don't need a second surgery and there was no complication. The patient still works and have hobbies like fishing and motorbiking.

Results and Conclusions: In our opinion the tumor wrist prosthesis may be an alternative or an option compared to a free fibula transplantation for the treatment of larger defects. You don’t have a donor side morbidity, the operation is not so complex and was doing in 2 ours with less collateral damage. This patient have still a good live quality and would take this treatment once again.

Keywords:
giant cell tumor, distal radius, custom made wrist prosthesis
The musicians' hand - A survey focusing on the challenges in diagnostics and therapy

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Objectives / Interrogation: Professional musicians challenge their bodies to perform up to 25 notes per second. Manual handicaps combined with an inadequate therapy can be fatal for a professionals' career. In order to efficiently understand a musicians' impairment, additional knowledge about instrument-related requirements are needed.

Methods: A questionnaire was sent to professional musical institutions in Austria focusing on musicians having medical problems considering their hands. General demographic data, data about the entity of their symptoms, the instrument, different therapies and their rehabilitation time was collected. In order to obtain a better comparability, a score was established emphasizing on the level of impairment.

Results and Conclusions: We found a predominance of female musicians and an average age of 28 (range 16-65). Most common impairments included tendinitis, hypermobility, nerve entrapment syndromes and rheumatoid diseases. Mean duration of symptoms was 7.5 months.

The main risk factor for the development of symptoms were extended practice times (p<0.5).
Loss of fine motor skills, loss of strength and pain were leading symptoms. 9.8% were offered a surgical option, but only 3% admitted to the procedure, mostly being skeptical of the doctors' real understanding of their problem. In the surgically treated group, the procedure offered a good option with a favorable functional outcome.

In the treatment of musicians with problems in the hand, treatment should be adapted to the specific needs of each musician. Further examination with the instrument can be helpful to understand the nature of their problems. If surgery is needed, early intervention can be beneficial to the patient. Additional ergotherapy, retraining of their technique and psychological help can quicken the process of healing.

Keywords:
musician hand notes impairment nerve entrapment tendinitis music physiology
Free vascularized osteocartilagineous and osteoperiosteal medial femoral condyle graft for recalcitrant scaphoid non-union - Clinical and radiological outcome

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Objectives / Interrogation: We present our experience with the use of a free vascularized bone graft from the medial femoral condyle (MFC) in the treatment of long-standing scaphoid non-union.

Methods: We report the clinical and radiological outcome of 38 treated scaphoid non-unions in 37 patients. Due to a fragmentented, unstable or avascular proximal pole or failed previous antegrade screw fixation 9 patients out of 37 were treated with an osteocartilagineous graft (proximal pole replacement). The other patients were treated with an osteoperiosteal graft. The mean age at the time of the procedure was 26 years (range 17-42 years). 15 (39,5%) patients underwent previous surgery with persistent non-union. 36 (97%) of the patients were male and one (3%) was female.

Preoperative gadolinium enhanced MRI scans were available for 31 (84%) patients and showed a compromised perfusion or avascularity of the proximal scaphoid pole in all cases. The mean time of persisting non-union until surgery using MFC graft was 51 months (range 6-184 months). The mean post-operative follow-up time was 16 months (range 6-53 months).

Results and Conclusions: Bone union was achieved in 9 out of 9 (100%) cases treated with a osteocartilaginous MFC graft and in 25 out of 29 (86%) cases treated with a osteoperiosteal MFC graft. Overall union rate was 89,5%. We saw a decreased union rate associated with previous screw fixation and with a combined volar and dorsal surgical approach. We observed no major donor site morbidity and all minor donor site symptoms wore off within one year. In terms of the clinical outcome we saw an improvement of the average grip strength (preoperative mean value 34kg, final follow up 44kg). The scapholunate and radiolunate angle improved as well (SL average 6° improvement, RL average 10° improvement). The range of motion of the wrist at final follow-up remained about the same. Within one year after the surgery 31 (83,7%) of the patients reported complete pain relief. The mean preoperative DASH score was 58,6 points and decreased to 18,8 points at final follow-up. The mean PRWE score decreased from 62,4 points before surgery to 29,6 points at final follow-up.

We see the advantages of this method in the possibility of a proximal pole replacement with an osteocartilagineous graft, the high union rate, the moderate donor site morbidity, the consistant vascular anatomy in the MFC area with a long pedicle, the possibility of harvesting a rather big graft and the comparably easy shaping since its a free vascularized graft.

Keywords:
vascularized, femoral condyle, graft, scaphoid, non-union
Pyoderma gangrenosum of the Hand. Case Report

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Objectives / Interrogation: Pyoderma gangrenosum (PG) is a rare inflammatory skin disorder. It is typically associated with chronic systemic inflammatory or neoplastic diseases, but may also arise secondary to the injury or surgery (pathergy). PG is difficult to be diagnosed. Currently it is a "diagnosis of exclusion". We present a case of postinjury PG of the little finger.

Methods: Case Report

Results and Conclusions: 69-year-old female was admitted to our clinic with suspicion of finger cellulitis. She reported to injured her left little finger 5 days before. Since then she is complaining about increasing redness, swelling and functio laesa. Despite operative debridement of the wound, the local findings became worse. The patient was consulted by our dermatologist. The diagnosis of pyoderma gangrenosum can only be made from clinical and histological findings according to the Mayo criteria. Based on this we evaluated the major and criteria. Under the prednisolone administration, there was a significant improvement. After completion of the diagnosis, therapy with ciclosporin and prednisolone was initiated. After a week of systematic therapy, the skin defect on the little finger was covered with split skin from the left elbow. After the week, the patient was discharged home. The control after two months continues to show good results without recurrence signs.

Keywords:
Pyoderma gangrenosum
Pathways to Nonunion of a Scaphoid Fracture

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Objectives / Interrogation: To investigate the causation of scaphoid fracture nonunions which underwent bone graft surgery at 20 centres within the UK.

Methods: Data was collected from the hospital records of 796 patients undergoing scaphoid fracture nonunion surgery. This was completely by a collaboration of clinicians who were part of the scaphoid non union group.

Results and Conclusions: Results: 306 and 346 of patients presented to the NHS within 2 and 4 weeks respectively of the acute scaphoid fracture. 305 and 223 presented over 4 weeks and 12 weeks respectively of their fracture (incomplete data in 145 instances).

Of the 306 who presented within 2 weeks, appropriate treatment for the acute fracture was started within 2 and 4 weeks respectively in 172 and 188 cases. 74 of these 306 had no treatment during the first 13 weeks post-injury.

Patients who sought medical advice within 2 weeks but did not commence any treatment until after 4 weeks attended 1-4 different health resources before their fracture was diagnosed. Data from 121 of these cases showed first attendances with an Emergency Department (79), GP (10), Minor Injuries unit (20), Therapist (2), Walk-In Centre (5) and Fracture/Hand Clinic (2). Of the 79 who first attended an Emergency Department, 66 required attendances with 2-4 further health resources before their fracture was diagnosed.

Conclusion: This data show the present mechanisms for managing acute scaphoid fractures are failing, and causing the majority of scaphoid fracture nonunions. The problem is probably multifactorial with issues regarding patient awareness of the possibility of a fracture and compliance with treatment, and difficulties with the diagnosis of scaphoid fractures by health professionals. Efforts should be concentrated on addressing these issues, and also improving the success rate of surgery to treat scaphoid fracture nonunions.

Keywords:
Scaphoid, non union, bone graft
Effectiveness of operative treatment in chronic long-lasting carpal tunnel cases

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Objectives / Interrogation: Carpal tunnel syndrome (CTS) is the most common peripheral neuropathy. CTS diagnosis is usually based on physical examination. Tinel’s and Phalen’s tests are proved as high sensitive and specific. In the literature it is unclear what results can be expected and achieved in chronic cases. There is a doubt how much improvement the patients can get in cases with accompanying muscle atrophy and sensation deficits. The aim of the study was to assess patients clinical condition after operative treatment of chronic long-lasting carpal tunnel syndrome.

Methods: We examined 114 patients (93W, 21 M) average age 57 y.o. after long-lasting carpal tunnel syndrome (mean: 8 years) operative treatment were examined with Biometric grip strength dynamometer, 2PD test. Grip strength was examined with electronic Biometric dynamometer. Patients underwent clinical examination with basic tests confirming clinical condition (Tinel’s and Phalen’s tests). We used DASH, PRWE and BCTQ Questionnaire to assess patients condition.

Results and Conclusions: There was a significant difference (p<0,0001) between DASH results before and after surgery. DASH result before was decreased from 44,6 ± 18,9 to 16,1 ± 20,4 . The PRWE result decreased significantly (p<0,0001) from 67,4 ± 38,2 to 10,9 ± 26,2. There were also significant increase (p=0,0002) of global grip strength from 15,9 ± 8,1 kg to 25,8 ± 9,6 kg. After surgery in BCTQ patients assess night wrist pain to 0,4 ± 0,8 and wrist pain during everyday living activities to 1,7 ± 1,2. There were no significant difference between 2PD test. Before surgery patients result was 6,2 ± 3,4 mm and after 5,4 ± 0,8. Long lasting carpal tunnel syndrome influence patients everyday living activities and diminish hand function. The prolonged time of disease leads to a small decrease of fingers two-point discrimination and a significant decrease of grip strength.

Keywords:
CTS, chronic, surgery
Relationship between ulnar variance and shape of the midcarpal joint.

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Objectives / Interrogation: In 1993, Viegas et al. investigated the incidence and distribution of intracarpal arthrosis in 393 dissected cadaver wrists: 45% had cartilage damage at the proximal pole of the hamate, and 36% degenerative tears of the TFCC. The two conditions were rarely found in the same wrist. Indeed, a TFCC tear tends to be associated with positive ulnar variance, and this tends to coexist with a lunate type I. A luno-hamate impingement is expected to coexist with a type II lunate. We hypothesized that a long hamate, associated with a lunate type II, tends to have a negative UV, while a short hamate, associated with a lunate type I, tends to have a positive UV. Hence we investigated whether there exists a relationship between the midcarpal inclination (MI) angle, type of lunate and the ulnar variance (UV) in the general population and patients with proven ulnar impaction syndrome.

Methods: A retrospective, quantitative, population based analysis (asymptomatic patients taken from the hospital data base) was performed assessing 342 postero-anterior radiographs of normal wrists taken in pronated position with the arm in 90° abduction and 40 postero-anterior radiographs of patients with ulnar impaction syndrome. We estimated the type of lunate and measured the midcarpal inclination angle (MI) angle and UV. A statistical analysis was performed to assess the relationship between these parameters.

Results and Conclusions: We found a weak correlation between the MI angle and ulnar variance in the general population. Type II lunate wrists have a greater MI angle than those with Type I lunate (p<0.05).
In patients with ulnar impaction syndrome who have lunate type II, a smaller positive ulnar variance is symptomatic compared to those who have lunate type I. In this ulnar impaction population there is an inverse linear correlation between ulnar variance and MI angle ($R^2$ 0.15).
In the general asymptomatic population we could not confirm our hypothesis of a negative relation between the MI angle and ulnar variance. In the symptomatic ulnar impaction population we do see a negative correlation between MI angle and ulnar variance. The clinical relevance is that positive ulnar variance is better tolerated by the type I lunate wrist compared to the type II lunate wrist who has a higher risk to develop and ulnar impaction syndrome even with slight ulnar positive variance.

Keywords: ulnar variance, mid carpal inclination angle, ulnar impaction syndrome, type of lunate
carpal tunnel and median nerve volumes changes before and after carpal tunnel surgery (Comparison of endoscopic and mini open technique)

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Objectives / Interrogation: To compare carpal tunnel volume and n.medianus volume changes in preoperative and postoperative MRI of patients who were operated with 2 different techniques.

Methods: In Bahçelevler State Hospital/ISTANBUL, 17 wrists of 13 patients who were diagnosed with carpal syndrome were included to our study.

In open technique, the transverse carpal ligament was cut by inserting a 1 cm longitudinal incision 1 cm distal to the distal wrist crease. It was noted that the incision tunnel passed through the middle of the 4th finger.

Microaire Smart release system was used for endoscopic surgery. In a single portal, incision, 1 cm transverse incision was made between palmaris longus and flexor carpi ulnaris tendons over most detectable proximal wrist crease. The direction of the blade was again aimed at the 4th finger center. Transverse carpal ligament was cut distal to proximal and inferior to superior direction.

Median nerve volume and carpal tunnel volume were measured in T2 fat-printed images. The distal and proximal borders of the carpal tunnel (pisiform bone and hook of hamatum) were identified on the coronal plane. (1)

The cross-sectional widths varied between 2 mm / 3 mm according to the MRI. Depending on the length of the carpal tunnel, 4 to 11 axial sections were taken from the MRI. The image was enlarged and the area of the median nerve and carpal tunnel was marked to find the axial cross-sectional area (mm2). Each section was measured 3 times and the average of 3 numerical values was taken (mean axial area mm2). Each mean axial carpal tunnel and median nerve area was multiplied by the width to find the estimated volume. (OAA * Width)

Total of all gave us estimated carpal tunnel and median nerve volume.

Results and Conclusions: There was a significant difference between preoperative carpal tunnel volumes and median nerve volumes, postoperative carpal tunnel volumes and median nerve volumes. p<0,0001. When we compared the two methods in terms of volume increments, a significant difference was found.

When techniques are compared with each other, we can see significant difference between pre- and post-operative cts volumes or n. medianus volume.

In our study, we found that 2 different techniques succeeded in increasing the carpal tunnel and median nerve volumes, but they did not have any superiority to each other.

Keywords:
mri, carpal tunnel syndrome, endoscopic, mini open

References:
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A new finger-preserving procedure as an alternative to amputation in recurrent severe Dupuytren’s contracture of the small finger

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Objectives / Interrogation: Recurrent severe Dupuytren contracture of the small finger proximal interphalangeal (PIP) joint is a difficult problem. Further surgery and joint release carries high risk of neurovascular injuries and residual contracture. Other treatments like PIP arthrodesis or arthroplasty commonly yield poor results. Patients are often offered finger amputation. We have devised a novel surgical procedure consisting of middle phalanx monobloc resection and ligament reconstruction to create a new functional interphalangeal joint.

Methods: Two patients with severe small-finger PIP joint contracture after multiple treatments who requested finger amputation were offered and accepted this new procedure. Through a dorsal incision the extensor tendon is incised longitudinally exposing the middle phalanx and interphalangeal joints. The collateral ligaments of both IP joints are detached from the middle phalanx. The middle phalanx is dissected from soft tissues (including the flexor digitorum superficialis tendon) and removed. The distal phalanx is brought proximally and the ends of the collateral ligaments are sutured with non-absorbable sutures with the joint held in extension and congruency. The two patients were evaluated at 18 months and 15 months after surgery, respectively.

Results and Conclusions: Both patients regained good finger posture with almost full extension and had normal sensation and no pain. The first patient had 60 degrees active flexion in the newly fashioned joint and the second patient had 35 degrees. Both patients had full MCP flexion and extension, normal 2-point discrimination in the small finger and higher grip strength in the treated than the contralateral hand. Radiographs showed a congruent new IP joint. Both patients were very satisfied with the outcome.

In patients with Dupuytren disease and severe recurrent PIP joint contracture after multiple treatments, this novel procedure consisting of middle-phalanx excision and ligament reconstruction creating a new functioning interphalangeal joint has good short-term outcomes and is a favorable alternative to finger amputation. Longer follow-up will show whether these results are durable.

Keywords: -
Is night pain the most disturbing symptom for patients with carpal tunnel syndrome?

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Objectives / Interrogation: There are different factors influencing the postoperative results of carpal tunnel syndrome. Our hypothesis was that patients with preoperative night pain will be more satisfied after the neurolysis of the median nerve than those without night pain.

Methods: A retrospective study was performed based on a prospective data collection. In the period 2014 and 2018 467 patients were operated in our unit for carpal tunnel syndrome, 29 were excluded due to missing data. In all cases open carpal tunnel release was performed without synovectomy. Changes in daytime numbness, nighttime numbness, night pain, and satisfaction was registered. For the evaluation of the subjective findings, a Visual analogue scale of 1-10 (VAS) was used. The patients were selected into 3 groups according to the level of preoperative night pain. Group 1 had no night pain prior the operation, group 2 had mild night pain (2-5 VAS) and group 3 had severe night pain (6-10 VAS). Significance was evaluated using Z-test (p=0.05).

Results and Conclusions: Group 1 had 77 patients (17.6%), group 2 had 74 patients (16.9%) and group 3 had 287 patients (65.5%). The average of preoperative night pain was 4 VAS in group 2 and 8.86 VAS in group 3. Patients with severe night pain complained of significantly higher level of daytime and nighttime numbness (7.18 VAS and 8.8 VAS respectively) compared to the ones without night pain (5.58 VAS and 5.3 VAS respectively). The level of night pain decreased to a minimal level after 1 week in all groups (1.36 VAS in group 1, 1.69 VAS in group 2 and 1.72 VAS in group 3). By the third month the night pain practically disappeared in all groups (1.32 VAS in group 1, 1.31 VAS in group 2 and 1.67 VAS in group 3). 3.6 VAS daytime numbness remained for group 3 which was significantly higher than the other groups (1.69 VAS in group 1 and 2.23 VAS in group 2). The overall satisfaction by this time was 8.45 VAS in group 1, 8.8 VAS in group 2 and 8.66 VAS in group 3.

Discussion
Our hypothesis failed as no significant difference was found in the satisfaction levels of the patients with and without night pain before surgery.

Keywords:
night pain, carpal tunnel
Melorheostosis of the hand.

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Objectives / Interrogation: Melorheostosis is a rare mesenchymal dysplasia. It develops with a sclerotomal distribution, usually affecting one limb. On plain radiographs the irregular cortical hyperostosis occurring on one side of the affected bone is seen as the characteristic melting "candle wax" sign. We present two rare cases of melorheostosis of the hand.

Methods: The first case involves a 55 years old Greek woman presenting with melorheostosis of her left hand. The disease involved the lunate, the capitale, the metacarpal and the phalanges of the middle and index fingers. The patient complained for pain and dyskinesia due to bony spurs between the metacarpals, as well as the proximal and middle phalanges. At presentation flexion at the metacarpophalangeal (MCP) joint of the index finger was at 20o and at the proximal interphalangeal (PIP) joint was 0o. Although the difficulties of any surgical intervention were presented to the patient, she insisted on being operated. Under general anesthesia and tourniquet a straight incision was performed between the second and third metacarpal, while as a second straight incision at the radial site of the middle finger. Although extensive tenolysis of the extensor tendons successful, during the procedure to remove the marble-like bony spurs two saw blades were destroyed and any effort to continue stopped. A plaster cast was used for protection and rest and the patient was discharged from hospital the next day.

The second case involves a 36 years old Albanian woman who reported pain and mild stiffness at her left hand. The radiological studies revealed melorheostosis affecting the lunate, the capitate, the metacarpal bones of the middle and index finger, and the proximal and middle phalanx of the middle finger.

Results and Conclusions: Results: At three months postoperatively the first patient showed no improvement in relation to her previous condition. Also she denied any suggestion of ray amputation of any or both of the affected fingers. The second patient continues her professional as a hair stylist, without the need for any surgical intervention.

Conclusion: Literature lacks evidence considering effective surgical intervention for the cortical hyperplasia in cases of melorheostosis of the hand. Ray amputation seems as the only alternative in cases of extensive hand dysfunction, only after taking into consideration the special needs of the patient.

Keywords:
melorheostosis, "candle wax" sign, mesenchymal dysplasia, hand, rare disease
Surgical repair of dorsal capsulo-ligamentous complex for dislocation of the thumb carpometacarpal joint

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Objectives / Interrogation: Acute dislocation of the thumb carpometacarpal (CMC) joint is a rare, high-energy injury because of the strong capsulo-ligamentous complex structure. There are a few reports of this injury in the literature, and its optimal treatment remains controversial. This study aimed to evaluate the clinical outcome after surgical repair of the dorsal capsulo-ligamentous complex.

Methods: Six patients with a mean age of 42.7 years (range, 30-56 years) treated for the thumb CMC joint were reviewed retrospectively. The ruptured dorsal capsulo-ligamentous complex was repaired using suture anchors in all patients, and the joint was immobilized with a Kirschner wire pinning and splint for 3 weeks. The clinical outcome was assessed by measuring the range of motion of the thumb CMC joint and the Japanese Society for Surgery of the Hand version of the Quick Disability of the Arm, Shoulder, and Hand (Q-DASH-JSSH) score.

Results and Conclusions: The mean radial abduction of the thumb CMC joint was 61°, and the volar abduction was 59°. The mean Q-DASH-JSSH score was 4.0 (range, 0-15.6). There were no cases of infection, nerve disturbance, or osteoarthritis. Anatomical reduction of the thumb CMC joint was observed in five patients at the final follow-up. However, in a rugby football player, we found subluxation of the thumb CMC joint at 12 months of follow-up due to reinjury while playing rugby. In this patient, anatomical reduction was observed at 6 months of follow-up. Surgical repair of the dorsal capsulo-ligamentous complex with suture anchors is a reliable and simple treatment for unstable dislocation of the thumb CMC joint.

Keywords:
thumb carpometacarpal joint, dislocation, dorsal capsulo-ligamentous complex
**Arthroscopic Anatomic Allinside (3A) reconstruction of the TFCC**

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**Objectives / Interrogation:** To report the preliminary experience on a novel technique of arthroscopically assisted tendon graft reconstruction of the Triangular Fibrocartilage Complex (TFCC) in the treatment of Distal Radio-Ulnar Joint (DRUJ) instability resulting from irreparable tears.

**Methods:** The technique uses a 3mm strip of the ECRL tendon, which is introduced in a radial metaphyseal tunnel originating from the anatomical sites of insertion of the DRUJ ligaments at the edges of the sigmoid notch. The tunnel is created under arthroscopic control using a wrist drill guide. The ulnar tunnel accepting the extremities of the tendon graft is created with an in-out technique, under arthroscopic control, to allow for the intra-articular fixation of the graft, using an interference screw. Postoperative immobilization with restricted forearm rotation was discontinued at 5 weeks, then post-operative rehabilitation was started. This novel technique was used in 5 patients, that were reviewed at minimum follow-up of 18 months. The DRUJ stability, visual analog scale of pain (VAS), ability to return to work, Prono-Supination range, grip strength and the Mayo Wrist Score were used for evaluation.

**Results and Conclusions:** We had no intra-operative complications. All patients had a stable DRUJ at follow-up and returned to previous work. VAS was significantly reduced and Prono-Supination, grip strength, and Mayo Wrist Score increased post-operatively. Compared to the previously described techniques of tendon graft reconstruction of the TFCC, this novel technique shows the main advantage to replicate the anatomic location of the tendon graft on the radius, which is achieved totally under arthroscopic control, without the need of fluoroscopy, with limited periarticular surgical dissection.

**Keywords:** TFCC, irreparable tears, reconstruction, Arthroscopy, Tendon graft
Fingertip Amputation - Different Injuries, Different solutions

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Objectives / Interrogation: The distal phalanx of fingers has a significant relevance in hand functionality and finger aesthetics. Therefore, it must be replanted in case of amputation. Microsurgical reimplantation is widely accepted as the technique which provides the best outcome. The main difficulties lie in the adequate anastomosis of the vessels due to the small calibre of the veins at this level and a high degree of vasospasm, especially in crush amputations.

Methods: PMO, male, 55 years old, suffered a serious traumatic injury to his left index and third fingers due to a crushing/cutting accident with a heavy metal sheet. The patient did not smoke and had a previous history of hypertension and angina pectoris (both were controlled with medication).

The index finger suffered a complete amputation at the level of the base of the nail plate and had bone exposition. The third finger suffered an incomplete amputation at the DIP joint level; nonetheless the deep flexor tendon was the only structure connected to the proximal portion of the finger. The fingertip was clearly ischemic.

The patient was quickly transferred to the operating room (8 hours of ischemia). In the index finger we proceeded with debridement, bone shaping and coverage with a volar advancement flap (Atasoy). In the third finger we opted to try to salvage the fingertip. First, we removed the remaining bone fragments and fused the middle and distal phalanx with 2 Kirshner wires. Then we repaired the extensor apparatus and the collateral nerves. After that we anastomosed the collateral ulnar artery and a central dorsal vein. At the end of the surgery, after tourniquet release, the fingertip was perfused. Finally, the skin was closed with few simple sutures and an occlusive dressing was applied.

Results and Conclusions: 6 months postoperatively the patient has complete range of motion in the MCP and PIP joints of the index and 3rd finger and a good sensitivity in both finger pulp (static 2-point discrimination of 4 and 5 mm, respectively). The patient is very happy with the functional and aesthetic result.

Conclusion
Fingertip traumatic amputations are always a difficult challenge to solve. Microsurgery reimplantation offers the best outcome possible. Two of the most important factors for its success seem to be the mechanism of injury and hot ischemia time. Prompt revascularization with a skilled microsurgical technique is the most effective treatment.

Keywords:
reimplantation; anastomosis; ischemia; fingertip
Modified Arthroscopic Resection Arthroplasty for isolated STT osteoarthritis

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Objectives / Interrogation: Distal resection of the scaphoid is known as an arthroscopic treatment of isolated STT osteoarthritis as an alternative treatment to open procedures, like resection arthroplasties or STT Fusion. Due to the insertion of carpal ligaments on the distal scaphoid, which are promoting mediocarpal stability, we prefer the arthroscopic resection distally on the trapezoid and the trapezium (TT-RSA) without resection of the scaphoid. We are presenting the follow up of our modified procedure (n=20) with the objectives on pain reduction, functional scores and patient satisfaction.

Methods: N=24 arthroscopic TT-RSAs were included in the study after exclusion of 3 patients with the need of secondary procedures and exclusion of resection arthroplasties with simultaneous surgeries on the carpus or the wrist. Average follow up time was 16,7 months. Patient age was 58,8 years on average. We evaluated qDASH and pain score VAS (0-10) in rest and on exertion preoperatively, after 6 months and on follow up. Also grip strength, key and pulp pinch and patient satisfaction was evaluated.

Results and Conclusions: QDASH in the ongoing study is 51,2 ± 18,5(SD) preoperatively, 32,4 ± 22,3 six months postop and 12,7 ± 15,9 on follow up. Resting pain is reduced from 4,9 ± 3,0 VAS preoperatively to 1,2 ± 2,2 on follow up. Pain on exertion is reported with 8,0 ± 2,1 preoperatively and 3,3 ± 2,7 on follow up. Patients are largely pleased with the procedure and recommend it. Grip strength was 80% of the contralateral side, pulp and key pinch 90,5% and 95,2% respectively.

Conclusions: Arthroscopic resection arthroplasty of the trapezoid and the trapezium (TT-RSA) can be recommended as a minimal invasive procedure and shows a major pain reduction for isolated STT osteoarthritis, if a preexisting mediocarpal instability is ruled out as the leading cause for the STT osteoarthritis.

Keywords:
STT, osteoarthritis, arthroscopy, resection arthroplasty
May be the arthroplasty with spacer the best solution of CMC arthrosis in under seventy patients.

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Objectives / Interrogation: Maintenance of high of trapezium-metacarpal joint should be the aim in the CMC arthrosis Eaton's stage 2-3 surgery in under-seventy patients.

Methods: I used two different spacers in in my personal series of 190 consecutive cases of: Arthroplasty in CMC arthrosis, stages 2°-3° Eaton classification.
One hundred forty  cases with Pirodisk (pirocarbon spacer, age thirty-eight to sixty-five, follow up from ten to one year ), fifty cases Reg Joint (poliLactid acid biosorbable spacer, age from 45 to eighty-one, follow up five to one years).
The same technique for the Reg Joint, created an hole with specific tools into the biosorbable spacer.
The terminal end of FRC split is used to reconstruct the CMC dorsal ligament, "reinforced" from ALP detached from the 1° metacarpal base.
One hundred-ten (eighteen bilateral), twenty man (two bilateral) in Pirodisk series, forty women (four bilateral) and six man in Reg-Joint series.

Results and Conclusions: All patients were evaluated clinically, at 15, 30, 60 e 90 days, only twenty rx control and three Tc were done in first five months for persistent wrist pain.
One hundred and sixty-five patients compiled the quick-D.A.S.H. (Short disability of Harm-Shoulder and Hand) questionnaire (the average value was 17.5 point (from 13 to 28).
Kapandy value 8-10, (average nine)
Pain: V.A.S. 1.8 average (range 1-4), was 5.5 before surgery.
Pinch 4.6 (was 3.4 before surgery because of pain) similar to the other hand.
Grip: average 18.5 Kg (was 13 before surgery), 22 kg the value of the other hand.
No statistically difference were find between two groups.
All patients reached their best range of motion and were able to restart the normal work related activities in 2 to 6 months (average 2.8 months).
Eight patients were treated for trigger thumb and six for Dequervain disease at four-eight month from first surgery in Pirodisk series, only two woman was re-operated after eighteen months, replacing with reg-joint spacer.
On conclusion 90% of very-good and good results, 9% fair, 1% bad (two cases in pirodisk serie).

Keywords:
CMC arthrosis, rizoarthrosis.

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Objectives / Interrogation: In this study, we introduce an innovative and new approach to the production of 3D printed orthosis in hand surgery on the example of a mini orthosis for mallet finger.
Frequent problems in the therapy of mallet fingers are prefabricated finger orthoses, that lead to insufficient results. Since individualized thermoplastic orthosis are not available in every setting, a new approach is software assisted planning of individualized orthosis and 3D printing. We have developed a new design for a DIP orthosis and present a pilot study.

Methods: We treated 10 patients with fresh or old (<6 months) extensor tendon rupture (Zone 1) or after failed treatment in a prefabricated orthosis. Patients received a preliminary thermoplastic orthosis, that was individually fitted with the aim of a mild overextension in the DIP joint (-10°). A hand laser scan was performed of the affected digits. 3D mesh-software customization of the orthosis was performed according to the fingerscan and 3D printing with PA12 executed. A thermoplastic orthosis was kept by the patient as a backup. After 8 weeks and 12 weeks, ROM was measured and patient feedback for haptic, comfort and restrictions of daily use was inquired.

Results and Conclusions: After 8 weeks, all patients in the ongoing study reached an extension deficit of 0° to 10°. The haptic experience was graded 8.5 (1-10), comfort was graded 7(1-10). 3 patients complained of pressure problems which required the printing of new modified orthosis. In total patients wore 70% of the time the 3D print orthosis, but changed back to the thermoplastic orthosis for 30%. All patients would undergo the treatment with the 3D orthosis again. Patents with prior treatment with a confection orthosis graded the 3D orthosis as very superior to the prefabricated orthosis. When directly compared to the thermoplastic orthosis, patients rated the experience comparable.

Conclusions: We demonstrate the therapeutic ability of individualized 3D printed orthosis for Zone 1 extensor tendon injuries. Advantages are comfort, haptic experience, waterproofness and long-term stability of the orthosis. Treatment goals were achieved, even after unsuccessful treatment as a second line therapy. Patients reflected a comparable rating and feedback as thermoplastic orthosis from our specialized hand therapists. Therefore 3D printing could offer an individualized treatment, even if - as in many hospitals or practices - there is no specialized occupational therapy with a broad orthosis experience.

Keywords: orthosis, 3D print, mallet finger, hand scanning
Pacinian neuromas and neurofibromas: an uncommon cause of pain in the hands and fingers. Literature review.

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Objectives / Interrogation: The study’s aim was to review the literature regarding the epidemiological, clinical, radiological, and histological characteristics of the Pacinian corpuscle neuromas (hyperplasia) and neurofibromas in the hand and fingers, in order to support clinicians in managing tumors responsible of unclear symptomatology in the hands and fingers.

Methods: A search of PubMed, Medline, Embase, Cochrane, and Google Scholar databases was undertaken, without restriction on date, language or publication status. The mesh terms used were "pacinian" or "pacini", "tumor" or "corpuscle tumor" or "neuroma" or "hyperplasia" or "hypertrophy" or "pacinioma" or "neurofibroma", and "hand" or "finger". Of the 1050 articles found, 67 met the inclusion criteria. Among these, 55 articles referred to Pacinian tumors at the level of the hands and fingers, and 12 articles referred to anatomical, histopathological, radiological and immunohistochemical studies regarding the Pacinian corpuscles without reporting a specific clinical case. All the case reports and cases series included in our final selection were evaluated for quality assessment by the first and last authors.

Results and Conclusions: A total of 72 tumors affecting the Pacinian corpuscles of the hand and fingers were identified, among which 58 cases (80.6%) were labeled as Pacinian corpuscles neuroma or hyperplasia (PCNH) and 14 cases (19.4%) as Pacinian corpuscle neurofibroma (PCNF). To the best of our knowledge, this is the largest review published. We found statistically significant difference between PCNH and PCNF in terms of age of appearance (50.2 vs. 31.1 years, p = .001), presence of pain (84.6% vs. 40%, p = .002), of sensory changes (57.9% vs. 0%, p = .027), of a visible or palpable mass (48% vs. 85.7%, p = .012), and history of trauma (64.2% vs. 12.5%, p = .006). Furthermore, the recurrence rate is not insignificant (21.2% for PCNH and 50% for PCNF, p = .244).

In conclusion, PCNH and PCNF behave differently with respect to their epidemiological and clinical presentation. Imaging may support the differential diagnosis with other common painful lesions of the hand. These findings are in contrast with previous reports, which decried the value of clinical signs in favor of a diagnosis mostly based on the histological examination. Accurate anamnestic data collection and clinical examination are essential to differentiate these conditions, while pathology tests are important to confirm the diagnosis.

Keywords:
Pacinian corpuscle neuroma, Pacinian hypertrophy, Pacinian hyperplasia, Pacinian neurofibroma, hand tumor
LONG-TERM RESULTS OF TREATMENT OF RADIO-SCAPHOID ARTHRITIS AND SNAC WRIST BY USE OF PYROCARBON IMPLANT (APSI)

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Objectives / Interrogation: Adaptive proximal scaphoid implant (APSI), maintaining carpal height and replacing an articular surface, prevents the worsening of arthritis and carpal collapse. Good tolerance of Pirocarbon and conformation of the implant give good expectations when there are lesions of styloscaphoid articulation.

AIM: In this retrospective study the authors describe their experience with the use of a Pirocarbon implant for proximal scaphoid in styloscaphoid arthritis linked to SNAC and SLAC wrist.

Methods: From January of 1999 to January of 2018 93 wrists were treated (85 for SNAC wrist from scaphoid pseudoarthrosis grade 2 and 3; 8 for SLAC wrist from S-L lesion). All cases were evaluated pre and post-operatively with MMWS, PRWHE and DASH scores with an average follow-up of 96 months (min 6 - Max 208).

Results and Conclusions: All the patients reported relief from pain, small improvement in ROM and improvement strength. At the follow-up there was an average reduction of pain from 7,01 to 2,7 VAS. There was an improvement of grip and pinch force from 51% to 85% of controlateral side. 85% of the patients were satisfied with the results and were able to return to the precedent activities. Improvement of DASH from 89 to 29 and of PRWHE from 101 to 27,8. Radiographic controls revealed 6 cases of complication with 4 cases of dislocation of the implant, no reduction in carpal height nor worsening of radio-lunate angle.

Replacement of proximal pole of scaphoid with APSI can restore a functional range of motion free from pain in patients affected from styloscaphoid arthritis maintaining height of proximal carpal row and preventing subsequent deterioration or collapse.

Keywords:
APSI, pyrocarbon implant, proximal scaphoid
ARTHROSCOPIC TREATMENT OF DORSAL WRIST GANGLIA: INFLUENCE OF DORSAL CAPSULODESIS

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Objectives / Interrogation: Dorsal wrist ganglia have been associated to mucoid dysplasia and anatomically related to dorsal scapholunate ligament complex. Arthroscopic treatment has lead to faster recovery and allowed simultaneous treatment of concurrent lesions during wrist assessment. High recurrence rates are nevertheless a concern. Here, the authors compare clinical results after arthroscopic treatment of dorsal wrist ganglia using arthroscopic excision alone and arthroscopic excision combined with dorsal capsulodesis.

Methods: A retrospective study included 19 patients (3 male and 16 female) with dorsal wrist ganglia submitted to arthroscopic excision (Group A, n= 10) or arthroscopic excision and dorsal capsulodesis (Group B, n= 9), between January 2011 and December 2017. Clinical evaluation included wrist range of motion, power strength and grip strength measures. Visual Analogue Scale (VAS) for pain and Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire were applied. Statistical analysis was displayed with Graph Pad Prism 6 for Windows 10.

Results and Conclusions: After 42.27±17.74 months of follow-up (range 14.97±81.81), mean range of power strength, pinch strength and range of motion values were all above 80% of the contralateral side for both groups. Post-operative pain was significantly lower for both groups (Group A: VAS 6,88±2,03 vs 1,94±2,82; Group B: VAS 6,86±2,04 vs 1,81±1,94; p<0.05). Average DASH score was 3,50±7,84 for Group A and 2,87±3,64 for Group B. There were no significant statistical differences for functional parameters between Group A and B. Recurrence rate was 30% for Group A and 11% for Group B. There were no registered complications.

Arthroscopic treatment of dorsal wrist ganglia by excision allows good functional results and significant improvement of preoperative pain with no major associated complications. According to our data, when performing routine dorsal capsulodesis simultaneously, positive results are maintained. The association of ganglionectomy and dorsal capsulodesis in our series allowed a significant lowering in recurrence rates (11%) in a short-term follow-up. We believe that dorsal scapholunate ligament complex might play a role in dorsal ganglia pathogenesis and recurrence. However, prospective studies with randomization, larger samples and longer follow-up periods are needed to validate these results.

Keywords:
Dorsal wrist ganglion; Dorsal capsulodesis; Recurrence rate
Should I stay or should I go - how safe is the routine removal of volar locking plates after healed fractures of the distal radius?

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Objectives / Interrogation: We present our experience with removal of locked volar distal radius plates and screws and note the different complication rates between medically indicated (MI) and non-medically indicated (NMI) hardware removal.

Methods: We retrospectively reviewed all distal radius fractures treated with volar locking plates at our institution from 2003 to 2018 (1,473 cases) and identified those who underwent hardware removal. Patients were divided into two groups (MI and NMI) according to their indication for implant removal.

Results and Conclusions: A total of 66 patients (42 women, 24 men) underwent hardware removal (incidence 4.5%). The average age was 53.3 years (min 19, max 87). The MI group consisted of 31 patients (47%) and the NMI group of 35 patients (53%). According to the AO classification, there were 18 type A (27.3%), 7 type B (10.6%), and 41 type C (62.1%) distal radius fractures. The average interval between initial trauma and primary osteosynthesis was 5.6 days (min 0, max 100). The most common indications for hardware removal in the MI group were limited range of motion (n = 14), post-traumatic CTS (n = 6), ulnar impaction syndrome (n = 4), mechanical problems (n = 3), pain with identifiable source (n = 3), and tenosynovitis (n = 1), while in the NMI group the indications were patient’s wish (n = 33) and pain without an identifiable source (n = 2). The mean length of implantation was 63.8 weeks (range, 9-557). Overall there were 5 complications (4 persistent pain, 1 hematoma requiring revision) (incidence 7.6%). All complications occurred in the MI group (16.1%) (p = .02). There were no statistically significant difference between the two groups in terms of age (p = .70), gender distribution (p = .89), type of AO fracture (p = .87), time interval between injury and initial osteosynthesis (p = .29), and time between osteosynthesis and hardware removal (p = .34). Conclusion: We found statistically significant difference in the rate of complication between medically and non-medically indicated hardware removal following volar locking plate fixation of distal radius fracture. Non-medically indicated hardware removal of a healed distal radius fracture treated with volar locking plate is a safe procedure.

Keywords:
hardware removal; distal radius fracture; complications; indications; volar locking plate.
LONG-TERM RESULTS OF TREATMENT OF SCAPHO-TRAPEZIUM-TRAPEZOID (STT) ARTHRITIS BY USE OF PYROCARBON IMPLANT (STPI)

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Objectives / Interrogation: Scapho-Trapezium-Trapezoid (STT) arthritis is commonly treated by isolated distal scaphoid resection or plus biologic interposition. Isolated distal scaphoid resection can reduce carpal height developing DISI deformity in long term follow up. Scapho trapezium pirocarbon implant (STPI) is used as a spacer to maintain carpal height and reduce long term DISI deformity. Good tolerance of Pirocarbon and profile of the implant give good life expectancy.

AIM: In this retrospective study the authors describe their experience with the use of a Pirocarbon implant for distal scaphoid in STT arthritis.

Methods: From January of 2007 to September of 2018 42 wrists (Viegas 1 and 2) of 36 patients were treated. All cases were evaluated pre and post-operatively with MMWS, PRWHE and DASH scores with an average follow-up of 72 months (min 3 - Max 138). 6 cases were treated bilaterally.

Results and Conclusions: There was an average relief from pain, no significant improvement in flexion extension ROM and significant improvement grip and pinch strength. At the follow-up there was an average reduction of pain from 7,01 to 1,7 VAS. There was an improvement of grip and pinch force from 51% to 88% of contralateral side. 85% of the patients were satisfied with the results and were able to return to the precedent activities. Improvement of DASH from 89 to 15,6 and of PRWHE from 101 to 19. Radiographic controls revealed 6 cases of complication with 1 case of dislocation of the implant, light reduction in carpal height in 4 pz and average radio-lunate angle passed from 11° pre-operatively to 14° post-operatively.

Replacement of distal pole of scaphoid with STPI can restore a good functionality of wrist and pinch, a complete range of motion free from pain in patients affected from STT arthritis maintaining carpal height and avoiding increase of capito-lunate angle or collapse.

Keywords:
STT arthritis, STPI, Pyrocarbon, Distal scaphoid, wrist arthritis
Results of fascia lata interposition arthroplasty for elbow ankylosis

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Objectives / Interrogation: Elbow ankylosis is a predictable complication in severe complex trauma of the distal humerus or the proximal end of the ulna in which, in addition to stiffness, there is an important joint compromise but no prosthetic replacement is indicated. In young and motivated patients the recovery of the articulation can be restored with the interposition arthroplasties with ition of fascia lata. The aim of the work is to report our experience of a series of five patients operated between the years 2009 and 2017 with this method.

Methods: Five patients were operated by means of elbow arthrolysis, posterior skin access with a deep medial access with epicondylar osteotomy and fascia lata interposition (age 35, 40, 50, and 45 years - 2 women 3 men). In two cases at the end of surgery and ligament reconstruction it was necessary to use the external fixator to protect the reconstruction permitting immediate active movement. In the remaining three cases the elbow had good residual stability and was not protected after surgery. The minimum follow-up was 2 year, the maximum of 9 years. Four times the operated side was the dominant side. Regarding the etiology there were four post-traumatic cases and one post-coma. Ankylosis was present at 90 ° in 3 patients and at 80 and 70 ° in the others. Patients were evaluated with the mayo Elbow Performance Score MEPS. Once the fascia was harvested from a patient's triceps in all the others from tissue bank. Every time the fascia was folded on itself and secured by holes to the distal humerus. The principles of technique are shown in the presentation.

Results and Conclusions: Results
The mean age was 43 years (range 36 to 59 years) at time of surgery. There were no major complications. In all patients a degree of satisfactory particularity was achieved without pain that allowed to bring the hand to the mouth in 4 cases and 5 cm from the face in the last case. There were no cases of secondary instability. The average extension deficit was 40 degrees (SD +/- 10). Two cases were classified as excellent (MEPS>80), two good (MEPS>60) and one fair (MEPS > 40).

Conclusion
Elbow interposition arthroplasty with fascia lata or tricipital fascia is a valid alternative in patients with severe functional limitation who have no indication for an elbow prosthesis (young, active patients). The addition of distraction and external fixation, in conjunction with ligament reconstruction, has addressed the instability problem and therefore improved results.

Keywords:
elbow ankylosis, interposition arthroplasty elbow
The United Kingdom experience of trainee led multicentre prospective studies in hand surgery

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Objectives / Interrogation: The evidence base for hand surgery is low quality. Most evidence is level III or below and there are few randomised controlled trials. The Reconstructive Surgery Trials Network (RSTN) was founded in 2013. It is the UK clinical trials network for hand and plastic surgery and part of the Royal College of Surgeons Clinical Trials Initiative. It is supported by the BSSH and BAPRAS. The aim was to review the progress of the RSTN after 5 years.

Methods: The review assessed the hand surgery studies supported by the RSTN. It focused on the experiences of collaborators involved in the studies, the study outputs and subsequent impact.

The RSTN has developed its own systems involving the early adoption of a range of technical innovations to support its work. These were reviewed to identify successes and challenges that might benefit other groups.

Results and Conclusions: The RSTN has supported eight hand surgery projects. It is developing a core pathway for the workup of studies, typically including systematic reviews, clinician and patient surveys, and prospective cohort studies before randomised controlled trials. Topics include: nail bed repair, antibiotics in hand surgery, splinting in hand conditions, hand trauma, placebo arm studies, use of Kirschner wires and trigger finger.

A national network of local representatives has been recruited to stimulate involvement, and these reps and study collaborators have been managed using videoconferencing and mailing list management programs. Annual national trials days have become a focus for new study ideas and provided trial methodology to surgical trainees.

To date the studies have generated over 20 publications and presentations. Over 100 collaborators have been PubMed cited and €1M grant money raised. One RCT is recruiting and a further three are in the pipeline. Two studies have an international component. Successes have included the involvement of a large number of trainees, delivering projects on small budgets and impact of studies. Challenges have included geographical location, maintaining engagement and lack of resources.

Trainees are willing to engage in clinical research. They are capable of setting up multicentre studies that attract funding. More needs to be done to support high quality multicentre clinical research that will make a positive contribution to the evidence base in hand surgery. We present this on behalf of the RSTN committee and our collaborators.

Keywords:
randomised controlled trial, research, hand surgery
Outcome of terrible triad injury of the elbow: do concomitant fractures make a difference?

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Objectives / Interrogation: Terrible triad injuries (TTI) of the elbow are challenging to treat. Aim of this study was to compare the clinical, functional and radiological results from the treatment of these complex fracture-dislocations with or without associated ipsilateral injuries of the upper extremity.

Methods: Twenty-one patients treated for terrible triad injuries of the elbow were retrospectively reviewed at an average follow-up of eighteen months. Group I (n = 9) included patients with isolated TTI and Group II (n = 12) patients with TTI in addition to fractures of the ipsilateral upper extremity. Initial treatment after closed reduction of the dislocation included splint immobilization or temporary external fixation. Treatment of the radial head and of the coronoid fracture was in the majority of cases surgical while both lateral ulnar and medial collateral ligament were managed mostly conservatively.

Results and Conclusions: Overall results were good, with VAS, DASH and MEPI measuring on average 1.5, 16.9 and 89.8, respectively. A high-energy trauma (p = .023) and the use of an external fixator as initial treatment (p = 0.19) were significantly more correlated to patients in Group II than in Group I. MEPI scores were significantly higher for patients in Group I than in Group II (p = 0.46), although both groups had scores corresponding to good and excellent functional results. No difference was found between the two groups in terms of complication rates or heterotopic ossification.

Conclusion: The presence of associated ipsilateral injuries of the upper extremity in patients suffering from terrible triad injuries of the elbow affects the initial treatment, whereas the overall clinical, functional and radiological results are similar to that of patients with isolated injuries of the elbow.

Keywords:
terrible triad injury; elbow dislocation; radial head fracture; coronoid process of the ulna fracture
Use of Processed Human Nerve Allograft in Reconstruction of Brachial Plexus Birth Injuries

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Objectives / Interrogation: To describe our experience with the use of processed human nerve allograft in the reconstruction of brachial plexus birth injuries.

Although the standard approaches to reconstruction of defects in the brachial plexus include sensory nerve autografts and nerve transfers, the availability of processed decellularized nerve allograft presents another option, which may be used in lieu of, or in addition to nerve autografts and nerve transfers.

Methods: The study design consisted of a retrospective review of the medical records of patients who underwent brachial plexus reconstruction that involved the use of processed human nerve allograft at our hospital from April 2012 to October 2013. Thirteen patients met the inclusion criteria for the present study. All patients underwent nerve grafting using a processed nerve allograft. All operations were performed by the same surgeon (JAIG).

Results and Conclusions: Results:
The participants ranged in age from 6 to 12 months. Of the 13 patients, 7 were female (54%) and 6 were male (46%). 7 were affected on the left (54%) and 6 were affected on the right (46%). 9 patients sustained upper plexus (Erb's) injuries (69%); 2 patients sustained extended Erb's injuries (15%) and 2 patients sustained global injuries (15%). 7 patients underwent concomitant spinal accessory to suprascapular nerve transfer (54%). Concomitant autograft was used in 5 cases: sural nerve autograft was used for reconstruction in 4 cases (31%) and cervical plexus autograft was used in 1 case (8%).

The number of processed nerve allografts used in each case ranged from 1-2; two patients each received 2 grafts. The length of processed nerve allograft ranged from 3.0-4.7cm with average length of 4.2cm. The allograft was placed in an end-to-end fashion in 4 cases (31%) and end-to-side fashion in 9 cases (69%). The donor signal was obtained from the C5 and/or C6 nerve roots and the recipient sites included the suprascapular nerve, anterior and posterior divisions of the upper trunk and the middle trunk.

Conclusions:
Although the observed recovery in many of the patients cannot be exclusively attributed to the use of processed nerve allograft, the results of the present study suggest that processed nerve allografts may be used in a supplemental fashion in reconstruction of brachial plexus birth injuries.

Keywords:
obstetrical brachial plexus injury, processed nerve allograft
Assessment of surgical treatment for carpal tunnel syndrome. Endoscopic vs Open release.

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Objectives / Interrogation: To compare the clinical and functional results of surgical treatment of carpal tunnel syndrome between endoscopic and open techniques release

Methods: Cases series study that included patients who underwent either open or endoscopic release. The open technique was performed using the conventional palmar approach and endoscopy was carried out using Agee's one-portal technique. Immediate complications and progress within the first month after surgery were assessed. Long-term assessment was conducted. This included assessment of functionality (DASH), strength (level II JAMAR dynamometer) and level of pain (VAS) Additionally, satisfaction with the outcome (improvement of symptoms) and procedure (recovery process) was evaluated

Results and Conclusions: 408 procedures (open 184, endoscopic 224) performed in 331 patients with a mean age of 56.3 ± 13.5 years were included, 85.5% being women. Axonal injury (7.1%) and thenar atrophy (24.3%) were similar between treatment groups (p>0.05). During the open procedure 22.8% of cases needed associate surgical procedures as compared with 1.8% in the endoscopic group (p<0.05) The most common associate procedures were flexor tenosynovectomy and trapeziectomy with tenosuspension, among other. No statistically significant differences were observed between either open or endoscopic techniques in relation to intraoperative complications or infection. Adequate improvement of symptoms was observed in 98.3% of patients and need of physical therapy was more common for the open technique. A higher incidence of pillar pain, wound pain and scar adhesions within the first month was found for the open technique (p<0.05)

A total of 78 patients was contacted to evaluate long-term outcomes, with a mean follow-up of 28 months. The DASH scale showed an average of 3.2 points. No differences in symptom relapse or long-term pain were observed (p<0.05) Grip and pinch strength was more than 80% on the non-compromised side in the majority of patients

Patients who underwent the endoscopic technique showed greater satisfaction in relation to the surgical procedure and initial recovery (open 70%, endoscopic 98%, p< 0.05) but there were no differences regarding satisfaction with respect to the final outcome of either technique (p >0.05).

Conclusions: Although long-term clinical and functional outcomes were similar, the endoscopic technique showed faster recovery, less complications within the first month, reduced need of physical therapy during recovery and greater level of patient satisfaction

Keywords:
Carpal tunnel syndrome, open carpal tunnel release, endoscopic carpal tunnel release, surgical treatment.
PERILUNATE FRACTURE-DISLOCATIONS: CLINICAL AND RADIOLOGICAL RESULTS WITH A MINIMUM 2-YEAR OF FOLLOW-UP

List of authors:
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Objectives / Interrogation: Perilunate dislocations are complex wrist injuries. Despite optimal treatment, permanent partial loss of wrist motion and grip strength is expected. Due to its rarity, only few reports including treatment outcomes exist in the literature. Here, the authors describe clinical and radiological results after perilunate dislocations and fracture-dislocations.

Methods: Retrospective study including 12 patients that underwent surgery for closed perilunate dislocations and perilunate fracture-dislocations of the wrist, between January 2012 and December 2016. All patients were male and mean age was 34.54±11.96 years old (range 22-56). Clinical evaluation included wrist range of motion, power strength and grip strength measures. Visual Analogue Scale (VAS) for pain and Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire were applied. Radiological assessment was performed with plain radiographs. Statistical analysis was displayed with Graph Pad Prism 6 for Windows 10.

Results and Conclusions: After 49.94±16.47 months of follow-up (range 25.60±76.50), mean range of motion values (comparing to contralateral side) were: flexion 89.63±50.59%, extension 60.81±26.87%, radial deviation 72.84±34.48%, ulnar deviation 77.77±35.81%, pronation 101.97±11.97% and supination 79.57±31.92%. Mean power strength and pinch strength were 82.18±16.68% and 91.09±27.16%, respectively. Post-operative pain and DASH score were 2.58±2.93 and 10.77±12.37, respectively. The mean carpal height ratio was 1.54±0.08 (range 1.44-1.64) and the mean scapholunate angle was 50.73º±9.95º (range 32.00º-66.00º). Arthritic changes were found in 25% of the patients. Two patients had a scaphoid non-union. One patient developed scapholunate dissociation. DASH scores correlated with supination and power strength and pinch strength (p<0.05), but not with other motion parameters neither radiological results. Age significantly correlated with final degenerative changes (p<0.05).

Our data overlap current literature on what concerns functional results. Most of the parameters reach 80% of the contralateral side values. Lower extension values do not correlated with DASH scores, meaning those are still acceptable results for these patients. Carpal height ratio and scapholunate angles were preserved for the majority of the patients. We believe that the low rate of degenerative changes comparing to other papers could be explained by the shorter follow-up period. Age might pose as an important indicator for wrist arthritis.

Keywords:
Perilunate dislocations; Fracture-dislocations; Wrist arthritis
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Abstract no.: IFSSH19-1786

EVALUATION AND MANAGEMENT OF TFCC INJURIES

OBJECTIVES / INTERROGATION: Our primary objective is to describe TFCC injuries that required treatment in three different clinical scenarios. Additionally, to correlate the physical exam and MRI with the arthroscopic findings.

METHODS: Retrospective study including 105 patients and 107 wrists with TFCC injuries treated arthroscopically between January 2015 and July 2018.

We included patients with DRUJ instability (69), ulnar impaction syndrome (25) and patients with arthroscopic indication different from TFCC injury (13). Only were included patients who required treatment. Patients with distal radius fracture were excluded.

TFCC injuries were classified according to Palmer and Atzei classifications.

All physical examinations and MRI results were compared with the arthroscopic findings.

No functional results were evaluated.

RESULTS AND CONCLUSIONS: From a total of 107 wrists, 63% presented type 1B injuries, 14% type 2A, 9% type 1C, 7% type 1A and 3% type 2C according to Palmer.

In the type 1B injuries group, 72% presented type 3 injuries and 27% type 2 according to Atzei.

In the DRUJ instability group 83% presented type 1B injuries. In the ulnar impaction syndrome group 40% presented type 1B injuries and 32% type 2A. In the miscellaneous group the findings were heterogeneous without trends.

In the main group 88% presented a positive fovea sign and 72% a positive ballottement test.

The DRUJ instability group and the ulnar impaction syndrome group they both presented a positive fovea sign in all cases. 97% of the DRUJ instability group and 40% of the ulnar impaction syndrome presented a positive ballottement test.

In the miscellaneous group those findings were not seen.

Only in three cases the MRI was entirely coincident with the arthroscopic findings.

The DRUJ instability appeared to be highly suggestive of proximal tear of the TFCC.

In patients with ulnar impaction syndrome we need to consider the existence both proximal and degenerative injuries.

The fovea sing seems to be highly sensitive for TFCC injuries, and the ballottement test highly specific for proximal tears.

The MRI not prove to be a useful tool to diagnose or rule out clinically relevant injuries of the TFCC.

KEYWORDS:
triangular fibrocartilage complex, arthroscopy, foveal tear, DRUJ instability, fovea sign, ballottement test.
RECONSTRUCTION OF THE DISTAL RADIOULNAR INSTABILITY BY USING THE EXTENSOR RETINACULUM

List of authors:
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Objectives / Interrogation:
Disturbances of the distal radioulnar joint (ARUD) are relatively common and its instability presents a diagnostic and therapeutic challenge due to the biomechanical complexity of this joint.
In cases without arthrosis, where direct repair of CFCT is no longer possible, reconstructive techniques are the most indicated, but in general, they do not present satisfactory results.
Objective: to evaluate the effectiveness of extensor retinaculum in the treatment of chronic distal radioulnar joint (DRUJ) instability through clinical and radiographic results. Is it effective?

Methods: The casuistry consists of ten cases, three of which are female. The mean age was 41.75 years and the mean time between the trauma and the surgical procedure was 13 months. In the surgical technique, after the reduction and fixation of the (DRUJ), the extensor retinaculum is used, which is disinserted from its ulnar insertion, maintaining its support base in the third extensor compartment. Divided into two tapes that are traced and fixed to the ulna with metal anchors of 2.7mm under maximum tension. The kirschner wire and the immobilization are maintained for 6 weeks.

Results and Conclusions: Joint stability occurred in the postoperative period in 100% of the cases. There was improved DASH after surgery for all patients from 74.6 to 38.3. The EVA presented a mean decrease from 8.5 to 4.0, in the active postoperative period and 1.0 at rest. All joint movements evaluated were improved. There was a mean palmar grip strength gain from 13.5kgf to 19.0kgf. There was a statistically significant improvement of all these parameters, with the exception of joint range of motion. In the radiographic evaluation, in all cases, the DRUJ congruence was obtained in the immediate postoperative period.
Conclusion: the technique of using the extensor retinaculum to stabilize chronic lesions of the distal radioulnar joint is effective and obtains good clinical and radiographic results.

Keywords:
Distal Radioulnar Joint, chronic instability, extensor retinaculum, ligament reconstruction
Radial Nerve Palsies Associated with Paediatric Supracondylar Humeral Fractures: A Caution in the Interpretation of Neurophysiological Studies

List of authors:
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Objectives / Interrogation: Traumatic and iatrogenic neurological complications associated with paediatric supracondylar humeral fractures are well recognised. The severity of the nerve injury associated with supracondylar humeral fractures can be difficult to assess clinically and relies upon clinical progression or absence of recovery and neurophysiology. It is accepted that complete nerve palsy with neurophysiological complete block and absence of clinical recovery after three months requires surgical exploration and reconstruction. However, we argue that even a partial nerve palsy that is failing to recover as expected by three months should be explored even when the neurophysiology suggests the nerve is in-continuity.

Methods: We report two cases of closed Gartland type III paediatric extension-type supracondylar humeral fractures treated with open reduction and internal fixation. Both children developed persistent post-operative radial nerve motor palsy. Neurophysiological studies sought prior to exploration indicated a degree of sensory nerve function in both cases, indicating a nerve in-continuity.

Subsequent surgical exploration revealed interfragmentary radial nerve compression at the fracture site at two levels in one case and at one level in the second case. The site of compression was excised and the nerve grafted. Excellent near normal radial nerve recovery was achieved except for the persistent loss of extensor carpi radialis function in the first child.

Results and Conclusions: We publish these findings to highlight the possibility of misinterpreting the incomplete nerve lesion and the neurophysiology of a nerve incontinuity, as a nerve that would spontaneously recover. At exploration, in these two cases, it was clear by the level of inter-fragmentary compression, that the nerve would not have recovered without surgical intervention. We discuss the short-comings in neurophysiology test interpretation that may lead to this synopsis.

We propose that the decision to explore a peripheral nerve should be based solely on clinical acumen. We recommend prompt referral and urgent surgical exploration of persistent peripheral neuropathy associated with supracondylar humeral fractures, even where the nerve palsy is partial and in the face of neurophysiological evidence of an intact nerve. Delays in referral vastly compromise nerve regenerative potential and increase the likelihood of secondary reconstructive procedures.

Keywords:
nerve injury, supracondylar fracture, radial nerve
TRANSFER OF THE TRAPEZIUM MUSCLE FOR EXTERNAL SHOULDER ROTATION GAIN IN PATIENTS WITH BRACHIAL PLEXUS INJURIES

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Objectives / Interrogation: In brachial plexus injuries after complete neurological treatment (neurolysis, grafting, nerve transfers) and adequate physiotherapy, secondary surgery may still be required to improve shoulder stability and function. The external rotation of the shoulder is essential for daily functions, as it allows the patient to properly position the hand in the coronal plane of his body. The weakness of external rotation in the brachial plexus lesions keeps the upper limb in a vicious position of internal rotation and generates functional limitation in the simple daily activities.
Objective: to analyze the results of the surgical technique of transfer the trapezius muscle to obtain external rotation of the shoulder. It aims to evaluate the stability of the shoulder as an adjunct effect.

Methods: prospective study between June 2013 and December 2016. The technique of trapezius muscle transfer was performed in patients with brachial plexus injury, with deficit in stability and external rotation of the shoulder, with time lapse longer than 12 months of the accident or cases where there was no recovery (total or partial) after repair surgeries or nerve reconstruction. The casuistry consists of ten cases, all male, of traumatic origin, coming from motorcycle accidents. The mean age was 23.8 years (18 to 28), with average time between the accident and the muscle transfer of 20.8 months (13 to 30 months). Parameters such as shoulder movement arc, DASH score and degree of muscle strength were analyzed in the pre and postoperative periods.

Results and Conclusions: Results: The gain of the external rotation was on average 30°, with statistical significance (p <0.05%). In all cases there was improvement in shoulder stability, improvement of pain and satisfaction with the procedure. The DASH scores had an initial mean of 67 points and a final score of 36 points. Conclusion: In patients with chronic brachial plexus injury, the transfer of the trapezius muscle to obtain external rotation of the shoulder is effective and presents good clinical results. With this technique, good shoulder stability is obtained, providing an improvement in the quality of life of these patients.

Keywords:
brachial plexus injury, paralytic shoulder, shoulder external rotation, muscle transfer
BRAQUIAL PLEXUS: NEW ADULT AND CHILDREN DIAGRAM OF DIVISIONS AND CORDS.

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Objectives / Interrogation: Demonstrate the positioning of the divisions and cords of the brachial plexus of the adult and the child.

Methods: The work consists of 10 brachial plexus of adult men dissected by the same team. The findings were compared with the literature through a review including articles of interest in the area.

Results and Conclusions: We find the same anatomy in the 10 dissected plexuses. Contrary to what most diagrams represent, we observe that all posterior divisions have superior and posterior positioning, whereas anterior divisions have inferior and anterior positioning. Reviewing articles published in the literature, we have identified conflicting results. In the articles involving dissection of adult, the results were similar to ours, we identified reports of 254 dissected brachial plexuses and all had the same anatomical position described previously. We observed different positioning when the articles used infantile brachial plexuses. 340 dissections were analyzed and all were different from the adult brachial plexus. In the infantile plexus, the posterior divisions of the upper and middle trunk had inferior and posterior positioning, while the posterior division of the inferior trunk had superior and posterior positioning. The anterior divisions of the upper and middle trunk had superior and anterior positioning, whereas the anterior division of the lower trunk had inferior and anterior positioning. The lateral cord was formed by the anterior divisions of the upper and middle trunk as well as in the adult, but it was the most cranial cord among all, while in the adult it was central. The posterior cord was formed by the fusion of all posterior divisions not differing from the adult, but it was situated in a central position, while in adult was the most superior of all. The medial cord is similar between the infantile and adult plexus, being formed by the continuation of the anterior division of the inferior trunk and still considered the lower cord of all. The differences between the anatomy of the brachial plexus for children and adults are evident. We know that the nerve roots in the child are more horizontal and that at the end of growth they end up positioning obliquely and posteriorly, however, it is clear that the modifications are not restricted only to the roots, but also to the positioning of the divisions and cords. Unifying the graphical representation of the brachial plexus of adults and children is a serious error because it does not represent reality.

Keywords:
Anatomy, Brachial plexus, divisions.
Comparison of Hand Surgery Exposure in U.S. Plastic and Orthopaedic Residency Programs

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Objectives / Interrogation: Pursuit of hand surgery fellowship in the United States is primarily sought after by those with residency training in orthopaedic surgery or plastic surgery. Given these different pathways to reach fellowship, there currently remains uncertainty regarding the disparities in case volume or exposure which may exist between both these training pathways. This study sought to highlight the case volumes of residents over a 5-year period and identify any differences.

Methods: The Accreditation Council for Graduate Medical Education (ACGME) case logs between 2012 and 2016 were obtained for residents in orthopaedic surgery and plastic surgery programs. National mean number of procedures performed per resident were extracted and organized into one of 12 procedure categories. Chi-square analysis was employed to evaluate whether the distribution of cases varied across the study period for each training pathway.

Results and Conclusions: Procedures sharply differed between residents and fellows in plastic surgery and orthopaedic surgery.

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<tr>
<td>Incision/Excision</td>
<td>31.35%</td>
<td>13.00%</td>
<td>29.35%</td>
<td>12.37%</td>
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<td>13.54%</td>
<td>27.39%</td>
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<td>Intro/Removal</td>
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<td>0.00%</td>
<td>0.64%</td>
<td>0.00%</td>
<td>0.56%</td>
<td>0.00%</td>
<td>0.52%</td>
<td>0.00%</td>
<td>-</td>
</tr>
<tr>
<td>Repair/Reconstruction</td>
<td>11.67%</td>
<td>21.87%</td>
<td>8.83%</td>
<td>21.90%</td>
<td>8.80%</td>
<td>20.43%</td>
<td>9.28%</td>
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<tr>
<td>Fracture Open Treatment</td>
<td>16.84%</td>
<td>15.78%</td>
<td>20.71%</td>
<td>15.11%</td>
<td>20.69%</td>
<td>17.19%</td>
<td>20.32%</td>
<td>17.25%</td>
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<tr>
<td>Fracture Closed Treatment</td>
<td>10.57%</td>
<td>0.00%</td>
<td>14.83%</td>
<td>0.00%</td>
<td>15.82%</td>
<td>0.00%</td>
<td>16.67%</td>
<td>0.00%</td>
<td>-</td>
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<td>Amputation</td>
<td>1.46%</td>
<td>5.50%</td>
<td>1.71%</td>
<td>5.34%</td>
<td>1.65%</td>
<td>5.05%</td>
<td>1.61%</td>
<td>4.72%</td>
<td>0.170</td>
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<td>Arthroscopy</td>
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<td>0.00%</td>
<td>1.40%</td>
<td>0.00%</td>
<td>1.39%</td>
<td>0.00%</td>
<td>1.32%</td>
<td>0.00%</td>
<td>-</td>
</tr>
<tr>
<td>Replant/Revascularization</td>
<td>9.53%</td>
<td>3.41%</td>
<td>7.70%</td>
<td>3.02%</td>
<td>7.38%</td>
<td>3.17%</td>
<td>5.98%</td>
<td>3.02%</td>
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<td>Nerve Repair/Reconstruction</td>
<td>1.08%</td>
<td>9.08%</td>
<td>0.37%</td>
<td>9.42%</td>
<td>0.44%</td>
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<td>0.60%</td>
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<td>Neuroplasty</td>
<td>10.73%</td>
<td>15.62%</td>
<td>11.94%</td>
<td>15.85%</td>
<td>12.66%</td>
<td>15.15%</td>
<td>13.74%</td>
<td>15.73%</td>
<td>0.470</td>
</tr>
<tr>
<td>Primary Closure</td>
<td>3.26%</td>
<td>6.65%</td>
<td>1.40%</td>
<td>6.80%</td>
<td>1.45%</td>
<td>6.32%</td>
<td>1.41%</td>
<td>5.88%</td>
<td>0.020</td>
</tr>
<tr>
<td>Skin Graft</td>
<td>1.68%</td>
<td>9.10%</td>
<td>1.13%</td>
<td>10.20%</td>
<td>1.09%</td>
<td>9.64%</td>
<td>1.15%</td>
<td>9.77%</td>
<td>0.330</td>
</tr>
</tbody>
</table>

Orthopaedic surgery trainees performed a lower proportion of the following procedures: incision/excision, repair/reconstruction, amputation, nerve repair/reconstruction, neuroplasty, primary closure, and skin graft. Conversely, plastic surgery trainees performed fewer intro/removal, open or closed fracture treatment, arthroscopy, and replant/revascularization procedures.
Overall disparities exist in case exposure between plastic surgery and orthopaedic surgery trainees. Overall, orthopaedic surgery trainees do not appear to be receiving a similar proportion of soft tissue and nerve procedure volume as do their plastic surgery counterparts prior to hand fellowship.

**Keywords:**
training; hand surgery; plastic surgery; orthopaedic surgery; residency; fellowship
Early Active Vector Adjustable Skin Traction (EAVAST) for phalangeal fractures of the hand

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Objectives / Interrogation: The study aimed to determine the efficacy and outcomes of EAVAST in the treatment of middle and proximal phalangeal fractures in comparison with surgical management.

Methods: A retrospective cohort study has reviewed the outcomes of middle and proximal finger phalangeal fractures managed by EAVAST (n=54) compared to surgical cases (n=47) in a public hospital over a 3-year period. Age range was 13-77 years. Outcome measures utilized included total active motion (TAM), clinical outcome measures (Belsky criteria), and grip strength. Main method of treatment was used for analysis grouping.

Results and Conclusions: In finger fractures at eight weeks post fracture, a mean 230° TAM (95% CI range 90°-285°, SD 34.2) was achieved with traction (n=54) compared to mean 198° TAM (95% CI range 50°-286°, SD 54.8) for surgical cases (n=47). The results were statistically significant (p<0.001). In the traction group, results were excellent in 18%, good in 41% and poor in 33% cases by Belsky’s criteria. In the surgical group excellent results were present in 9%, good in 28% and poor in 50%. There were no significant differences in grip strength between the traction and surgical groups.

The groups were similar in age and handedness, the traction group received more comminuted fractures (61%) than the surgical group (43%). ANOVA regression analysis showed age to be statistically significant in effect on data variation (p=0.026). Intra-articular classification (p=0.08), comminution (p=0.91), and location of fracture (p=0.41) were not statistically significant.

The traction group had less complications (5%) than the surgical group (22%).

This study shows EAVAST may provide improved TAM and clinical outcomes compared to surgery with less complications and should be considered an effective option for the management of middle and proximal phalangeal fractures of the hand.

Keywords:
skin traction fracture finger digit phalangeal trauma EAVAST active motion vector adjustable dynamic earlyactive
Anteromedial release for post-traumatic flexion pronation contracture of the wrist.

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Objectives / Interrogation: To propose a novel surgical technique to treat patients with wrist stiffness due to a soft tissue contracture in flexion-pronation after injuries or cast immobilisation.

Methods: Lack of extension and radial deviation, presented as a form of wrist stiffness, is related to multiple entities and has its own pathomechanics (ligament injury, tendon injury, pronator quadratus muscle disruption, scar retraction) that originate in the volar-ulnar compartment of the wrist.

Indeed, no soft-tissue release will ever correct bone deformity or joint incongruity, which is the most common cause of pronosupination loss, and must be corrected prior to addressing soft tissue contractures.

Not infrequently, however, there is a concomitant soft-tissue contracture that causes pain which should not be underestimated, and this is the object of our technique.

Lee et al. classified wrist stiffness into intrinsic and extrinsic aetiology. Most intrinsic adhesions are best managed arthroscopically while multilevel extrinsic contractures are more complex and require an open approach. Once an extrinsic mechanism has been recognised the anteromedial release has been tested in some patients by our group and has been shown to safely improve range of motion without destabilising or denervating the joint.

It requires minimal postoperative immobilisation, permitting rehabilitation in two weeks with good results.
Results and Conclusions: We have observed that stiffness limiting extension and radial deviation comes from the volar-ulnar compartment. It is a rare occurrence after wrist injury but can result in significant disability if it persists despite conservative management. In these cases, surgery is indicated.

We propose a safe and predictable technique to access the volar-ulnar corner, not only the distal radioulnar but also the ulnocarpal and midcarpal Space of Poirier. This approach offers a good therapeutic option for this particular form of extrinsic stiffness of the wrist. It is important to protect the surrounding anatomy in order to avoid further injury.

Keywords:
Extrinsic wrist stiffness, loss of supination, volar-ulnar compartment.
Ulnar shortening osteotomy: using a novel compression technique

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Objectives / Interrogation: Positive ulnar variance is one of the problems that cause ulnar sided wrist pain. Ulnar shortening osteotomy may be recommend to decompress the ulnar carpus and TFCC.
A novel technique of ulnar shortening osteotomy using the AO axial compression principle in a reversed compression direction used to achieve fracture simultaneous compression and shortening.

Methods: A prospect case series study was conducted on 19 patient with positive ulnar variance, 8 of them had post traumatic radial shortening. The average age was 35.6 years, the dominant hand involved in 10 patients. The osteotomy was performed using power saw with 2 mm thick blade, 7-8 cm proximal to the DRUJ, if the desired amount of shortening is less than 3mm, a single cut was performed started at the medial border of the ulna and directed proximal and lateral. The distal fragment was fixed first with a small LC-DCP plate, then the plate was fixed tho the proximal fragment in eccentric position of the hole. The direction of the osteotomy and the axial compression of the fracture in a reversed way allow proximal slide of the distal fragment and fracture compression.

Results and Conclusions: After a mean follow up of 3.2 years, ulnar sided wrist pain improved on VAS from 6.3 to 1.9. The mean Mayo wrist score improved from 46 to 77 points and the Q-DASH score improve from 52 to 15. Non of our patient developed DRUJ instability or impingement. The technique used in this study is simple and effective in treatment of ulnar impaction syndrome specially when special instrument and expensive implant for ulnar shortening are unavailable.

Keywords:
Ulnar impaction, shortening osteotomy
Axillary Hidradenitis Suppurativa in Female: Excision and Reconstruction by Axillary Flap

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Objectives / Interrogation: Hidradenitis suppurativa is a chronic, recurrent inflammatory condition of the apocrine sweat glands. It usually involves axilla and females are more prone to developed infection. Initially though it is confined to apocrine sweat glands but later through recurrent infections it involves other glands and subcutaneous tissue leading to extensive tissue destruction and fibrosis. This chronic debilitating disease had widespread functional and psychological implications. Patients face difficulty in maintaining personal hygiene; more prone to recurrent infection and also had a poor quality of life. There are different modalities of treatment ranging from conservative treatment to surgical excision and coverage of the defect by primary closure, skin graft and flap coverage. Axillary flap is a suitable option for coverage of the defects as it provides a reliable, effective and simple method of treatment.

Methods: A prospective, observational study was design to conduct in Burn & Plastic Surgery Unit, Dhaka Medical College Hospital over a period of 3 years from January, 2016 to till date. 15 axillary flaps were done for reconstruction of axillary defect after wide local excision of all hair bearing skin and subcutaneous tissue in 10 patients with hidradenitis suppurativa. Excised tissue was sent for histopathology in all cases. The patients were observed for one year postoperatively for functional and aesthetic result and for any complications or recurrence.

Results and Conclusions: All fifteen flaps were survived with excellent outcome. One patient developed recurrent lesion. Donor site was closed primarily in all cases. All operations were done under general anaesthesia. Histopathology report reveals granulomatous inflammation suggesting tuberculosis in 3 patients which was treated by anti tubercular hemotherapy. Mean hospital stay was 14 days. All are female with age range from 20 to 35 years. About 50% patients had bilateral lesion. On functional evaluation full range of movement of shoulder joint was preserved. Axillary flap is a functionally useful and aesthetically acceptable option for reconstruction of the axillary hidradenitis suppurativa.

Keywords:
Hidradenitis suppurativa, axillary flap
Wide Awake and ultrasound guided release of the lacertus fibrosis for chronic exertional compartment syndrome of the forearm. A prospective study.

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Objectives / Interrogation: Chronic exertional compartment syndrome is a common condition in athletes and motorcyclists. The purpose of this study was to confirm our hypothesis that exertional compartment syndrome was due to a pronator median nerve entrapment at the lacertus tunnel.

Methods: We conducted a prospective study from January 2016 to August 2017. All the patient who complains for an exertional compartment syndrome (ECS) were included. The diagnosis of ECS was based on the existence of a pain appearing with effort and disappearing at rest, a weakness (grip) during effort and an elevated compartment pressure (>50mmHg). All the patients have had a clinical exam including muscle testing, a scratch collapse test and the search of a Tinel sign at the elbow.

Surgical procedure:
Anesthesia: The patient is anesthetized 30 min preoperatively using 30-40 ml 1% lidocaine with epinephrine and buffered (sodium bicarbonate) solution. We performed an hydrodissection assisted with an ultrasound guidance. An ultrasound evaluation of the relative motion between the median nerve and pronator muscle was made to entrapment. A limited incision is done at the proximal edge of the lacertus fibosus. The release of the lacertus fibrosis was done from proximal to distal. A second ultrasound evaluation is made to confirm that the median nerve entrapment had disappeared. A muscle testing was made. All the patients were reviewed 6 months after surgery.

Results and Conclusions: Results: We included 7 patients (all men) with an average of 26 years (17-42). The group included 5 competition motorcyclists, 2 around the world sailors. Symptoms have lasted an average of 12 months. Both hands were involved. In all patient the muscle testing revealed a typical pattern of weakness attesting to a pronator median nerve entrapment. The scratch collapse test was positive. Immediately after the release, muscle testing was normalized. One week after surgery all patients were free of symptoms. Two patients have had a second compartment pressure evaluation. It was normalized. At the last follow up all the patients could resume normal exertional activity.

In conclusion, the study emphasizes that ultrasound guided lacertus fibrosus release is a safe method to treat chronic exertional compartment syndrome. The length of surgery, recovery time and scar sequelae are less significant. Furthermore, this study points out the claw effect of the lacertus fibrosus as an etiology of the exertional compartment syndrome.

Keywords: exertional compartment syndrome, median nerve, lacertus fibrosus
Clinical outcomes in revision carpal tunnel decompression using the AxoGuard nerve protector

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Objectives / Interrogation: Carpal tunnel release is associated with revision rates of 5-9%. Recurrent symptoms may be associated with perineurial scar formation and impaired nerve glide during functional movement of the wrist and flexors. An extended exposure of the median nerve with revision decompression and neurolysis is the recommended treatment, however the outcome of surgery is less favourable than for primary decompression surgery. We report a single institution experience of using porcine submucosa extracellular matrix (AxoGuard® AxoGen Inc., Alachua FL) in revision carpal tunnel surgery.

Methods: All patients undergoing revision carpal tunnel decompression and wrapping with an AxoGuard nerve protector between 2013 and 2018 were identified from a database at a regional hand and peripheral nerve injury service. Data capture included patient demographics, pre-and post-operative pain scores, sensation, Tinel's sign, DASH score and patient satisfaction. assessed by DASH score were recorded.

Results and Conclusions: Results
Thirteen patients with recurrent carpal tunnel compressive neuropathy were treated with revision release and AxoGuard nerve protector wrapping during the study period. The mean age at revision surgery was 42 years (range 24 to 79 years) and the mean follow up period was 42 months (range 4-36 months). The indication for application of the AxoGuard nerve protector was severe epineural scarring which was noted in all patients. Post-operative pain levels on a visual analogue scale improved from 8 to 3 (p<0.05) and subjective sensory improvement was from of 4 pre-operatively to 7 post-operatively using a 10/10 scale. All but one patient with neurofibromatosis reached the minimum clinically important difference in DASH score. Following revision surgery, absence of Tinel's sign was noted in all patients. In the current series there were no complications associated with the use of porcine submucosa extracellular matrix as a nerve wrap.

Conclusions
The application of a porcine submucosa extracellular matrix wrap as an adjunct to revision decompression and neurolysis of the median nerve is an effective treatment for patients with severe epineural scar formation and adhesions. This pilot study has defined the treatment and assessment protocol. A large scale multi centre randomised controlled trial comparing simple decompression versus decompression and adjunctive wrapping in revision carpal tunnel surgery is required to evaluate the outcomes further.

Keywords:
Carpal Tunnel Compression, Nerve Wrap, Revision Surgery
Evaluation for fracture type of mallet finger

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Objectives / Interrogation: The purpose of this study was to determine whether only one extension block Kirschner-wire was sufficient fixation for mallet finger fractures.

Methods: We reviewed 33 cases with a mallet fracture, involving more than one-third of the articular surface, with or without volar subluxation of the distal phalanx. There were 12 females and 21 males with a mean age of 35.4 years (15 to 62). A case injured his index finger, thirteen cases their middle finger, thirteen cases their ring finger, and six cases their little finger. We measured transverse diameter of the proximal fragment and whole distal phalanx in the axial view of computed tomography (CT), then ratio of proximal fragment size was calculated. The fragment deviation from center of distal phalanx was evaluated in the three dimensional reconstruction image of CT. The deviation defined the percentage which the length between fragment center and whole distal phalanx center divided by transverse diameter of the proximal fragment and whole distal phalanx.

Results and Conclusions: The mean joint surface involvement was 50.6% (33% to 71.7%) in sagittal view of CT. The average of transverse diameter and ratio of the proximal fragment was 7.4mm and 75.2%, respectively. There was the case whose proximal fragment was less than half of distal phalanx diameter. The mean deviation from center of distal phalanx was 3.1%. The largest deviation was 10.3%. The proximal fragment was broken into 2 pieces in the 2 cases. In conclusion, in the case of one part fragment, it was able to support the proximal fragment with the central extension block of distal phalanx. But in the case of two parts fragment, one part was supported with the extension block, whereas another part was not supported. And so, only one extension block may be insufficient. We evaluated the size and the deviation of the proximal fragment by CT. It was difficult to evaluate correctly them by plain radiograph, therefore the preoperative CT evaluation was useful. In the future, the injury mechanism should be solved for the case of two parts fragment.

Keywords:
Mallet finger, extension block pin, computed tomography
Lipofibroma Hamartoma of the peripheral nerves of the upper extremity. Analysis of twelve cases.

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Objectives / Interrogation: Lipofibromatous Hamartoma (LFH) is a rare condition that involves diffuse infiltration of peripheral nerves by normal appearing fibrous and adipose tissue. The epineurium and perineurium are enlarged and distorted by excess fatty and fibrous tissues that infiltrate between and around nerve boundaries. The cause of LFH remains obscure; the tumor is usually present at birth and may be associated with digital enlargement. In the upper extremity, the median nerve is the most commonly involved but also the radial nerve and branches, the ulnar nerve and branches and even the entire brachial plexus may be interested.

Methods: In the period between 1989 and 2017 twelve patients (7 men and 5 women) were observed. The mean age was 20.4 year (range 35 to 15 years). Three patients had associated macrodactyly. Child with macrodactyly under age of 14 years old were excluded from this study. All patients showed a palpable mass, with sensitive peripheral nerve signs in 10 cases; MR examination was done in all cases.

The median nerve and its branches were involved in 10 cases, the ulnar and radial nerves respectively in one case. Open carpal tunnel release was done in 5 cases with the aim to decrease motor and sensor impairments. Microsurgical intra-neural dissection with partial excision of the fibrofatty tissue of the neoplastic elements of the median nerve was performed in two cases. The median nerve was resected and grafted in one case.

Two cases involving the radial and ulnar nerves were treated with fascia decompression and epineurolysis. Two cases of LFH of the median nerve were under observation.

Results and Conclusions: Four patients had a regression of neurological symptoms after carpal tunnel decompression. Microsurgical dissection generated disappointing results in both cases treated. Poor sensory recovery was recorded when the entire median nerve was excised and reconstructed with sural nerve grafts. Any improved function was reported in the radial and ulnar nerves after fascia decompression and epineurolysis. MRI is a valid a valid support in the preoperative differential diagnosis. Biopsy is not routinely recommended owing to potential functional deficits; The role of microsurgical debulking procedure remains unclear. On the basis of our experience and after reviewing the literature, the treatment should be limited to decompression of the ligament or fascia over the involved nerve; an epineurolysis may be additionally performed.

Keywords:
Hamartoma, Lipofibromatous, nerve

References:
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Corrective osteotomies of the radius: Grafting or not?

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Objectives / Interrogation: One of the most common complications following distal radial fractures is malunion, especially when treated with closed reduction and cast immobilization. The aim of this study is to review the current literature regarding corrective osteotomies to provide the best evidence of the rule of bone grafting.

Methods: Our MEDLINE literature search included 280 studies using the following key words "Malunited distal radius fracture" and 150 studies using key words "Corrective osteotomy of the distal radius". Inclusion criteria were: Malunited distal radial, extra-articular fracture, volar locking plate, use of iliac bone graft (cancellous or corticocancellous), non-use of bone graft. Twelve studies met the inclusion criteria.

Results and Conclusions: Seven of the 12 studies considered, described the use of a graft; the remaining five studies didn't use any graft. Type of malunion was dorsal in most of the studies. The healing time was comparable using the graft or not (mean 12.5 weeks), ranging from 7.5 to 16 weeks. The mean disabilities of the arm, shoulder and hand score improvement was 23 points both in the studies that used the graft and in those not using the graft. This review demonstrated that corrective osteotomy of extra-articular malunited fractures of the distal radius treated by volar locking plate does not necessarily require bone graft. Maintaining a volar cortical contact following corrective osteotomy is important to ensure the physiological transmission of the force vector through the synthesis, and, in this case, the use of bone graft is not necessarily required. Bone grafts however, remain a valuable support, especially to fill gaps when a large defect is created.

Keywords:
Radial fracture; Osteotomy; Graft; Volar plate; Malunion
Advancement of Homodigital Neurovascular Island Flaps

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Objectives / Interrogation: Homodigital neurovascular island (NVI) flaps are used for reconstruction of pulp defects. Previous articles have reported up to 22mm of flap advancement, although it is not clear from these studies, how flap advancement was measured and if flexion of the digits were required and to what extent. In our practice, we have not been able to achieve this degree of advancement. The aim of this study is to determine the maximal advancement of a homodigital neurovascular island flap. We hypothesize that extent of flap advancement correlates to the extent of dissection and the length of digit.

Methods: 27 cadaveric digits were dissected. The distance from the fingertip to the flexion creases for the distal interphalangeal joint (DIPJ), proximal interphalangeal joint (PIPJ) and palmodigital crease (PDC) for the fingers and interphalangeal joint (IPJ) and PDC for the thumb were marked and measured. A 1x1cm flap was designed on the radial and ulnar aspect of the pulp and sequentially elevated till the proximal interphalangeal joint crease, PDC, and bifurcation of the common digital artery. The ulnar digital artery of the index, middle and ring finger were then sacrificed and the flap dissected till the superficial palmar arch. The advancement of the flap at each dissection point was recorded.

Results and Conclusions: Average advancement following dissection till the PIPJ crease, the palmo-digital crease, following division of adjacent digital artery and till the superficial arch were 8mm (SD 2.5), 12mm (SD 3.6), 16mm (SD 2.8) and 19mm (SD 4.6) respectively. When dissection was done till the palmodigital crease, it was found that advancement was 20% of the digit length. We found that the Homodigital NVI flap could be advanced for a maximum of 19mm when dissection was carried out till the superficial arch with the digit fully extended. In addition, the degree of advancement can be predicted based on the length of the finger and is approximately 20% of finger length. We suggest that in future studies of flap advancement, authors should specify the method of measurement and quantify, if any, the degree of flexion of the PIP joint and MPJ. This will allow us to have a more accurate indication of flap advancement.

Keywords:
Neurovascular island, flaps, advancement, fingertip amputation
The abduction system of the fifth finger. An anatomic and electromyographic study

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Objectives / Interrogation: The purpose of this research is to study the role of the EDQ and the hypothenar muscles in the abduction of the fifth finger in a cadaveric and electromyography study.

The abductor digiti quinti and flexor digiti quinti are both typically considered the prime abductors of the fifth finger. This movement can be impaired in clinical situations such as ulnar neuropathies and post-burn scars on the hypothenar region. The extensor digiti quinti (EDQ) has been used as a tendon transfer and there is evidence that its rerouting improves the abduction of the fifth finger.

However, the abduction ability of the EDQ compared to the hypothenar muscles, has not been studied so far, to our knowledge. Does the EDQ have an abduction action?

Methods: 10 cadaveric fresh frozen hands were studied. A 1.5 Newton traction was sequentially exerted on the abductor digiti quinti, flexor digiti quinti and EDQQ. The resultant angle between the fourth and fifth finger was measured.

5 volunteer healthy patients were studied by means of an electromyography protocol. While performing abduction of the fifth finger, the electric activity on the hypothenar eminence and the extensor digiti quinti was recorded.

Results and Conclusions: Results
The EDQ abducted the finger 32.4° in average (CI95% 28.62-35.38), the abductor digiti quinti 39.9° (CI95% 35.22-44.58), and the flexor digiti quinti 31.2° (CI95% 26.21-36.18). There are significative statistical differences (p>0.05) between the degrees abducted by the EDQ and the flexor and abductor digiti quinti. During abduction, the electromyography noted synergic activity between the hypothenar muscles and the EDQ.

Conclusions
The fifth finger abduction system is constituted by two components: a) intrinsic - the hypothenar muscles - and b) extrinsic - the EDQ -. Both elements act simulataneous and synergically. This fact may suggest that the extrinsic part may still be abducting the fifth finger even when the hypothenar component is absent. Even though the EDQ featured less abductor power than the abductor digiti quinti, the amount of angular variation in the cadaveric experiment suggest a significant abductor role of the EDQ in clinical situations.

Keywords:
Abduction little finger EDQ anatomy EMG
Total Wrist Arthroplasty in Rheumatoid and Posttraumatic Arthritis: Highly different survival rates

List of authors:
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Objectives / Interrogation: Introduction: Total Wrist Arthroplasty (TWA) in painful panarthritis is to establish a stable, painfree wrist to cope with daily life. Even with newer designs the procedure's prognosis would remain uncertain. Numbers of implants in the US would not differ between 2008 and 2016. Progressively older patients preferably with rheumatoid arthritis are operated on. Aim of the study was the comparison of revision free post-OP time and total implant survival between the two entities.

Methods: Material and Method: Between 2002 and 2018 31 patients received UNI 2 total wrist arthroplasty KMI. 18 of these were included. 9 Cases in either group with rheumatoid or post traumatic arthritis. Rheumatoid patients: n=8 (1M,7F -1operated on both wrists) age at surgery 65,5 years, with Carpus Simmen Stadium 1+2, 6 with long lasting Cortisol. In the Group of posttraumatic patients: n=9 (6M,3F; mostly SLAC Wrist) age at index surgery was 64 years.

Results and Conclusions: Results: In the rheumatoid patients group first revision n=5 (Changing of polyethylene (PE) alone or together with carpal plate) was done at an average of 47 months. Arthrodesis either as immediate and final solution or as secondary or even tertiary revision was undertaken after 85 months n=6. In the post traumatic group revision meant exclusively changing of the polyethylene layer after a period of 112 months. None of the bony implants was loose. In only one female patient with demand of walking aids arising after index surgery arthrodesis was done 36 months after implantation. 4 other implants stay symptomless with a follow up of 75,5 months. The difference is statistically significant.

Early results of TWA were encouraging. Midterm results in mixed indications showed 90% survival rate. An own FU showed 50% failure rate in rheumatoid patients after 5 years. Initial symptoms of PE wear are reported to be carpal tunnel syndrome due to synovitis and metallosis later on. In the literature recommendation is given for TWA in older patients and rheumatoids although TWA and arthrodesis will not differ markedly in quality of life. Our data let entertain grave doubts about TWA in rheumatoid arthritic patients. We now prefer arthrodesis over TWA in this group. Numbers of implantation in post traumatic wrists growing in adverse.

Keywords:
Total wrist arthroplasty
Does pre-operative depression and anxiety affect outcome after trapeziectomy?

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Objectives / Interrogation: Trapeziectomy is used to treat osteoarthritis of the carpo-metacarpal joint. Depression associated with osteoarthritis is a well-established phenomenon and dissatisfaction may be linked to the patient’s mood pre-operatively. The objective of this study is to explore the association of pre-operative anxiety and depression with functional outcome for thumb pain and function before and after trapeziectomy.

Methods: Twenty-two consecutive patients undergoing trapeziectomy completed pre-operative Hospital Anxiety and Depression Scale (HAD) and quickDASH (DASH) pre and post-operatively. Median results are reported. Non-parametric statistics were used to evaluate the relationship between variables.

Results and Conclusions: Results
Twenty-two patients, 18 female and 4 males, with a median age of 63 (IQR 57, 66) years were recruited to the study. Median follow up was 38 months. Fourteen right and 8 left trapeziectomies were performed. Median pre-operative DASH was 58 (IQR 43, 70) and 18.1 (IQR 4.5, 35) post-operatively (p < 0.001).

Fourteen participants showed evidence of anxiety or depression: 6 mild, 5 moderate and 3 severe.

DASH improved by 36 points with or without evidence of anxiety or depression. Pre-operative DASH increased with HAD (p = 0.02) and across HAD categories: none 52, mild 49, moderate 61 and severe 75.

Change in DASH increased with HAD category: none 36, mild 32, moderate 34, severe 49 but no statistically significant difference among groups was seen (p = 0.59).

Post-operative DASH tends to be worse if HAD is moderate or severe, 27 and 25, than none or mild, 19 and 17.

Conclusions
The difficulty of interpreting pre-operative anxiety or depression and outcome after trapeziectomy is establishing a causal relationship. Although the greater improvement is seen the more severe pre-operative anxiety or depression, absolute post-operative function tends to be worse. This study suggests that trapeziectomy offers equal functional improvement in the presence of POAC or without.

Keywords: trapeziectomy, anxiety and depression, osteoarthritis
Case Report: Lipofibromatous hamartoma of the digital branches of median nerve

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Objectives / Interrogation: Lipofibromatous hamartoma is a rare benign tumour which is characterised by diffuse infiltration of peripheral nerves by fibrous and adipose tissues.

In 2013, a comprehensive literature review by Tahiri et al. reported that there have been 180 known cases of lipofibromatous hamartoma of the median nerve published in literature; to the best of our knowledge there have been approximately 10 more cases published since that time.

We are reporting a case of lipofibromatous hamartoma of the median nerve in the hand and its digital branches.

Methods: Case Report:

A 39-year-old lady presented with gradually decreasing sensations along the ulnar border of her thumb for six months. She reported having a swelling affecting her thumb since birth. Examination revealed soft non-tender lump on the first web space and ulnar side of the thumb with some numbness and no motor deficit.

MRI scan showed thinly capsulated non-enhancing lobulated predominantly fatty lesion centred around the median nerve and its digital branches in the hand and wrist. The fat was noted to insinuate between the nerve fibers. The appearances were in keeping with lipofibromatous hamartoma.

Median nerve was explored, and its branches were identified. The ulnar digital nerve of thumb was totally taken over by disease and therefore excised. The radial digital nerve of the index was involved at flexor zone 2; the lesion was dissected without nerve interruption.

Microscopic examination showed multiple nerve bundles and Pacinian corpuscles surrounded large amounts of mature fibrofatty tissue. The nerve fascicles themselves were preserved and showed only perineural fibrosis. These features confirmed the diagnosis of lipofibromatous hamartoma.

Results and Conclusions: Lipofibromatous hamartoma is a rare and benign fibro-fatty tumour of unknown etiology. To date, there have been less than 200 cases reported in literature. Approximately one third of the cases had associated macrodactyly.

MRI scan is pathognomonic modality for Lipofibromatous hamartoma diagnosis. Treatment options range from observation of asymptomatic cases to prophylactic carpal tunnel release with or without neurolysis in symptomatic patients. A biopsy is recommended with carpal tunnel release to confirm diagnosis. Treatment of macrodactyly, if present, should be addressed separately.

Keywords:
lipofibromatous hamartoma, median nerve
Ultrasound-guided carpal tunnel release - a new technique by using a tissue-preserving cutting device

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Objectives / Interrogation: Ultrasound-guided carpal tunnel release (UGCTR) is a new minimal-invasive treatment option for patients with carpal tunnel syndrome. Compared with an open procedure it has the advantage to place the incision outside the weight bearing zone and, therefore, to limit the risk of pillar pain. Related to an endoscopic treatment a continuous visualization of the nerve and its related structures is possible.

Methods: UGCTR was performed in twenty Thiel-embalmed cadaver extremities using a U-shaped cutting device with a cutting edge protected by its specific location inside the U. The individual anatomy was sonographically investigated to rule out anatomical abnormalities and to localize the course of the median nerve, the flexor retinaculum (FR) and the superficial palmar arch (SPA) prior to the treatment. A small incision along the distal wrist crease ulnar to the palmaris longus tendon was made, the distal forearm fascia was incised, and the flexor retinaculum was divided under permanent sonographic visualization, changing repeatedly from a longitudinal to a transverse view.

Results and Conclusions: The study was performed using a researcher-blinded protocol. UGCTR was performed by a hand surgeon followed by a dissection by an anatomist to proof the complete separation of the FR and the exclusion of any lacerations of relevant structures. The study results will be presented.

UGCTR allows a controlled dissection of the FR with an permanent visualisation of the median nerve and the SPA. The length of the surgical incision can be reduced and transferred to a non-weight bearing area to limit the risk of postoperative scar tissue pain. Therefore UGCTR seems to have some advantages over an endoscopic or open carpal tunnel release.

Keywords:
median nerve, ultrasound-guided, carpal tunnel release, minimal-invasive, carpal tunnel syndrome
The avascular proximal pole nonunion treatment with NVBG from radius, open or arthroscopically: a role for core decompression and biophysics.

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Objectives / Interrogation: There is a general consensus about the indications of a VBG, but up to now there is no evidence for technique superiority between VBGs and NVBGs. There is still no consensus on definition of avascular necrosis of the PP: x-ray, CT scan, MRI, histology, or bleeding points at surgery.
Since some years, arthroscopy has been proposed for proximal pole nonunion, even with vascular impairment, using a spongious NVBG to fill the emptied PP.
It is well known that the metaphyseal core decompression of the distal radius can incite hyperaemia and, more recently underlined, can stimulate regional bone regeneration factors, the Bone Morphogenetic Protein-2 BMP-2 to accelerate revascularization of a necrotic lunate or even of a scaphoid avascular proximal pole non-union (APPN). Even the biophysical treatment has been recognized to be able to stimulate BMP-2.

Methods: 13 patients, between 18 and 30 years, with scaphoid APPN confirmed at surgery by the absence of bleeding points, with obvious need for volar grafting detected by CTCB, has been treated through a mini-invasive volar approach, characterized by:
- a volar NVBG, spongious or corticospongious only in case of shortening of the bone, harvested from distal radius, producing a metaphyseal core decompression.
- a stable fixation by means of an headless screw with a short leading thread, or 2 Kirschner wires, when the proximal pole, after debridment in nearly emptied, making impossible a volar screw fixation. Technical details of Kirchner wires stable application, are shown.
- an early biophysical treatment (CCEF) therapy, for at least 2 months.
Arthroscopic Bone Graft (2 pts.) is based on the same technical aspects, harvesting the spongious bone graft from the dorsal radius.

Results and Conclusions: Results
Radiological union was obtained in all patients with obvious proximal pole revascularization, detected by CBCT or MRI, with gadolinium when need. Optimal ROM recovery was observed, without any functional limitation, even when Kirschner wires are still in place after many years.

Conclusions
The technical aspects of this approach are similar to the increasingly popular Arthroscopic Bone Graft in APPNs, but performing a longstanding stable fixation is easier with open surgery. In practice, as long as the proximal pole is intact and the cartilage is good it is possible to have its revascularization even with a NVBG, open or arthroscopically. VBG still remains a correct indication after failed fixation with NVBG, but it is not an absolute indication.

Keywords:
The Effect of Radioscapholunate Fusion with and without Distal Scaphoid and Triquetrum Excision on Capitolunate Contact Pressure

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Objectives / Interrogation: Radioscapholunate (RSL) arthrodesis has been demonstrated to be effective for patients with isolated radiocarpal arthritis. However, it has been associated with decreased ROM and midcarpal arthritis postoperatively. To improve ROM after RSL arthrodesis, distal scaphoid excision (DSE) and triquetrum excision (TE) may be performed. Capitolunate (CL) joint forces were measured to evaluate the effect of each of these motion-improving RSL fusion modifications on the midcarpal joint.

Methods: Ten wrist specimens were dissected of all superficial soft tissue. The carpus was exposed and RSL arthrodesis was performed using plates and screws. Contact area, pressure, and force were measured in the CL joint during application of uniaxial load, using pressure sensitive film. Measurements were obtained before RSL fusion, after RSL fusion, after RSL fusion with DSE, and after RSL fusion with DSE and TE. Statistical analyses were performed using a one-way ANOVA.

Results and Conclusions: Results: RSL fusion, with and without DSE, significantly increased contact forces (p < 0.03) in the CL joint from 5.05 ± 1.24 N to 7.59 ± 2.82 N and 6.87 ± 2.82 N, respectively. TE reduced CL contact forces to 6.26 ± 1.88 N. The CL contact pressures were similar between all groups (p = 0.42). Additionally, RSL fusion with or without DSE increased the CL contact area between 32% and 43%, while TE reduced CL contact area from RSL fusion to an intermediate level.

Conclusions: Motion increasing procedures performed at the time of RSL fusion may affect midcarpal joint contact force and area. These results showed that DSE increased contact forces resulting from RSL fusion, while the addition of TE reduced contact forces to an intermediate level. While the clinical significance of these findings is unknown, surgeons should take this information into consideration when counseling their patients on the possibility of developing adjacent joint arthritis in the future.

Keywords:
Partial wrist fusion
How can we avoid complications following ORIF of Distal Radius Fractures with a palmar locking plate?

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Objectives / Interrogation: The increasing number of fixed-angle plate systems used to treat DRF carries with it the problem of determining the optimal fixation for unstable fractures. Our goal was to analyse the clinical and radiological outcomes of patients with displaced, unstable DRFs treated with a palmar locking plate.

Methods: Over a mean 15-month period, 141 consecutive patients were treated for an unstable dorsally displaced DRF. Objective and subjective functional results (active ROM; strength; DASH score; VAS; Green and O'Brien Score) and radiographic assessment (palmar tilt, radial inclination, ulnar variance, fracture union) were assessed. Potentials for complications were given special attention.

Results and Conclusions: 114 patients with a mean age of 57 years were treated. Fractures were classified as type A2 (n=39), A3 (n=16), C1 (n=24), C2 (n=30), or C3 (n=5). The modified Green and O'Brien Score revealed 31 excellent, 54 good, 23 fair and 6 poor results. Active wrist motion averaged 54° extension (82% of uninjured side), 46° flexion (72%), 81° pronation (95%), and 82° supination (95%). Mean grip strength was 70% of the uninjured side. 81 patients (71%) were pain free, 17 patients (15%) had mild pain, 10 patients (9%) had moderate pain and 6 patients (5%) severe pain. Mean DASH score was 13 points. Fracture union was achieved in all patients. A mean loss of palmar tilt of 3.4°, radial inclination of 0.4° and ulnar variance of 1.2 mm was measured. Overall complication rate was 27%. Most frequent problems were flexor and extensor tendon irritation (57% of the total number of complications). CTS was observed in 3 patients, CRPS in 5 patients. In 2 cases, loosening of a single screw and loss of palmar fragment was seen. Delayed union occurred in 3 patients and intraoperative intraarticular screw displacement was recognized in 1 patient. Neither clinical outcome nor complication rate were dependent on fracture type (intra- vs. extraarticular).

Very distal palmar plate position can interfere with the flexor tendon system, too long screws can penetrate the extensor compartments and distal screws in comminuted fracture patterns can cut through the subchondral bone and penetrate into the radiocarpal joint. We present our algorithm to avoid these complications using the intra-operative dorsal horizon view, pronator quadratus flap and fragment specific plate fixation.

Keywords:
distal radius fracture, palmar locking plate, ORIF, complications
Open palm vs closed technique for treatment of multiple digit involvement with Dupuytren's contracture: A prospective randomized study.

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Objectives / Interrogation: Introduction: Dupuytren's contracture is a fibroproliferative disease that affects the palmar aponeurosis resulting initially in nodule formation often with progression to cords with increasing contractures of affected digits. Contractures result in flexion deformities of the metacarpophalangeal (MP) and interphalangeal (PIP and DIP). Frequently multiple digits are involved. The use of collagenase injections has reduced the number of patients in need of surgical intervention. Still some patients would require surgical treatment especially if there is multiple digit involvement. Open palm technique has been shown to improve the functional outcome especially when used for multiple digit involvement.

Methods: Between 2002 and 2017 a prospective randomized study was conducted comparing the functional outcome of treating multiple digit involvement of Dupuytren's contracture using either open palm technique (Group I) vs. closed technique (Group II). Patients were assigned randomly to either group. There were 27 patients in group I vs 25 in group II. Both groups were very similar in age, gender, and number of digits involved. The average flexion deformities of MP and PIP joints in group I was 56 and 34 degrees respectfully compared to 62 and 27 in group II. 12 patients in group I (45%) and 17 patients in group II (68%) had excision of the check-rein ligaments of the PIP joints. Follow up ranged from 14 months to 178 months for both groups with an average of 42 months.

Results and Conclusions: Results: There were 3 complications in group I (transient paresthesia in 2 and digit wound dehiscence in 1) vs. 9 complications in group II (3 CRPS, 2 hematoma formation, 3 wound dehiscence and one nerve injury) (P=0.001) Average post-operative flexion deformities of the MP and PIP joints at final evaluation were 12 and 7 degrees respectively in group I vs 18 and 12 in group II. Recurrence was seen in 5 patients (19%) in group I vs. 12 patients (48%) in group II (P=0.002). Recurrence was more in patients who were treated earlier in the study. There were no infections in either group.

Conclusions: When compared to closed technique, open palm technique for multiple digit involvement in Dupuytren's contractures, provides better functional outcome including less complications and less incidence of recurrence.

Keywords:
Dupuytren; Open Palm; Surgery;
Do we need to treat a Grade 3 scapholunate ligament injury according to Geissler classification in acute Distal Radius Fractures? Results of rearthroscopy at the time of Implant removal.

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Objectives / Interrogation: Scapholunate (SL) ligament injuries in acute distal radius fractures (DRFs) are rare. While partial ruptures as Grade 1 and 2 according to Geissler are treated none-operatively and complete ruptures as Grade 4 are treated operatively there is no consensus weather or not Grade 3 injuries should be treated surgically at the time of fracture fixation. We report about the natural history of untreated Grade 3 SL ligament tears associated with acute DRFs.

Methods: Eleven patients (9 male and 2 female) with an average age of 56 years with acute DRF (all AO type C3) were treated using palmar plate fixation in 8 cases and dorsal plate fixation in 3 cases. In all patients an acute Grade 3 SL ligament injury was diagnosed arthroscopically. The SL ligament injuries were not treated in any of the patients. At the time of implant removal a rearthroscopy was performed to assess any progression of the SL ligament instability. Additionally radiological and clinical examination was assessed at the time of the last follow-up and compared to the uninjured side.

Results and Conclusions: The average follow-up time was 2.6 years. The wrist extension was 64°, flexion 57°, pronation 73° and supination 68°. Mean grip strength was 82% of the uninjured contralateral side. Mean DASH score and PRWE score were 10 points and 15 points, respectively. The mean pain assessed with the visual analogue scale was 2. The immediately post-operative SL gap on posterioranterior (PA) x-rays with the wrist in ulnar deviation was average 1.6 mm and at the final follow-up 1.8 mm. Three patients showed radiocarpal arthritis Grade 2 according to Knirk and Jupiter. The implant removal and rearthroscopy was performed at the average time of 1.8 years. During the rearthroscopy we could not detect any progression of SL instability from Grade 3 to Grade 4.
Grade 3 SL ligament injuries according to Geissler associated with acute DRFs treated without any surgical intervention showed no progression of SL instability to Grade 4 assessed with rearthroscopy at the time of implant removal.

Keywords:
arthroscopy, SLL, SL ligament tear, rearthroscopy, Geissler classification, SL instability, Distal radius fracture
Long-term outcomes after the intra-articular distal radius fractures with volar locking plate

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Objectives / Interrogation: To evaluate the long-term outcomes of treatment with volar locking plate (VLP) for the intra-articular distal radius fractures with clinical and radiological evaluation at least more than 5 years after surgery.

Methods: Twenty limbs (9 males and 11 women) of 44 distal radius intra-articular fractures that were treated surgically with VLP during the 5-year period from 2006 to 2010 were directly examined. Subjects included 1 limb of B3, 5 limbs of C1, 10 limbs of C2, and 4 limbs of C3 in AO classification. The mean age at surgery was 65.8 years (range, 48-81 years) and the mean postoperative follow-up period was 7.4 years (range, 5.1-9.8 years). X-ray parameters (RI; radial inclination, VT; volar tilt, UV; ulnar variance) at immediate post-operation and final follow-up, the articular gap and step-off on immediate postoperative X-ray, and osteoarthritic changes on final plain X-ray (evaluated by Knirk and Jupiter classification; KJ), Quick-DASH score, VAS score (full score of 10), range of motion, and grip strength were evaluated.

Results and Conclusions: Although there were no significant changes in RI and VT, the UV significantly increased from 0 mm at immediate postoperative X-ray to 0.7 mm at the final follow-up X-ray (p = 0.02). There were 4 limbs without joint space narrowing (KJ 0), 10 limbs with mild narrowing (KJ 1), 4 limbs with obvious narrowing (KJ 2), and 2 limbs with osteophytes and cyst formation (KJ 3). The articular gap and step-off on immediate postoperative X-ray averaged 1.1 mm. For the correlation between the articular gap and step-off and KJ classification, and between AO classification and KJ classification, greater residual articular gap and step-off and more complex fracture type significantly progressed osteoarthritic change (p < 0.01 and p = 0.02, respectively). Average Quick-DASH score was 3.3 points, and average VAS score was 0.55 points, indicating good self-assessment results. Quick-DASH score was not significantly correlated with KJ classification, however VAS score and KJ classification were significantly correlated (p = 0.03). The mean range of motion was almost the same as that on the unaffected side, and the mean ratio of grip strength on the affected side was 0.98, indicating good functional recovery.

We concluded that long-term outcomes of the distal radius fractures with VLP showed a significant correlation between fracture type or reduction status of the articular surface and osteoarthritic progression, however functional outcomes were good.

Keywords: intra-articular distal radius fracture, long-term outcome, KJ classification
The influence of arthroscopy, arthrotomy and conventional fluoroscopy in palmar locking plate fixation of intra-articular unstable distal radius fractures - a prospective randomized trial

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Objectives / Interrogation: The objective is to evaluate arthroscopy (AS), arthrotomy (AT) and simple fluoroscopy (FS) in palmar plate fixation of intra-articular distal radius fractures (DRFs) and their correlation with clinical outcome. Our hypothesis was, that arthroscopy would lead to better reconstruction of the joint surface and detection of concomitant soft tissue injuries and thus leading to better clinical results

Methods: 58 patients (aged from 18 to 80) with intra-articular DRFs were randomized to one of the three groups (AS: n=20, AT: n=18, FS n=20). Palmar plate fixation was performed within 2 weeks. Pre- and postoperative CT scans were used to assess joint congruity and residual step off. Any additional soft tissue injuries that were detected were documented. On the follow up examinations at month 3, 6, and 12, patients were evaluated in terms of radiological parameters, pain, ROM and functional scores.

Results and Conclusions: Mean ROM: AS: Extension: 60°, Flexion 47°; FS: Extension: 59°, Flexion 46°; AT: Extension: 51°, Flexion 44°. Mean radial inclination: AS: 19.7°; FS: 20.1°; AT: 20.2°. Mean dorsopalmar tilt: AS: 5.9°; FS: 1.7°; AT: 2.5°. Mean ulnar variance was negative in all three groups (AS: -0.2 mm, AT: -0.2mm, FS: -0.5 mm). Post-operative mean step off in the joint: AS: 0.3mm; FS: 1.1mm; AT: 0.8mm. Mean grip-strength in AS: 28Kg; FS: 24Kg; AT: 21Kg. Partial scapholunate injuries (n=2 Grade 1 according to Geissler; n=1 Grade 2; n=2 Grade 3) were only seen in the AS group. Complete SL injuries were documented in the AS group (n=2 Grade 4), in the AT group (n=1 Grade 4) and none in the FS group. All complete SL ligament ruptures were treated by ligament fixation using bone anchors and K-wire fixation. Post-operative SL instability with an average increased SL-Joint gap in the stress X-rays of 2.1 mm compared to the uninjured side was measured in the FS group. TFCC lesions were detected in the AS group (n=3 Palmer type 1B; n=2 Palmer type 1C and n=2 Palmer type 1D).

Patients who were treated arthroscopically experienced significantly less pain over the entire follow up time compared to the other two groups. The average PRWE-Score at 12 months in the AS group was: 5 points; FS: 9 points; and in AT: 8 points. This difference was not significant.

The data shows a superiority of additional arthroscopy in palmar plate fixation in intra-articular DRFs, in regards to the radiological parameters, ROM, grip strength, pain and functional scores. Arthrotomy has the worst clinical outcome of the 3 groups.

Keywords: arthroscopy, arthrotomy, fluoroscopy, palmar plate fixation, intraarticular, distal radius fracture, joint surface
**The Arthroscopic Hook Test is Not Pathognomonic for a Foveal Tear of the Triangular Fibrocartilage**

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**Objectives / Interrogation:** The purpose of this study is to evaluate the accuracy of the arthroscopic hook test in determining the presence of a foveal insertion tear using dry arthroscopy of the radiocarpal and distal radioulnar joint.

**Methods:** 63 dry arthroscopies of the distal radioulnar joint were performed between July 2016 and 2017 for the management of painful distal radioulnar joint instability. The presence of a positive or negative hook test was documented. The integrity of the foveal insertion was determined using debridement, visualisation with a 1.9mm arthroscope and probing.

**Results and Conclusions:** Of these 63 cases, 44 (70%) had a positive hook test and 19 (30%) had a negative hook test. Of the 44 cases with a positive hook test, 38 (60%) were found to have an intact fovea (false positive) and 6 (9.5%) were found to have a foveal tear (true positive). Of the 19 cases with a negative hook test, 17 (27%) were found to have an intact fovea (true negative) and 2 (3%) were found to have a foveal tear (false negative). By applying these values to the Statistical Measures of Validity, the specificity, sensitivity, false positive rate, false negative rate and diagnostic accuracy of the hook test in determining the presence of foveal pathology can be determined.

The specificity of the hook test in determining the presence of foveal pathology was found to be 0.31. The sensitivity was found to be 0.75. The false positive rate was found to be 0.69 and the false negative rate 0.25. The diagnostic accuracy was found to be 0.36.

All cases with a positive hook test were associated with a tear of the triangular fibrocartilage. However, the hook test was not found to be an indicator of the specific nature of the tear. It is important to debride and feel the mechanical integrity of the foveal insertion in order to determine if a foveal, peripheral or both foveal and peripheral repair is required.

**Keywords:**
arthroscopy, wrist, triangular fibrocartilage
Treatment of Hand and Wrist injuries in the Professional American Football Player: Return to Play

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Objectives / Interrogation: Objectives: This study reviews the evaluation and treatment of fifty six professional American Football players' hand and wrist injuries and the strategies on return to play.

Methods: Methods: The medical records and radiographs of fifty six professional American Football players treated by a single fellowship-trained Orthopedic Hand Surgeon from 2000-2018 were reviewed. An analysis of the treatment results including nonoperative and operative management along with specific equipment modification will be presented.

Results and Conclusions: Results: The injuries sustained included 14 Wrist injuries, 9 Thumb MP joint injuries,3 fractures at the thumb metacarpal base,3 metacarpal fractures of the fingers, 1 finger MP dislocation,5 proximal phalangeal fractures, 11 PIP dislocations, 3 middle phalanx fractures and 2 distal phalanx fractures and 5 extensor avulsion injuries. All patients returned to their pre-injury position. Strategies were individualized for the player and position. 21 players were treated operatively and 32 players were treated nonoperatively. Various techniques in equipment modification such orthoplast splinting, custom glove inserts, and cast immobilization allowed earlier return to play.
Conclusions: A strategic use of nonoperative and operative treatment with the addition of equipment modification will allow the professional athlete to minimize lost time and safely return to play.

Keywords:
football players, wrist injuries
Expectations and illness perceptions influence the success of non-operative treatment of first carpometacarpal osteoarthritis (CMC-1 OA)

Objectives / Interrogation: Recent research has outlined the pivotal role of psychological factors in pain and disability associated with first carpometacarpal osteoarthritis (CMC-1 OA). However, the association of pre-treatment expectations and illness perceptions (patients set of beliefs about their CMC-1) with treatment response after non-operative treatment is currently unknown. In the present study we aimed to assess the effect of psychological distress, pain catastrophizing, treatment outcome expectations and illness perceptions on the response to non-operative treatment for CMC-1 patients.

Methods: Between September 2017 and September 2018 all patients with CMC-1 OA who were non-operatively treated were included. As part of routine clinical care patients completed the Michigan Hand Questionnaire (MHQ, range 0-100) before and 3 months after treatment. A change score was calculated to measure the response to treatment. Patients also completed the Patient Health Questionnaire-4 (range 0-12), Pain Catastrophizing Scale (range 0-52), Credibility/expectancy Questionnaire (range 3-27) and the Brief Illness Perceptions Questionnaire (range 0-10) before treatment. Univariable and multivariable linear regression analysis were used to assess the effects of these factors on the change in MHQ.

Results and Conclusions: 219 patients were included in the study. Patients were predominately female (79%) and mean age was 59 years old, mean (±SD) change scores were 10.0 (±18), 5.1 (±16.4) and 5.6 (±12.8) for respectively pain, hand function and the MHQ total score. In the univariable analyses pre-treatment expectations and illness perceptions were significantly correlated with the MHQ change scores. Performing light physical labor, higher pain catastrophizing, higher expectations, and more understanding of the disease (B = 6.88[0.22 - 13.6], B = 0.38[0.05 - 0.71], B = 0.68[0.13 - 1.23] and B = 1.57[0.14 - 3.00]) were associated with more improvement in pain. Experiencing more consequences and more personal control from the illness was associated with more improvement in hand function (B = 1.33[0.02 - 2.64], B = 1.04[0.04 - 2.04]).

Discussion
Pre-treatment expectations and illness perceptions play a role in response to non-operative treatment for first carpometacarpal osteoarthritis. Our results suggest that optimizing patient expectations and illness perceptions at the start of a non-surgical treatment for thumb osteoarthritis could lead to better treatment outcomes.

Keywords:
CMC; expectations; illness perception; conservative
HAND AND WRIST INJURIES FOLLOWING MOTORCYCLE TRAFFIC ACCIDENTS IN MEDAN, NORTH SUMATRA, INDONESIA

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Objectives / Interrogation: To analyze the epidemiological profile of patients with hand and wrist injuries following motorcycle traffic accidents.

Methods: Data of this retrospective observational study was obtained from 227 patients' medical records who were admitted to orthopaedics department of Adam Malik General Hospital with hand and/or wrist injuries following motorcycle traffic accidents in 2016 to 2017.

Results and Conclusions: Results
Out of the total of 763 hand and wrist injury patients, 227 (29.7%) were identified as victims of motorcycle trauma events due to road traffic accidents. Hand injuries accounted for 68 (30%) of cases, wrist injuries were 127 (55.9%), and both hand and wrist injuries were 32 (14.1%). The male-to-female ratio was 3:1. The average age of patient was 26.6 years with a range from 1 to 78 years old, median age: 23 years. Adult group (19-64 years old) constitutes 68% of all cases, < 19 years old were 28%, and elderly ( >64 years old) were 4%. 146 patients (64.3%) sustained injuries to their dominant hand, while 81 (35.7%) were injured to the non-dominant hand. Hand fractures occurred in 61 (26.9%) patients, and wrist fractures were found in 129 (56.8%) patients. Of all cases, 17 patients (7.5%) needed an amputation.

Conclusion
The results indicate that hand and wrist injuries are commonly occurred in motorcyclist due to road traffic accidents and cause significant morbidity in their functions following the events. More than 50% of the hand and/or wrist injured patients involved in motorcycle accidents were adult male. Injuries more often found on the dominant hand than the non-dominant side.

Keywords:
Motorcycle accidents, hand and wrist injuries, epidemiology
Correlation between ultrasound image and surgery in De Quervain's tenosynovitis

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Objectives / Interrogation: BACKGROUND
De Quervain's tenosinovitis is a common condition with a rate of men to women of 10:1 and an incidence of 0.5% and 1.3%, respectively, in the general population. It is a disorder with important repercussions on patients' professional lives due to the fact that they require an interruption of essential hand movement needed in their everyday jobs, which contributes to work absence. Additionally, it is a disorder in many cases incorrectly diagnosed; therefore, patients don't receive appropriate treatment. Previous studies have shown that ultrasound is a dependable technique for the diagnosis of De Quervain's tenosynovitis.

OBJECTIVES
General objective
To describe the usefulness of soft tissue ultrasound as a presurgical diagnostic complimentary method in chronic stenosing tenosynovitis or De Quervain's disease.

Methods: METHODS
A retrospective, observational, descriptive, cohort studio was performed. Between 2011 and 2015, 33 patients were included considering a prior De Quervain's tenosinovitis clinical diagnosis. All patients underwent ultrasound. To determine the correlation between the ultrasound and the findings after surgery, Spearman's rank correlation test was used.

Results and Conclusions: RESULTS
A total of 33 patients were chosen after meeting the stipulated selection criteria; 24% of these were men and 76% women. The mean age was 41.6, with a median of 39 years old. We found a positive correlation between the ultrasound and surgical findings in 85% (28 of 33) of the patients included.

CONCLUSIONS
There is a strong correlation between the ultrasound and the surgical findings in patients with a prior clinical diagnosis of De Quervain's tenosynovitis. The complimentary imaging technique favors the therapeutic approach, which is why it is a conduct recommended in these patients.

Keywords:
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Nerve transfer for brachial plexus injuries: new surgical technique

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Objectives / Interrogation: Brachial plexus injury is an entity that frequently affects the young population with a low incidence, but with a great impact on functionality and quality of life. Despite advances in reconstruction techniques, the treatment of this lesion remains difficult, requiring more research and development of new techniques that allow optimizing results. Our objective is to describe a surgical technique based on the transfer of median nerve's fascicles to the axillary nerve and its anatomical characterization.

Methods: the anatomical bases and the surgical technique were described in cadavers with subsequent implementation in a patient with brachial plexus lesion at the upper primary trunk level, previous informed consent and consecutive clinical follow-up.

Results and Conclusions: Results: Brachial plexus exploration was performed on five cadavers, identifying axillary nerve and median nerve. By intrafascicular dissection of the median nerve, the transfer is performed to the axillary nerve without any tension. This technique is applied in a selected patient with upper brachial plexus injury, through an axillary approach. Two years of follow-up, it found to be reinnervation of the deltoid muscle with functionality of 110° for shoulder abduction and 90° for external rotation.

Conclusion: As described in this technique the use of the fascicles of the median nerve for the transfer to the axillary nerve is an anatomically possible option to improve shoulder abduction in combination with spinal accessory nerve transfer to suprascapular nerve in patients with upper segments brachial plexus injuries, its benefit should be compared with techniques so far described.

Keywords:
brachial plexus; median nerve: axillary nerve; nerve transfer
Computer-assisted Fragment Reduction of Distal Radius Fractures Depends on Surgical Planning Experience

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Objectives / Interrogation: Preoperative planning of fracture treatment leads to a better understanding of the pathology and its management, such as e.g. the surgical approach, the intraoperative challenges and the implant choice. Despite the advantages of 3D analysis and surgical planning in corrective osteotomies of the upper extremity, computer-assisted reduction of distal radius fractures has not been investigated so far. Current computer-based methods still rely strongly on clinical-based knowledge, which is mandatorily provided by a surgeon. Therefore, we hypothesize that the accuracy of fracture realignment is dependent on the surgical planning experience of the user.

Methods: A set of 3D bone models of distal radius fractures (n = 22) of varying complexity were presented to four readers with different surgical planning experience. The readers included a senior surgeon (SS, 23 years of experience), a resident surgeon (RS, 6y), a biomedical engineer (BE, 3y) and a medical student (MS, <1y). The objective was to perform a free-hand reduction of all fracture fragments with the use of a medical CAD planning software. To perform the final 3D displacement analysis, the fragment realignment of the SS was defined as the reference for the other three readers. The drawback of current computer-assisted displacement analyses requiring a coordinate system was solved by a newly introduced 3D-transformation. This displacement analysis consists of only two measurement parameters for each fragment: a pure shift (3D-translation) and a pure rotation (3D-angle).

Results and Conclusions: Regarding the 3D-translation, the post-hoc analysis showed that the RS as well as the BE performed a significantly better fragment reduction compared to the MS (p =0.03). Regarding the 3D-angle, a statistical trend towards the RS as well as towards the BE was observed compared to the MS.

We conclude that computer-assisted reduction of distal radius fractures is depended on the surgical planning experience. The hereby newly described 3D displacement analysis showed to be a promising way to describe the displacement of bone fragments. It is coordinate-system-invariant, mathematically distinct, program-independent implementable, inter-experimental comparable and surgical intuitively understandable.

Keywords:
distal radius fracture, computer-assisted planning, fracture reduction, 3D displacement analysis, planning experience
**Objectives / Interrogation:** The boutonniere deformity of the thumb is the most common deformity of rheumatoid thumb. Metacarpophalangeal (MP) joint arthroplasty is indicated for the deteriorated MP joint with preserved soft tissue stability. Feldon introduced to use flexible hinge toe implant for the MP joint reconstruction because of its better mechanical strength compared to finger joint implant. We hypothesized rheumatoid thumb reconstruction using flexible hinge toe implant would improve the clinical outcomes and radiological findings.

**Methods:** Swanson implant arthroplasty for at the thumb MP joint was performed on the 108 cases (male 11, female 97) between 1986 and 2014 with minimum follow up of 6 months. The average age was 61 yrs. old and the average follow-up period was 4 yrs. The duration of the rheumatoid arthritis at the time of surgery was 22 years. Combined with this MP joint arthroplasty, arthrodesis at the IP joint in 26 cases, capsulodesis at the IP joint in 4 cases, suspensionplasty at the CM joint (Thompson) was performed in one case. Radiological assessments were performed and MP flexion angle and IP extension angle were measured. Extension loss at MP joint was divided into 4 groups: normal (less than 5 degree), mild (5 to 19 degree), moderate (20 to 39 degree) and severe (40 and more degree).

**Results and Conclusions:** In the radiological assessment, the pre- and the postoperative flexion angles at the MP joint were 42 and 17 degrees, and extension angles at the IP joint were 37 and 0 degree(s). Preoperative severity was mild in 15 cases, moderate in 36 cases and severe in 56 case. Postoperative severity was improved to normal in 9 cases, mild in 50 cases, moderate in 44 cases and severe in 3 cases. In one case, postoperative infection occurred and implant was removal of required. 3 cases of implant fracture occurred and revision was performed in 2 cases and removal was performed in 1 case with a synovitis. Swanson implant with a grommets did not cause implant fracture. By the rheumatoid thumb surgery, deformity was corrected. The ratio of implant failure was lower than that in the previous reports.

**Keywords:** Boutonniere deformity, rheumatoid arthritis, thumb, Silicone implant, grommet
Reasons to consult for late surgery and functional status of patients with congenital upper limb deformities persisting beyond childhood

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Objectives / Interrogation: Congenital upper limb anomalies present in a wide variety of clinical pictures. Function largely depends on multiple factors including mental capacity and clinical presentation of the anomaly. Correction, in general, if indicated, is recommended during early childhood to optimize function before formal education starts and sometimes to avoid perceived decrease in function because of deformity. There have been limited reports on these conditions persisting beyond the recommended age for reconstruction. Indications for surgery on a later time have also not been explored adequately.

We aim to describe the common reasons why patients consult for late surgery and assess baseline function of the patient prior to reconstructive surgery.

Methods: We report our series of patients with congenital anomalies consulting for late surgery of congenital anomalies, on the indications and functional status prior to surgery measured as by the Filipino DASH.

Results and Conclusions: We present a series of 17 patients. The most common indication for surgery is concerns regarding work opportunities. Hope for a better function, cosmesis, social pressure and hygiene were less commonly mentioned reasons. Most of the patients did not complain of significant problems in doing activities of daily living. This is supported by their DASH scores, educational attainment and employment status prior to surgery.

The common indications to request for surgery of common congenital anomalies in later years were mostly not due to loss of function. Most patients were able to adapt well but opted to have surgery to increase opportunities for employment or less commonly in the hope of improving social relations.

Keywords:
Anatomic distribution of the axillary nerve and its implications in the treatment of the paralytic shoulder

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Objectives / Interrogation: To evaluate the anatomic distribution of the main and terminal branches of the axillary nerve into the deltoid muscle through dissection and measurement in adult cadavers and to find the best donor for nerve transfer surgery based upon its distribution.

Methods: Anatomic study was performed on 20 shoulders of unembalmed cadavers. The relationships between the nerve and the tip of the acromion, coracoid process, greater tubercle of the humerus, subscapularis muscle, the quadrangular space and all of the nerve branches inside the deltoid muscle were measured regardless of the specimens age and gender. The anatomic branch pattern was also described on each specimen.

Results and Conclusions: The mean distance between the tip of the acromion and the axillary nerve was 6.1 cm (range, 4.6, 7.7 cm). The mean distance between the coracoid process and the axillary nerve was 4.8 cm (range, 4.0, 6.3 cm). The mean distance between the greater tubercle of the humerus and the axillary nerve was 5.2 cm (range, 4.0, 5.8 cm). The axillary nerve gave off no branches before entering into the quadrangular space in all of the specimens. The axillary nerve branched out at a distance of 1.4 cm (range, 0.8-2.4 cm) from the quadrangular space. The anterior branch of the axillary nerve supplied the anterior and middle parts of the deltoid muscle and the posterior branch supplied the posterior part of the deltoid muscle in 80% of the specimens (Type D pattern of distribution, Leechavengyongs et al). These findings regarding the innervation pattern show an important variation in the Colombian population. Our study suggests that nerve transfer to the anterior branch alone would not reinnervate the posterior part of the deltoid muscle in almost all the patients.

Keywords:
Nerve transfer, Axillary Nerve, Deltoid
Forearm Corrective Osteotomy pitfalls: What Can Go Wrong Will Go Wrong!

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Objectives / Interrogation: We present two cases of forearm corrective ostotomies with sequelae due to classical mistake with regard to pathology, planning and execution of surgery and the later restitution of function fit to daily life.

Both cases show the sequelae of typical error. These errors in relation to the relevant literature seem to us interesting for the hand surgery community.

Methods: Case 1: (K.B.) was operated at the age of 18: Arthroscopy and ulna resection osteotomy due to a central lesion of TFCC at the right wrist. No further symptoms of impaction syndrome. Ulna shortening ended with a minus of 5 mm. He then suffered from an overload of the DRUG as well as of the brachioradialis muscle with Wartenberg Syndrome. Release of the superficial branch of radial nerve was done in a first step. Followed by radius shortening osteotomy. The patient recovered completely with full forearm rotation and coping with his duty as manual worker.

Case 2: (T.Z.) hurts his right elbow and forearm whilst fleeing out of Afghanistan. He first presented to the doctors in Austria with a painful limitation of the elbow and forearm. The radial head is dislocated. The underlying Monteggia lesion remains unrecognised. He was then operated on performing a double osteotomy of the ulna and radius. To gain relocation of the radial head a double angulated ulna fixation is done and the radius plated in a queer manor. The proximal part of radius due to biceps traction in full supination is fused to the distal part in complete pronation. The now total blockade of forearm rotation is explained to him by the severe starting situation and he was given two options: Radial head resection or the one bone forearm. Asking about which to prefer he came to our institution. Our solution was removal of the hardware and ulna corrective osteotomy with anatomical plate in a first step. Later we did radial derotation osteotomy. He ended up with a nearly full ROM at the elbow and a forearm rotation with 40° prono-supination each.

Results and Conclusions: Both cases show the sequelae of typical error. These errors in relation to the relevant literature seem to us interesting for the hand surgery community.

Keywords:
forearm corrective osteotomy pitfalls
Percutaneous advancement of proximal tendon stump with the pull-out technique for the treatment of acute mallet fingers

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Objectives / Interrogation: Correction of extensor lag is the key point for treating acute mallet finger in order to avoid swan neck deformity. This study aims to investigate the therapeutic effect of percutaneous advancement of proximal tendon stump with the pull-out technique on treating acute mallet fingers.

Methods: In this prospective study, 22 cases of acute mallet finger received advancement of proximal tendon stump with the pull-out technique. A transverse 3-0 Prolene running beneath the skin was used to advance the tendon distally. The DIP joint was fixed at slight overextension with a 0.8 inch Kirschner wire for 6 weeks. After the removal of the pin, active DIP flexion was started.

Results and Conclusions: The mean extensor lag before surgery was 45° (range 20°-75°). At 6 month follow-up, 15 patients had nearly full range of motion (extension lag<5°), 5 patients had a residual deformity of 10° and two had a poor result with a 30° deformity. 21 patients were fully satisfied with the improvement of DIP extension and only one was unsatisfied, but did not want to receive further treatment. In this preliminary report, this technique using percutaneous advancement of proximal tendon stump with the pull-out technique provided a safe, economic and efficient way of correcting mallet finger deformities without obvious incision during surgery.

Keywords:
Mallet finger; surgical technique; minimal invasive;
Immobilization after a TFCC operation

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Objectives / Interrogation: The immobilization after a TFCC operation is needed. Do modern orthoses have an advantage over immobilization with a plaster cast?

Methods: The immobilization by orthosis brings some advantages for the patient, treating physician and therapist. These are mainly in the unproblematic handling and better hygienic conditions with a very good immobilization of the wrist and forearm. In our study, 150 patients were treated with a TFCC garment orthosis and interviewed after completion of the treatment by questionnaire.

Results and Conclusions: In the survey, the patients confirm that the restrictions in everyday life in the areas of personal care, dressing and undressing, preparation and meal intake are low. With regard to the handleability of the orthosis, the patients give top marks. Restrictions on mobility of the elbow and wrist caused by a rigid plaster supply are prevented by the construction of the orthosis and the given straight line of freedom. This ensures the earliest possible functional use of the operated hand.

Keywords:
Non-surgical treatment for symptomatic carpal tunnel syndrome: a randomized clinical trial comparing corticoid injection versus night splint.

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Objectives / Interrogation: There is no consensus regarding to the non-surgical treatment of carpal tunnel syndrome. Among the treatment options, local corticoid injection (CI) and/or wrist immobilization with night splint (INS) are commonly prescribed. However, there is a lack of high quality evidence comparing these two modalities of treatment. The aim of this study was to compare INS versus CI for patients with CTS.

Methods: Randomized clinical trial comparing CI versus INS for confirmed CTS with a minimum post intervention follow-up of six months. The diagnosis of CTS was established according to the Graham’s criteria - CTS-6 (four or more criteria indicate CTS) with an eletroneuromiography. Patients were randomized (1:1 ratio) and allocated to either INS or CI. Clinical assessment were were performed just before the intervention, within the first week, one, three and six months after the intervention. Primary outcomes were defined as presence or absence of nocturnal paresthesia and of Boston-Levine (QB) questionnaire symptom scale. Secondary outcomes were: pain improvement assessed by visual analogue scale (VAS) and complications rates. Sample size was calculated to find a 30% (alpha, 5%; Beta, 80%) difference in the remission of nocturnal paresthesia.

Results and Conclusions: From 100 eligible included patients, 95 complete the study planned follow up (45 INS and 50 CI. Corticoid injections demonstrated to be superior to INS in the remission of nocturnal paresthesia (remission rates at 1 month, 84.6% vs. 43.83%, p=0.001; 3 month, 71.1% vs. 40.4%, p=0.00001; 6 month, 80.3% vs. 28.8%, p=0.0001). Boston-Levine scale results were higher for INS compared to CI (42.2 vs 32.7, p=0.001 at 1 month; 46.7 vs. 32.3, p=0.0001 at 3 months; and 51.4 vs. 32.3, p=0.001 at 6 months, for INS and CI arms respectively). VAS scores were lower for CI group compared to INS. Both groups presented no complications. We conclude that CI is superior to INS for improving carpal tunnel syndrome related nocturnal paresthesia and severe symptoms. We also report that both interventions were found to be safe with no complications were reported.

Keywords:
nerve compression syndrome, carpal tunnel syndrome, neuritis, randomized trails
Full-Length Finger Reconstruction for Proximal Amputation With Expanded Wraparound Great Toe Flap and Vascularized Second Toe Joint

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Objectives / Interrogation: Most of the frequently used methods for finger reconstruction have their own limitations. Reconstruction of a full-length finger with normal appearance, in patients with proximal digital amputation, remains a challenge.

Methods: Between January 2002 and November 2013, a total of 86 fingers (60 patients) with proximal phalanx amputation were surgically repaired. A compound flap comprising an expanded wraparound flap from the great toe and a vascularized proximal interphalangeal (PIP) joint from the second toe was harvested to reconstruct a full-length finger. The flap was used to reconstruct the nail, skin, and the distal phalanx; the PIP joint was used to reconstruct the PIP joint. To attain normal length of the finger and right PIP joint positioning, an iliac bone graft was inserted into the distal-middle or proximal phalanx.

Results and Conclusions: All reconstructed fingers retained their viability and natural appearance and were of near-normal length with a normal PIP joint positioning; 12.8% (9/86) of the procedures required re-exploration owing to compromised circulation. Secondary procedures were required in 71% (61/86) of the cases. With the exception of 1 case, the donor-site complications were mild; the average range of motion at the other PIP joints was 52 degrees (-15 to -5 degrees of extension, 25-90 degrees of flexion). Approximately 80% of the normal functionality and 93% of the normal appearance with respect to aesthetics were restored.

CONCLUSIONS:
The full-length finger reconstruction procedure allows for construction of natural-appearing full-length fingers with normal PIP joint positioning and a near-normal functional recovery for proximal digital amputation. The operation is technically complex and time consuming and demands a skilled operator for successful outcomes.

Keywords: -
New technologies in thumb base osteoarthritis: case report.

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Objectives / Interrogation: To evaluate the effectiveness of an app to implement a postsurgery exercise program.

Methods: We present 60 years-old woman with thumb base osteoarthritis. A trapezium exeresis and tenosuspension ligamentoplasty with FCR was performed using a modified Burton Pellegrini technique. After cast removal, surgery service provided access to an app with an individualized home exercise program. The objective of the program was to promote dynamic joint stability and rehabilitate muscles that reduce dorsoradial subluxation and instability through conscious neuromuscular training. At one week, 3 weeks and 3 months postsurgery, manual dexterity through Nine Hole Peg Test, functionality through QuickDash and grip and pinch strength and were evaluated. The app developed control motor oriented exercises that can be adapted to pain and range of motion.

Results and Conclusions: The patient showed improvement in all the measures. Baseline measures were: 45,65 seconds in Nine Hole Peg Test, 10 pounds in grip strength, 1 pound in pinch strength and 79,54 points in QuickDash. After 3 weeks the patient measures were 21,73 seconds in Nine Hole Peg Test, 15 pounds in grip strength, 2 pound in pinch strength and 75 points in QuickDash. Finally, at three months: 19,05 seconds in Nine Hole Peg Test, 25 pounds in grip strength, 4 pound in pinch strength and 63,63 points in QuickDash. Difference from baseline to 3 month measures were: -26,6 seconds in Nine Hole Peg Test, +15 pounds in grip strength, +3 pound in pinch strength and -15,91 points in QuickDash. Patient completed the program with a 76% of adherence and report using the app as an enjoyable and easy way to develop exercises.

Conclusions: apps seems to be an optimal format for sensorimotor approach in postsurgery process. These results suggests the suitability of a tablet app for postsurgery exercise program in thumb base osteoarthritis.

Keywords:
app, innovation, thumb base osteoarthritis
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**Objectives / Interrogation:** Objectives: To investigate the changes in the length of the palmar, proximal and dorsal subregions of the scapholunate interosseous ligament (SLIL) in healthy human subjects during the wrist flexion-extension in vivo.

**Methods:** Methods: We obtained computed tomography scans in six wrists of healthy volunteers. The scans were performed with the wrist at 5 positions, from 60° of flexion to 60° of extension, 30° increments. We reconstructed three-dimensional images of scaphoid and lunate with software. The paths of three different fibers of SLIL were modeled. Each subregions of SLIL are divided into three beams. The lengths of each beams of SLIL between their respective origin and insertion points were measured and compared among different positions of wrist flexion-extension.

**Results and Conclusions:** Results: From neutral position to flexion of 60°, the plamar and proximal subregions of SLIL lengthened significantly. From neutral position to extension of 60°, the intermediate and dorsal beams of proximal subgions lengthened significantly. From neutral position to flexion of 30° and extension of 30°, the distal beam of plamar subregions lengthened significantly.

Conclusions: During the wrist flexion-extension, the length of the palmar and proximal subregions of the SLIL changed substantially, but the dorsal subregions changed minimally.

**Keywords:**
scaphoid, lunate, ligament, three-dimension, in vivo, kinematics
Union in Scaphoid Fractures: Single versus Double Screw Fixation

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Objectives / Interrogation: Scaphoid fractures or nonunion are treated by a variety of surgical techniques. Recently, the number of screws (single or double) for fixation was reported to be important for union. As the double screwing provides two axes of fixation with increased stability, we hypothesized that the union rates would be better especially for the waist nonunion. In this study, we aimed to compare the union rates in patients with single- or double-screw fixation in different clinical presentations of scaphoid problems.

Methods: In total, 41 patients with scaphoid fractures were identified who were operated between October 2016 and June 2018. Of the 29 patients with postoperative follow-up; patients were grouped as acute cases, proximal pole and waist nonunion. Patients were treated with screwing while the proximal pole nonunions were treated additional vascularized bone grafting, and waist nonunions were treated with additional nonvascularized autografting. We determined the union by assessing the radiograph, return the work and pain with palpation at last visit. For statistical analysis, union rates were compared within each group in regards to single- or double-screw fixations.

Results and Conclusions: The mean age of the patients was 31.6 years and the mean follow-up was 7.9 months. There were six patients with fracture, eight patients with proximal pole nonunion, and 15 patients with waist nonunion. Union was achieved in all acute cases independent from the number of screws. Proximal pole union was achieved in 100% (3/3) of patients with double-screw and 80% (4/5) of patients with single-screw fixation (p=0.408). Waist union was achieved in 77.8 % (7/9) of patients with double-screw and 66.6% (4/6) of patients with single-screw fixation (p=0.634). All of the patients with union returned to work and were pain-free with palpation. When the radiographs and computerized tomography images were assessed in detail for the five patients with persisting nonunion, mal-reduction was observed for all of the patients.

In this study, although we observed increased union rates for double screwing for both proximal pole and waist nonunion, the differences were not statistically significant. This might be related to the small number of our cases and further studies with larger sample sizes are needed. Surgery for acute cases arises as a good choice for union independent of screw count. When the nonunion cases were reviewed, not the screw count but the anatomic reduction appears as the most important predictor of union.

Keywords:
scaphoid, nonunion, screw, fracture
A systematic review of the quality of distal radius systematic reviews: Methodology and reporting assessment

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Objectives / Interrogation: Many systematic reviews (SRs) have been published about the various treatments for distal radius fractures (DRF). The heterogeneity of SRs results may come from the misuse of SR methods, and literature overviews have demonstrated that SRs should be considered with caution as they may not always be synonymous with high-quality standards. Our objective is to evaluate the quality of published SRs on the treatment of DRF through these tools.

Methods: The methods utilized in this review were previously published in the PROSPERO database. We performed an analysis of the current literature of 41 SRs of surgical and nonsurgical interventions for acute DRF in adults. A comprehensive search strategy was performed in the MEDLINE database and we manually searched the grey literature for non-indexed research. Data were independently extracted by two authors. We assessed SR internal validity and reporting using AMSTAR (Assessing the Methodological Quality of Systematic Reviews and PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyzes). Scores were calculated as the sum of reported items. We also extracted article characteristics and provided Spearman's correlation measurements.

Results and Conclusions: Forty-one articles fulfilled the eligibility criteria. The mean score for PRISMA was 15.90 (CI 95%, 13.9 - 17.89) and AMSTAR was 6.48 (CI 95% 5.72 - 7.23). SRs that considered only RCTs had better AMSTAR [7.56 (2.1) vs. 5.62 (2.3); p=0.014] and PRISMA scores [18.61 (5.22) vs. 13.93 (6.47), p=0.027]. The presence of meta-analysis on the SRs altered PRISMA scores [19.17 (4.75) vs. 10.21 (4.51), p<0.001] and AMSTAR scores [7.68 (1.9) vs. 4.39 (1.66), p<0.001]. Journal impact factor or declaration of conflict of interest did not change PRISMA and AMSTAR scores. We found substantial inter observer agreement for PRISMA (0.82, 95% CI 0.62 - 0.94; p=0.01) and AMSTAR (0.65, 95% CI 0.43 - 0.81; p=0.01), and moderate correlation between PRISMA and AMSTAR scores (0.83, 95% CI 0.62 - 0.92; p=0.01). We conclude that DRF RCT-only SRs have better PRISMA and AMSTAR scores. These tools have substantial inter-observer agreement and moderate inter-tool correlation. We exposed the current research panorama and pointed out some factors that can contribute to improvements on the topic.

Keywords:
distal radius fracture, systematic reviews, research methodology
Ulnar nerve decompression or transposition under wide-awake local anesthesia without tourniquet management of cubital tunnel syndrome

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Objectives / Interrogation: Objective: Ulnar nerve decompression or transposition at the elbow traditionally requires regional or general anesthesia. The purpose of this study was to assess the feasibility and the outcome of performing these procedures under wide-awake local anesthesia without tourniquet and sedation.

Methods: Methods: We examined retrospectively the charts of 18 consecutive patients having undergone ulnar nerve entrapment surgery under wide-awake local anesthesia without tourniquet. All the patients were performed in minor operating procedure suites. 12 patients were performed in situ decompression with minimal incision; 4 patients were performed in situ decompression with long incision; 2 patients were performed ulnar nerve anterior subcutaneous transposition. The bleeding and pain during the operation was evaluated. The complications of this procedure were surveyed. After the operation, the patients were asked how patients feel about this procedure.

Results and Conclusions: Results: All the patients had successful decompression of ulnar never under local anesthesia without tourniquet and sedation. During the operation, adequate pain control was reported by all the patients, adequate bleeding control was achieved with no need for a temporary tourniquet. There were no hematoma and infection of incision in the group. All the patients stated that they would choose to have the operation performed under wide-awake local anesthesia without tourniquet again, but one would have favoured general anaesthetic because of anxiety. Conclusion: Ulnar nerve decompression or transposition at the elbow under wide-awake local anesthesia without tourniquet is a reliable procedure and is well tolerated by the majority of patients.

Keywords:
cubital tunnel syndrome, decompression, transposition, wide-awake, local anesthesia without tourniquet
Fibro - adipose vascular anomaly in the forearm, a new and rare disorder.

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Objectives / Interrogation: Fibro-adipose vascular anomaly (FAVA) is a distinctive malformation due to its radiological and histopathological characteristics. It is a mesenchymal malformation that presents in focal and diffuse form, whose changes include muscle adipose infiltration, phlebectasia, venous anomalies and malformation of the subcutaneous lymphatic system that tend to surround the neural structures. The aim of this study is to describe a clinical case in a 22-year-old woman with a diagnosis of a fibroadipose vascular anomaly in the forearm.

Methods: Retrospective evaluation of a 22-year-old female, with no morbid background, that presented on consultation with approximately 3 years of evolution of volume increase in medial region of left forearm, of progressive growth and oscillating size and which is associated with progressive lack of force of the limb and digital flexion deficit. Studied with sonogram and MRI with confirmed a vascular tumor (hemangioma) of the forearm infiltrating the carpal tunnel and the flexor muscles at the forearm.

Results and Conclusions: Multidisciplinary evaluation of the patient and images with the radiologists concluded that it was a fibro adipose vascular anomaly out of the reach for sclerotherapy. She went under surgery for tumor resection. Surgery findings included an extensive adipose tumor that infiltrated all the flexor muscles at the forearm deep to the pronator muscle and surrounding the median nerve. The hole of the tumor was excised. Good post operative evolution with full wrist and finger motion and transitory median nerve neuropraxia that spontaneously recovered within 3 months.

From the clinical point of view it is important to recognize the FAVA since it may require a different treatment to the classic vascular malformations, due to the abundant fibro-adipose formation that makes the sclero-therapy of little or no utility, making surgical resection necessary.

Keywords: Anomaly, fibroadipose vascular, forearm, malformation.
Outcomes of flexor tendon repairs in zones 2 under wide-awake local anesthesia no tourniquet

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Objectives / Interrogation: Objective: We retrospectively reported the outcomes of flexor tendon repairs in zone 2 under wide-awake local anesthesia no tourniquet.

Methods: Methods: From January 2015 to October 2017, we performed primary or delayed primary repair for completely divisions of flexor digitorum profundus (FDP) tendon in zone 2 in 23 fingers (20 patients) under wide-awake local anesthesia no tourniquet. We repaired the FDP tendons using 6-strand M-Tang core suture with 4-0 looped sutures, followed by a running peripheral suture using a 6-0 nylon suture. A digital active extension-flexion test was performed during the operation after tendon repair to determine the strength of tendon repair and the venting extent of A4 pulley or A2 pulley. Active partial range flexion exercise were initiated from day 3 to 5 after surgery during early active mobilization. The outcomes were evaluated with Strickland criteria and Tang criteria.

Results and Conclusions: Result: A total of 23 fingers were followed up more than 6 months (mean 10 months). By the Strickland criteria, 15 had excellent, 5 had good, 2 fair, and 1 had poor results. According to Tang criteria, excellent and good function was achieved in 9 and 10 fingers, fair in 2 and poor in 2 fingers at the final follow-up, respectively. No repaired tendon had rupture.

Conclusion: We conclude that flexor tendon repair in zone 2 under wide-awake local anesthesia no tourniquet yields good outcomes.

Keywords:  
Flexor tendons; zones 2; wide-awake, local anesthesia no tourniquet
The impact of coagulation disorders on complex hand trauma management

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Objectives / Interrogation: Simply by definition (damage to at least two functional structures within the hand) or by mechanism (avulsion, extensive damage) complex hand trauma of the hand represent challenging conditions in regard to treatment and rehabilitation. If there is also a preexistent bleeding disorder, the whole management must be reassessed.

Methods: Either drug-induced, congenital or idiopathic, there are no universal peri-operative recommendations guiding the surgical plan for patients with bleeding disorders.

Results and Conclusions: Illustrated by clinical cases, the authors highlight the difficulties encountered with such patients during the treatment of complex traumatic hand injuries.

Keywords:  

Radial Dysplasia: Intrinsic soft tissue changes and their effect on disease progression.

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Objectives / Interrogation: Objectives
Radial dysplasia (RD) affects approximately 1:8,000 live births. Recurrent ‘wrist’ deviation during growth affects all current treatment approaches; the underlying cause of this recurrence is unknown.

Previous animal work suggests connective tissue fibroblasts shape the developing limb musculature, and mutations restricted to these fibroblasts cause abnormal extracellular matrix production and reproduce the wider soft tissue anomalies seen in RD. This study investigated intrinsic changes to limb connective tissue in RD patients, as a potential cause of the disease phenotype and recurrence.

Methods: Methods
Ethical approval and informed parental consent were obtained. Limb fascial biopsies from RD patients and age-matched normal controls (hand trauma patients) were dissociated and cultured in vitro. Extracellular matrix (ECM) proteins were fluorescently stained and both the ECM proteins expressed and their organisation were quantified. The ability of RD and control patient fibroblasts to shape muscle development was assessed by culture with a normal human muscle cell line.

Results and Conclusions: Results
RD patient fibroblasts produced significantly less organised ECM than control fibroblasts (p<0.001). RD ECM differed in composition from control ECM, and was significantly less able to support organised muscle growth in culture.

Conclusions
These results support the hypothesis that there are intrinsic soft tissue changes in RD, which are developmentally distinct from the skeletal defects. These soft tissue changes plausibly contribute to recurrent ‘wrist’ deviation during growth, and present a target for both surgical and genetic treatment.

Keywords:
Radial dysplasia: extracellular matrix: soft tissue
Aesthetic and functional Reconstruction after fingertip injuries: Pivot flap technique

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**Objectives / Interrogation:** The fingertip is one of the regions most often exposed to trauma of the hand. Loss of the tactile function and capability of the pinch can affect the hand functions irreversibly and seriously. Reconstruction with glabrous and sensation skin is essential for ideal resurfacing of fingertip after injuries. The purpose of this study is to analyze the palmar pivot flap as an option for fingertip and pulp defect in selected cases.

**Methods:** We used the palmar pivot flap to repair fingertip and pulp defect in 12 patients (9M, 3F) with age ranging from 29 to 52 years (mean 38y) There were two cases of index finger, 6 middle finger injuries and 4 ring finger injuries. We observed oblique or transverse defect with or without bone exposure. The flap is an axial pattern flap based on the subcutaneous transverse branches of the digital artery. The flap is pivoted up to 90° in order to reach adjacent defect. The donor defect is limited to the same digit avoiding scars in different finger. The average size of affected area was 2cm x 2cm up to 2.5 cm x 3 cm. Eleven patients were treated in emergency. We never used skin graft to cover donor site, all healed primarily. Outcomes measured PIP and DIP range of motion, sensation, pain, cold intolerance, percussion tenderness and aesthetic result.

**Results and Conclusions:** All flaps survived. We achieved complete mobility of PIP joint (>95°) and DIP joint (>80°). Sensory recovery was demonstrated in all flaps after 8 weeks (mean 2 SPD was 6.4), no painful tips reported, 2 cases had mild cold intolerance, no mild percussion tenderness; Only 1 patient was not satisfied with aesthetic appearance because onychodystrophy occurred. The palmar pivot flap can provide sensate glabrous skin for the effective reconstruction of finger tip and pulp defects, resulting in aesthetically and good functional outcomes. Because of simple technique procedure, it may be employed in outpatient surgery under local anesthesia.

**Keywords:**
pivot flap, finger tip, pulp loss
Treatment of pink pulseless hand following supracondylar humeral fractures in children at our hospital

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Objectives / Interrogation: (Objectives) Pink Pulseless Hand (PPH) is characterized by radial pulselessness in a complex of good hand perfusion which can remain pink and warm. The management and treatment of this condition is still very debated.

Methods: (Methods) We report 4 cases of arm traumas which occurred in pediatric patients at our hospital since June 2016. Four cases were all fall trauma, presenting pucker sign, anterior interosseous nerve paralysis. In all cases, after the fixation of the fracture by the orthopedic surgeon, the clinical evaluation demonstrated the PPH.

Results and Conclusions: (Results) We decided to proceed with an immediate surgical exploration and decompression followed by a prompt recovery of the pulsatility. In 2 cases, we found the brachial arteries in spasm, using papaverine improved blood flow well. In 1 case, the blood flow was disrupted, inner membrane injury and thrombus formation were observed, veins were collected from the left lower thigh by diagnosis of brachial artery injury and revascularization was performed. In 1 case showed thrombus formation, and thrombectomy was performed with a fogarty catheter. Postoperative course was uneventful. At 2-year follow-up, the young patients have a normal hand function with no neurovascular damages and regular peripheral signals.

[Conclusions] According to the literature, observation is the treatment of choice for many authors. But Blakey et al. reported a long-term outcomes study of 26 patients with PPH who had delayed presentation, 23 had signs of Volkmann's ischaemic fibrosis in the affected limb. And White et al reported brachial arterial injuries could be proven in 70% no return of pulse after closed reduction. 2 cases of 4 our patients (50%), presented brachial artery injuries. In addition, reperfusion injury following PPH which treated conservative follow-up has been reported with a frequency of 0-33 %. PPH requires urgent surgical exploration if no return of pulse after closed reduction.

Keywords: pulseless pink hand, brachial injury, spasm
Vascularised bone graft from distal femur in upper extremity reconstruction

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Objectives / Interrogation: To analyse our experience and indications for vascularised bone graft from distal femur and its application in upper extremity reconstruction.

Methods: Since 2012 to 2018 authors have performed 53 surgical procedures using free vascularised femur condyle bone grafts. 51 of them were medial femoral condyle grafts (MFC) and 2 - lateral femoral condyle grafts (LFC). MFC were used for scaphoid bone grafting (19), Kienböck's disease (7), bone defects after tumor excision (2), osteochondritis dissecans of the humerus condyle (1). It was also used in cases of forearm bones (14), humerus (5), metacarpal bones (2) and clavicle (1) nonunions. LFC were made for the scaphoid nonunion and in case of a gunshot injury of 3-5 metacarpal bones. Osteochondral graft was performed in 11 cases. In one case we used osteocutaneous flap.

Results and Conclusions: We have used a. descendens genicularis and her transverse branch for the MFC. Average length of the pedicle was 5,7 cm (from 1,5 to 8 cm). LFC was taken with the superior lateral artery (average length 3,75 cm). Average volume of the bone graft was 7,44 cm³ (1 to 28,1 cm³). For the osteochondral graft it was 3,38 cm³ (2 to 6,9 cm³). Bone healing was achieved in 36 of 39 (92.3%) cases which were investigated in one year after surgery.

We have analysed donor site morbidity after MFC harvest. Complaints of 13 patients' were analysed. They included pain, numbness and instability. 3 patients with MFC (23%) reported issues: pain in 3 (23%) and numbness in 1 (8%). Swelling occurred in 2 (15%) of patients. There was no statistically significant correlation between the postoperative time and patients' complaints (p>0,05). We conducted a survey using the Lower Extremity Functional Scale (LEFS). In MFC group LEFS minimum score was 71 points, maximum - 80, average - 77,6.

According to our practice main indication for MFC and LFC flaps are proximal scaphoid nonunion with failure of previous operation or destruction of proximal pole, Kienböck's disease stage IIIA, long bone defects less than 5 cm with at least one failure of surgical treatment and Koenig disease of capitulum humeri with bone necrosis of more than 50% of it.

High rate of success and low donor site mobility make distal femur the main donor area for relatively small bone defects and convex cartilage bone defects.

Keywords:
vascularised bone graft; medial femoral condyle graft; lateral femoral condyle graft;
Arthroscopic partial resection arthroplasty and allograft tendon interposition in stage III trapeziometacarpal osteoarthritis

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Objectives / Interrogation: Trapeziometacarpal joint arthritis is a frequent joint degenerative disease. Nowadays there are various surgical options available for the treatment of this pathology that provide good clinical results. The arthroscopic technique is offered as an alternative to the open surgical options providing the benefits of less tissue aggression, less post-surgery pain and the diagnose of chondral lesions not identified in radiographic studies.

Methods: The authors present 17 cases of trapeziometacarpal joint arthritis, Eaton-Littler stage III, treated in the ambulatory surgery unit. Most patients are female, mean age 61,38 ± 6,71 years-old. All patients were submitted to trapeziometacarpal chondroplasty, osteophyte removal and tendinous allograft interposition (semitendinosus, semimembranosus or tibialis anterior muscle). The joint was stabilized with the use of a percutaneous trapezio-metacarpal K-wire. The patient used a wrist splint for 4 weeks and a wrist splint for 2 months at night. All patients were assigned a specific physical rehabilitation program for 4 weeks and were then evaluated clinically and functionally.

Results and Conclusions: The mean follow-up time was 20,29 months. The mean Visual Analogue Scale (VAS) improved from 8,47±0,83 before surgery to 1,63±0,96 after surgery. The anterior and lateral grip strength of the thumb improved from 3,81Kg and 2,83Kg before surgery to 6,4Kg and 5,4Kg after surgery, respectively. There were 3 cases of temporary hypoesthesia that resolved with cutaneus care and 2 cases of partial tendinous exteriorization that were resolved surgically. There were no complications related to the use of an allograft.

Discussion: Although there are multiple surgical options there isn't a consensus on the best technique for the treatment of the trapeziometacarpal joint arthritis. This work shows the results of an arthroscopic technique with tendinous interposition applied to 17 patients, all performed by the same surgeon. The use of a tendinous allograft allows for less surgical injury and less surgery time.

Conclusions: The use of arthroscopic trapeziometacarpal chondroplasty and tendinous allograft interposition is a safe and reliable procedure that allowed to improve VAS and thumb grip strength. If these results endure and can be reproduced this procedure could be considered a “biological arthroplasty”.

Keywords: Trapeziometacarpal Osteoarthritis; First Carpometacarpal Osteoarthritis; Arthroscopy; Arthroscopic Chondroplasty; Tendinous interposition; Allograft Tendon interposition
Surgical Treatment of DIP Ganglion by Excision and DIP Synovecctomy without skin flap: 10 cases

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Objectives / Interrogation: To show that surgical treatment of ganglion cysts (mucous cysts) of the DIP joint can be done with careful complete excision of the ganglion and stalk resection combined with dorsal synovecctomy. A small area of thin skin overlying the cyst can be resected and left open. No skin flap is necessary.

Methods: Retrospective review of 10 cases. Mean follow-up time is 25 months. There were 8 index and 2 middle fingers. Mean age is 60 years.

Surgical technique:
All operations were performed in axillary block anaesthesia, with upper arm tourniquet.
The incision was Y-shaped, centered dorsally over the DIP joint. The ganglion with the stalk coming from the DIP joint was carefully excised. In cases with very thin skin overlying the ganglion maximally 3x3 mm of the skin were excised and left open for spontaneous granulation.

Results and Conclusions: Results:
After a mean follow-up of two years all of the 10 operated patients showed normalized nail growth, no scarring, a good aesthetic result, good ROM, no recurrence of the ganglion.

Conclusion:
The surgical treatment of DIP ganglion cysts needs to consist of careful resection of the cyst with the stalk and dorsal synovecctomy. In some cases resection of a small area of thin skin overlying the ganglion is necessary. This area can be left open, coverage with skin flaps is not necessary.

Keywords:
DIP ganglion cyst, mucous cyst, nail deformity, surgical technique
Composite Graft and Temporary Dermo-dermal Fusion to the Palm - A Treatment Option of Fingertip Amputation in Children

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Objectives / Interrogation: Fingertip amputation in toddlers or children of preschool age is frequent. Loss of more than half of the nail bed and exposure of bone asks for coverage and reconstruction of nail bed and length. In small children the reconstruction by microsurgical replantation is impossible. In adults Paavilainen et al described 2009 a successful reconstruction by refixation of the tip by composite graft and temporary dermo-dermal fusion of the deepithelized fingertip to the palm to improve blood supply temporarily. Encouraged by his results we wanted to check if this technique is efficient in the not cooperating young children too.

Methods: From 2000 to 2018 we performed the dermo-dermal fusion in 28 children, 17 of them were in preschool age. The median age of was 5.3 years. In 22 cases the amputation level was in zone 2 and 6 in zone 3 of Rosenthal classification. The amputations were caused by squeezing and avulsion in 27 fingers and by a clean cut in 1 patient. Postoperative they were immobilized in a fist bandage pressing the tip into the palm and a forearm finger cast for 4 weeks.

Results and Conclusions: In 22 of 28 cases the fingertip refixation was successful and the major part of the pulp and nail length could be preserved. In 3 cases the children had torn their finger out of the palm in the first 10 days postop ahead of time. These 3 patients healed secondarily with a good result in 2 and a satisfying result with some shortening of the tip in 1 patient. In 3 patients the fingertip was lost due to necrosis and infection.

This technique is an option to preserve length of the distal phalanges and nail bed in comparison to the treatment with semi-occlusive dressings and local flaps. In the aftercare it is essential to protect the injured finger against pull out.

Keywords: Fingertip amputation, children
Early results of first patients with Motec wrist arthroplasty in Latin America

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Objectives / Interrogation: Multiple solutions exist to treat a wrist with posttraumatic degenerative changes. Depending on the extension of the degenerative osteoarthritis and on the functional condition of the patient, salvatage are indicated such as four corner fusion or proximal row carpectomy. When the degenerative osteoarthritis compromises the radiocarpal joint, the surgery more commonly performed in active patients is Total Wrist Arthrodesis that allows pain control but sacrificing mobility. Long term studies in patients with TWA have demonstrated an important functional disability. In the last years, there have been published very promising results in non rheumatoid patients. Motec Wrist (Swemac Orthopedics) is a new model of arthroplasty, with ceramic covered implant, ball and socket joint type with a metal on metal or metal on peek pair of friction. Indicated for all kinds of degenerative osteoarthritis in high demand patients. The follow-up to 3.2 years of 30 hard-working patients operated with Motec, demonstrated good results. The aim of this study is to show the early functional and radiologic results of the first patients that underwent total wrist arthroplasty with Motec in Latin America.

Methods: Non probabilistic sample of patients that underwent Motec Wrist Arthroplasty in 2018. Patients were evaluated at pre op, 3 and 6 months post operative with AP and lateral wrist x rays, wrist range of motion (º), grip force with a JAMAR dynamometer (kgs), DASH and PRWE. Results were analyzed with tables of frequencies, ranges and medians. Statistical analysis with R software.

Results and Conclusions: 3 patients were operated in 2018 with Motec arthroplasty. All male, mean age of 48 yo. The pre-op diagnose was snac wrist IV in 2 cases and a failed proximal row carpectomy (due to kiembock disease) in one case. Mean pre op DASH was 40, and PRWE 50 pts. Mean wrist extension of 30º, and 60º flexion, radial deviation 0º, ulnar deviation 10º. Mean Grip strength 17 kg. All were operated with the standard technique with no intraoperative complications. At 6 months post-op. No signs of implant loosening at x-rays. Mean wrist extension 50º, flexion 50º, radial deviation 30º, ulnar deviation 30º. Grip strength 25 kg. All 3 patients with no pain. DASH 15, PRWE 10 pts.

Conclusion: Motec wrist arthroplasty is a good alternative of treatment for post traumatic osteoarthritis of the wrist in young high demand patients, with good functional results in the short term and no significant complications for this small sample.

Keywords:
arthroplasty, wrist, motec
Mycetoma of the upper extremity caused by Nocadia brasiliensis- Casereport

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Objectives / Interrogation: OBJECTIVES: Since traveling around the world is a mass phenomenon, the confrontation with exotic and particularly rare symptoms of infections of the hands and upper extremity is inevitable.

Methods: PRESENTATION OF CASE: The patient (52 year old man) - with a severe pyarthrosis of the right radiocarpal joint with massive destruction of soft tissue and a palmar abscess as well as a severe pyarthrosis of the left elbow with neurotmesis N. radialis - was transferred from another hospital after multiple debridement and stabilisation of the joints with an external fixateur. Secondary diagnoses: Colitis ulcerosa (i.d. 1994, therapy: Mesalazin, Prednisolon 7,5 mg / d), pulmonary sarcoidosis. The pathogen was Nocardia brasiliensis, gram-positive actinomycetes bacteria that causes Mycetoma, which is a chronic, frequently subcutaneous, granulomatous infection that commonly affects the feet. The disease usually occurs in tropical and subtropical areas and is endemic to Latin America, India, and Africa. Long-term infection is associated with multifocal osteomyelitis.

INTERVENTIONS: The treatment consisted of multiple irrigation and debridement procedures including resection of the affected bone, soft tissue coverage by local rotational flap and the use of i.v. and oral antibiotics: Amikacin 1g 1-0-0-0, AmoxiClav 2,2 g 1-1-1-1, Imipenem 1g 1-1-1-1.

Results and Conclusions: RESULTS: After eradication of infection, intensive ergotherapy was necessary to regain adequate function of the right hand and left elbow, the neurotmesis of the radial nerve was temporary.

CONCLUSIONS: Mycetoma of the upper extremity caused by Nocadia brasiliensis is very rare. Treatment consists of identifying the pathogen and then administrating the appropriate antibiotics and surgical débridement as required. To achieve optimal results, interdisciplinary communication and treatment is mandatory. In some cases, amputation is necessary. Super-infection with other types of bacteria can result in sepsis and death.

Keywords:
mycetoma, Nocadia brasiliensis, infection upper extremity
Dynamic Distal Radioulnar Stabilization for Acute Triangular Fibrocartilage Complex Injury

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Objectives / Interrogation: Distal radial fractures, with or without fracture of the ulnar styloid, and radial shaft fractures may result in instability after disruption of the distal radioulnar ligaments or a tear of the peripheral triangular fibrocartilage complex (TFCC). Regardless of the approach taken (i.e. conservative treatment, K-wire fixation, open or arthroscopic repair), correct treatment of this rupture requires immobilization of the wrist and elbow for a period of six to eight weeks. The purpose of this study was to describe the results of distal radio-ulnar joint instability treatment using dynamic stabilization to allow early mobilization of both the radiocarpal and distal radioulnar joint as soon as week one postsurgery.

Methods: Between July 2008 and February 2013, a retrospective study was performed of 16 consecutive patients presenting distal radius fracture or Galeazzi fracture dislocation who exhibited an unstable DRUJ during intraoperative manual stress testing (via the Ballottement test) after fixation of the distal radius. Once instability was confirmed, dynamic stabilization was performed. All patients had radiographic evaluation of their wrist. CT arthrography (CTR) was performed at 3 months to evaluate TFCC healing. After surgery patients were immobilized one week with a short cast. All patients were monitored at 1 month, 3 months, 6 months and 1 year after the fracture. Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire, Ballottement test, radio-ulnar joint Range of motion (ROM), pain, grip strength, return to work, radiographic angulation and complications were monitored.

Results and Conclusions: All patients were followed for an average of 12 months after surgery. After 1 month, all patients were satisfied with good range of motion and grip strength. The Ballottement test was negative in 15 patients (93.75%), and only 1 patient showed persistent instability probably related with osteoporotic bone. TFCC healing was observed in 14 patients (87.5%) and fracture healing was observed in all 16 patients. Revision surgery was performed in one patient (6.25%) due to flex-extension limitation and no other complications were recorded. The high incidence of DRUJ instability in fractures of the distal radius and Galeazzi fracture-dislocations is well described in the literature. The technique presented in this article illustrates a reliable method for dynamic stabilization of the DRUJ with satisfactory results at short-term follow-up.

Keywords: Radioulnar joint, triangular fibrocartilage complex, distal radius fracture, instability, Galeazzi fracture-dislocation.
SL reconstruction with fibertape- a possibility of a gentle SL reconstruction? First experience with a new surgical technique

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Objectives / Interrogation: Small ligament- great impact; that could be the description of the scapholunar ligament. Damage to the SL ligament can lead to instability and cause scapholunate advanced collapse or SLAC wrist. Over the years various ligament reconstruction or tenodesis techniques have been described. However, as of today, there is no internationally recognised "gold standard". The long- term clinical results are usually limited and some techniques result in disproportionate collateral damage.

Methods: Recently, we use the fibertape ( Fa. Arthrex), which is among others used in the arthroscopic rotator cuff repair, in combination with two anchors for fixation. In this technique, small incisions are made over the dorsal capsule for the introduction of the anchors, while preserving the ligamentous structures. With the development of new anchors the tape can be installed with a pretension after the reduction. Up to now we refused on the transfixation pinning of the carpus, because of the clinical and radiological stability during mobilisation. Additional morbidity from e.g. harvesting tendons may be dropped. After the surgery the patients are immobilised in a splint for 6 weeks, and full stressing is possible after 12 weeks.

Results and Conclusions: So far, nine patients with the appropriate indication were supplied with these surgical technique. The longest follow-up period is 5 years. Active wrist range of motion, grip strength and radiological appearance are promising.

After cadaver training, we are using this new method on suitable patients. The first experience has been encouraging. Larger numbers of cases and long- term results will show, if these method can become established. A positiv effect is the less effort, the gentle preparation while preserving ligaments, waiving of transfixation and shorter immobilization.

Keywords:
A Standardized Patient Education Video Program for Improvement of Post-operative Pain Management after Outpatient Upper Extremity Surgery

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Objectives / Interrogation: Pain after surgery is common and not always well controlled. Results of a recent survey of adult surgical patients showed 86% experienced pain after surgery; of these, 75% had moderate/extreme pain during the immediate post-surgical period, with 74% still experiencing these levels of pain after discharge. Post-surgical pain was the most prominent pre-surgical patient concern, and nearly half reported they had high anxiety levels about pain. The importance of patient education regarding pain management is agreed upon, although support in the literature, especially in the outpatient setting, is not strong.

The objective of this prospective, randomized, placebo-controlled experimental study is to investigate the effect of adding a formalized patient education program (videos and recovery diary handout) to the current standard-of-care counseling on patient experience after outpatient orthopedic upper extremity surgery.

Methods: One hundred and three adult patients undergoing elective outpatient, upper extremity surgeries were randomized to view one of two educational programs: 1) a 2-video series regarding post-operative pain management or 2) a video regarding wound care. Randomization was stratified based on the expected postoperative opioid prescription size. Outcome measures included both validated (PROMIS Pain Intensity) and non-validated (pain scale, measures of satisfaction and knowledge) scores.

Results and Conclusions: Eighty-nine patients completed the study, resulting in analysis of 47 patients in the wound care group and 42 patients who received formalized education in pain management. Patients who received the additional wound care education showed an increase in pain intensity as measured by the PROMIS Pain Intensity Short Form 3a administered 3 days after surgery (average of 0.13 points on a 5 point scale) compared to pre-operative levels, whereas patients who had received pain management education showed a decrease in their PROMIS Pain Intensity Score of 0.81 points (p=0.04). Similarly, patients undergoing the pain management education reported significantly lower pain scores (pain rated on a scale from 0-10; average 2.7 vs 3.1, p=0.004) with the most clinically significant benefit on post-operative days one to five.

A formalized pain management education program can significantly decrease the pain experienced by patients after outpatient upper extremity orthopedic surgery. The authors recommend that a comprehensive approach to pain management include a focus on patient education.

Keywords:
pain, patient education, opioid, surgery, hand surgery
A prospective randomized trial comparing clinical outcomes of treatment with buddy taping of 4th and 5th metacarpal vs closed reduction and cast immobilization in fifth metacarpal neck fractures with less than 70° of volar angulation.

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Objectives / Interrogation: The ideal treatment for fifth metacarpal neck fractures is still under debate. Although these fractures are typically treated nonoperatively, most often with closed reduction and splint immobilization, cast immobilization seems to not be superior to soft wrap without reduction in most cases.

The aim of this study was to determine if the outcomes of buddy taping for three weeks was not inferior to reduction and cast immobilization for fifth metacarpal neck fractures with volar angulation < 70° and no rotational deformity.

Methods: Between August 2016 and March 2018, 72 patients with fifth metacarpal neck fractures were prospectively enrolled and treated with buddy taping or a cast with previous reduction during 3 weeks according to an established randomization sequence. All patients were monitored at 3 and 9 weeks after fracture and the primary outcome was measured by the Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire. Range of motion (ROM) of the metacarpal phalangeal (MCP) joint, pain, grip strength, return to work, radiographic angulation and complications were recorded.

Results and Conclusions: After 3 weeks, patients treated with buddy taping were satisfied with good fifth MCP joint ROM and their DASH score was significantly lower than the other group.
At 9 weeks, clinical outcomes in the soft wrap group were better in terms of grip strength, range of motion and score obtained in DASH questionnaire, but this statistical difference was without clinical relevance.
A subjective long-term evaluation was performed by phone; at a median of 1 year, a QuickDash score gave a median of 0 points. There were more complications in the group of patients treated with cast immobilization. Increased fracture angulation was not significantly different between the groups. Duration of time off work was 28 days shorter with the soft wrap compared to the cast treatment (P <0.001).
There is no benefit to reduction and splint immobilization of fifth metacarpal neck fractures with initial angulation of less than 70°. The use of soft wrap and buddy taping with early mobilization resulted in satisfied patients, good clinical results and significant improvement in lost work time.

Keywords:
fifth metacarpal neck fracture, Cast, buddy taping, Prospective & Randomized
Cerclage wiring and its modification for long oblique/spiral fracture of the metacarpal shaft

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Objectives / Interrogation: It is not so easy to perform lag screw technique for long oblique/spiral fracture of the metacarpal shaft because of difficulty to place the screws, measure correct length of the screws and develop a crack. The purpose of this study is to reveal the postoperative outcome of cerclage wiring procedure reported by Gropper and Al-Qattan, and introduce our modification of this procedure.

Methods: Sixteen metacarpals in 15 hands in 14 cases (12 males and 2 females) were treated for long oblique/spiral metacarpal shaft fracture. Initial 7 metacarpals were immobilized by original 2 or 3 single looped cerclage stainless-steel wires of nearly 0.5mm in diameter. Next 4 metacarpals were stabilized by double looped cerclage sutures with #2-0 FiberWire to avoid the removal. Recent 5 metacarpals were treated by double looped cerclage wires to improve the stability. Affected hands were immobilized with intrinsic plus position by plaster splint for within 2 weeks postoperatively. Postoperative outcome and complications were investigated in all cases.

Results and Conclusions: Bone union was achieved without rotational malunion and shortening in all 16 cases. However, wire aberrance to the fracture site was occurred in an initial metacarpal, and mild limitation of the affected metacarpophalangeal joint in an oldest (77 years) initial case. Also, constriction of the cortex was appeared in 3 metacarpals treated by cerclage sutures. No complications were seen in all recent metacarpals treated by double looped cerclage wires. Cerclage wiring procedure is easy, cost-effective and reliable compared with other procedures. Double looped wire is more stable and reliable than single looped wire. We are going to continue performing double looped cerclage wiring technique for long oblique/spiral metacarpal shaft fractures.

Keywords:
metacarpal shaft fracure, cerclage wiring
Scaphoidectomy and double column arthrodesis for SLAC and SNAC wrist

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Objectives / Interrogation: To evaluate the functional and radiographic results of a scaphoid excision and four-corner arthrodesis technique using percutaneous headless compression screws.

Methods: A cohort of 84 patients, mean age 45 (range, 20-66) years, was treated for SLAC 3 and SNAC 3. After scaphoid excision and removal of cartilage and subchondral bone in the midcarpal joint the DISI deformity was corrected. Luno-capitate fixation was achieved with two Herbert screws and triquetro-hamate fixation was done with one or two Herbert screws, always in a proximal to distal direction. Bone graft was never used.

Results and Conclusions: At a mean follow-up of 9 months (ranged from 3 to 24 months), 34 patients were reviewed (30 males and 4 females). Pain at rest and under load improved passing from 7 and 8 to 0 and 3 respectively, flexion-extension decreased from 83° (flexion 41° / extension 42°) to 54° (flexion 24° / extension 30°), grip strength increased from 20 to 21 kg, Mayo Wrist Score increased from 34 to 55. Radiological examination were done every months and CT-scan in some doubt case in which the consolidation was not clear. X-ray images demonstrated the consolidation of the luno-capitate arthrodesis in almost 2 months, the triquetrum-hamate arthrodesis reached the consolidation one month later. Some patients complaints discomfort in the ulnar side for almost 3 months. All patients return at previous work or status in 3 months but one. This case was reoperated for nonunion with the same technique using Herbert screw of bigger dimension and obtained healing in 2 months. No radiological osteochondritic/arthritis changes were observed at follow-up due to the lunate holes created by screws.

Conclusions: These results were comparable to or better than the results of previously published techniques in terms of fusion rates, alleviation of pain, grip strength, range of motion; Mayo wrist score. The technique showed the real advantages of strong compression for arthrodesis healing.

Keywords: wrist arthritis, SLAC wrists, SNAC wrist, mid carpal arthrodesis
Results of Fascia Lata Soft Tissue Interposition Elbow Arthroplasty for Chronic Neglected Posterior Dislocations of the Elbow of more than 1 year duration

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Objectives / Interrogation: Neglected posterior dislocation of the elbow is common in developing countries. Neglected posterior dislocations often present with myositis ossificans from massage and treatment from bone-setters in developing countries. Such problems in young, active patients present a challenging problem to the upper extremity surgeon. Pain and loss of motion associated with elbow stiffness is poorly tolerated and constitutes a major functional impairment.

Methods: We evaluated the clinical results of open reduction and fascia lata interposition arthroplasty in patients with neglected posterior dislocation of the elbow of more than 1 year duration associated with myositis ossificans, focusing on range of motion, stability & pain. All patients underwent open reduction, contracture release, triceps plasty, fascia lata interposition arthroplasty with a hinge elbow fixator distractor and collateral ligament reconstruction.

Results and Conclusions: 11 patients (all males) were treated for neglected dislocation of the elbow between Jan 2009 and Dec 2015 at our Institute. Mean time from injury was 15.7 months (range, 12-24 months). The mean period of follow-up was 29.33 months (range, 14-48 months). All patients had satisfactory pain relief. 8 out of 11 (72.7%) patients had an excellent or good result by the objective criteria of the Mayo Elbow Performance score. 2 patients had fair outcomes. In 1 patient instability of the elbow, both before and after surgery, was found to be associated with an unsatisfactory result.

Conclusion: Interposition arthroplasty, combined with hinged external fixation, is a viable solution for neglected posterior dislocations of the elbow in young active individuals in developing countries. The use of a fascia lata graft provides a stable and adequate interposition material without overstuffed the joint. Our mid and long term results are encouraging and we feel that this is a viable and robust non-prosthetic arthroplasty option in carefully selected patients.

Keywords:
Distal Digital Nerve Repair Using Nerve Allograft with a Dermal Substitute

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Objectives / Interrogation: In this case, we demonstrated the effectiveness of allograft in repairing traumatic digital nerve injuries distal to the trifurcation.
We also show the utility of dermal skin substitutes in reconstruction following complex hand injuries.
These techniques allow for a greater range of options for hand surgeons offering reduced morbidity for patients with traumatic injuries.

Methods: A 17-year-old male presented with full thickness open wounds to the left index and long digits along the radial contact surfaces of the left index and long digits. Portions of the radial digital nerve were missing on both the index and long fingers with gaps of 2.2 cm and 1.6 cm respectively. The gap in the index finger was distal to the trifurcation, and the long finger was at the trifurcation. The index and long digits had skin loss of 3 x 1.8 cm and 3.2 x 1.6 cm, respectively, on the volar radial aspect of both digits.
1-2mm diameter allografts were selected to match the native nerve. The allograft was positioned between ends of the nerve segments followed by a nerve connector over each anastomosis.
Considering the distal nature of the nerve repair in the index digit, we chose to connect the nerve allograft to multiple small nerve ends.
Due to multiple digits involved and difficulty gaining distal coverage of the fingers, we elected to place dermal substitute. We placed bilayer meshed integra directly over the nerve repair and wound for the soft tissue coverage.
Six months after follow up, the patient reported improvements in strength and return of full range of motion. The patient reported normal sensation, and Semmes-Weinstein sensory mapping correlated with these results.

Results and Conclusions: Nerve allograft placement is a viable alternative in cases of traumatic injury to digital nerves as it mitigates the unorganized distribution of nerve fibers found in nerve conduits as well as donor site morbidities found with autografts.
We used a dermal substitute to cover and protect the underlying subdermal structures including the nerve allograft. The porosity of this material allows it to better approximate the physiological function of the skin originally covering the wound, resulting in a more complete return to normal functionality as well as superior aesthetic outcomes. This case indicates that dermal skin substitute can be used as an alternative to autograft and skin flaps for increased functionality and reduced donor site morbidity.

Keywords:
Dermal Substitute; Digital Nerve; Distal Nerve Injury; Nerve Allograft; Nerve Repair
Cell-loaded custom made fibrin glue nerve conduits optimize the repair of peripheral nerves in a sciatic nerve graft model in rats

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Objectives / Interrogation: Incomplete nerve regeneration after injuries to the peripheral nervous system remains a significant problem in clinical routine and raises the need for supportive strategies. We examined the effect of an additional adipose derived progenitor cell-loaded fibrin glue conduit in the model of a 20 mm long peripheral nerve defect in the rat treated with an autologous nerve transplant.

Methods: Cells were isolated from the inguinal fat pad of the rats using the ARC centrifuge (Ingeneron). To improve the regenerative potential of adipose derived progenitor cells, we preconditioned the cells in 2% of hypoxia for 3 days before they were applied. Cells were suspended in liquid fibrin glue (ARTISS; Baxter) which was then cast into a solid nerve conduit of 25mm in length and 2mm of wall thickness. The cell-containing conduits were then applied around a 20mm autologous nerve graft in a sciatic nerve defect model covering both coaptation sites. While the experimental group (n=9) received hypoxically preconditioned cells, the control groups received either the fibrin conduit alone (n=9), the conduit containing non-preconditioned adipose derived progenitor cells (n=9) or no conduit at all (n=9). During the trial period of 16 weeks we conducted weekly walking-track and static foot-print-analyses. Afterwards the animals were sacrificed and the bilateral gastrocnemius muscle was weighed. Histological evaluation including axon density and axon size was carried out.

Results and Conclusions: Functional analysis in terms of sciatic function index showed significant improvement in all groups treated additionally with fibrin conduits when compared to the control group that did neither receive conduit nor cells indicating faster functional regeneration. The group that received hypoxically preconditioned cells produced the best results, followed by the non-preconditioning group, which in turn yielded better results than the fibrin conduit group without cells. The gastrocnemius muscle’s weight was significantly higher in conduit groups and conduit-treated animals showed an increased axon density when compared to control group without conduit. Slightly higher numbers of axons in animals with cell-containing conduits were detected. These results indicate the beneficial effect of an adipose derived progenitor cell-loaded fibrin glue nerve conduit in addition to microsurgical nerve repair in the model of an autologous nerve transplant in the rat, yet the underlying mechanisms need to be further investigated.

Keywords:
Fibrin sciatic nerve modell stem cells
Long Term Functional Results of Camitz opponensplasty in Severe Carpal Tunnel Syndrome with Severe Thenar Atrophy

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Objectives / Interrogation: Introduction: Camitz opponensplasty is a tendon transfer of the palmaris longus tendon to the thumb for patients with loss of thumb opposition and abduction in severe carpal tunnel syndrome. The purpose of this study is to evaluate the long-term functional results of patients with more than 10 years after surgery.

Methods: Methods:
A retrospective review of patients who had Camitz opponensplasty for more than 10 years was conducted. All patients who had the surgery before 2007 were reviewed. 63 patients had the surgery between 1987 and 2007. 32 patients were available for review. Their age at the time of surgery averaged 68 years (range 58-72).
All patients presented with severe numbness and tingling and complete loss of active thumb abduction or opposition. Electrodiagnostic studies confirmed severe carpal tunnel syndrome and the complete loss of motor unit recruitment in the abductor pollicis brevis muscle. The procedure was combined with open carpal tunnel release.
All patients were evaluated clinically for grip and pinch strength, active range of motion of thumb palmar and radial abduction, sensory evaluation and Kapandji score. No electrodiagnostic studies were performed. DASH score was also obtained.

Results and Conclusions: Results:
31 patients were satisfied with the procedure. Active thumb palmar abduction significantly improved from a preoperative average of 15 degrees to 52 degrees. The grip strength improved from a preoperative average of 42% of the contralateral side to 87% (range 56-92%). Pulp pinch strength improved from a preoperative average of 40% of the contralateral side to 88%. Kapandji score improved from an average of 2 to a postoperative average of 9.5 (range 8-10).
Semmes-Weinstein Monofilament test showed improvement from an average of 6.65 preoperatively to 3.61 postoperatively.
DASH scores averaged 8 (range 2-23). We did not have preoperative DASH scores to compare with.
When compared with the final values at time of patients' discharge there was a significant improvement of Pinch strength, Kapandji score, Active thumb radial and palmar abduction and return of sensibility.

Conclusions: This study shows that patients have open carpal tunnel release and Camitz opponensplasty continue to improve and maintained the improvement for a long time. Therefore, It is considered a reasonable choice for patients with loss of abduction and opposition of the thumb secondary to severe CTS.

Keywords:
Carpal Tunnel; Tendon transfer; Thenar atrophy; Long term results
Complex thumb metacarpophalangeal joint dislocation caused by ulnar collateral ligament entrapment in a 6 year old.

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Objectives / Interrogation: Case Report

Methods: A right handed 6-year-old girl presented to the hand trauma clinic with a painful left thumb having fallen on it whilst playing 11 days previously. On examination, her thumb was tender and dorsally angulated at the level of the MCPJ. There was minimal active movement at the joint. Examination and stress manipulation of the joint was not performed given the child's age and discomfort. An xray showed a dorso-radial dislocation at the thumb MCPJ. Under general anesthetic, a further attempt at closed reduction proved futile. Open surgical exploration by a dorsal approach of the metacarpophalangeal joint revealed avulsion of the proximal origin of the ulnar collateral ligament with a slip of periosteum. This was identified within the joint space and tethered by fibrous tissue. There was no damage to the radial collateral ligament or volar plate. The avulsion was mobilised and a successful reduction was achieved. The ligament was re-attached to its anatomical position on the metacarpal head using a transosseous suture.

Results and Conclusions: In irreducible thumb metacarpophalangeal (MCPJ) dislocations, the volar plate is most commonly found in the joint preventing closed reduction. We present a 6 year old child with an irreducible thumb MCPJ, of which we identified the ulnar collateral ligament as the culprit interposing soft tissue stopping reduction. This has not been described before and we wish to share our clinical and surgical management of this unique case.

Keywords:
The Endoscopic Carpal Tunnel Release in 175 Patients: Learning Curve, Complications and 1.5 Year Review

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Objectives / Interrogation: The most common peripheral neuropathy is caused by the idiopathic carpal tunnel syndrome (CTS). The surgical decompression is usually performed with an open (OCTR) or endoscopic carpal tunnel release (ECTR). The ECTR is supposed to show a flat and complicated learning curve and to be technically more demanding than the OCTR. Therefore, we wanted to examine the learning curve while establishing ECTR in our clinic and monitored a total of 175 patients for complications and outcome during a 1.5 year period. Moreover, we wanted to figure out, which operative method shows the higher patient acceptance.

Methods: From April to November 2017, 52 patients with idiopathic CTS were included in a pilot study, operated in a single center by one surgeon using the one-portal ECTR-procedure. The operative time was measured and any remaining hematoma was scored at the time of stitch removal 12 days after surgery. The postoperative pain level was evaluated (VAS 0-10). Regression of the typical CTS symptoms such as nocturnal numbness and pain (NMP) was also monitored. From November 2017 to September 2018 another 123 patients were operated with ECTR and monitored identically. Finally, 8 patients who were operated bilaterally with OCTR and ECTR by the same surgeon were interviewed, which operative procedure they preferred.

Results and Conclusions: In the beginning, 30 ECTR were needed to establish a stable and representable process. In the first 30 patients, greater variabilities in the operative time from 6 to 27 min. were recorded and 2 ECTR-procedures were converted into an open surgical approach. In the first third of 52 patients (1-17), the average operative time was 11.8 min., in the second third (18-35) 8.0 min. and in the last third (36-52) 5.5 min. were needed. During the learning phase, operative revisions, due to complications, were not observed. However, there was one iatrogenic partial lesion of a three-part motoric thenar branch in an extremely obese patient (patient no. 119), that had to be reconstructed microsurgically during the same operation. By all 175 patients, the NMP disappeared post-operatively and the pain level was low (VAS 0-2). In case of a CTS, 7 of 8 patients who were operated bilaterally, wanted to be operated again with ECTR, 0 of 8 preferred OCTR and one patient was indecisive. Thus, these results do not confirm the assumed prolonged learning process. If the guidelines are respected, the ECTR is confirmed to be a save and favorable procedure with a high patient acceptance.

Keywords:
CTS, endoscopic carpal tunnel release, ECTR, OCTR
FREE VASCULARIZED INTERDIGITAL JOINT TRANSFER OF THE HAND: TWO CASES SERIES

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Objectives / Interrogation: Show innovative surgical technique for the reconstruction of dysfunctional joints of the hand. A viable option is presented to reestablish the interphalangeal joint function. Will this technique be a good option?

Methods: We present two cases of patients with loss of interphalangeal joint functionality of the hand, secondary to a circular saw. Non-vascularized joint transfer from functional metacarpo-phalangeal to dysfunctional interfalangia is performed to re-establish joint function. First case: 62-year-old man. It has amputation at F1 level in the 5th finger and arthrodesis of proximal PIP of second finger. A non-vascularized transfer of the 5th metacarpophalangeal joint to the proximal interphalangeal joint of the index finger was performed. Joint resection of MTF and PIP joint, edges regularization, MTF joint placement replacing the PIP in index, fixation with minifragment screws without head, through articular cartilage. Repair in second surgery of flexor tendons. Second patient: male, 34 years old. Trauma with amputation at the index finger F1 level, dysfunctional PIP of third finger of the same hand. Resection is performed devascularized MTF block of the index finger, transferred to PIP of third finger. The technique was modified, cortical-spongy bone wedge construction with articular cartilage was made, both wedges are adapted to F1 and F2 bones, achieving adaptation with non-osteosynthesis material.

Results and Conclusions: The first case, articular cartilage necrosis was generated, so the osteosynthesis material had to be removed. Patient can still perform work, with limited mobility of PIP transfer. No pain and partial functionality. The second case do not generate articular cartilage necrosis. We think that it was secondary because we did not place osteosynthesis and bone wedge was left for osseointegration. Joint transfer is a viable option in patients suffering from interdigital joint dysfunction. The context of the patient, the donor joint, the receiving joint, the receiving site where the transfer is made, the state of the soft tissues and also explain the patient that it has a failure rate, series describe up to 15% must be taken into account. The greater follow-up is necessary, as well as increasing the number of patients who perform this type of surgeries. In our center, with low resources, in a context where agriculture is the main work, the functionality of the hand is essential. This is why it is a viable option to re-establish joint functionality.

Keywords:
JOINT TRANSFER, HAND, FINGER, MICROSURGERY
Technical tips for managing pilon proximal interphalangeal joint fractures.

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Objectives / Interrogation: Proximal interphalangeal joint (PIPJ) pilon fractures of the hand are common and difficult to treat. This is often from an axial loading pattern of injury, resulting in splaying of the PIPJ with compression of the central portion of the articular surface. In select patients, operative management is undertaken in the form of dynamic frames such as a Suzuki frame or open reduction internal fixation (ORIF) with plates, with or without bone grafting.

Methods: Invariably, traction is required intra-operatively to assess reduction. It is often difficult to maintain accurate reduction with the lead surgeon or assistant pulling on the end of the digit, and often leads to the clinicians fingers being inadvertently exposed to radiation. In our practice, we have found an effective method to apply traction and avoid radiation exposure to our surgeons hands. We pass a 15cm transverse kirshner wire (k-wire), usually a 1.1 or 1.3 through the head of the middle phalanx, and leave the ends long. A surgical swab is wrapped around on each end of the k-wire and traction can be applied. Should reduction be acceptable with traction, this wire can then be the distal wire of an external fixation such as a Hynes Giddens or Suzuki frame. When the fracture extends distally to involve the distal aspect of the middle phalanx, this transverse wire is passed transversely through the base of the distal phalanx. This can be removed at the end of the ORIF. In addition to traction, the wire ends aid in retraction the other fingers dorsally during ORIF.

Results and Conclusions: We have found this maneuver extremely useful in managing what is often a tricky fracture. We would like to share this tip with photos and imaging.

Keywords:
Stuntspecific traumata of the hand and wrist at professional stuntwomen and stuntmen

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Objectives / Interrogation: The body-stress and risk of accidents of the hands and wrist’s for professional stuntwomen and stuntmen do not correspond to those of actors, but much more to those of professional competitive athletes in various hand-involved sports. Thus, there is a high risk of specific hand and wrist injuries in this profession, even if special job-specific and stunt-specific protectors are used and protective measures are carried out. Nevertheless, this has not yet been specifically recorded in the literature. The question of how occupational disabilities and their durations in this particularly risky occupational group can be traced back to injuries of the wrist’s and hands is not adequately described in the literature.

Methods: The aim of the present retrospective study was therefore to record the occupation-specific risk for hand and wrist injuries in professional stuntwomen and stuntmen. For this reason, in a period of 12 months 120 professional stuntwomen and stuntmen (definition of professionalism is the predominant > 80% income protection of the injured by the activity in the above-mentioned profession) in German-speaking countries were interviewed to injuries of the hands and wrists, in the past 10 years as part of their professional activity. The detected injuries were grouped by type and by accident mechanism (type of stunt leading to injury). In addition, the forms of treatment, resulting occupational disabilities and persistent limitations of stunt ability after hand injuries as stuntwoman and stuntmen were recorded.

Results and Conclusions: The results showed that despite the high risk of injuries in the context of the occupational activities mentioned above serious injuries occurred significantly less often than minor injuries in the surveyed group. Most common injuries were joint and bony injuries of more than 40%, followed by tendon and other soft tissue injuries. Specific injury patterns of the wrist’s and hand could be assigned to typical common stunt forms. Thus, the study allows the creation of a stunt-dependent risk profile for wrist and hand injuries. In addition, thus stunt-dependent risks for the emergence of resulting occupational disabilities periods and their duration can be derived. This is here of interest not only for private accident insurances, but also for the German social accident insurance institution - Berufsgenossenschaft. From this, however, stunt-specific hand-protective measures can be derived and recommended. These are presented in connection with the stunt-forms.

Keywords:
hand wrist trauma stuntmen stuntwomen
Does timing of carpal tunnel release influence the results?

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Objectives / Interrogation: In case of carpal tunnel syndrome, the patients’ fear of the operation may lead to long lasting symptoms. Our hypothesis was that the longer the patient waits till the operation, the worse the results will be.

Methods: We performed a retrospective evaluation of our database on carpal tunnel syndrome. The preoperative and postoperative findings were collected prospectively. In the period between 2014 to 2018 467 patients underwent median nerve release for carpal tunnel syndrome in our center. 24 patients were excluded due to missing data. In each case we performed open carpal tunnel release without synovectomy. The grip and pinch strength were measured with a dynamometer. The changes in numbness, night pain and satisfaction were registered. For the evaluation of subjective findings, a visual analogue scale of 1-10 was used. The patients were selected into 5 groups according to the time interval between the first symptoms and the operation. Significance was evaluated using Z-test (p=0.05).

Results and Conclusions: Values of preoperative daytime and nighttime numbness were similar in all 5 groups. In the first group (symptoms for less than 3 months), the daytime numbness was 6.5, the nighttime numbness was 7.67. The night pain was 6.97 points. These values at the end of the first week, were 5.29 for the daytime numbness, and 4.13 for the nighttime numbness. The night pain almost totally disappeared. All the other groups gave similar results, with only two significant difference. The grip strength increased significantly during the first three months in the first group compared to the preoperative values. Opposite to this in the fifth group (symptoms for more than 3 years) the grip strength did not reach the preoperative level after 3 months. The satisfaction of the patients was similar in all groups, but in the first group there was an increasing tendency during checkups, and the fifth group was the most satisfied (9.2) after 1 week and the values showed a decreasing tendency.

Based on our results we can conclude that regardless of the time from the appearance of the first symptoms the subjective complaints decrease with no significant difference after neurolysis. An early operation will result in a continuously improving tendency in the postoperative stage. Patients with longer anamnesis will reach an early improvement of symptoms thus high satisfaction at 1 week postoperatively. However, with time they do not improve their results. This way our hypothesis failed.

Keywords: carpal tunnel syndrome, symptoms, timing of operation, results
Surgical treatment of proximal nerve entrapment at the elbow by release of the lacertus fibrosus release with ultrasound surgery and WALANT

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Objectives / Interrogation: Compression of the median nerve to the elbow (PMNE) is considered rare. Difficult to diagnose, simulating a carpal tunnel with which it can sometimes be associated, it is rarely detected with conduction studies. The purpose of this study was to assess the feasibility and benefits of the ultrasound-guided release of lacertus fibrosus with Walant for the treatment of PMNE.

Methods: We conducted a prospective study from April 2015 to January 2017. Only patients with an isolated PMNE were included.
All patients received a bilateral clinical examination including muscle testing, a scratch collapse test, the search for a Tinel sign (elbow and wrist) and a Phalen sign. The strength was measured with a Jamar and the function was evaluated with a Quick DASH. All the patients have had a conduction study Diagnostic criteria were: an anomaly in the FPL, FCR and FDP II tests, a Tinel sign at the elbow below the Lacertus, a positive scratch collapse test, which disappears after cold application, an absence of clinical signs suggestive for a carpal tunnel syndrome and normal conduction study. Anesthesia was performed according to the WALANT protocol. A limited incision was made at the proximal edge of the lacertus. The section was performed with a kemis knife and an ultrasound guidance with a 6-15mHz probe. At the end of the procedure a testing of the FPL and the FDP II was performed to confirm the improvement of the immediate recovery of the motor function. All the patients have had a clinical review at D8, D45, and D90.

Results and Conclusions: We included 36 patients (20 women and 16 men) with an average age of 46.2 years (19-70). The dominant side injury involved 21 patients, two patients had bilateral injuries. No adverse events were noted during the procedure and no additional anesthesia was useful. Two postoperative hematoma was observed, which did not require resumption, and motor testing was normalized for all patients at the last follow up. The average preoperative Quick DASH was 38.9 (12 - 68.2). At the last follow up the average Quick Dask was 11 (0 - 38).
Conclusion: The Ultrasound-guided release of the lacertus fibrosus is effective and reliable for the treatment of the pronator median nerve entrapment. The Walant protocol allows immediate evaluation of the effectiveness of the treatment.

Keywords:
median nerve
Surgical reconstruction for congenital thumb hypoplasia: a retrospective review of long-term results

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Objectives / Interrogation: Congenital thumb hypoplasia is a malformation involving abnormal development and differentiation in the longitudinal radial axis. Various surgical reconstructions are available for each deficiency, but empirical evidence that allows for evaluation of the results of the different techniques is scarce. This retrospective study analyses the outcomes of patients who underwent surgical reconstruction for congenital thumb hypoplasia in our institution.

Methods: All patients who underwent surgical reconstruction for congenital thumb hypoplasia, performed by the senior author, and for whom a minimum of 3 years of follow-up data were available, were identified by a retrospective records review and were recalled for clinical assessment. Case notes, clinical assessments, and radiological data obtained from the medical records were reviewed. At follow-up, objective and subjective measurements were conducted.

Results and Conclusions: From 32 reconstructions for thumb hypoplasia in 29 patients, 19 patients (22 affected thumbs) could be included for analysis. The mean (SD) follow-up duration was 9.0 (3.9) years (range 3.6 years - 16.2 years). Our results for range of motion and subjective parameters are in line with data from comparable studies. The percentage of unstable metacarpophalangeal (MP) joints in this study was relatively high (45.5% in extension and 72.7% in 30° flexion) compared to the literature. Imbrication of local tissue alone at the ulnar side of the MP joint for ulnar collateral ligament reconstruction seems to stretch and fail with time. Furthermore, a secondary arthrodesis due to painful instability at the MP joint was required in four patients. The abductor digiti minimi (ADM) was the preferred method to restore opposition in our study in most cases. Compared to studies that used predominantly a Flexor digitorum profundus (FDS) opposition transfer, our patients had higher results in grip strength (77% of normal), despite the higher number of MP joint instability. However, the inconsistency of application of pre-operative classification is a problem with most outcomes studies on this topic and renders comparison difficult. The establishment of a valid, age-related assessment method for thumb hypoplasia, which considers preoperative measurements, includes intraoperative findings, and is applicable in the preoperative age category (1-3 years) would be a valuable contribution for the future.

Keywords: Congenital, thumb hypoplasia, reconstruction
Severe Dupuytrens Contracture treated by the McCash Technique (open palm) and Full Thickness Skin Grafts to the Involved Fingers: Results and Complications.

List of authors:
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Objectives / Interrogation: Objective: We hypothesized that using an open palm technique and full thickness skin grafts would result in satisfactory correction of the flexion contractures with minimal complications.

Methods: Methods: 95 patients with severe Dupuytrens contracture were operated on between 2010 and 2017 by the senior authors. The patients were evaluated pre and post op by the surgeons. The average follow up was 18 months.

We evaluated:
1-ROM of MCP?\(^s\) + PIP?\(^s\) pre and post op
2-Post- operative pain
3-Time for healing of the open wound
4-Complications:
    flare reaction (RSD)
    loss of FTSG
    nerve injury

Results and Conclusions: Results: Patients were all seen initially at 3-5 days post op. They were then followed 2 weeks post-op. The average VAS pain score was 3.4 at 3-5 days post op and all patients were off any strong medication by 1 week.

ROM   pre-op           post-op
MCP   5 degrees        55 degrees
PIP   25 degrees       75 degrees

Time for healing of open of open wound was 18 days.

Complications:
flame reaction (RSD symptoms)- 3
loss of FTSG- 2
nerve injury/ neuropraxia- 2

Conclusion: Severe Dupuytrens contracture can safely be treated by using an open palm technique and small transverse finger incisions. Defects in the fingers are treated by full thickness skin grafts. The use of the open technique and small incisions results in very few severe complications.

Keywords:
Severe Dupuytrens, FTSG
The use of dorsal butters wire in treatment of distal radio fracture

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Objectives / Interrogation: Some cases with comminuted intra articular distal radius fracture have an associated dorsal rim fracture, this fracture may cause re displacement of the fracture and/or carpal bone dorsal subluxation. This study was aimed to assess the effectiveness of dorsal buttress wire in preventing re displacement of the fracture and carpal subluxation.

Methods: The study included 79 patient with AO type C unstable distal radius, all of them had a dorsal rim fragment that compromised the stability of the fixation after either ORIF or CRIF of the main fragments. An Intra-focal K-wire was inserted in the fracture site just proximal to the dorsal fragment obliquely to buttress it. The stability of the fracture was reexamined under fluoroscopy. This technique was used with volar plating in 16 patient and with CR and pining in the remaining patients.

Results and Conclusions: After a mean follow up of 18 months, there were no cases of fracture redisplacement during follow up period. However, CR did not achieve acceptable reduction in 7 patients secondary to more than 2 mm radial shortening and/or loss of solar tilt. The average Mayo wrist score was 72 point. Two cases developed CRPS that responded to conservative treatment. 17 patient were unsatisfied with the scar at the site of pin insertion.

Dorsal buttress k wire add in the stability of distal radius fracture post reduction and may represent a good alternative to simultaneous dorsal and solar plating.

Keywords:
Dorsal rim; Distal radius fracture; intra focal pinning
Arthroscopic Treatment of Thumb Basal Joint Arthritis

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Objectives / Interrogation: Thumb carpometacarpal (CMC) joint arthritis is a common problem in clinical practice in the Western and other populations, with a variety of treatment options. However, it is not very common in the Indian sub-continent.

Patients, usually women, complain of pain, particularly with pinch and grip, which can interfere with daily activities.

When non-operative means of treatment fail, surgery is an option. Surgical options have included reconstruction of the ligaments about the thumb with or without removal of the joint surface, arthroscopic shrinkage of the ligaments or debridement, corrective osteotomy to redistribute contact forces in early stages of arthritis, arthroscopic and open procedures, thumb carpometacarpal (CMC) fusion, and excision of all or part of the trapezium with or without interposition of any materials.

Recent advances in small joint arthroscopy have established the role of this technique in the treatment of Grade II and early Grade III CMC arthritis of the thumb.

Arthroscopic treatment is relatively new and is performed only in select centers in the Indian sub-continent. It allows for joint visualization and treatment and staging of disease in a minimally invasive fashion with the ability to revise the surgery to complete trapeziectomy if necessary with progression of symptoms.

In this paper, which is the first report of arthroscopic treatment of thumb CMC arthritis, we describe our experience of arthroscopic debridement and ligament shrinkage in the treatment of CMC arthritis of the thumb in the Indian population.

Methods: We reviewed 12 patients who underwent arthroscopic debridement and thermal shrinkage in Eaton Stage II & III CMC arthritis of the thumb. We measured the grip and pinch strength and the range of motion.

Results and Conclusions: The minimum follow up was 1 year. All patients had a satisfactory reduction in their pain levels. There was a statistically significant improvement in the post-operative pain scores and the pinch strength while the ROM remained mostly unchanged. 3 patients had radiological deterioration of the arthritic changes with pain only on strenuous activities. There were no complications and all patients were satisfied with their outcomes.

Conclusion: Thumb arthroscopy and arthroscopically assisted treatment of the thumb CMC arthritis combined with thermal shrinkage of the capsule and ligaments is a safe and effective technique for Eaton stage II & III arthritis.

Keywords:
Arthroscopy, Thumb, CMC, debridement, Radiofrequency, thermal shrinkage
Surgery for the tetraplegic upper limb: Initial experience and early results

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Objectives / Interrogation: The need for upper limb surgery for tetraplegic patients was identified at a large spinal rehabilitation centre. (100 bed unit)
A clinic dedicated to the care of these patients was established in 2013 focusing on a team approach including surgeons, occupational and physiotherapists.
This study is a retrospective review of the first 21 patients treated surgically at our unit.

Methods: Tetraplegic patients are seen once a month at a dedicated clinic for evaluation and possible upper limb surgical reconstruction.
Surgical procedures consisted of either posterior deltoid to triceps, or biceps to triceps transfer for restoration of elbow extension.
Grasp and pinch reconstruction was performed according to principles described as the Alphabet procedure.
Nerve transfers limited to the supinator nerve to the posterior interosseous nerve in selected early cases.

Results and Conclusions: Patients in the biceps to triceps group improved an average of 2 MRC grades of elbow extension.
Grasp reconstruction patients exhibited an improvement in pinch grip and finger flexion power.
All surgeries evaluated according to the Canadian Occupational Performance Measure (COPM)
Nerve transfers performed end to end and encouraging early results achieved.

Surgical reconstruction of the upper limb in tetraplegia is to the benefit of the patient.
Patients express a high level of satisfaction following procedures performed for elbow extension and grasp and pinch reconstruction.
We aim to continue offering upper limb surgery to these patients and hope to improve our approach and techniques.

Keywords:
Philological role of the upper limb and other parts of the body

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Objectives / Interrogation: Human perception of the body directly affects the formation of language. The significance of certain body parts can be represented by the actions and verbs associated with them. Knowing this connection can help assess their value.

Methods: We compiled a questionnaire with one hundred of the most frequently used verbs of English according to Linguasorb.com and five body parts: eyes, ears, upper and lower limbs, and the heart. The interviewees were asked to select which verbs they associated with the given body parts. By association we considered subjective - rational or intuitive - opinion that certain body parts logically relate to actions described by the verbs. It was necessary to indicate participants' age, gender, level of proficiency in English and native language.

Results and Conclusions: Overall 40 people participated in the survey. Average age was 30 years, from 19 to 48. The percentage of males was 42.5%, females - 57.5%. The native language for the majority (36 people) was Russian, one each for German, French, Spanish and Karachai. The level of English was determined as A1 by 3 people, as A2 - by 4, as B1 - by 9, as B2 - by 10, as C1 and C2 - by 7 for each. We analyzed the answers to the questionnaire. There were no verbs for which respondents would uniquely give a single answer, although for each verb the answer was predominant. We estimated the most frequent body part-verb connection. For example, for the verb "be" the most frequent association was with heart, for "go" - legs, for "put" - hands. Then we evaluated body parts that were chosen more than others for each verb. Thus, 40 verbs were associated with hands, 20 - eyes, 19 - legs, 17 - heart, 4 - ears.

Human perception of organs, segments and parts of the body has a natural reflection in the use of verbs. From philological point of view, amongst different parts of the body, upper limb and especially hand has been considered a unique and indispensable tool, being the most functional one, whereas the sense organs can be referred to as specific and monofunctional.

Keywords:
hand function; body parts; language; verbs; questionnaire
The Safety of Hand and Upper-Extremity Surgical Procedures at a Freestanding Ambulatory Surgery Center: An Updated Review of 41,751 Cases

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Objectives / Interrogation: More Procedures are being completed on an outpatient basis at freestanding ambulatory surgery centers. The purpose of our study was to determine the safety and rate of adverse events in outpatient hand and upper-extremity surgical procedures.

Methods: A retrospective review of cases at a single, freestanding ambulatory surgery center over an sixteen-year period was performed. In our analysis, 41,751 cases were performed and were included. Adverse events were defined as serious complications causing harm to a patient or leading to additional treatment. Using state-reportable adverse events criteria as a guideline, we divided the adverse events into seven categories: infection requiring intravenous antibiotics or return to the operating room, postoperative transfer to a hospital, wrong-site surgical procedure, retention of a foreign object, postoperative symptomatic thromboembolism, medication error, and bleeding complications. These adverse events were then analyzed to determine if they led to additional laboratory testing, hospital admission, return to the operating room, emergency department visits, or physical or mental permanent disability.

Results and Conclusions: Results: There were eighty-six reported adverse events, for an overall rate of 0.21%. There were no deaths. There were twenty-five infections, twenty-four postoperative transfers to a hospital, thirty-two hospital admissions after discharge, one medication error, and four postoperative hematomas. There were no cases of wrong-site surgical procedures or retained foreign bodies.

Conclusion: Our study shows that, with a selected patient population, a very low adverse event rate (0.21%) can be achieved. Our review showing few adverse events, no deaths, and no wrong-site surgical procedures supports our view that hand and upper-extremity surgical procedures can be completed safely in the outpatient setting at a freestanding ambulatory surgery center.

Keywords:
Preliminary experience with the litos/ dynamic finger distractor for proximal interphalangeal joint fracture dislocations

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Objectives / Interrogation: Objectives:
We aimed to establish clinical and radiographic outcomes of unstable proximal interphalangeal (PIP) joint fractures treated with the litos/ finger distractor device.

Methods: Methods:
We retrospectively reviewed notes of 18 consecutive cases of patients with unstable fractures involving the PIP joint. We recorded infections and re-operations. Active range of motion was reviewed at 4-6 weeks and at 8-12 weeks. Joint defects of more than 1mm and incongruity were assessed using plain radiographs.

Results and Conclusions: Results:
A total of 10 men and 8 women with an average age of 34.5 (range 17-65) years were included. The average extension lag at 4-6 weeks, before removal of the distractor, was 20° (0-50) with active flexion to 65° (40-90). At 8-12 weeks post operatively was 20° (5-55) and 75° (60-95) respectively. Out of the 18 cases, one required a re-operation due to surgical issue and there were five superficial pin site infections requiring a course of oral antibiotics. Two joint surfaces had a step >1mm and four a defect of >1mm. Two patients had subluxed joints on follow up x-rays following removal of the distractor.

Conclusions:
Fractures involving the PIP joints of the fingers are difficult fractures to manage surgically with unpredictable outcomes. These fractures are frequently complicated by dislocation of the joint, which demands distraction to align the joint surfaces yet allowing early motion in order to prevent stiffness. There are multiple methods for addressing this but many are technically demanding. The litos/ finger joint distractor offers an alternative in a ready-made package. This system relies on three K-wires and two spring-loaded adjustable distractors holding the reduction while allowing movement of the PIP joint immediately after the operation.
The litos/ finger joint distractor system was relatively easy to use and the post-operative range of motion and the radiographic results were good considering the type of injury. There was a substantial amount of complications but only one required surgical intervention.

**Keywords:**
Fracture, PIP joint, Fracture dislocation, litos, litos/, distractor, proximal interphalangeal joint, finger fracture
Revision-Arthrodesis after Failed Total Wrist Arthroplasty

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Objectives / Interrogation: Traumatic arthrosis, osteo arthrosis, rheumatoid arthritis and other lesions at the region of the wrist may lead to severe pain, malposition, instability and malfunction of the wrist joint. Resections of parts of the destroyed joint, partial fusions and the wrist arthrodesis are today the standard methods to treat these complaints. Different types of total wrist arthroplasties were developed to preserve painfree motion. But there is a high incidence of failures of total wrist arthroplasties. We review our experiences in revising total wrist implant arthroplasties to arthrodeses. The most common mode of failure of the arthroplasties in our series was metacarpal loosening with dorsal perforation of the stem. Loosening of the proximal stem, progressive malposition of the wrist and other causes appeared. We used for the revision arthrodesis in all our cases tricortical iliac crest bone grafts and additional spongiosa transplants from this donor site region. In one case we used a vascularized iliac crest bone graft to bridge the bone defect because of a bad host quality of the recipient area. Fixation was achieved with plates and screws.

Methods: Our average follow-up period was 60 month. 81 patients with failed wrist implants (7 different types) were treated with this technique. 80 wrist's undergoing arthrodesis achieved a solid painless fusion after a single operation. In one case a non-union with a loosening of the screws due to using a non-rigid plate was seen. In this case a revision was necessary to achieve a bone healing. In defined time spans all patients received examinations of range of movement of the finger joints and the force of the hands. Clinical and radiological control was carried out in comparison of both hands. The assessment of the result after healing according to the DASH-score (Disability of Arm/Shoulder /Hand) was done.

Results and Conclusions: All patients were satisfied, pain free and achieved an increased pinch and grip strength after bony fusion (measured with Yamar-Vigorimeter). A persisting loss of carpal height was seen in all cases. Arthrodesis after failed total wrist arthroplasty is a satisfactory salvage procedure even in cases with a bad quality of the recipient area. We recommend a rigid fixation technique to prevent non-unions.

Keywords: Failed Total Wrist Arthroplasty
INTRAMEDULLARY CANNULATED HEADLESS COMPRESSION SCREWS OSTEOSYNTHESIS FOR METACARPAL AND PHALANGEAL FRACTURES

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Objectives / Interrogation: Intramedullary fixation of metacarpal and phalangeal fractures using cannulated headless screws is an effective technique with several theoretical advantages, among which minimal local invasiveness and early mobilization. The aim of our study is to evaluate the functional results and subjective evaluation.

Methods: 29 patients with a total of 33 fractures (26 metacarpal and 7 phalangeal) were surgical treated by the same surgeon with intramedullary cannulated headless screws. 3 patients had multiple fracture and they were all treated with this technique and in 4 cases there were severe soft tissue injury associated. Five were open fractures. Patients were followed prospectively until bone radiographical healing and a last evaluation was performed with a minimum 6 months follow-up. Functional results were evaluated in terms of active range of motion, grip force and pinch key, MHQ (Michigan Hand outcome Questionaire) and VAS (Visual Analogc Scale).

Results and Conclusions: At the latest follow-up (average 14 months, range 6-28) the mean total active motion was 239° (range 105°-280°), 250° (150-280) for metacarpals and 197° (105-280) for phalanges. Even if the technique requires a violation of the extensor tendon, the mean extension LAG at the MF was 1° and 0.7° at the PIP (excluding patients with concomitant tendon lesions). Patients recovered grip strength that was not significantly different from the contralateral limb. The average MHQ evaluation of patients with no associated lesions was 98% (compared to 75% of patients with associated soft tissue traumas). Patients with transverse and short oblique fractures obtained objective and subjective better results than patients with comminuted fractures. There were no cases of secondary displacement, malunion or non-union, rotational defects, infections or CRPS. Complications in terms of decreased range of motion and functional poor results were observed only in 3 of the 4 patients with associated soft tissue trauma (tenolysis is already planned for two of them). Despite intramedullary devices for treatment of metacarpal and phalangeal fractures has been known for a long time, the use of intramedullary compression cannulated headless screws has recently been increased. In our experience and according to literature, this technique leads to better results in transverse and short oblique fractures and allow early mobilization and faster coming back to activities.

Keywords:
Metacarpal fractures, phalangeal fractures, intramedullary fixation, cannulated screws, headless screw, compression screw, osteosynthesis in the hand
Clinical and ultrasonographical follow-up after early removal of distal radius volar plates positioned distal to the watershed line

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Objectives / Interrogation: Volar plating is accepted as standard treatment for distal radius fractures. Marginal fracture types may require plate positioning distal to the watershed line or volar rim precontoured plates to obtain stable anatomical fixation. Hardware distal to the watershed line is associated with increased flexor tendon pathology, with the flexor pollicis longus tendon (FPL) most at risk. We've performed early plate removal after bony consolidation to prevent these complications. Our purpose is to evaluate the procedure relevance of early hardware removal of plates distal to the watershed line was evaluated.

Methods: 20 patients, treated between 2013 and 2017, with plate positioning grade 1 or 2 according to Soong classification were included. Assessment was performed with mobility and grip strength measurements, function scoring with Quickdash, patient satisfaction questionnaire and ultrasonographical measurements of the distance of FPL to the volar rim and pronator quadratus (PQ) diameter.

Results and Conclusions: 8 cases had Soong grade 1 prominence, 12 were grade 2. Standard volar plate was used in 12 cases, volar rim plate in 8 cases. Anatomical reduction and bony consolidation were achieved in all cases. Mean time from placement to removal was 10.8 months. Mean time from removal to assessment was 2.9 years. Mean flexion and extension was respectively 87% and 90% compared to the contralateral side, ulnar and radial deviation 90% and 88%. Pro- and supination was symmetrical. Mean grip strength was 95% compared to the opposite side. Mean Quickdash score was 21.5. 85% of patients described their result as good to excellent with sense of improved mobility and decreased flexor tendon friction. 80% would undergo the intervention again. No refracture occurred. 1 patient suffered CRPS. After plate removal, the distance between FPL and volar rim increased from direct contact between tendon and bony prominence with plate in place, but was significantly lower in neutral (p=0.013) position and in full flexion (p=0.046) compared to the opposite side. PQ diameter showed no significant difference compared to the opposite side.

We conclude that early hardware removal for prominent plates results in high patient satisfaction, with a partial normalization of the flexor tendon positioning in reference to the distal radius on ultrasound.

Keywords: fracture, radius, osteosyntheses, removal, volar plate, watershed line, prominence, pronator quadratus, flexor pollicis longus, patient satisfaction
Inflammatory processes and elevated osteoclast activity chaperon atrophic non-union formation in a murine model.

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Objectives / Interrogation: Delayed bone healing, especially in long bones poses one of the biggest problems in orthopeadic and reconstructive surgery and causes tremendous costs every year. There is a need for adequate therapy but first of all we need to explore the causes. Earlier investigations of human scaphoid non-union revealed an elevated osteoclast activity, accompanied by upregulated levels of TGF-beta and RANKL. Interestingly, scaphoid non-union seemed to be well vascularized.

Methods: In the current study, we used a murine femur-defect model to study atrophic non unions. Different points of times were chosen over an observation period of 10 weeks, to gather insights into the dynamic processes of non-union formation.

Results and Conclusions: Histological and gen-expression analysis indicated enhanced osteoclast activity throughout the observation period, ongoing with elevated levels of TGF-beta, TNF-alpha, MMP9, MMP13 and RANKL. To our surprise, osteoblastogenesis seemed to be unaffected during early stages of non-union formation. Taken together we gained first insights into the formation process of atrophic non unions, in which inflammatory processes with a highly elevated osteoclast activity seem to play a leading role. Based on this findings new therapeutic options and treatment strategies could be investigated.

Keywords: non-union, osteoclast, RANKL
Correction of Thumb Duplication: A Systematic Review of Surgical Techniques

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Objectives / Interrogation: Surgical intervention for thumb duplication can be divided into three categories: simple excision of the accessory thumb, excision of the accessory thumb with reconstruction from available 'spare parts' and combining the two thumbs into one, as described by Bilhaut. This prospectively PROSPERO registered systematic review evaluates the overall, aesthetic and functional outcomes for the latter two options, aiming to facilitate evidence-based decision making when addressing thumb duplication and direct future research.

Methods: The review was performed in accordance with the Cochrane Handbook of Systematic reviews and PRISMA statement. Embase, PubMed, Medline and Cochrane databases were systematically searched. Studies offering comparisons of techniques were included. Risk of bias was assessed using the ROBINS-I tool. The quality of the evidence was assessed using the GRADE.

Results and Conclusions: Ten retrospective observational studies were included. Data did not consistently allow analysis by procedure type. Four studies reported similar overall outcomes between techniques, whilst two specifically reported poor overall outcomes for the Bilhaut procedure. Two studies reported comparatively worse aesthetic outcomes for the Bilhaut procedure with four studies reporting comparatively improved functional outcomes for this procedure. Overall, interpretation of outcomes was challenging with no patient reported outcome measures used. The quality of the evidence was universally 'very low' due to all studies being at risk of methodological bias.

Based on the available evidence, surgical techniques for thumb duplication correction appear comparable regarding overall outcome. There is limited evidence suggesting reconstruction with spare parts offers superior aesthetic outcomes at the expense of stability. However, the quality of available evidence is poor with few comparative studies, much heterogeneity between methods regarding outcome reporting and significant challenges regarding bias.

Further research is needed in the form of well conducted prospective comparative studies comparing surgical techniques. These should use appropriate patient reported outcome measures to facilitate evidence-based, patient orientated, decision making regarding the surgical management of thumb duplication.

Keywords:
Duplication thumb; Congenital Upper Limb Anomaly Surgery; Systematic Review
Ulnar dimelia with mirror hand - Current treatment strategies

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Objectives / Interrogation: Ulna dimelia is a rare congenital disorder, presenting with mirror hand, a term that describes the clinical presentation of this condition. But not all patients present with symmetry. There are numerous variations of digits in this condition, mostly seven fingers are present. The normal pre-axial or radial structures, like thumb, index, trapezium, scaphoid and radius are missing and the radius is replaced by a second ulna.
As genetic knowledge about limb bud formation increases, there is still a paucity of data regarding optimal treatment of this condition.

Methods: Problems that need to be taken into account in the treatment of mirror hands with ulnar dimelia are:
Limited elbow movement, decreased pro-/supination of the forearm, flexion contracture of the wrist with radial deviation, absent or weak extensor tendons, supernumerous digits but absent thumb, absent first webspace and thenar, thus no opposition, furthermore there may be syndactyly, divergent metacarpals and/or a palmar cleft.

In order to achieve an optimal functional outcome with an aesthetically pleasing, or at least inconspicuous, result one has to combine multiple steps of treatment that should be carefully planned and combined, if feasible, in order to minimize patient and his family’s burden.

The authors present their experience in treating several cases including the treatment protocol that developed over time as well as intraoperative steps and long-term follow-up.

Results and Conclusions: Our treatment strategies are derived from experience with congenital disorders. This knowledge lead to optimisation of the treatment of mirror hand. Furthermore experience with our own cases and their follow-up improved our strategy. The rarity of this congenital anomaly prevents feasibility of randomized controlled trials, because even if those would be ethically accepted, there would not be enough statistical power to those studies due to the limited number of cases. Thus the best available evidence is level IV.

The first step is adequate diagnosis, clinical and radiologic examination. When elbow flexion is feasible, which is mostly the case in young babies, the deviated wrist is splinted to correct deviation. The next step is a 3-dimensional distraction, similar to radial club hand treatment and thereafter a modified centralization. Thereafter a modified pollicisation with a reasonable compromise between form and function follows. Later a modified resection arthroplasty of one of the olecrans is helpful in improving pro-/supination.

Keywords:
ulnar dimelia, mirror hand, dicheirie, current concepts, treatment strategy
Concealed TFCC Tears Revealed- Role of Wrist Arthroscopy in the Diagnosis & Treatment of Occult Chronic TFCC Injury

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Objectives / Interrogation: The triangular fibrocartilage complex (TFCC) is an important stabilizer and load absorber in the wrist. There is a significant load borne by the ulnar aspect of the wrist during different wrist positions that pass predominantly through the TFCC. Injury to the TFCC is a frequent cause of pain and disability in the wrist. Good results have been reported with open repair. Advances in wrist arthroscopy have enabled these lesions to be repaired by minimally invasive methods. Arthroscopic repair of peripheral TFCC tears can provide satisfactory results with significant pain relief, increased grip strength, and an increased capacity to perform daily activities.

There is a large cohort of patients with an acute on chronic type of TFCC injury, who are clinically diagnosed with a TFCC tear with or without DRUJ instability, however the MRI is often unequivocal. We believe that this is due to scar formation in the injury zone that masks the lesion on an MRI. Arthroscopic examination and shaving of the scar tissue reveals the tear and allows optimal treatment of the lesion.

Methods: In this paper we describe our experience of 25 cases with chronic TFCC injury and an unequivocal MRI report. Arthroscopic evaluation and shaving followed by repair was performed. All patients were followed up for a minimum of 12 months. ROM, grip strength, pain scores and DRUJ stability were measured for outcomes measures.

Results and Conclusions: All patients had a significant improvement in their post-operative average Mayo Wrist Scores as compared to the pre-operative scores.

Arthroscopy of the wrist is considered the "gold standard" for evaluating and treating many intra-articular wrist conditions, such as triangular fibrocartilage complex tears, chondral injuries, distal radius fractures, carpal fractures, wrist ligament injuries, loose bodies, and ganglia. However, a thorough knowledge of wrist anatomy and surface landmarks is essential to proper diagnosis and treatment.

Keywords:
Arthroscopy, TFCC, Wrist, MRI, DRUJ
Diagnosis und therapy of isolated flexor pollicis longus fascicle lesions

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Objectives / Interrogation: Isolated flexor pollicis longus (FPL) nerve fascicle lesion represents a rare differential diagnosis of thumb flexion deficiency. Iatrogenic lesions of the FPL nerve fascicles can occur during operations in the forearm (e.g. osteosynthesis, removal of osteosynthesis material) due to its anatomical location. Here we illustrate three clinical cases and discuss the diagnostic and therapeutic modalities of thumb flexion reconstruction.

Methods: We present three patients (1 female, 2 male) who developed a thumb flexion deficiency following osteosynthesis or removal of osteosynthesis material after forearm fracture. Additionally to a thorough clinical examination, electrodiagnostic studies as well as high-resolution ultrasound investigations were performed.
In all three cases surgical exploration of the anterior interosseous nerve was performed and the isolated FPL fascicle lesions were confirmed by inspection, palpation and electrostimulation. Reconstruction in two cases was performed using a single 35 mm long nerve graft from the distal AIN (n=2). One patient was beyond nerve surgical repair (5 years after the injury) as such a tendon transfer using the extensor carpi radialis longus was performed. Active range of motion was assessed using a goniometer at three, six and twelve months after surgery. Functional outcome was additionally documented with videography.

Results and Conclusions: All three patients regained excellent thumb interphalangeal flexion with fine motor skills as was documented in active range of motion and videography.
There was no clinically detectable deficiency in forearm pronation after nerve harvest of the distal AIN in these two cases.

Iatrogenic isolated flexor pollicis longus (FPL) nerve fascicle lesion is a rare differential diagnosis of thumb flexion deficiency. We present our clinical experience, diagnostic algorithm and therapeutic options with this rare phenomenon. Primary reconstruction of the fascicle lesion with a distal AIN graft is a viable option for reconstruction of thumb flexion in such cases. If patients present late after injury, tendon transfers are still feasible and lead to a good functional result.

Keywords:
nerve lesion, reconstruction, AIN, iatrogenic
Innovations in man-machine interface for control and feedback of bionic prostheses

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Objectives / Interrogation: Bionic prostheses are an essential part of modern extremity reconstruction. Hereby the remaining bottle neck and main cause of high prostheses abandonment rates is the lack of a reliable interface between man and machine. Therefore, new implantable devices, capable of intuitive and sophisticated control as well as interfaces for sensory feedback, are important fields of research.
Aim of this study was to investigate an intraneural electrode for control and feedback as well as a full implantable system for reliable control in a rat and a rabbit model.

Methods: In a rat model a longitudinal intraneural electrode was implanted into the sciatic nerve and evaluated over different time periods (4-12 weeks) for biocompatibility as well as functional aspects. Further, a full implantable system, containing electrodes for EMG based control as well as a neural electrode for creating feedback sensations was implanted in a rabbit model and analyzed for feasibility, biocompatibility, reliability as well as technical features.

Results and Conclusions: Intraneural electrodes showed fibrosis and encapsulation in the nerve. This nerve damage further resulted in distal muscle atrophy and loss of muscle force.
The full implantable system was successfully tested for the investigation period (8 weeks) and evaluated for biosafety as well as technical features.
Conclusions:
Peripheral nerve interfaces have the capability of afferent and efferent interfacing with the human body. Nevertheless, there is always a compromise between interface selectivity and nerve damage. Fibrosis and resulting changes in impedance, as well as challenges in control with neural signals, emphasize EMG based control. With the tested EMG based fully implantable system, disadvantages of surface electrodes could be overcome to create a reliable and sophisticated prosthetic control.

Keywords:
bionic reconstruction, interface, animal model
RADIOCARPAL FRACTURE DISLOCATIONS: A NEW CLASSIFICATION PROPOSAL

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Objectives / Interrogation: A new classification proposal based on observation of 40 radiocarpal fracture dislocations.

Methods: The authors analyzed prospectively, the radiocarpal fracture dislocations patterns in 40 patients, utilizing Rx incidences in Post-anterior and Lateral views, and surgical findings, treated between 1995 and 2018 using the Dumontier Classification.

Results and Conclusions: There were 36 men and 4 women. The mean age was 24 years (range 18-45). They observed that in 30% (12) of the patients analyzed, had no correlation with the Dumontier classification. Nine patients, considered type II in Dumontiers Classification, presented fracture of the anterior lip that was interposed, or the Radio-lunate ligaments were torn. Three patients had a carpal bone fracture and no intrinsic ligament lesion was observed.

Conclusion: The Radiocarpal Fracture dislocation is a complex lesion and a more complete classification should be adopted.

<table>
<thead>
<tr>
<th>RADIOCARPAL FRACTURE-DISLOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Type I: radiocarpal fracture dislocation with volar ligament injury or volar avulsion fracture of the distal radius.</td>
</tr>
<tr>
<td>A) Dorsal</td>
</tr>
<tr>
<td>B) Volar</td>
</tr>
<tr>
<td>- Type II: dorsal or volar radiocarpal fracture dislocation with fracture of the radial styloid.</td>
</tr>
<tr>
<td>A) Without volar ligament lesion. (Large Radial Styloid )</td>
</tr>
<tr>
<td>B) With volar ligament lesion.</td>
</tr>
<tr>
<td>* Type III: with carpal injuries (fracture or intrinsic ligament lesion.)</td>
</tr>
</tbody>
</table>

Keywords: distal radius; carpal fracture dislocations; Dumontier classification.
Arthroscopy Assisted Partial Wrist Fusion without using Bone Graft

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Objectives / Interrogation: Partial wrist fusion is an effective surgical procedure for providing pain relief while preserving motion of the wrist in patients with localized arthritis of the carpus. The key is to fuse the involved joints and to allow motion through the uninvolved joints. Common indications for partial wrist fusions include scapholunate advanced collapse (SLAC) and scaphoid nonunion advanced collapse (SNAC).

Wrist arthroscopy allows excellent visualization of the articular surfaces of the carpal bones and ligaments while preserving the vascularity and soft tissue integrity which is violated in procedures employing arthrotomy. This serves as an apt basis for performing arthroscopy assisted partial wrist fusions. All potential complications such as adhesions and loss of movements are minimized by arthroscopic partial wrist fusion combined percutaneous fixation techniques.

Methods: We report our results of arthroscopic partial wrist fusions for various pathologies like Kienbocks disease, scaphoid non-union and post traumatic radio-carpal arthritis. While most authors use bone grafting with these procedures, we report out results without the use of any bone graft. This reduces the surgical time and morbidity without affecting union rates.

Results and Conclusions: 18 patients underwent arthroscopy assisted partial wrist fusion between June 2013 to December 2016. The pathologies included Kienbocks disease, scaphoid non-union and post traumatic radio-carpal arthritis.

10 patients underwent lunate excision and scapho-capitate fusion for Kienbock’s disease, 6 patients with SNAC II/ III wrist following scaphoid non-union underwent a scaphoid excision and capito-lunate fusion, while 2 patients underwent a radio-scapho-lunate fusion following radiocarpal arthritis resulting from a malunited intra-articular fracture of the distal radius. No bone grafting was utilized in any of the cases.

All patients had a significant improvement in their post-operative VAS and Mayo Wrist scores.

No post-surgical complications were observed and uneventful radiologic union was obtained in all cases.

Keywords:
Arthroscopy, Wrist, SLAC, SNAC. Partial Wrist Fusion, Arthritis
Onychomatricoma in the hand - three cases

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Objectives / Interrogation: Onychomatricoma is a rare benign fibroepithelial tumor developing from the nail matrix with striking clinical and histologic features. Onychomatricoma was first described in the literature in 1992 by Baran and Kint and less than 60 cases are described in the hand.

Methods: We report three case of onychomatricoma occurring in two female and one male with many years history of asymptomatic thickening of the fingernail. There was no history of preceding trauma. Nail clippings for mycology were negative on three occasions and hand radiographs showed no bony abnormality. Examination revealed diffuse thickening of the fingernail with increased transverse over-curvature. The nail was yellowish in color and there were longitudinal hollows visible as holes in the distal border. The nails of other fingers and toes were normal.

Results and Conclusions: Several clinical signs are striking enough to either make the diagnosis or at least to arouse suspicion:
- Longitudinal thickening of a part of the nail plate that often spares a portion of the normal pinkish nail
- Transverse and longitudinal overcurvature of the affected portion of the nail
- Xanthonychia of the affected part of the affected nail
- Longitudinal ridging that is sometimes quite prominent on the surface of the nail
- Splinter hemorrhages that are mostly proximal but sometimes distal
- Honeycomb cavities at the frontal margin of the thickened nail plate

Increased awareness of this entity is required among dermatologists, hand surgeons and histopathologists to ensure it is correctly diagnosed as there is a paucity of information in standard textbooks.

Keywords:
Nail matrix tumour, onychomatricoma, surgery, reconstruction
Paediatric Peripheral Nerve Injury: Long term Sensorimotor Recovery following Primary Surgical Repair

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Objectives / Interrogation: Peripheral nerve injuries in children are uncommon and complex to manage. A low threshold for surgical exploration should be used where there is a possibility of underlying nerve injury. Due to peripheral nerve injury being uncommon in this population there is a paucity of data on long term sensorimotor and functional outcomes following surgical repair. We present an 11-year retrospective analysis of paediatric peripheral nerve repair to identify long-term functional outcomes and risk factors for suboptimal recovery.

Methods: We conducted a retrospective analysis of our centre’s trauma database over an 11-year period to identify all patients under the age of 18 years presenting with peripheral nerve injury who underwent primary surgical repair, with nerve injury being confirmed intra-operatively. Electronic medical records were analysed to extract procedure type, time to surgery, mechanism of injury, past medical history, post-operative complications, post-operative sensorimotor recovery and post-operative follow up period. Descriptive statistics were applied to characterise the patient cohort. Statistical analyses were conducted to identify risk factors for suboptimal sensorimotor recovery.

Results and Conclusions: A total of 108 patients were identified over an 11-year period (2006-2018) from our dataset analysis. 13 patients were excluded due to incomplete data and 8 were lost to follow up. Of the 87 patients (61 male, 26 female) included in our study, the mean age at the time of injury was 7 years (0-16 years). Mean time to surgery from presentation was 2.2 days (0-8 days). Mechanisms of injury were predominantly lacerations with sharp objects or crush injuries. Of 87 patients with follow up data, 4 did not have sensorimotor improvement, 83 patients had either partial or complete sensorimotor recovery (95.4%). Post-operative complications were rare.

Long term sensorimotor recovery in paediatric patients with peripheral nerve injury requiring surgical repair is excellent. Post-operative complications are uncommon. Age at time of injury is inversely correlated with sensorimotor recovery, time to surgical repair is not correlated with sensorimotor recovery.

Keywords:
Paediatric; Nerve; Trauma; Repair; Recovery; Patient reported outcome measures
Botulinum Toxin A in the treatment of Raynaud's phenomenon secondary to Systemic Sclerosis; results of an open cohort study

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Objectives / Interrogation: Among patients with systemic sclerosis Raynaud's phenomenon (RP) is common causing pain, paraesthesia, ulceration, and gangrene. Botulinum toxin A (Btx-A) can be an effective treatment for RP when injected via a digital palmar approach. However, this technique can cause hand weakness resulting from lumbrical malfunction. This study aimed to determine the effect of Btx-A injected via a dorsal innovative approach to treat RP, limiting potential complications and to improve efficacy.

Methods: Thirty-eight patients received 100 units of Btx-x injected into both hands via a dorsal approach. Each patient had a baseline and 6-week hand assessment and thermographic image (FLIR E60bx).
Hand assessment included pinch and power grip strength measurements (Jammar plus digital pinch gauge and dynameter), range of movement using a goniometer, Kapandji thumb opposition test and a pain score using the visual analogue scale (VAS score 0-10). Patients were asked to report any symptoms of pain, colour change, cold intolerance on a weekly basis. Furthermore, patients were asked to complete a Disabilities of the Arm, Shoulder and Hand (DASH) score. Post injection, the hand assessment and thermography was performed at 15 minutes and at 6 weeks in a temperature controlled room at 23.7 +/- 2°C.

Results and Conclusions: Eighty-eight percent of patients reported an improvement in symptoms with a decrease in pain, swelling and improve colour change. Furthermore, 80% reported an improvement in cold intolerance with a decrease in their frequency and severity of Raynaud's attacks (p < 0.01). There was also a significant improvement in both the DASH score (p = 0.001), Kapandji score (p=0.001) and Hand strength (p<0.05) after 6 weeks. No patients reported any weakness at 6 weeks.
There was a significant mean increase in the temperature of all fingers after 6 weeks compared to baseline(p < 0.05). There was also a significant increase in the range of movement in all joints post Btx-A injection (p < 0.05). There were no complications with the innovative approach.

Btx-A injected via a dorsal approach improves symptoms and hand function of RP secondary to systemic sclerosis. We have shown an effective and safe surgical technique to treat RP in systemic sclerosis patients that can be delivered in an outpatient setting.

Keywords:
Raynaud's phenomenon, Botulinum toxin A, hand assessment, innovation
Does intra-articular and extra-articular soft tissue procedures can improve global shoulder function and glenohumeral deformity in OBPP patients? Retrospective cohort of 17 patients.

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Objectives / Interrogation: Whether or not combined intra-articular and extra-articular soft tissue procedures can improve global shoulder function and glenohumeral deformity in OBPP patients.

Methods: From March 2013 to October 2018, 30 procedures where performed in 27 children with obstetric brachial plexus palsy to improve shoulder external rotation and abduction. These procedures included combined latissimus dorsi and teres major transfer to the rotator cuff, musculotendinous lengthening of the pectoralis major and/or subscapularis tendons, open glenohumeral joint reduction and coracoidectomy in selected cases. Indication for surgery was progressive or stablished internal rotation contracture. Inclusion criteria were children with minimum post-operative follow-up of 6 months, enough data to obtain pre and post-operative modified Mallet scores (including the internal rotation category) and imaging of the shoulder (CT and MRI) to access Waters' Classification. Ten patients did not meet the inclusion criteria due to insufficient follow-up or incomplete data. Therefore, 17 patients were included in this study.

Results and Conclusions: There were 6 boys and 11 girls with a mean age of 3,7 years, ranging from 1 to 10 years. The mean post operative follow-up was 29 months, ranging from 6 to 59 months. According to the Waters Classification, we had 9 patients with type IV, 7 patients with type III and 1 patient with type II glenohumeral deformity.

The average pre-operative modified Mallet score was 15.92 (SD:1.94). The average post-operative modified Mallet score was 20.21 (SD:2.08). The average increase in modified Mallet score was 4.28 (SD:2.78). Post-operative imaging was performed in 10 patients, and 70% of those presented significant joint remodelling. Although all patients but one showed improvement in global shoulder function, we found some loss of internal rotation in 57% of Waters type IV patients, and 12.5% of Waters type II or III patients (p=NS). The overall incidence of internal rotation loss, including all patients, was 33,33%.

Combined intra-articular and extra-articular soft tissue procedures can improve global shoulder function and glenohumeral congruency in OBPP. Some degree of internal rotation loss can be expected in approximately 1/3 of the patients as a side-effect of the subscapularis tendon lengthening.

Keywords:
obstetric brachial plexus palsy, glenohumeral deformity, internal rotation contracture, Mallet score, Waters classification, tendons, transfer, lengthening, articular, subscapularis
Outcomes of Isolated Spinal Accessory to Suprascapular Nerve Transfers for Brachial Plexus Birth Injury: A Multi-Center Study

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3 Shriner's Hospital for Children - Philadelphia (Philadelphia)
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Objectives / Interrogation: Brachial Plexus Birth Injury (BPBI) affects approximately 1.5 children per 1000 live births in the United States. While exploration and nerve grafting has been the mainstay of treatment for BPBI, nerve transfers have gained popularity as they avoid donor site morbidity and place the donor nerve close to the endplate, therefore minimize re-innervation time. Nerve transfers for shoulder function involving the Spinal accessory to Suprascapular nerve transfer (SAN-SSN) have been frequently used in BPBI, often simultaneously with other procedures, but there is limited data from isolated procedures, which are not performed with any other nerve or tendon surgery. We describe the shoulder function recovery of 53 patients that were operated upon at three medical centers and underwent an SAN-SSN through either an anterior or posterior approach.

Methods: We retrospectively reviewed the cases of 53 patients at three institutions who had undergone a SAN-SSN after BPBI. Inclusion criteria were patients with BPBI who underwent a solitary SAN-SSN and who had both preoperative and minimum 36 months postoperative Active Movement Scale (AMS) scores. Patients for whom the primary surgery involved nerve reconstruction or tendon transfers were excluded. The primary outcome measures were the AMS scores for shoulder abduction, forward flexion and external rotation and secondary outcomes included the need for further shoulder surgery to improve function.

Results and Conclusions: 42 (79.2%) patients obtained functional shoulder motion (AMS>5) following surgery, with 23 (43.4%) patient obtaining full recovery of shoulder function against gravity (AMS=7). 40 (75.5%) patients did not proceed to further tendon transfers or corrective osteotomies to augment shoulder function. The anterior and posterior approaches were both found to be equally effective for isolated SAN-SSN in BPBI. In a multivariable binomial logistic regression the institution at which the surgery was conducted was found to be the only statistically significant factor to affect the ER functional outcome (P=0.04) SAN-SSN were able to recover functional shoulder motion in brachial plexus birth injuries and prevent tendon transfer procedures and corrective osteotomies in approximately 80% patients. The institution where the surgery was performed was shown to be independently correlated to outcomes, which is likely due to variations in AMS scoring among institutions. Outcomes continue to improve throughout the first three postoperative years.

Keywords:
Brachial Plexus Birth Injury, Spinal Accessory Nerve Transfer, Shoulder Function
Neurogenic Thoracic Outlet Syndrome: Results from 52 surgically treated patients

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Objectives / Interrogation: Central nerve stimulation (CNS) already has proved its efficacy for treatment of chronic severe pain. The aim of our clinical study was to prove the effectiveness of Peripheral Nerve Stimulation (PNS) with implanted systems for treatment of chronic neuropathic pain syndrome (CRPS2) of the extremities.

Methods: In sum we selected 31 patients (19 female, 12 male) suffering from CRPS2 for treatment, two patients suffering from causalgia due to complete posttraumatic brachial plexus lesion including root avulsion. Each patient had a history of microsurgical interventions to the nerves and every conservative treatment which was possible, but without any effect on the problem of neuropathic pain. None of the patients was able to use the extremity functionally. In all patients the VAS was in mean 9, even at rest. Stimulation leads were implanted close to the peripheral nerves (fascicles of the brachial plexus or sciatic or femoral nerve) and connected with percutaneous leads for temporary testing. Pain reduction of more than 4 points on the VAS scale gave indication for implantation of a pulse generator for continuous PNS.

Results and Conclusions: 28 patients were supported with the whole system. PNS was effective to reduce pain from VAS mean 9 to VAS mean 3 and to regain functional use of the extremity in most of the cases. Several technical complications, mostly electrode dislocation had to be noted. Relief from pain occurred immediately after onset of stimulation. The positive effect was directly correlated with PNS, and stable over years. On a scale from -5 to +5 patients rated +4.2 in answering the question if they would undergo the procedure again.

PNS reduced pain deriving from peripheral nerves reliable and effective. Regarding our follow up period of 3,5 years PNS produced a stable, nearby pain free interval in all patients. Positioning of the electrodes direct to the fascicles of the brachial plexus and close to the sciatic nerve at mid-thigh allowed movement of shoulder and hip at a nearby normal ROM. PNS seems to represent an important technology for treatment of chronic neuropathic pain in selected cases.

Keywords:
human, neuropathic pain, CRPS, surgery, Implanted system, retrospective analysis
A Novel Technique for the Surgical Management of Chronic Lateral Epicondylitis

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3 The Hand Surgery Clinics, Sahyadri Hospital (Pune)

Objectives / Interrogation: Lateral epicondylitis is usually self-limiting and resolves within 8-12 months. Once it resolves, recurrence is rare. Conservative management remains the mainstay of treatment. When conservative treatment fails, surgery is required for resistant cases. Morrey had put forth three categories of failure following surgical management of chronic lateral epicondylitis. Type 1 failure occurs when an inaccurate initial diagnosis is made or when a concomitant diagnosis is present which contributes to the pathology. Type 2 failure results from inadequate debridement of the pathological tissue from the common extensor origin. Type 3 failures are iatrogenic in nature.

We describe a novel technique to address the confounding factors—which includes decompression of the PIN, arthrotomy, plica / synovial excision, multiple drill holes in the lateral epicondyle, tendon debridement and offloading the tendon by reattaching it approximately 1cm distal to its actual origin.

Methods: We prospectively reviewed 14 consecutive cases of resistant lateral epicondylitis operated at our Institute from 2013 to 2015 with a minimum 2 years follow up.

Results and Conclusions: All patients had a minimum of 12 months conservative treatment before surgery. The right side was involved in 10 patients and the left side in 4 patients. There were 9 males and 5 females. The mean age was 46.21 years (range 38-56 years). Mean duration of pre-operative symptoms was 23.07 months and the mean follow up period was 31.07 months (range 24-41 months). The average post-operative VAS score reduced to 1.35 (range 0-6) from the average pre-operative VAS score of 7.79 (range 6-10). Our patients recovered 85% of grip strength on the operated side as compared to the opposite side. 12 of the 14 patients (85.7%) in our series had good to excellent functional outcomes on the Mayo Elbow Performance Index.

Conclusion: Our novel technique simultaneously tackles all components of the disease with decreased incidence of surgical failure.

It addresses the tendon, intra-articular pathology and decompression of the PIN provides additional benefit. This technique can therefore be recommended for wider surgical use, however, prospective randomized studies with a longer follow-up would add further evidence about the effectiveness of our technique.

Keywords:
Elbow, Lateral Epicondylitis, Novel Technique
**Operative Versus Non-Operative Outcomes Of Middle Clavicle Fractures: A Systematic Review And Meta-Analysis**

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**Objectives / Interrogation:** Midshaft clavicle fractures are among the most common bone injuries to the body. Superiority of operative vs. nonoperative treatment remains unclear, but recent studies have shown that nonoperative outcomes are not as favorable as once thought. We present a meta-analysis comparing treatment modalities of clavicle fractures.

**Methods:** PubMed and OVID were queried to identify studies published before October 2017 that reported on outcomes after operative vs. nonoperative treatment for clavicle fractures. Primary outcomes included rates of nonunion, symptomatic malunion, shoulder function (Constant and DASH scores), and need for secondary operations. Secondary analysis compared outcomes after different types of operative fixation vs. nonoperative treatment. Data were analyzed using t-test on the mean differences for statistical differences.

**Results and Conclusions:** Sixteen studies (1,206 patients) met inclusion criteria. Risk of nonunion was lower in the operatively treated patients (RR=0.21, 95% CI=0.06-0.32). Risk of symptomatic malunion was lower in the operatively treated patients (RR=0.17, 95% CI= 0.06-0.32). Constant and DASH scores were higher with surgical fixation compared to nonoperative management with mean differences of 6.8 points (95% CI, 2.1-10.9). Surgery with plates resulted in better DASH and Constant scores, fewer complications, and lower patient dissatisfaction (p< 0.05). There was no difference in the risk of secondary operation between groups (p=0.27) or long-term function in patients treated with nails or plates (p=0.41). Patients treated with plate fixation had >2 times increased risk of treatment failure compared to those treated with nails (p=0.04).

<table>
<thead>
<tr>
<th>Study</th>
<th>No. of Patients (O/N)</th>
<th>Age Range</th>
<th>Follow-up (months)</th>
<th>Operative</th>
<th>Non-operative</th>
<th>Study type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smith, 2001</td>
<td>30/35</td>
<td>Adults</td>
<td>12</td>
<td>Plate</td>
<td>Sling</td>
<td>RCT</td>
</tr>
<tr>
<td>Jubel, 2005</td>
<td>26/27</td>
<td>Adults</td>
<td>6</td>
<td>Nail</td>
<td>Bandage</td>
<td>NRCT</td>
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<tr>
<td>Witzel, 2007</td>
<td>35/33</td>
<td>Adults</td>
<td>12</td>
<td>Nail</td>
<td>Sling</td>
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<tr>
<td>COTS, 2007</td>
<td>62/49</td>
<td>16-60</td>
<td>12</td>
<td>Plate</td>
<td>Sling</td>
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<tr>
<td>Figueiredo, 2008</td>
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<td>Judd, 2009</td>
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<td>Chen, 2011</td>
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<td>18-63</td>
<td>15</td>
<td>Nail</td>
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<td>Mirzatolooei, 2011</td>
<td>26/24</td>
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<td>12</td>
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<td>Sling</td>
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<tr>
<td>Kulshrestha, 2011</td>
<td>45/28</td>
<td>20-50</td>
<td>18</td>
<td>Plate</td>
<td>Sling</td>
<td>NRCT</td>
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<tr>
<td>Virtanen, 2012</td>
<td>26/25</td>
<td>18-70</td>
<td>12</td>
<td>Plate</td>
<td>Sling</td>
<td>RCT</td>
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<tr>
<td>Robinson, 2013</td>
<td>86/92</td>
<td>16-60</td>
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<td>RCT</td>
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<td>Melean, 2015</td>
<td>34/42</td>
<td>&gt;18</td>
<td>12</td>
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<td>Sling</td>
<td>RCT</td>
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<tr>
<td>Wolfz, 2017</td>
<td>83/65</td>
<td>18-60</td>
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<td>Sling</td>
<td>RCT</td>
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<tr>
<td>Herzog, 2017</td>
<td>10/10</td>
<td>12-18</td>
<td>12</td>
<td>Plate/Nail</td>
<td>Sling</td>
<td>RCT</td>
</tr>
</tbody>
</table>

RCT=Randomized Controlled Trial, NRCT=Nonrandomized Controlled Trial

This study is the largest, most current, and most inclusive meta-analysis of clavicle fracture management to date. Our data show that operative repair results in lower rates of malunion, nonunion, and complications, and higher DASH and Constant functional scores. There were higher rates of failure with plate fixation. Our primary limitation was variable heterogeneity. Further studies need to be conducted to confirm these findings.
Keywords:
Clavicle Fracture, Meta, Outcomes
OUTCOMES OF POSTERIOR INTEROSSEOUS NERVE NEURECTOMY IN ACUTE TRAUMA

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Objectives / Interrogation: Wrist denervation for the management of chronic wrist pain is already known as a safe and effective procedure. However, there is no consensus on the performance of posterior interosseous nerve (PIN) neurectomy to reduce pain in acute trauma. The aim of this paper was to evaluate the PIN neurectomy effectiveness in improving analgesia in the postoperative period, when used associated to the surgical treatment of some acute affection.

Methods: This is a double-blind study lasting from March 2017 to March 2018. Thirty cases of wrist acute trauma that required surgical treatment with dorsal approach to the wrist were selected at an orthopedic trauma hospital. However, 10 patients were excluded because they did not complete the inclusion criteria, for example, isolated injury in the wrist without previous lesions. It was included 20 patients presenting perilunate dislocation, trans-scaphoid perilunate fracture dislocation or trans-radial-styloid trans-scaphoid perilunate fracture dislocation. They were randomized into two groups: the first group (10 patients) received the surgical treatment of their pathology associated with PIN neurectomy and the second group (10 patients) received the treatment without the neurectomy. The patients' degree of pain was assessed through a numerical scale of pain (1 to 10) on the preoperative period, on the first postoperative day and on the first return visit. Fisher's Chi-square test and the Mann-Whitney test with 95% confidence interval and p value <0.05 were used.

Results and Conclusions: The ratio of male gender was 85% and median age was 35.9 years (±14.36). The mean value of pain was 4.90, 2.85 and 1.85 on the preoperative period, on the first postoperative day and on the first return, respectively. The pathology with the highest degree of pain was transradial-styloid trans-scaphoid perilunate fracture dislocation (4.5, 2.8 and 2.0, respectively). The mean value of pain in the first group submitted to neurectomy was 4.50, 1.20 and 0.90 on the preoperative period, on the first postoperative day and on the first return, respectively. And the mean value of pain in the second group was 5.30, 4.50 and 2.80, respectively.

There was a statistically significant difference in the value of pain on the first postoperative day and on the first return (p = 0.01 and p = 0.04, respectively) among the two groups. The outcome showed that the association of the PIN neurectomy to the surgical treatment of acute affections reduced postoperative pain in the short and medium term.

Keywords:
PIN neurectomy, dorsal approach, pain, acute trauma
Dysplasia Epiphysealis Hemimelica (Trevor's Disease) of the scaphoid in a 9 year-old boy.

List of authors:
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Objectives / Interrogation: Dysplasia Epiphysealis Hemimelica (Trevor's Disease) is a rare disorder of the epiphysis in children, characterized by asymmetrical epiphyseal growth, considered a variant of osteochondromas. Its presentation in the upper limb is extremely rare. There is no malignancy reported. We demonstrate in this report a patient who underwent surgical treatment with preoperative programming through 3D-printing based on the CT scan images.

Methods: A 7-year-old boy entered the service with a complain of deformity in the left wrist associated with radial border pain without a history of trauma in February 2016. His orthopedic examination showed generalized restriction of left wrist range of motion. The wrist radiographs showed an enlarged, bipartite scaphoid with its extremities joined through a radiolucent halo with the distal portion oriented with a pronounced palmar tilt and more sclerotic than the remaining carpal bones. There were no adjacent joint changes. Magnetic resonance imaging demonstrating pericartilaginous hypersignal in the T2-weighted sequence. At first, clinical observation was chosen.

Results and Conclusions: The new exams showed an increase in the scaphoid with a pronounced worsening of the deformity, increase in the area of sclerosis and involvoment of the articular surface of the distal radius. Tomography ratified such changes. With these findings, surgical treatment with corrective osteotomy of the affected bone for joint rescue was chosen. For surgical program, biomodel reconstruction was used in 3D printing of the structure to be submitted to the intervention using DICOM® images. Process carried out without costs through the Information Technology Center Renato Archer, Campinas, Sao Paulo, Brazil.
post operative x-ray

**Keywords:**
Dysplasia Epiphysealis Hemimelica; Trevor's Disease; Schaphoid; 3D printing
Survival rates and outcomes for digital replantation

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Objectives / Interrogation: Since the development of microsurgical vascular anastomoses, digital replantation has become a well-established procedure in the field of reconstructive hand surgery. Advancements in surgical techniques and peri-operative management of such patients has resulted in high survival rates globally, with increasing focus now falling on achieving optimal functional outcome. This review will assess the literature on the outcomes of digital replant surgery, exploring the evidence pertinent to survival rates and functional outcomes.

Methods: A systematic search of the MEDLINE database was performed using predefined criteria. 21 review papers met the criteria reporting on outcomes of 1142 patients. The literature was reviewed examining variables concerning the injury, the patient, and surgical management assessing the impact on replant survival and functionality. Assessment of functional outcomes evaluated: active range of movement, two point discrimination, grip strength and return to work.

Results and Conclusions: Findings demonstrated various factors influencing replant survival, including; mechanism and site of amputation, type and duration of ischaemic insult, surgical techniques, and postoperative care and rehabilitation. Factors shown to be most influential in replant survival were; patient's age, mechanism of injury and number of anastomoses. Patients >50 and those <5 years of age demonstrated the highest failure rates, while the optimum patient group was 11-20 years of age. Guillotine injuries exhibited the best survival outcomes overall, when compared to crush/avulsion injuries. Enhanced survival outcomes were demonstrated in Zone 2 relative to Zone 1 (Tamai classification) in distal injuries, and proximal to the MCP in proximal injuries. In the analysis of functional outcomes literature revealed optimum functional restoration in injuries distal to the insertion of flexor digitorum superficialis, however in cases of injury sustained to the tendon, early secondary flexor tendon reconstruction and digital motion should be considered.

Keywords:
Finger, Digit, Replantation, Survival, Function
Single Incision Repair of Distal Biceps Tendon Ruptures- Results & Complications

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Objectives / Interrogation: Objective- Hypothesis: To review the objective results of single incision distal biceps repair. We hypothesized that function could be returned with few complications despite the literature suggesting a higher rate of PIN palsy and less return of strength when compared to the two incision technique.

Methods: Methods: The charts of 115 patients with distal biceps ruptures that were surgically repaired by two surgeons at the same institution over a 10 year period, were retrospectively reviewed. The post-operative ROM and strength were measured. Complication's including PIN palsy, lateral antebrachial cutaneous nerve paresthesias, heterotopic ossification and re-rupture were evaluated. The average follow up was 12 months.

Results and Conclusions: Results: The patient's average return of flexion strength was 105% of the contralateral side and supination strength was 90% of the contralateral side.

Complications:
PIN palsy-0
heterotopic ossification-2
radio ulnar synostosis-0
LABC neural paresthesias- 45%
Re-rupture of tendon- 0

No patient had to be re operated on for any complication.

Conclusions: Single incision repair of the distal biceps tendon can be performed with minimal serious complications. The return of function and strength is comparable to reported results of the 2 incision techniques.

Keywords:
Distal Biceps, Tendon Ruptures
Combination of two vascularized bone grafts for closing a huge defect of humerus. A case presentation.

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Objectives / Interrogation: To demonstrate a rare case of combination of two vascularized bone grafts to save the upper arm of the young woman in a case of chronic osteomyelitis

Methods: Female, 26 y.o., right hand dominant, was presented in outpatient clinic with a deformation of the upper arm, full range of motion in the shoulder and wrist joints, limitation of elbow flexion 95 degrees and 40 degrees insufficiency of extension as well a 12 year history of haematogenous osteomyelitis of the humerus. During the childhood she underwent several surgical excisions of the inflamed bone and was administered to a peroral antibacterial therapy during the periods of the exacerbation of the disease. After the X-ray and MRI examination, head of the humerus and 2-3 cm of the proximal diaphysis, as well as distal 3 cm of the humerus were considered as healthy enough to be left for reconstruction.

Two different vascularized bone grafts - fibular as flow through graft and iliac crest were harvested to close the defect of the upper arm. The primary fixation of both bone grafts as well as vascular connections were performed on the operation table outside the body. Later this complex bone graft was fixated with DePyu Synthes Long Philos plate in the proximal part of the humerus and cannulated 3.5 mm screws in combination of 1.5 mm Kirschner wires in the distal part. Bone grafts were wrapped into the previously prepared periosteal flap. Anastamoses of the complex bone graft were connected end to side to brachial artery and veins. After treatment included 8 weeks of peroral antibiotics and workout of ROM which started from the third week after surgery. Scheduled visits were performed every 2 months with measurements of the ROM and X-ray controls.

Results and Conclusions: Within a year after surgery patient is back to almost all daily and sporting activities, despite of the limitation of elbow flexion and visual differences of both upper arms. She has full extension and 110 degrees flexion of the elbow. The DASH score is 35 points. An active bone formation is presented between all fragments. Non-standard decisions and technical solutions could be successful in microvascular bone flap surgery in cases of large osteomyelitic bone defects of the upper arm.

Keywords:  
Vascularized bone graft, osteomyelitis, combined vascular bone grafts
Treatment of marginal rim fracture of the distal radius using a new fragment-specific plate

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Objectives / Interrogation: Marginal intra-articular distal radius fractures pose a significant challenge to the treating surgeon, small fracture fragments that are distal to the watershed line represent a clinical challenge. Stability of the marginal rim fracture is critical to provide structural support of the carpus, and failure to maintain reduction of this fragment can lead to catastrophic volar carpal subluxation or dislocation. The objective of this study was to evaluate the outcomes of distal radius fractures treated with a new fragment-specific plate.

Methods: A consecutive series of 10 patients who sustained distal radius fractures underwent radial column plating alone or in conjunction with other implants, between May 2016 and August 2018. For all patients, radiographs were obtained in standard anteroposterior and lateral projections associated with CT, which allowed to identify and describe the fragment. All patients were treated surgically with reduction and fragment synthesis using Medartis® Hook Plates 1.5. After the surgery the patients kept a splint for 3 weeks, then starting a rehabilitation program of physiokinetic therapy. All patients were evaluated with post-operative radiographs and at 1, 3 and 6 months. We also evaluated the articular range of motion in flexion-extension and in prono-supination and strength with the Jamar test, comparing the results with the contralateral wrist.

Results and Conclusions: The average follow-up was 15 months (2 - 24 months). Clinical checks show a progressive improvement in strength and symptomatology and a 92% mean ROM recovery compared to the contralateral side. In 6 cases an standard plate from APTUS® Wrist Distal Radius System 2.5 was associated, in 3 cases K wires were associated (one of them with also external fixation associated), for 2 patients two mini anchors (Mitek®) were used to stabilize the ligaments. In only one case it was necessary to remove the plate which occurred following the mobilization of a screw. All patients returned to their work-recreational activities prior to the trauma. There was no case of dislocation or secondary loss of reduction. All the control radiographs showed the restoration and maintenance of joint congruence at the radiocarpic level. In conclusion: radial column plating of the distal radius is a safe treatment modality and a valuable adjunct in the setting of complex distal radius fractures with few complications and objective scores consistent with return to normal function.

Keywords:
distal radius fracture, radial column plating, fragment-specific implant
Comparison of standard wrist CT and HR-pQCT (High Resolution Peripheral Quantitative Computed Tomography) in scaphoid nonunion after avascular bone graft and percutaneous screw fixation

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Objectives / Interrogation: A surgical treatment option for scaphoid nonunion is avascular bone grafting and screw fixation. This requires postoperative 6-16 weeks immobilization until adequate bony consolidation. This is especially problematic as it mainly affects young working-age patients. Therefore, the further development of imaging with reduction of exposure to radiation is desirable. HR-pQCT assessment offers a reduction in radiation exposure compared to standard CT. The aim of this pilot study is to compare HR-pQCT with standard CT to assess bony consolidation in scaphoid pseudarthrosis after avascular bone graft and screw fixation.

Methods: Between 02/2011 and 10/2013, prospectively 9 consecutive patients (10 scaphoids) > 16 years with clinically relevant scaphoid pseudarthrosis requiring surgery were included in our clinic using avascular bone graft and screwing. Baseline data was recorded followed by clinical evaluation after 2, 4, 6 weeks and 3, 6 and 12 months. A standard CT and HR-pQCT scan was performed every 6 weeks and 3 months to compare the assessability of bony consolidation.

Results and Conclusions: All patients were male with a mean age of 26.2 years. In 7 cases the dominant hand was affected (1x both). The accident mechanism was a fall on the extended wrist in 7 patients, in 2 it was not recoverable. In 6 patients there was a DISI preoperatively (average 24°). Relevant concomitant pathologies were fractures of: radius (intra-articular), forearm, os hamatum and a bony triquetrum tear. Range of Motion (ROM), DASH, patient rated wrist evaluation (PRWE), pinch and grip force selectively on both sides are presented.

HR-pQCT provided at least comparable results in all cases compared to standard CT, although in one case HR-pQCT revealed an early consolidation.

The possibility of a more precise assessment of bony consolidation in scaphoid pseudarthrosis, treated with avascular bone graft and screwing, by HR-pQCT is desirable and could lead to an individualized better evaluation and thus an earlier mobilization.

Keywords:
nonunion scaphoid, bone graft, Hr-PQCT, pseudarthrosis,
Osseointegrated thumb prosthesis as an alternative for microsurgical thumb reconstruction

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Objectives / Interrogation: Thumb amputation after traumatic injury or due to tumor resection leads to significant impairment of hand function, as well as psychological burden. Various techniques have been described, ranging from pollicization, phalangisation to complex microsurgical procedures, such as toe-to-thumb transfer. An osseointegrated thumb prosthesis via titanium fixation to the residual bone can provide a functionally and aesthetically viable reconstruction alternative for patients in which microsurgical techniques are not indicated. This retrospective study compares osseointegrated thumb prosthesis to other secondary reconstructive procedures (pollicization, toe to thumb transfer and lengthening).

Methods: We present one male patient who was treated with an osseointegrated thumb prosthesis 12 months after thumb amputation in the metacarpal joint because of an epitheloid cell sarcoma. There was no specific rehabilitation necessary. The outcome measures 9 and 24 months postoperatively included SHAP Test and were compared to patients with other secondary reconstructive procedures (pollicization, toe to thumb transfer and lengthening).

Results and Conclusions: In the performed SHAP Test (Southampton Hand Assessment Procedure) the patient with the osseointegrated thumb prosthesis reached 98 points. This correlates with standard values of healthy population. Furthermore the patient was very satisfied with the aesthetic appearance of the prosthesis. No complication (e.g. wound infection, implant loosening) were observed 24 months postoperatively.

An osseointegrated thumb prosthesis via titanium fixation to the residual bone can provide a functionally and aesthetically viable reconstruction alternative for patients in which microsurgical techniques are not indicated. Due to a stable fixation of the prosthetic finger to the bone, restoration of some sensory feedback with osseoperception can be achieved.

Keywords:
thumb amputation, osseointegration, prosthesis
Distribution of hand surgical knowledge by an open access textbook

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Objectives / Interrogation: Development of digital media and electronic publishing really advanced in the last decade. But access to knowledge and science is mostly limited by economic and copyright related barriers. Hand surgery is based on very specialized surgical education, research and current discussion. Commercial textbooks and journals are expensive and limited in distribution. Contents have to be revised in short time intervals and cause recent editions. Operative treatment and microsurgical techniques cannot be displayed adequate in printed media.

Methods: The beginning of this millennium is characterized by increasing information and communication technologies which allow the transfer of information through global communication systems. This opens up opportunities to create and share a wider array of educational resources. Social networking and collaborative learning becomes common. Based on these ideas an open access text book was created to spread hand surgical knowledge worldwide. First chapters are finished and include basics, extensive knowledge and technical videos.

Results and Conclusions: In the presentation the concepts and guidelines for OER, Open Access publishing and the use of Creative Common licences are explained. Using the concept for the Open Access Textbook the advantages and possibilities of OER are explained. Everybody with the possibility of internet use will have access to the complete actualized textbook. The license allows all material as text, tables, figures and videos to be used by everybody with slight restriction. Learning, teaching and developing of surgical techniques becomes easier and more established.

Keywords:
open access, textbook, learning, knowledge
COLLATERAL LIGAMENT INJURIES OF METACARPOPHALANGEAL JOINTS IN ATHLETES

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Objectives / Interrogation: Collateral ligament injuries of metacarpo-phalangeal joint are frequent in athletes especially in ski and ball sports. Despite thumb collateral ulnar ligament injuries are well known, thumb collateral radial ligament and collateral ligament injuries of long fingers, may be sometimes underdiagnosed and thus can lead to chronic instability of metacarpo-phalangeal joint. The aim of this study is to evaluate the results of the treated cases and recovery of work and sports activity.

Methods: In our Unit 110 patients were treated in five years, 45 of them were athletes (ski, basketball, football, rugby, gymnastics). There were 32 ulnar thumb collateral ligament, 8 radial collateral ligaments (group I), 3 radial and 2 ulnar collateral ligaments of long fingers (Group II). There were four chronic cases in group I and one in group II. Mean age was 32 yo (17-52), 31 males and 14 females. Dominant hand was involved in 39 patients. In acute injuries reinsertion with bone anchor or pull-out was performed while in chronic injuries reconstruction with a graft was performed. Thirty three patients were reviewed and at a mean follow up of 2 years (4-51 months). Patients were assessed with VAS, DASH, Mayo score, measurement of pinch and grip, stability (grade I-III). Rehabilitation protocol was started after 3-5 weeks after surgery.

Results and Conclusions: Stability was restored in all patients of group I, and in all but one patient of group II. GRIP was restored in 98% of thumbs and 88% of long fingers. Pinch was restored in 92% of thumbs and 75% of long fingers. According to Mayo Hand score there were in group I: 20 excellent, 5 good, 3 fair results. In group II there were 2 excellent, 2 good and 1 fair result. In group I mean VAS was 1, during sports was 2; in group II mean VAS was 0 and during sports was 1. Mean DASH was 10,9 (1,7-29,3) in group I, and 6,7(0-15,8) in group II. In Group I 94% of patients were satisfied with the treatment and 100% in group II. Slight residual stiffness of mean 10° of flexion (0-22°) was recorded in group I, none in group II. All patients returned to work and sports activities.

Conclusions: Stability can be restored with surgical treatment in the great majority of cases with restoration of grip and pinch strength despite a minimal lack of flexion with a recovery of previous work and sports activities.

Keywords:
An Innovative Approach to Preoperative Planning and Performing Corrective Osteotomy of the Radius.

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Objectives / Interrogation: The aim of the study is to develop a new way of planning and implementation of the corrective osteotomy of the radius, using the 3D modeling and individual templates, and also to analyze the proposed method in comparison with the classical method.

Methods: In the course of this study, 15 patients aged from 24 to 70 years were examined. The study was conducted on a Toshiba Aquilion 64 computer tomograph using specially developed protocols. Using a complex of 3D-adapted software, we performed individual 3D modeling and prototyping of anatomical models on MakerBot Replicator Z18 and Raise3D N2 DUAL 3D-printers. Individual templates were made on a 3D printer. For reference, in comparison, the second group of patients underwent classical measurements with the help of radiographs.

Results and Conclusions: The new protocol for planning and performing the corrective osteotomy of the radius, using 3D modeling and prototyping was developed. The analysis of the results of the planning and implementation of corrective osteotomy of the radius in 15 patients was carried out. The results showed that the application of the calculations obtained by drawing on radiographs, is not an accurate and reliable option in preoperative planning. Performing surgery with the use of the individual template totally eliminates subjective errors as well as the need to change the plan during operations. After the surgical treatment, for control purposes, on the three-dimensional model the main angular parameters were once again calculated and compared with the planned preoperative calculations. The arrangements of osteotomized fragments and the plate were also taken into account.

The target, pre-planned spatial position of the fragments of the radial bone and the plate, corresponding to the preliminary calculations, was obtained in 94% of cases.

For the comparative analysis, we evaluated the archive results of 15 cases of planning the corrective osteotomy of the radius in patients with post-traumatic deformities using standard X-ray and radiographs of the radial bone in front and side projections. The spatial position of the proximal fragment of the radial bone and the location of the plate on the postoperative radiographs corresponded to preliminary calculations in 41 (79%) cases.

In addition, the comparative analysis of the calculations of 3D modeling and single-plane planning was conducted. The findings show that in 100% of cases the average difference in the measurement of the angular parameters was 6 ± 2 (p <0.05).

Keywords:
Corrective osteotomy, the radius, 3D modeling, prototyping, Individual templates
How successful are intercostal nerve transfers to restore elbow flexion in plexus palsy?

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Objectives / Interrogation: For incomplete injuries of the brachial plexus intraplexal nerve transfers as the Oberlin transfer are successful and well accepted. In case of complete lesions extraplexal transfers are necessary. Different donor nerves are under ongoing discussion. The alternatives to intercostal nerve transfers are nerve grafts in selected cases, transfers of the accessory or phrenic nerve, free muscle transfers and contralateral donors. The aim is to evaluate the extent of failures of the intercostal nerve transfers compared to Oberlin transfers.

Methods: 41 patients with brachial plexus injuries (age 15 - 60; 37 male and 4 female) were treated between January 2010 to July 2017 with reconstruction of elbow flexion by nerve transfers. Of these, 21 had intercostal nerve transfers to the musculocutaneous nerve and 20 were treated with the Oberlin transfer including modifications. In all cases with intercostal nerve transfers the terminal sensory branch was used for direct neurotization of the elbow flexor muscles. The minimum follow-up was 12 months.

Results and Conclusions: Follow up of 34 patients until October 2018 could be included in the analysis. Elbow flexion between 45 and 140° (median 97.5°) with M3 or more strength was achieved by transfer of intercostal nerves to musculocutaneous nerve with a success rate of 72.2% (13/18). The results of Oberlin-transfers showed a successful flexion of M3 or more between 80° and 140° (median 115°) in 93.8% (15/16). The median muscle force rated 4/5 MRC in both transfers.

Intercostal nerve transfers led to an useful elbow flexion in more than 70% of cases. This experience is similar to several published results and meta-analyses. One reason for these good results might be the regular use of direct muscle neurotization by the terminal sensory branch of musculocutaneous nerve. Certainly intraplexal transfers like the Oberlin transfer are more successful with reliable functional reconstruction and a shorter reinnervation latency due to shorter distance to the recipient muscle. But up to now no concept for complete plexus injuries was published with reliable better results. Therefor intercostal nerve transfers to the musculocutaneous nerve are a helpful tool in plexus surgery concepts.

Keywords: plexus brachialis palsy, neurotizations, intercostal nerve transfer, oberlin transfer
Subungual exostosis of the fingers

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Objectives / Interrogation: Subungual exostosis (SE) is a benign bone tumor found on the distal phalanx of a digit, beneath or adjacent to the nail. Dupuytren gave the first description of the lesion (published after his death in 1847) when he reviewed his experience with 30 patients suffering from subungual exostoses of the great toe [1]. Nearly 80 percent of reported cases involve the great toe and the remaining cases involve other toes. Involvement of the finger by this lesion occurs very rarely, with less than 60 reported cases in the English language literature - most of them in the thumb. We report 3 cases of subungual exostosis in the fingers of female patients.

Methods: The patients underwent excision of the mass in the operating room in local anesthesia and finger block. After a short distal palmar incision the tumor was resected completely at the level of the normal periosteum. The distal border of the tumor was covered with cartilage.

Results and Conclusions: Finger SE are about 1.5 times more common in women than men. Unlike exostoses elsewhere in the body, SE often appear and continue to grow after skeletal maturity. About 50% present during the second or third decade of life, with the other half presenting in patients over age forty. Very often these lesions are misdiagnosed, leading to protracted morbidity from inadequate therapy or extreme treatments such as digital amputation or radiation therapy. We report three rare case of subungual exostosis on the fingers presenting as stony hard painful swellings in three female patients with complete and long time release of symptoms after surgery.

Keywords:
Subungual exostosis in fingers, Dupuytren’s-tumor, surgery of nail unit.
Solitary lesion of Molluscum contagiosum of the finger in an Immunocompetent Individual: A Case Report and review of literature.

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Objectives / Interrogation: Molluscum Contagiosum (MC) is a benign and contagious skin infection caused by molluscum contagiosum virus (MCV) of poxvirus family. MC is a self-limiting condition affecting the skin and mucus membrane. It is commonly seen in children of age 2-5 years, but can be seen in sexually active adults and immunosuppressed individuals. Clinically MC presents with small, discrete, dome shaped papules with central umbilication. The clinical presentation of MC in most cases is diagnostic which can be further confirmed by histopathology examination in cases that are not clinically obvious.

We report a case of MC in an immunocompetent female with atypical clinical presentation and radiological findings which is confirmed by histopathological findings.

Methods: A 36 year old lady presented to our clinic with a painless swelling over the dorsum of her left ring finger since 3 months resulting in difficulty in wearing her finger ring. There was no history of any trauma. The swelling was non-tender, soft in consistency, of approximate size of 6 X 8 mm over the dorso-radial aspect of proximal phalanx of left ring finger.

Routine radiographs were unremarkable, while an MRI revealed a well defined, space occupying lesion of approximately 10 x 8 x 5.5 mm; indicating benign neoplastic lesion, possibly a fibroma.

An excision biopsy was advised.

Results and Conclusions: Histo-pathological examination revealed epidermis of skin lined by lobulated stratified squamous epithelium showing hyperkeratosis, acanthosis, and parakeratosis. A cyst filled with large eosinophilic inclusions infiltrating into the epidermis. Molluscum bodies or colonies of MCV were seen.

This case report is perhaps the first of its kind with a rare presentation of Molluscum Contagiosum in an immunocompetent adult at an unusual location (finger). The MRI was also confounding as was the clinical appearance.

Follow up after 12 months showed no recurrence.

Keywords:
Molluscum Contagiosum, Rare presentation, Finger
How to deal with Selective Nerve Transfers - An Animal Study

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Objectives / Interrogation: Selective nerve transfers (SNTs) have been used broadly for the past decade to treat slow nerve regeneration, neuroma pain and to improve prosthetic control. SNTs change the motor unit extensively by connecting motor neurons to new functional targets. Good outcomes have been reported but little is known of the structural and functional effects. On a basic scientific level even less is known about how much motor input is required in order to achieve sufficient functional regeneration.

Methods: In 10 male Sprague Dawley rats the ulnar nerve (UN) was selectively transferred to the long head of the biceps after neurotomy of the biceps motor branch. In another experimental group (n=10), the deep branch of the ulnar nerve (DBUN), which is even more selective, was used to restore elbow function. These transfers were compared against a sham group (n=10) and a positive control group (n=10), in which the musculocutaneus nerve was crushed. Additionally, the equivalent operations were conducted in 20 Thy1-GFP rats (n=5 each group) to analyze nerve regeneration and neuromuscular junction formation.

Results and Conclusions: In all animals the biceps muscle was successfully reinnervated. In the UN group tetanic muscle force was 1.23 +0.21 mN, compared against 1.12 +0.17 mN in the DBUN group. Retrograde Labelling and MUNE (Motor Unit Number Estimation) correlated well and showed a statistically equivalent amount of regenerated motor neurons (86 +11 after UN transfer and 81 +10 in the DBUN group). Sensory and motory immunhistochemical axon quantification of the UN and its deep branch offered valuable clues on how much donor nerve is needed to restore motor function. However, only the UN transfer resulted in massive neuroma formation close to the coaptation site, which was visualized in Thy1-GFP rats. Muscle fibre typing and neuromuscular junction staining revealed impressive changes on all levels of the motor unit.

Transferring not only a high capacity donor nerve, but also an even more selective fascicular group and exploring the effects on the motor unit provides us with a deeper understanding of the neuronal plasticity of the peripheral nervous system. Tetanic muscle force, MUNE and retrograde labelling indicate that the motor neurons merely of the deep branch of the ulnar nerve supported sufficient regeneration and a lot of the additional input resulted in neuroma formation. Hence, nerve transfers could be performed even more selectively from this point forward.

Keywords: selective nerve transfer, animal model, motor regeneration

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Objectives / Interrogation: The relationship between financial and material support on the quality of hand surgery research remains unknown. Based on the increased resources likely required to perform high-quality research, we hypothesize that funding and other support is associated with higher levels of evidence in hand surgery research.

Methods: We performed a systematic review of all articles published in the Journal of Hand Surgery-American Volume over a 10-year interval, from January 2006 through December 2015. Papers were reviewed to determine the following: date of publication, volume/issue, category (clinical vs. non-clinical), number of authors, country of origin, and type of support received, if any. Clinical studies were further subcategorized into type and Level of Evidence from I-V. Support was defined as financial and/or material support as designated in the first page footer or text body of the paper and subcategorized into one of four categories (1) Industry (2) Education/Societal (3) Government or (4) Multiple, i.e. some combination of 1 through 3. Chi-square analysis was performed to determine the potential relationships between the aforementioned variables.

Results and Conclusions: 1792 studies satisfied inclusion over the study interval. Majority of studies were clinical (1,113; 62.1%) versus non-clinical (679; 37.9%), and financial or material support was used in 515 (28.7%). Non-clinical studies received a significantly higher rate support than clinical studies (40.2% vs. 21.7%; Chi-square test P < 0.0001). Education was the most common support source (158), followed by industry (150), government (124), and multiple sources (83). Industry was more likely to support clinical studies, while education and government sources were more likely to support non-clinical studies (Chi-square test P = 0.015). Level I and Level III clinical studies were associated with higher levels of funding than Level II, IV and V studies (Chi-square test P < 0.0001). Prognostic studies were most likely to be associated with support, while therapeutic studies were least likely (Chi-square test P = 0.03). Studies from the United States were more likely than others to receive support (31.2% vs. 25.0%; Chi-square test P = 0.011).

Non-clinical studies are more likely receive financial or material support. Among clinical studies, prognostic studies and those with Level I and III evidence, and were mostly likely to receive support. Studies originating from the U.S. received the highest rate of support.

Keywords:
The Influence of reactive oxygen species on pathophysiological mechanisms of Dupuytren's disease

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Objectives / Interrogation: Dupuytren's disease is characterized by an increased proliferation and differentiation of fibroblasts to myofibroblasts, which provides an enhanced expression of alpha Smooth Muscle Actin (alpha-SMA). alpha-SMA modulates the contraction of fibrotic nodules and cords of the palmar aponeurosis. In prior studies, we could already demonstrate, that exposure of myofibroblasts to blue light reduces alpha-SMA-expression and subsequently contraction of the palmar aponeurosis. Reason for this phenomenon seems to be increased concentrations of reactive oxygen species (ROS) due to photobiomodulation with blue light. Aim of this study was to examine how far exposure with blue light leads to higher concentrations of ROS. Moreover, the influence of ROS- concentrations on alpha-SMA-expression and on ROS- modulating enzymes like catalase and Manganese Superoxide Dismutase (M-SOD) as well as on the transcriptional factor Nuclear Factor- kB (NF-kB) was detected.

Methods: Isolation and cultivation of fibroblasts from palmar aponeurosis tissue of patients with Dupuytren's Disease (n=7) as well as from carpal tunnel tissue (CTS, n = 7), as control group, was ensued. Differentiation of fibroblasts to myofibroblasts was established by dispensation of Transforming Growth Factor beta (TGF-beta). LED-Arrays that emit at wavelength of 453 nm (40 Joule, 38 mW/cm2) were used for irradiation with blue light. Expression of catalase, alpha-SMA, NF-kB and Mn-SOD were detected by western blot analysis.

Results and Conclusions: In both experimental groups, exposure to blue light lead to decreased expressions of catalase, Mn-SOD and tendentially reduced levels of NF-kB. Moreover, augmentation with hydrogen peroxide showed a reduced alpha-SMA expression. This suggests, that the therapeutic benefit of decreased alpha-SMA expression by blue light treatment could be modulated by ROS concentrations, especially by hydrogen peroxide levels. Our results demonstrate that decreased expressions of catalase through blue light exposure appears to be the cause for higher ROS- concentrations and seems to participate relevantly in pathophysiological mechanisms as well as therapeutic options in Dupuytren's disease.

Keywords:
Dupuyten's contracture, blue light exposure, reactive oxygen species, catalase, alpha Smooth Muscle Actin
ULNAR HEAD PROSTHESIS IN RHEUMATOID ARTHRITIS

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Objectives / Interrogation: Ulnar head implants are indicated in post-traumatic arthritis of DRUJ, failure of previous operations (Bowers, Sauvé-Kapandji, Darrach), tumor resection. This technique is also indicated in inflammatory arthritis with pain at DRUJ or limitation of pronosupination in alternative to other operations but it is still controversial. Controversy is related to the possibility of other surgical options as Sauvé-Kapandji, Darrach o Bowers procedures that are widely used in RA patients. Moreover diffuse concomitant or subsequent involvement of radiocarpal or intercapal joints of the same hand may necessitate a multiple operation plan. The aim of this study is to analyse the results and define the actual indications of this technique in RA patients

Methods: Out of 53 wrist treated with ulnar head implant in our Unit, 10 patients had inflammatory arthritis (9 RA and 1 Psoriatic arthritis) were treated as affected by akyosis or osteoarthritis type of RA according to Simmen Classification. Of those, one had a previous failed Bowers operation. All were females. Mean age 56yo (42-74). All patients had a limitation of pronosupination and elective pain at DRUJ. Five patients were reviewed with a mean follow up of 6 years (2-10 years). Mayo score, Dash and PRWE score were used to evaluate the results

Results and Conclusions: The results were good in 2 patients, fair in 3. Restoration of pronosupination was obtained in all patients except one who had a supination limited to 50°. Mean ulnar deviation was 27° (0-45°), mean radial deviation was 5° (0-15°), extension 20° (0-40°), flexion 21° (5-30°). Mean DASH was 42 (22.5-47.5) and PRWE was 31 (11-48.5). Pain was absent in 2 cases, occasional in 2 cases, moderate in 1 case. No complications recorded.

From our data the results were satisfactory in all patients even if arthritis can progress in other joints of the same hand and limb. There is a bias in the results of the wrist scores used as other joints of the upper limb are involved in RA and this creates worse clinical scores compared to post-traumatic patients. Among salvage procedures ulnar head implant gives a very good restoration of function and aesthetic appearance of the wrist. This technique is indicated in selected cases of isolated DRUJ arthritis without excessive laxity, with limitation of pronosupination and elective pain at distal radio-ulnar joint.

Keywords:
Corrective Osteotomy Arthroscopically assisted of Intra-Articular Distal Radius Malunions with out-in technique

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Objectives / Interrogation: Conservative treatment or not correct surgical treatment of distal radial fractures carry out to healing with articular gap > 2mm with pain, loss of ROM and arthritic changes at midterm follow-up. The corrective osteotomy of intra-articular defects represent an complex challenge for surgeon. The surgical articular visualization is complex and a dorsal approach with capsula incision frequently evolve in stiffness as a result of capsular retraction. There was realized an technique for intra-articular distal radius malunions from outside to inside under dry arthroscopic visualization by the use of compass for define the correct site of osteotomy.

Methods: There performed surgery on 9 patients for intra-articular malunion of the distal radius 10 to 30 months after the injury, in all the cases the fractures was intra-articolar in 3 cases the step-offs was a consequence of incorrect surgical treatments in 6 cases was a consequence of conservative treatments in plaster. In 3 cases the osteotomy regarded more than 3 fragments. In 3 cases there was associated osteotomy of the extra-articolar distal radius.

Results and Conclusions: Follow-up ranged from 12 to 24 months. The articular joint was reconstruct without step-offs more than 1 mm, in 2 cases thers a partial dislocation of the fragment for not sufficient stable synthesis but the dislocation was less than 2 mm without clinical effect on rom restoration. According to the Gartland and Werley score, there were 3 excellent and 6 good results (mean score of 3.1). The Modified Green and O'Brien system achieved a mean score of 80, with 3 excellent, 5 good, and 1 fair results. The mobilization VAS has passed from 7 to 2 and the medium ROM improvement was 65°. Arthroscopically assisted osteotomy permits direct visualization of the site of osteotomy and preserve the dorsal capsula and ligaments, the outside-inside technique by use of compass provide to draw very well the line of osteotomy, in comparison with arthroscopy inside-outside there was realized any time after fracture, there was an economic solution in exchange with navigated solution or custom mask of cutting techniques.

Keywords:
corrective osteotomy, arthroscopically assisted
Open CMC-1 fracture dislocation with avulsion of the thumb and laceration of first web space - severe hand trauma

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Objectives / Interrogation: Introduction: Open CMC-1 fracture dislocations is rare injury to the hand and thumb caused by high-energy trauma, such as explosions, thumb entrapments and punch press injuries. It is possible only in case of thenar and first web space laceration. In most cases additional massive injury to the hand and fingers is present whereas narrowing of first web and immobility of the thumb are in danger. Authors would like to point out importance of appropriate treatment for future function of the hand.

Methods: Patients and methods: 7 consecutive cases were reviewed between 2007 and 2018. Etiology were pyrotechnics (4 cases), dog bite (1 case), punch press (1 case) and thumb entrapment by ski lift rope (1 case). In all cases open reposition and fixation of 1st metacarpal and reconstruction of thenar muscles and first web were performed. Additional bone and soft tissues injuries were also reconstructed (2 ray amputations, osteosynthesis of metacarpals and falanges and soft tissue coverage performed) Local care and immediate hand therapy and splinting were part of treatment. Healing period took approximately 3 months. Thumb opposition, sensitivity and first web space span were evaluated as end result.

Results and Conclusions: Results: Residual adduction contracture of first web space appeared in all cases average 45 degree. 6 cases suffered from dysestesia of thumb and all cases had opposition lag (Kapandji 6 in 3 cases, Kapandji 5 in 2 cases and in 2 cases rough grip) but functional hand grip and thumb function were preserved.
Conclusion: open CMC-1 fracture dislocation is part of massive laceration of thenar muscles and first interossus muscle. NC bundles are seriously damaged while remain usually in continuity. Serious damage of bones and soft tissues require individualised treatment, specialized aftercare and additional surgical procedures can be expected.
Permanent consequences such as web space narrowing, loss of sensitivity and opposition can be expected.

Keywords:
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Objectives / Interrogation: This trauma is potentially devastating for the hand. Usually the initial benign appearance of the 
wound can lead to underestimate the injury and then to delays in diagnosis and adequate treatment sometimes due to lack of 
common knowledge of the seriousness of this injury.

We compare our experience with what comes from literature, in order to get useful tips and tricks for the management

Methods: On between 2004 and 2014, we treated 25 patients suffering high pressure injuries. We reviewed all in 2018, 4 
patients were lost to our review.

the materials injected were: in 8 patients oil, in 4 paint, in 3 grease, in 2 air, one sand and one water.

10 patients underwent surgery within 6-12 hours; other 10 underwent delayed surgery because they were seen after several 
days up to 30days from trauma; one patient was treated conservatively for a subcutaneous emphysema of the right emysoma.
The age was in a range from 22 years to 62 years with a predominance of patients in their thirties.
The most affected site was dominant hand.
The mean hospitalization time was from 1 to 9 days.

Surgery included a common time of early and aggressive debridement followed by several surgical procedures as well as tenolisys 
and decompression of the anatomical structures involved, reconstructive techniques with pedicled flaps(9 times) up to not rare 
amputations 2 cases.

outcome was assessed by clinical examination and return to functional and working activities, patient's satisfaction rate, DASH 
score

Results and Conclusions: 9 patients had a return back to normal working activity; 4 patients were unsatisfied; 1 patient took 
long neurological discomfort over 2 years; 7 report mild functional recovery. Dash score was 6.2.

we can assess that the prognosis depends on several important factors: latency time, toxicity of the material injected, site of 
lesion, age of the patient, aggressive and prompt surgery. On our hands, the most important keys are: prompt diagnosis, early 
surgery, with a wide exploration, accurate debridement with detection of all the damaged tissue, and reconstructive surgery with 
flaps or tendon or skin graft; of course. Antibiotic therapy, the possibility of repeated or secondary surgery and early and intensive 
physiotherapy, are required and patients should be informed about possible poor prognosis.

Keywords:
Perilunate fractures and perilunate dislocations in polytrauma

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Objectives / Interrogation: Generally there is a high rate of missed or incorrect diagnosis for perilunate (fracture) dislocations (PD). Especially in severe injured or polytrauma patients the focus of diagnosis and treatment is restoring vital functions, therefore wrist injuries are sometimes diagnosed or treated later. Thus the aim of this study was to analyze the diagnosis, management and outcome of PLF in polytrauma patients in our Level I Trauma Center.

Methods: In this retrospective study all PD in polytrauma between 10/1994 and 09/2017 were included. All 17 patients with a mean age of 36.1 years (range: 17.2-61.1) were male. The mechanism of injury included falls from > 3 meter in ten cases, < 3 meter in three cases and traffic accidents in four cases. The mean injury severity score was 40 (range: 25-75). Most cases (12) were initially diagnosed by conventional x-ray (Gilula-lines, SL-gap,) and by CT scan. In 3 cases it was diagnosed later at an average of 7 days (1-49). 2 patients were transferred to us from another centre.

Results and Conclusions: From the 17 patients one died in the OR, thus 16 were treated surgically. Reasons for late or alternative care were: precarious soft tissue situation, severe SHT, delayed diagnosis and exitus letalis. We found two cases of persistent carpal instabilities. Range of motion (ROM) will be presented.

Closed reduction should be performed acutely, followed by open reduction and ligamentous and bony repair with internal fixation, whenever possible. In the special setting of polytrauma life threatening injuries are of course prioritized influencing the outcome of these severe wrist injuries.

Keywords:
Perilunate fractures, polytrauma, perilunate dislocations
The use of Carboxymethylcellulose (Dynavisc®) to prevent adherences after WALANT flexor tendons repair

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Objectives / Interrogation: Perineural and peritendineous scar formation is responsible for loss of function, pain, loss of gliding in peripheral nerve and tendon surgery. Collagen synthesis rate is considerably increased during the 4th week. Dynavisc® is a carboxymethylcellulose (CMC) and Polyethylene Oxide (PEO) gel based on a novel surgical device designed to reduce postsurgical adhesions, creating a physical barrier combined with the immunomodulation of the inflammatory fase. Wide awake (WALANT) is a new-technique in hand surgery anesthesia without the use of turquet and the active movement and collaboration of the patient during the surgery. Their efficacy, when they are used in the same time, was assessed in a retrospective, randomized, controlled, clinical trial, comparing results of tenorrhaphy of flexor tenolysis in zone 2.

Methods: In control group of 12 consecutive flexor tendons repair a standard tenorrhaphy in local-regional anesthesia was performed whitout any anti-adhesion device. In treated group, 12 consecutive WALANT flexor tendons repair, Dynavisc® was applied into the flexor sheath. All patients were evaluated: early and late complications, secondary surgery and at 30, 60 and 180 days after surgery by testing Total Active Motion (TAM), Quick-DASH questionnaire.

Results and Conclusions: Patients in study group had a statistically better recovery of finger motion at long time intervals, specially after 60 and 180 days from the tenedon surgery. The use of wide-awake and Dynavisc® doesn't correlate with increase particoular types of complication. The objectives of the study were to measure the efficacity and to check the safety of WALANT Dynavisc® by assessing adverse effects. CMC-PEO gel can reduce peritendineous scar tissue. Long term hydrolysis (> 30 days) can protect, in our opinion, the surgical site from fibroblasts migration and differentiation, during an important period of collagen synthesis (4th post-operative week). The encouraging results confirmed the Dynavisc effectiveness in flexor tendon surgery.

Keywords:
flexor tendons repair, Wide awake, gliding, carboxymethylcellulose and Polyethylene Oxide
Recruitment efficiency for randomised controlled trials in digital nerve repair

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Objectives / Interrogation: The gold standard treatment for a complete traumatic peripheral nerve lesion involves direct end-to-end microsurgical repair. Tension across the repair site contributes to formation of scar and the risk of neuroma formation. Conduits may be used to reduce scar tether at repair sites or to provide a supported segment of injured nerve for sutureless repair. A randomized controlled trial investigating the outcomes of digital nerve repair requires a two-stage recruitment process. This report summarises the recruitment efficiency and strategies that may result in enhanced participation.

Methods: Patients were assessed using the "ten-test" sensory evaluation following hand injury. Patients with reduced sensation in a digital nerve distribution were referred to a research nurse for consent and first stage recruitment to the CoNNECT study. Intra-operative confirmation of a complete nerve injury meeting inclusion criteria allowed second stage recruitment and randomisation. Analysis of screening data and recruitment logs from June 2017 to October 2018 enables assessment of recruitment efficiency.

Results and Conclusions: 236 patients met clinical screening criteria and 192 consented for trial recruitment (12 per month). At operation 113 patients did not meet the second stage recruitment criteria (75 patients no visible nerve injury, 20 with partial nerve injury, 8 had injuries outside of the target zone, 2 had a nerve gap requiring reconstruction with a graft, 1 proceeded to primary digit amputation and 7 patients were deemed by the operating surgeon not to fulfil the first stage eligibility criteria). 69 patients had at least one nerve injury meeting the second stage inclusion criteria. 3 patients did not proceed to randomisation due to limited operating time and 3 further patients were not randomised due to operator uncertainty regarding the trial protocol. 73 nerves in 63 patients were randomised to one of the three study arms. 1 patient has since withdrawn from the study after randomisation and completion of the procedure.

Our RCT demonstrated that only 27% of patients clinically screened participated in the study and 6 patients were missed at second stage recruitment due to time constraints or inadequate planning of theatre resources. Recruitment efficiency is 91% and retention is 98% for the CoNNECT study. Careful monitoring of recruitment efficiency highlights areas where training and resource allocation can optimise study participation.

Keywords:
Randomised controlled trial, Nerve repair, digital nerve repair, ten-test, recruitment efficiency
Is the use of whole vial of collagenase Clostridium histolyticum dissolved in 1.0 ml of solvent safe and effective?

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Objectives / Interrogation: Collagenase Clostridium histolyticum (CCH) is a widely accepted alternative treatment option to surgery for Dupuytren's disease (DD). Recommended amount of CCH for MCP joints is 0.58 mg in a volume of 0.25 ml and for PIP joints 0.58 mg in a volume of 0.20 ml. The rest of collagenase vial is disposed of. We think there is no reason not to use the whole vial of CCH. Also, the recommended total amount of injected volume seems to be so small to cure enough tissue affected with DD. We tried to use the whole vial of CCH with less concentrated dilution to find if this approach is safe and effective.

Methods: Patients with DD and with total finger extension deficit (MCP + PIP) more than 30 degrees were indicated for CCH treatment. We excluded patients with previous surgery at the site of CCH injection. In all cases, only one infiltration was applied. We used the whole vial of CCH (0.9 mg) and we dissolved it in the volume of 1.0 ml of solvent. The fingers were manipulated under the wrist block 24 hour later. The follow-up included a minimum of 4 weeks after the treatment.

Results and Conclusions: Between October 2014 and September 2018 total of forty-seven hands of forty-three patients were treated with more diluted CCH. All treated hands had a cord rupture or nodules dissolved at the site of injection. All patients respond and all patients improved their total extension deficit of treated finger. No one patients reported unsatisfactory results. Adverse effects occur in all patients, the most serious were larger skin tears and hematoma of arm and forearm and transient axillary lymphadenopathy. All these side-effects of CCH activity disappeared spontaneously or with conservative treatment (analgesics, cooling, local antibiotic ointments) during 3-10 days. Any major complications, e.g. tendon rupture, anaphylaxis, CRPS, continuous pain etc. were not recorded.
We demonstrate that the use of the whole vial of the CCH is safe. Based on our experience, we also think, that dilution of 0.9mg of CCH into 1.0 ml of the solvent has similar effectivity as original dilution and it allows for the treatment more amount of affected tissue. Total follow-up of 4 weeks we consider as enough time to find if our approach is effective and safe. We can conclude that dilution the whole vial of CCH into 1.0 ml of solvent seems to be safe and effective and increases a total amount of possibly treated tissue without decreasing the collagenase activity. Using whole vial od CCH can improve the economic aspects of DD treatment.

Keywords: Dupuytren, collagenase, miniinvasive treatment, vial, dilution
ARTHROSCOPIC PRE-OPERATIVE PLANNING IN WRIST OSTEO-ARTHRITIS

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Objectives / Interrogation: Wrist osteoarthritis can be localised to different articular surfaces of radiocarpal or inter-carpal joints and develops according to predictive patterns. The most frequent causes of the degenerative disease are post-traumatic (SLAC and SNAC wrist) that after many years lead to carpal collapse. Other causes can also related to deposition of calcium pyrophosphate in the joint (SCAC wrist), or advanced stages of osteonecrosis of lunate or carpal bones or previous infections while primary conditions are rare.

The degenerative condition can be studied with plain radiographs and advanced diagnostic imaging techniques as CT scan and MRI scan. Wrist arthroscopy is an additional technique that allows the direct visualization of articular surfaces and identify precisely the damaged intra-carpal joints. Arthroscopy has a higher sensibility and specificity compared to MRI and is considered the gold standard in evaluating cartilage damage. The aim of this study is to use arthroscopy as a guide to surgical choice in order to preserve the intact joints and avoid progression of arthritis.

Methods: Thirty-two patients underwent wrist arthroscopy before the planned surgical procedure. All patients had Xrays and CT scan or MRI scan pre-operatively. All were males, mean age 52 (38- 65). There were 16 SNAC, 13 SLAC and 3 Kienbock Disease. Arthroscopy can be performed as a separate-first step procedure or at the same operating time. Radio-carpal joint and midcarpal joints are examined with standard portals (3-4, 6R, MCR, MCU). Additional portals can be added if needed.

Results and Conclusions: The surgical treatment was modified according to arthroscopic finding in all patients. The disadvantage of this procedure is the increase of operating time or necessity of two procedures to be performed. Open surgical treatment was performed after arthroscopy in a one-step procedure in 7 cases and in two steps in 25 patients. With the use of arthroscopy the treatment can be tailored according to the residual intact cartilage surfaces in order to have more durable results. Sometimes it is possible to post-pone salvage procedures and find more conservative solutions especially in the early stages of SLAC and SNAC.

Keywords:
Definitive Management of Open Fractures of the Hand and Wrist in an Outpatient Setting: Is Urgent Debridement Necessary?

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Objectives / Interrogation: We hypothesized that surgical debridement may be delayed up to one week from the time of injury for open fractures of the hand and carpus without increased risk of infection or secondary procedure.

Methods: We conducted a retrospective review of patients seen at our tertiary upper extremity referral center for open fractures from the carpus distally over a 6-year interval. Records were queried for patient demographic information, injury history, initial management and operative findings. The primary outcomes of interest were incidence of infection and need for additional surgery. Numerical outcomes were compared using independent t-testing and categorical outcomes with Fisher's exact testing.

Results and Conclusions: A total of 284 patients with a mean age of 43 ± 17 years were included. The mean BMI for the cohort was 27.1 ± 5.4 and included 79.2% males, 4.7% diabetics, 26.7% smokers, and 33.9% with associated workers’ compensation claims. All patients underwent bedside irrigation and debridement at the time of their initial presentation to the emergency department. The three most common mechanisms of injury were crush (46.6%), saw (20.8%), and traumatic amputation (9.7%). The median time interval from injury to surgery was 4 days (range, 0 to 34). The three most common methods for fracture stabilization were K-wire fixation alone (50.7%), splinting (41.4%), and plate and screw fixation (4.0%).

Complications occurred in 16 patients (6%), including 4 patients (1.4%) who developed infection. Two infections required debridement and two were successfully treated with oral antibiotics. Revision of nonunion, unplanned revision amputation for wound issues, and tenolysis for stiffness were each required in 3 patients. The most common planned revision surgeries were for coverage of soft-tissue defects (skin grafting in 5, local flaps in 4). Diabetes was the lone factor predictive of complications (complication rate = 18.8% in diabetics vs. 3.9% in non-diabetics; Fisher’s exact P = 0.033). Time interval from injury to initial surgery was not significantly different for the patients who developed complications (mean 4.9 ± 5.6 days) vs. those who did not (mean 5.3 ± 6.0 days; P = 0.78).

SUMMARY
Delayed treatment of open hand/wrist fractures does not lead to increased incidence of infection or complications. Diabetics with open hand/wrist fractures are at greater risk for developing postop complications. Revision surgery is most likely to be required for issues related to wound healing and coverage.

Keywords:
Porcine submucosa extracellular matrix nerve wrapping of scarred nerves

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Objectives / Interrogation: Scar tissue formation in the vicinity of a peripheral nerve causes compression, ischaemia, impaired glide and tether, resulting in a pain syndrome - neurostenalgia. Neurolysis of a scarred nerve may bring initial relief from pain but secondary scar formation usually follows. Adjunctive wrapping may reduce scar formation. Biological tissues may result in donor site morbidity. The AxoGuard® nerve protector (AxoGen Inc., Alachua FL) is a layered porcine submucosal extracellular collagen matrix that may be sutured around nerves following neurolysis providing a layer for revascularization and restoration of nerve gliding. This report is on utilization, safety and outcomes of the AxoGuard® in a tertiary referral peripheral nerve service.

Methods: After obtaining ethics form the institutional audit review board, a review was performed of all cases where AxoGuard® nerve protectors were used in primary or revision nerve surgery from June 2015 to July 2018. General demographic data, indications, nerves involved, complications and early follow up data were collected and evaluated.

Results and Conclusions: Over a 3-year period AxoGuard® nerve protectors were used in 71 patients. The indication for surgery was a scarred nerve after trauma in 32 cases, scarring after primary nerve surgery in 19 cases, primary trauma in 9 cases (including one nerve transfer due to a significant size mismatch), nerve scarring after elective non-nerve surgery in 5 cases and nerve tumours in 5 cases. The most commonly involved nerves were the ulnar nerve (32), median nerve (14), digital nerves (11) and the common peroneal nerve (3).

One patient had an early re-exploration due to a post-operative haematoma and one patient had a late exploration due to adjacent tendon adhesions. There have been no complications related to the AxoGuard® nerve protector and no cases of post-operative infection.

Conclusion
The AxoGuard® nerve protector is a versatile tool in complex peripheral nerve surgery with no reported device related complications in a consecutive series of 71 patients.

Keywords:
Scarred Nerve, Porcine Submucosa Extracellular, Nerve Wrap
Concomitant Ipsilateral Endoscopic Carpal and Cubital Tunnel Release: A Single-Center Review of 103 Consecutive Cases

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Objectives / Interrogation: Endoscopic carpal tunnel release (eCTR) performed in conjunction with endoscopic cubital tunnel release (eCuTR) would have a high rate of success in relieving symptoms related to both carpal and cubital tunnel syndrome, with low rates of complications and revisions.

Methods: We conducted a retrospective study of consecutive patients who underwent endoscopic decompression of the ulnar nerve at the elbow and median nerve at the wrist over a 5-year interval. Patients with less than 3 months of follow-up were excluded. Modified McGowan Grades were assigned to each patient pre- and postoperatively. Comparison of pre- and postoperative numerical outcomes was performed using paired t-testing.

Results and Conclusions: 103 patients with mean age 55.4 ± 11.6 years satisfied inclusion. QuickDASH scores improved significantly from 55.4 ± 23.2 preoperatively to 12.2 ± 15.9 postoperatively (paired t-test; P < 0.001). Grip strength improved from 89.8 ± 35.5% of the contralateral side preoperatively to 97.1 ± 36.8% postoperatively, although this difference only approached statistical significance (paired t-test; P = 0.071). Similarly, key pinch strength improved insignificantly from 96.5 ± 44.0% to 99.3 ± 34.6% (paired t-test; P = 0.65).

One patient was converted to open surgery with a modified medial epicondylectomy after the ulnar nerve was found to be unstable intraop and had complete resolution of his symptoms. Two patients had worsened McGowan grades postoperatively (Table 2) and required revision for recurrent symptoms; one male was found to have massive perineural scarring at 6.5 months and underwent revision neurolysis with anterior subcutaneous transposition, while the 2nd patient was found to have moderate scarring with a subluxating nerve at 3.5 months when she underwent a revision neurolysis with modified medial epicondylectomy. Both patients were active smokers, as smoking was the lone predictive factor of needing revision surgery (Fisher’s exact; P = 0.023). Eight patients had no change in their postoperative McGowan grade, while the remaining 93 patients improved by at least one grade.

Combined endoscopic decompression of the ulnar and median nerves is a safe and effective treatment option for patients with concomitant ipsilateral cubital and carpal syndrome. Patient-rated outcome scores improved significantly after surgery, while improvements in grip and pinch strength were not significant. Active smokers were at higher risk for requiring revision surgery and worsening of symptoms.

Keywords:
Arthroscopic spiral tenodesis reconstruction for SL instability

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Objectives / Interrogation: To report the anatomical study and preliminary clinical experience with an arthroscopic adaptation of the ECRL antipronation spiral tenodesis for Scapholunate and Radiolunate ligaments deficiency.

Methods: After an anatomical cadaveric study, 5 patients were operated using this technique. The following extended portals were used: 1-2; 4-5 and volar-radial. A 8cm distally based strip of the ECRL was passed within the STT joint and through a tunnel on the scaphoid, where it is blocked using a 3x8 mm interference screw. Then, it was retrieved in the dorsal radio-carpal joint, fixed on the dorsal ridge of the lunate with a bone anchor, and introduced in a tunnel through the triquetum, to exit on the volar aspect of the radio-carpal joint. Subsequently, the tendon graft is deployed through the volar-radial portal and fixed on the radial styloid using a fork tipped interference screw. The visual analog scale of pain (VAS), SL instability (as assessed using the Watson test to dislocate the proximal scaphoid over the dorsal rim of the radius), ability to return to work, range of motion (ROM), grip strength were used for evaluation at minimum follow-up of 12 months.

Results and Conclusions: No intra-operative complications were recorded. One patient developed significant post-operative osteopenia, without obvious signs of CRPS. Pain under load decreased from 7.5 to 2, all SL were stable (Watson test cannot dorsally dislocate the scaphoid). All patients returned to previous work. ROM was reduced of 27% compared to pre-op values. Grip strength increased fo 33%.

Conclusions: Arthroscopic spiral tenodesis reconstruction is feasible and safe, producing comparable results as the standard technique.

Keywords:
SL instability, Spiral reconstruction, arthroscopy, tenodesis
intraneural ganglion of the distal ulnar nerve- a case report

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Objectives / Interrogation: In our department for hand surgery we saw a 49 year old man who had been suffering from a weakness while spreading his small and ring finger for almost three months. No loss of sensation or dysesthesia had occurred. He had first presented himself to a neurologist who excluded pathologies of his cervical spine by an MRI and a CT scan.

Methods: During our clinical examination we saw an atrophy of his interosseous muscles of the fourth and fifth finger along with a weakness in spreading these fingers. He also brought an MRI which showed a cyst of unclear origin.

Because of the clinical findings we were sure that there was a pathology compromising the function of the distal ramus profundus of the ulnar nerve. That's why we saw the indication to explore the nerve in the OR.

During the surgery we saw an intraneural ganglion of the n. ulnaris and removed it.

Results and Conclusions: Intraneural ganglia of the distal ulnar nerve are a rare finding and can mostly be diagnosed by a detailed clinical examination.

We saw our patient again after three and six months. He has fully recovered the function of the hand and is again able to play the piano.

Keywords:
intraneural ganglion, n. ulnaris, nerve compression syndrome
Clinical, surgical and imagistic correlations in the carpal tunnel syndrome

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Objectives / Interrogation: As one of the most common entrapment neuropathies, carpal tunnel syndrome raises significant costs through surgery and rehabilitation.

Methods: Although the diagnosis is mostly clinical, additional evaluation may be useful for confirmation of diagnosis and treatment management.

Results and Conclusions: In cases with divergent clinical and EMG findings, MRI may be helpful in selecting patients who would benefit from surgical release.

Keywords:
Irreducible palmar dislocated isolated fracture to the styloid process of second metacarpal - a unique fracture mechanism.

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Objectives / Interrogation: A 40-year-old patient came to our clinic with swelling on the back of his hand and pain 14 days after a fall. Radiographs showed a larger fragment palmar of the base of the Metacarpal II in the lateral radiograph and a gap in the area of the styloid process MC-II.

Methods:
The patient was operated on and the entire slightly wedge-shaped styloid process could be recovered from the palmar dislocation position and fixed with a screw osteosynthesis after cleansing to the anatomical position.
The fracture healed and after three month there was no pain and full ROM.

Results and Conclusions: The unique injury mechanism resulted from the wedge-shaped shape of the MC-II processus, and an injury mechanism that results in a dorsal displacement of the MC-II basis. The styloid process can't follow the dorsal displacement of the second metacarpal and after spontaneous reposition the styloid fragment is pushed palmar.
This is the same mechanism as in a perilunate dislocation.

To other similar cases in our unit are compared with this case.

Keywords:
irreducible fracture dislocation, styloid process of metacarpal base, unique fracture dislocation
**Distal radio-ulnar replacement: our early experience with a constrained prosthesis**

**List of authors:**
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**Objectives / Interrogation:** Objectives:
Arthropathy of the distal radioulnar joint (DRUJ) occurs due to a variety of pathology, including congenital instability, as well as inflammatory, degenerative and post-traumatic arthritis. Treatment consists of resection, fusion and arthroplasty. However in some cases, instability, pain or failure of primary procedure necessitate further intervention to regain improved function.
The Scheker (Aptis Medical) prosthesis allows for mechanical function with a semi-constrained mechanism in this group of patients, by use of a cobalt chromium radial plate containing a hemi-socket articulating with a UHMWP ball attached to a cobalt chromium fluted stem in the ulna.
Our aim is to assess the outcome of our patients, comparative to the positivity of other studies using the same implant.

**Methods:** Methods:
We evaluated the outcome of surgery in a series of consecutive patients from 2013 onwards, in a NHS hospital performed by a single surgeon, providing a regional service. Indications for surgery were in keeping with NICE guidelines. Outcomes were measured using clinical and radiological assessment, with the added use of functional scores and questionnaires. All patients underwent standardised rehabilitation with splinting and hand therapy over a minimum of a 6 week period.

**Results and Conclusions:** Results:
10 patients with mean age 56yrs, at time of surgery, were followed for a mean time of 2.5 years (max 6 years).
5 patients had arthritis following trauma, 2 had congenital deformity leading to instability, 2 had osteoarthritis & 1 patient had rheumatoid inflammatory disease with instability.
2 patients had previous ulnar head replacements, one had a failed radio-ulnar fusion with stump impingement & 3 had degenerative instability after wrist trauma. The other 4 had pain & instability due to their primary pathology.
All patients reported improved forearm rotational ROM (supination and pronation), reduced pain (VAS) and improved functional outcome (DASH & PRWE scores).
Implant survival is 100%, with no evidence of infection or need for further surgery to the DRUJ.
Patient satisfaction was high, with early visible improvement seen within weeks of the procedure.

Conclusion:
Early to mid-term results suggest that the semi-constrained Scheker prosthesis is a reliable implant in restoring functional stability for patients who have painful degenerative instability of the DRUJ. Further follow up is advised for long-term assessment to assess whether there may be potential for more widespread use.

**Keywords:**
DRUJ, ulna, wrist instability
Pedicled deltopectoral adipofascial flap and lipofilling techniques for management of recurrent thoracic outlet syndrome

List of authors:
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Objectives / Interrogation: Thoracic outlet syndrome (TOS) is a symptom complex caused by compression of one or more of three neurovascular structures: the brachial plexus, subclavian vein, or subclavian artery, between the first rib and clavicle. Management of recurrent cases of thoracic outlet syndrome present a challenging clinical conundrum. Various surgical techniques have been described to introduce a ‘firebreak’ in attempt to reduce recurrence rates.

We report for the first time, the novel technique of a pedicled adipofascial flap +/- adjunctive lipofilling in attempt to reduce further recurrence of TOS, improve functional outcomes and improve scar quality.

Methods: We analysed data from a prospectively maintained database comprising patients presenting consecutively for surgical management of TOS. All cases of recurrent TOS were identified and clinically assessed by the senior author (HG) at the Oxford University Hospitals NHS Trust between April 1997 and November 2017. All patients underwent standard pre-operative investigations to include: 1. clinical history and upper limb examination 2. provocative TOS tests for vascular and neural compression 3. MRI spine and brachial plexus 4. electrophysiological studies.

Patients diagnosed with recurrent TOS underwent brachial plexus re-exploration, neurolysis +/- arteriolyis and pedicled deltopectoral adipofascial flap overlying the clavicle +/- lipofilling.

Results and Conclusions: Recurrent cases of TOS were identified in 22% of our cohort (n=30). There was a female preponderance in this cohort (75%) and age ranged from 22-75 years (mean: 41 years).

80% of patient reported improved scar quality and 65% reported reduced pain scores following the procedure.

To conclude, we describe the novel technique of pedicled deltopectoral adipofascial flap +/- adjunctive lipofilling for the management of recurrent TOS, with good surgical and functional patient-reported outcomes.

Keywords: deltopectoral adipofascial flap, recurrent thoracic outlet syndrome
New ligament reconstruction for midcarpal instability - a case report

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Objectives / Interrogation: Literature is scarce regarding reported cases and treatment of midcarpal instability. While diagnosis is reasonably well established but its treatment is still an unsolved problem. Poor results of soft tissue reconstruction led others to advocate arthrodesis but there is a considerable risk for radioscaphoid impingement and obliteration of the important dart throwing movement. We describe a novel technique in ligament reconstruction of the combined radiocarpal -midcarpal instability.

Methods: We are presenting a case of a 20-year old student male with a rare type of right dominant midcarpal instability (combined radiocarpal -midcarpal instability). The patient refused limited wrist fusion. A new technique for ligament reconstruction was utilized in this case using the extensor carpi radialis longus (ECRL) tendon. The tendon was used to reconstruct triple ligaments; the short radiolunate, the dorsal radiocarpal, and the dorsal intercarpal ligaments through a combined volar and dorsal approaches.

Results and Conclusions: The patient became pain free. The flexion-extension range of the wrist was 85% of the contralateral side. The wrist was stable with no clicking occurred up to 30-month follow up. The patient was satisfied with the results.

Conclusion: The technique in this case yielded satisfactory result at the short term. It can be an addition to the treatment of this perplexing condition. However, it needs to be applied on a larger number of patients to definitely judge its effectiveness.

Keywords:
Acquired vascular malformation on fingertips: a report of three cases

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Objectives / Interrogation: Acquired digital arteriovenous malformation is a rare vascular anomaly usually involving the fingertip or periungual region.

We report three cases of acquired vascular malformation on fingertip of 3 adults.

Methods: Case 1:
A 48-year-old lady presented with a vascular lesion on the left ring finger pulp that has been present for one year. No history of trauma. Recent recurrent bright red pulsating bleeding following minor trauma was reported.

Examination revealed 5mm purplish skin on the ulnar border of the pulp which did not reduce in size with elevation. Ultrasound scan showed 2mm subcutaneous lesion surrounded superficially by prominent vascularity. The appearance was in keeping with vascular malformation.

Fingertip was explored and small lesion with overlying skin ellipse were biopsied. A small group of vessels at the base were cauterized. Histopathology showed proliferation of capillary channels with a bland of endothelial lining which confirmed the diagnosis of capillary hemangioma.

Case 2:
A 55-year-old lady presented with a few-year history of a vascular lesion on her left ring fingertip without previous trauma. This was previously cauterized by dermatologists, recurred and started to bleed repeatedly over the last year.

Examination revealed bluish compressible lesion on the radial border of the pulp. Doppler scan showed 1cm longitudinal subcutaneous lesion with increased venous vascularity. There was prominent flow but no feeding vessel or direct communication with digital vessels. These findings were consistent with hemangioma.

Pulp was explored and general oozing with no obvious leash of vessels was found. Vessels in the base were cauterized and the wound was closed directly. 3 months postoperatively, patient reported no further bleeding.

Case 3:
A 69-year-old retired right handed lady presented with 10-year history of a small vascular lesion on the tip of her right ring finger following minor trauma without open wounds. The lesion started recently to bleed with minimal trauma. Examination revealed 8X4mm capillary venous malformation. Treatment options were discussed and patient preferred having the base of the lesion cauterized without excising the overlying skin.

Results and Conclusions: Acquired digital arteriovenous malformations are rare acral vascular lesions that can involve fingertips usually with history of previous trauma. Treatment ranges from observing asymptomatic cases to complete excision of symptomatic lesions with or without local flap or skin graft reconstruction.

Keywords:
acquired digital vascular malformation, fingertip
Trigger Finger Percutaneous Release - Safe, Effective and Less days Off

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Objectives / Interrogation: To evaluate the safety, efficacy, recovery time and repercussion on the functional status of the percutaneous surgery technique for the treatment of trigger finger.

Methods: A two phase study was designed. In the first phase, percutaneous release of A1 pulley was performed in cadaver hands and verified by an incision over the A1 pulley. In the second phase, after informed consent, 20 patients underwent percutaneous release of the A1 pulley with an intramuscular needle. Preoperative and post operative functional status was assessed by the QuickDASH score before and 2 weeks after the procedure. Parameters like pain during the intervention and in the post-op period, time to return to work, patient satisfaction, recurrence of trigger finger and complications were also evaluated.

Results and Conclusions: Patients got back to daily life tasks and to work before than the mean time described in the literature with the open surgery procedure, as well as had a shorter time of pain post-op. We had few complications and all the patients improved their functional status measured with the QuickDASH score after the procedure. Percutaneous surgery for trigger finger has shown to be a safe technique, with faster recovery than the open surgery, even in centers more experienced with the open technique.

Keywords:
Percutaneous Trigger Finger Release
Cat Bite: an underrated injury

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Objectives / Interrogation: Domestic cat bites are common and are often minor wounds that can be treated by simple wound care and short term antibiotic therapy with good to excellent outcome. However, delayed presentation may lead to significant morbidity or even mortality. The authors report a case series of severe hand infections following cat bite resulting in significant morbidity.

Methods: 20 cases of cat bites to the hand and wrist that were referred to hand surgery unit for further treatment were retrospectively reviewed between July 2014 and August 2018. Data included patient demographics, anatomical site of injury, clinical diagnosis, radiographic features, inflammatory markers and microbiology results, method of treatment, antibiotic regimen, and functional outcome. The patients’ clinical notes were reviewed.

Results and Conclusions: The subjects consisted of 18 females and 2 males aged 27-86 years (mean age of 58 years). Eighteen patients underwent surgical intervention and 2 were managed non-operatively. Of those patients treated operatively; eleven underwent single surgery (irrigation and debridement), and 7 had multiple operations secondary to septic arthritis, osteomyelitis, necrotising fasciitis and deep soft tissue infection. Mean length of hospital stay was 11.6 days in those underwent multiple surgeries. The index finger was the most common site of injury. Pasteurella species was isolated from 39% of infected wounds. Four fingers underwent amputation due to extensive soft tissue infection, tissue destruction and necrosis, particularly in those presented late and had diabetes. Delayed presentation resulted in multiple surgeries, protracted hospital stay, longer antibiotic course, and significant soft tissue complication, which resulted in significant morbidity. Risk of amputation was significantly higher in a diabetic finger with peripheral neuropathy. The results of our case series suggest that any symptomatic cat bite to the upper limb, especially hand and wrist, must be treated promptly, essentially within 48 hours of injury and no later than 72 hours. Delayed presentation conveys complicated surgery and or significant morbidity.

Keywords: -
CoNNECT: 6 month follow up data for a randomised controlled trial in digital nerve repair

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Objectives / Interrogation: Microsurgical repair of the injured digital nerve is considered to be the gold standard. Complications associated with neurorrhaphy include repair site scar and neuroma formation estimated at 5-9%. The CoNNECT study is a randomised controlled trial evaluating nerve repair using a Neurolac conduit (Polyganics) as an adjunct to microneurorrhaphy or as a detensioning sutureless nerve co-aptation.

Methods: Patients were recruited from a tertiary referral regional hand trauma service. Patients with sensory loss following an open injury were screened for eligibility then recruited and consented for trial participation. Confirmation of second stage eligibility was after surgical exploration and at that stage complete digital nor common digital nerve injuries amenable to direct repair were randomised in a 1:1:1 ratio (direct repair; repair plus conduit; conduit alone). Patients were assessed at 2 weeks, 6 weeks, 3 months and 6 months by a research hand therapist with DASH scores plus sensory evaluation using 2PD and monofilaments. Complications including clinically suspected neuroma, pain and cold intolerance were recorded.

Results and Conclusions: 63 patients with 73 nerve injuries have reached at least 6 months follow up under the study protocol. There have been no post-operative infections, conduit extrusions, allergic reactions or explantations during the study. No clinically suspected neuromas have been identified in the 73 nerves reaching 6 month follow-up.

The study is powered for 240 digital nerve repairs to allow for drop-out. The final sensory outcomes will be reported after closure of the recruitment period. The interim analysis of 73 nerves is part of the trial data monitoring and to date there are no adverse events attributable to the implanted Neurolac device. The study will be one of the largest randomised controlled trials evaluating digital nerve repair and will evaluate efficacy of a sutureless technique in nerve co-aptation.

Keywords: CoNNECT, digital nerve repair, digital nerve, neurorrhaphy, sutureless
Guyon canal syndrome: a not so common cause of cubital nerve entrapment

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Objectives / Interrogation: Ulnar nerve compression can happen along its path in the upper limb, being more common, according to its anatomy, around the elbow. Its distal compression, at guyon canal, is rare but globally the ulnar entrapment is the second most common peripheral nerve entrapment neuropathy in the upper limb.

Ulnar compression at the Guyon’s canal can be caused by a number of factors, including acute or repetitive trauma, carpal bone fractures, additional muscles, tumors (lipoma, ganglion), diseases of the neighboring vessels, metabolic/degenerative diseases. The distal cubital lesion is classified according to its location in the Guyon’s canal and consequently the symptomatology that causes.

Methods: The authors present a case of a 58 year-old female patient with progressive loss of muscular strength with an acute onset, associated with paresthesia in the 4th and 5th fingers, of her right hand. With no history of recent trauma. In the physical examination the muscular atrophy of the thenar and hypothenar eminence was notorious. Wartenberg, Jeanne’s and Froment’s signs were positive, with no sensory dorsal alterations, no palpable masses, no traumatic lesions identified.

Electromyography showed a compression of the ulnar nerve at the wrist level, in the Guyon canal, mainly motor. Surgical decompression at the Guyon canal was decided, with identification and resection of a synovial cyst deeper to the ulnar nerve, at the carpal bones, causing ulnar nerve compression.

Results and Conclusions: Six months after the surgical procedure with electromyography showing improvements compared with the pre operative exam. Twelve-months follow up with improvement of the muscular strength and trophism, hand movements specially grasp, pinch, thumb adduction and 4th and 5th fingers’ movement and paresthesia.

Conclusion: Compression of the ulnar nerve is the second most common cause of nerve compression of the upper limb, although, its distal compression is rare. Medical history, physical examination and complementary studies allow its diagnosis, identification of the most probable etiology and help in its posterior treatment approach.

Keywords:
Ulnar Nerve Compression Syndromes; Synovial Cyst; Ulnar Nerve; Guyon Canal
nail unit matrix transplantation - aesthetic surgery after traumatic amputation of the distal phalanx

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Objectives / Interrogation: A young man presented himself in our department with the wish of a nail transplantation. Years ago he had suffered from a traumatic partial amputation of the distal phalanx of his index finger causing the loss of his nail. Besides the floppy feeling aesthetic reasons were his main intention for wishing a reconstructive procedure.

Methods: We offered two different possibilities: a skin graft to simulate a nail which he didn't favor because the floppy feeling would persist. Second option was the transplantation of two half toe nail matrix grafts which would cause a narrowing of the toe nails while receiving one new nail for his index finger.

He chose the nail unit matrix transplantation which went really well. The donor toes were of the same side. The whole procedure was documented in detail.

The patient was able to leave the clinic on the same day and the whole surgery was performed in local anesthesia.

Results and Conclusions: In this case we received a good cosmetic result and a pleased patient. Nevertheless complications like infections, rejection of the nail and its matrix and unsatisfying cosmetic results have to be discussed before.

Keywords:
nail matrix unit transplantation, plastic surgery, amputation of the distal phalanx
RECONSTRUCTION OF THE RADIO ULNAR COLUMN WITH THIRD METATARSIAN FREE FLAP AND COMPUTED 3D PLANNING

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Objectives / Interrogation: The use of the third metatarsal allows reconstructing bone and cartilage defects of the distal radius with tissue of similar characteristics, we describe how to optimize the original technique using three-dimensional computer-assisted planning technology.

Methods: A 19-year-old woman referred from another city due to bone and cartilaginous defect of the lunate and sigmoid fossa of the right radius as a sequel to palmar plate removal of the radio six months previously. She presented intense pain with severe limitation of the mobility arches. Using three-dimensional images of the radius and the left foot, the cutting guides are designed to obtain a bone fragment of the third metatarsal to measure the size of the defect, preserving the plantar cortex, unlike the original technique, minimizing the morbidity of the donor area. The free flap of the third metatarsal is raised based on the lateral tarsal branch of the pedius dorsal artery, anastomosed in the recipient bed to the radial vessels and fixed with 1 bicortical screw. No more screws are placed because of the risk of bursting the bone fragment and altering its vascularization. The patient follow up shows improvement of pain, ranges of mobility in progression with physical therapy and without functional limitation of the donor area.

Results and Conclusions: The combination of microsurgery techniques and 3D computerized assistance allows to accurately reconstruct defects of high complexity in the upper extremity, providing healthy joint cartilage and sufficient bone support. Arthrodesis is restored. The tools are designed tailored to the patient's defect and allow the simulation of surgery and its possible inconvenience before they occur in the operating room, optimizing the original description of the technique.

Keywords: -
Arthroscopic diagnosis of TFCC peripheral tears using "Trampoline Test" and "Hook test"

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Objectives / Interrogation: The Trampoline and Hook test are commonly used in the arthroscopic assessment of TFCC tears. This study aims to evaluated the reliability and the advantages of these tests to identify laceration of the distal or proximal component at the periphery of the TFCC

Methods: The study group included 135 patients (97 male, 38 female, mean age 43.5 yrs) into 2 groups. Group A: 80 patients with chronic ulnar sided wrist pain and positive "fovea sign". Group B (control group): 55 patients with other complaints. Clinical DRUJ instability was evaluated by the ballottement test. Radiocarpal and DRUJ were scoped using "Dry Technique" and TFCC was tested by the Trampoline and Hook test. Test specificity, sensibility and likelihood ratio were assessed. Statistical significance was evaluated with the Pearson chi-square and Fisher's exact test.
Patients diagnosed as having a laceration of the foveal insertions of the TFCC were treated with bone anchor refutation of the tear. Patients with distal tear an intact foveal insertions of the TFCC were repaired with a capsular suture.

Results and Conclusions: Results: Trampoline and Hook test showed an overall specificity of 67.27% and 96.36%. Test sensibility was 75% and 0% (p<.001) when TFCC foveal insertions were intact and 56% and 100% (p<.001) when they were lacerated, respectively. Trampoline test showed an overall positive likelihood ratio of 2.4. Hook test showed an overall positive likelihood ratio of 22.
All patients improved after the selected treatment was performed according the the arthroscopic findings.

Conclusions: Trampoline and Hook test are reliable to make a diagnosis of peripheral TFCC tear. The Hook test shows higher specificity and sensibility to recognize TFCC tears. Values of positive likelihood ratio suggest that the probability to detect any TFCC peripheral tears is higher for the Hook than for the Trampoline test, especially when the foveal insertion of the TFCC is lacerated. The positive Hook test circumvents the need of a confirmatory DRUJ arthroscopy in case of suspected foveal detachment of the TFCC.

Keywords:
TFCC tear, Hook test, trampoline test, peripheral tear, arthroscopy
Comparing non-vascularized scaphoid reconstruction for scaphoid nonunion with or without an intraoperative, single shock wave therapy (ESWT) - preliminary results

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Objectives / Interrogation: Does an intraoperative, single application of focused ESWT improve the consolidation of the scaphoid after reconstruction with a non-vascularized bone graft to treat scaphoid nonunion?

Methods: In a prospective, randomized study, patients with a scaphoid nonunion, mostly with compromised vascularity of the proximal pole fragment, had scaphoid reconstruction with a non-vascularized bone graft. Surgery was combined with focused, high-energy ESWT intraoperatively (intervention) or not (control group). Bony consolidation was evaluated by CT scans at 12 and 18 weeks, in case of failing or incomplete healing additionally at 24 weeks. The rate of patients without scaphoid consolidation after 24 weeks was calculated for each group. In those patients with a finally healed scaphoid, the extent of consolidation across the bone graft was assessed for each CT examination.

Results and Conclusions: In this ongoing study, 58 patients were enrolled so far, of which 9 did not finish follow up till 24 weeks. The rate of persistent nonunion was 22% in the ESWT group and 38% in the control group. Among the patients with scaphoid consolidation, the extent of scaphoid consolidation was 84% of the scaphoid's square area after ESWT and 73% in the control group 12 weeks postoperatively, 86% and 84% at 18 weeks, and 91% and 88% at 24 weeks.

Keywords:
Scaphoid, nonunion, ESWT
Nerve transfers to the deltoid: Evolution of a surgical technique

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Objectives / Interrogation: Deltoid paralysis follows injury to the C5 nerve root or the axillary nerve. Nerve transfer provides a reliable method of restoration of function and typically the donor nerve is from one of the triceps branches. The technique has evolved from the description of triceps to axillary nerve transfer through an anterior approach (Stoffel 1911) to the modifications of the posterior approach using the medial triceps branch (Mackinnon). The rationale for the technique evolution is defined with an algorithm for reconstruction.

Methods: A review of literature on nerve transfer to the deltoid was undertaken to develop an algorithm for reconstruction of axillary nerve function. The results of this algorithm were evaluated using the outcomes of 60 consecutive nerve transfers to deltoid performed in a specialist nerve injury service.

Results and Conclusions: The medial nerve to triceps is now the favoured donor nerve for restoration of axillary nerve function in isolated C5, C5 and C6 combined and isolated high-grade axillary nerve injury or rupture. The nerve is sutured to the main axillary nerve to reinnervate deltoid and teres minor when necessary. The avoidance of the long head triceps branch maintains the only intact shoulder stabilising muscle in the C5 and C6 combined injury and is now the preferred donor in all nerve transfers to deltoid; due to the higher motor axon count, the length of the donor allowing closer placement of the neurorrhaphy to the motor point and the low donor morbidity. In cases of associated C7 dysfunction or isolated posterior cord injury, the FCU fascicle of the ulnar nerve is the preferred donor nerve and the procedure is undertaken through a posterior approach. The nerve transfer to deltoid is performed synchronously with a posterior spinal accessory to suprascapular nerve transfer in cases of C5 complete injury.

The current reconstructive algorithm for deltoid function is effective and allows rapid reinnervation without loss of stabilising function of the long head of triceps at the glenohumeral joint.

Keywords:
Nerve transfer, Deltoid, Axillary nerve, Shoulder, C5, C5 root injury
Radiological analysis to determine risk factors for aseptic loosening in the linked-type total elbow arthroplasty

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Objectives / Interrogation: Total elbow arthroplasty yields good long-term results but requires revision surgery in some cases. We have recently experienced a first case of aseptic loosening of a linked-type total elbow performed at our institute which needed revision. We have analysed radiological features which may predict aseptic loosening in the linked-type total elbow arthroplasty.

Methods: 27 elbows with the Coonrad-Morrey prosthesis who were operated at our institute and followed up for more than three years, were included. 21 were female and 6 were male, and the mean age at the time of operation was 68. Every operation was performed by a single senior surgeon by Campbell’s approach. Pre-operative x-rays and post-operative x-rays were analysed, including flexion-extension placement of both components, valgus-varus placement of both components, state of bone union at the anterior flange, state of cementing, and zone of osteolysis according to Hastings and degree of osteolysis according to Morrey.

Results and Conclusions: Type V osteolysis according to Morrey’s classification (gross loosening) was seen in two cases (one on the humeral side, another on the ulnar side), type IV in two cases (one on the humeral side, another on both sides), and type I-III in four cases (three on the humeral side, one on both sides). One of the cases with type V osteolysis needed revision surgery of the humeral component 7 years and 10 months after the primary operation. Osteolysis types VI-V were significantly cubitus varus post-operatively compared to types I-III (carrying angle: type IV-V 180.4°(±5.4); type I-III 172.0°(±7.7). p<0.05). Mean extension angle placement of the humeral components and mean flexion angle placement of the ulnar components were also significantly higher in types IV-V. Cases of gross loosening presented with osteolysis beginning around the joint and spreading to the components. Post-operative cubitus varus may be a factor to predict future aseptic loosening hence precise component placement at the primary operation is essential to avoid it.

Keywords:
Fractures of the pisiform bone- is osteosynthesis useful?

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Objectives / Interrogation: Fractures of the pisiform bone are not uncommon. Almost always a conservative therapy is performed. For postoperative complaints due to arthrosis, a pisectomy is recommended. Can this osteosynthesis make sense?

Methods: 5 of the 7 patients could be followed up. Resting pain, stress pain, wrist mobility, DASH and exact clinical investigation of the pisiform area were examined.

Results and Conclusions:
There was no pain in any of the patients, no evidence of osteoarthritis was found. 2 patients did not remember which side had been operated on. Neither rest nor stress pain was reported. A slight reduction in hand mobility in dorsiflexion was found in 2 patients.

Osteosynthesis of the pisiform bone may be useful. A nonsensical operation is not according to our results.

Keywords:
fracture pisiform bone, osteosynthesis, arthritis
THE TURNER SCIENTIFIC RESEARCH INSTITUTE FOR CHILDREN'S ORTHOPEDICS

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Objectives / Interrogation: Traditional methods of the bone's replacement doesn't provide positive results in many cases, particularly in combination of bone, muscular, soft tissue and articular defects. Besides, the main difficulty of these methods is the impossibility of the restored segment to grow, since non of these methods doesn't provide the restoring of growth plate which is absent from the moment of birth or destroyed after the pathological involvement. Blood-supplied bone graft may have still functional growth plate, it also may be taken as a part of big complex of tissues, including skin, subcutaneous fatty tissue, fascia, muscles and nerves.

Methods: From 1993 up to the present time on the Department of Reconstructive Microsurgery and Hand pathology 85 children were treated by microsurgical transplantations of the bone grafts. Among them 51 children had congenital developmental defects and 34 - acquired deformations.

Results and Conclusions: For transplantation we used: diaphysis of the fibular bone or external part of the scapula in the replacement of the bone defect, diaphysis in the absence of involvement of the soft tissues, 1 or 2 metatarsal bones for the restoration of distal or proximal epimetaphysis of bones, one or two ribs as a part of thoracodorsal flap in replacement of extensive defects, metatarsophalangeal joint of the first and second toes for the reconstruction of underdeveloped or injured joints. Analysis of the obtained results showed significant perspectivity of the application of microsurgical transplantations of tissue complexes in severe bone defects in children with congenital and acquired pathologies.

Keywords:
Microsurgery, transplant, bone
Managing Painful Wrist and Trapezio-Metacarpal Arthritis in Patients with SCI Using Surgical Joint Denervation

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Objectives / Interrogation: Patients with spinal cord injury (SCI) have an increased incidence of painful wrist and trapezio-metacarpal arthritis due to the accumulated long-term load on their upper extremity or post-traumatically. However, many of the affected individuals opt against standard bony procedures, such as arthroplasty, joint implants or arthrodesis for fear of lengthy immobilisation, loss of motion, and other complications, e.g. postoperative instability.

Methods: We have studied the effects of alternative surgical denervation in 8 wrist and 7 trapezio-metacarpal joints (2 bilateral, 1 combined) during a 4-year period in 8 paraplegic and 4 tetraplegic individuals.

Results and Conclusions: Pain intensity regarding dropped by at least 50% on the visual analogue scale in all cases and results were rated as satisfactory by all patients.
No conversion to total joint arthrodesis was necessary within the follow-up time.
Surgical joint denervation seems to be an underused option to treat painful osteoarthritis in SCI patients as we are unaware of a previous description.
However, compared to more invasive methods, it provides important advantages as preserved joint integrity, no need for postoperative immobilization, technical simplicity, inexpensiveness and with low risk profile. All alternatives remain possible for future, e. g. arthrodesis or arthroplasty prosthesis and results can be reliably anticipated by preoperative test nerve blocks.
This study shows that surgical denervation of the wrist and thumb carpo-metacarpal joint is a minimally invasive option to reduce pain and preserve motion and function in this population with special demands.

Keywords:
wrist - carpo-metacarpal - join - denervation - paraplegia - tetraplegia
IFSSH19-1990

Engineering Drawing Analysis Applied to Complex Radiographs

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Objectives / Interrogation: To explore how engineering drawing analysis can be applied to understand x-rays of complex fractures.

Engineering drawing is a technical and graphical language with its own rules. It is useful to apply the principles of engineering drawing to complex radiographs when the supplied views do not supply enough information to identify the bones or fracture fragments.

Methods: The engineering drawing principle that is important in the application to interpreting radiographs is that in an isometric projection, the shortest distance between a point and a plane will be equidistant in all planes that contain that line and are perpendicular to the first plane. This principle is clearest when presented in an example. (NOTE: the abstract program does not allow uploading of images, which are an essential part of this submission.)

In this isometric projection of a house, the red line in the left view, called a front elevation view, will be the same length in the side elevation view on the right. It will also be the same length in any view in which the image of the house is rotated on the line (the plane of view will contain that line).

In radiology terms, a front view is a PA view, and the side view is a lateral view. Importantly, any view involving only pronation or supination (the oblique views) will show all distances which are purely proximal-distal as true-length lines. There is a restriction, which is normally easily met: the magnification of the radiology views must be the same.

Results and Conclusions: This method is best explained with an example.

In this complex wrist radiograph, the PA looks almost normal, but the lateral looks seriously abnormal. The presentation will demonstrate how engineering drawing principles can sort it out.

This view appears to clearly show the lunate:

But an engineering analysis shows that it is not, a different shadow on the lateral is the lunate: Identify the lunate on the PA, and extend horizontal lines to the lateral. The margins of the lunate must lie on these lines. The lines identify a different shadow on the lateral as the lunate.

So what is the apparent “lunate”?
It is a proximal scaphoid, which is fractured.

An engineering drawing analysis can help to identify fragments and bone in the PA, any oblique, or lateral view, as long that the images are taken with rotation about a longitudinal line, which is the same as any degree of pronation and supination. This can be helpful in analyzing complex fractures or dislocations.

Keywords: radiograph, diagnosis, engineering drawing
The Opioid Epidemic in the US: A Method for Changing the Opioid Prescribing Habits of Surgeons

List of authors:
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Objectives / Interrogation: The United States represents 5% of the world's population yet accounts for 99% of the global hydrocodone (Vicodin, Norco) production. Clearly, US physicians are overprescribing opioids. Orthopedic surgeons are the highest prescribing group of US physicians, and their habits need to be changed.

Objectives  (1) To determine what is the average, range, and nature of the opioid and other medication routinely prescribed by a US surgeon for a volar plating of a standardized surgical procedure (distal radius fracture, as determined in a prior study), and (2) To determine if feedback of this data to the surgeon result in a change of prescribing habits

Methods: The method was to interview surgeons by email who perform ORIF of distal radius fractures using a volar plate as to their normal perioperative pain management protocol, with specific reference to the choice of opioid and how many were prescribed. Opioid prescriptions were translated into Morphine Equivalents (MEs), for comparison. Feedback was given to the surgeon how they compared to the study average in terms of MEs, choice of opioid, supplementary medication, as well as the characteristics of the highest 5 prescribers and the lowest 5 prescribers in the study. A second interview was conducted to determine if this feedback prompted the surgeon modify their pain management protocol.

Results and Conclusions: 78 surgeons completed the first interview with enough data to allow completion of the analysis. The number of opioids ranged from 5 morphine equivalents (MEs) to 160 MEs, with a mean of 46.0 and a mode of 30. The lowest 5 respondents prescribed an average of 13 MEs, usually hydrocodone, reported that their patients' pain was well-controlled, and refill requests were rare. The highest 5 respondents prescribed an average of 115 MEs and used more Dilaudid and Percocet than the group as a whole. Fear of weekend requests for opioid refills was cited as a main reason for prescribing large amounts of opioids. Upon re-interview after feedback of the results, 95% had already begun, or planned to, decrease their opioid prescription number, change to less-addictive opioids, and to increase multimodal approaches.

Using ORIF of a distal radius fracture as an index procedure, it was found that merely giving feedback to surgeons regarding how they compare to their peers is useful in prompting evaluation of their perioperative pain program and in decreasing the quantity of opioids prescribed.

Keywords:
opiod, surgery, post-op management
CASE REPORT PYOGENIC GRANULOMA INTRAVASCULAR

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Objectives / Interrogation: OVERVIEW
Intravascular masses in the hand are uncommon and rarely reported on. Intravascular pyogenic granulomas were initially described 37 years ago by Cooper and others. In 2008 four cases were described in the hand and two fingers. Its incidence is related to the use of oral contraceptives or during pregnancy and, so far, its pathogenesis is unclear. It presents clinically as a small, soft, volar nodule. Definitive diagnosis is only made by histological analysis. Treatment is necessary since it may cause alterations in grip strength and range of motion of the fingers. These nodules can also contain elements of Masson tumor, so complete surgical resection is indicated. This paper presents the case of a 65 year old patient with a mass resulting in an intravascular pyogenic granuloma and a review of the medical literature pertaining to the subject.

Methods: CASE REPORT
The patient is a 65 year old male with no relevant medical history, who sustained a penetrating wound eight months before consulting. A splinter entered the thenar region of his left hand as he supported his weight on a staircase railing. The patient removed it completely, but soon noticed that a mass with progressive growth that developed at the puncture site (Figure No. 1). The patient consulted for pain when grasping, which limited hand function. Upon clinical evaluation a slightly mobile, non-painful, well defined mass, approximately 2x3 cm in size, and negative to trans-illumination was found in the palmar aspect of his hand. Finger range of motion was normal. Hand x-ray was unremarkable and an ultrasound reported a well-defined, hyper-ecogenic lesion in the thenar area. The mass was completely resected through a volar approach at the base of the thumb. A firm, well-defined, irregular mass of approximately 2 x 0.5 cm was obtained (Figure 2). Histological examination revealed a vascular tumor composed of wide spaces divided by thick walls with endovascular proliferation and endothelial hyperplasia and some hemosiderophages. (Figure 3) These findings are considered to be characteristic of a benign vascular tumor compatible with an intravascular pyogenic granuloma.

Results and Conclusions: Although the pathogenesis of pyogenic granulomas is unknown it should be suspected in patients who are pregnant or undergoing hormone replacement therapy. The intravascular variant is rare and clinically presents as a single, small, soft, slightly mobile, subcutaneous nodule, which should be completely removed because it has been related to Masson tumors.

Keywords: Pyogenic Granuloma, Granuloma telangiectatic, lobular capillary Hemangioma, capillary Hemangioma, injuries in his hand.
Effectiveness of ultrasonography and nerve conduction studies in the diagnosing of carpal tunnel syndrome: clinical trial on accuracy

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Objectives / Interrogation: Objectives: The aim of this study was to evaluate the effectiveness of two diagnostic tests routinely used for diagnosing carpal tunnel syndrome, ultrasonography and nerve conduction studies by comparing their accuracy based on surgical results, with the remission of paresthesia as the reference standard.

Methods: Methods: We enrolled 115 patients, all of the female gender with a high probability of a clinical diagnosis of carpal tunnel syndrome. All patients underwent ultrasonography and nerve conduction studies for a diagnosis and subsequent surgical treatment. As a primary outcome, the accuracy of the ultrasonography and nerve conduction studies diagnoses was measured by comparing their diagnoses compared with those determined by the surgical outcomes. Their accuracy was secondarily evaluated based on before and after scores of the Boston Carpal Tunnel Questionnaire.

Results and Conclusions: Results: Overall, 104 patients (90.4%) were diagnosed with carpal tunnel syndrome by the surgical reference standard, 97 (84.3%) by nerve conduction studies, and 90 (78.3%) by ultrasonography. The concordance of nerve conduction studies and surgical treatment (p <0.001; kappa = 0.648) was superior to that of ultrasonography and surgical treatment (p <0.001; kappa = 0.423). The sensitivity and specificity of ultrasonography and nerve conduction studies were similar (p = 1.000 and p = 0.152, respectively: McNemar's test). The Boston Carpal tunnel Questionnaire scores were lower after surgery in patients diagnosed by both ultrasonography and nerve conduction studies (p <0.001 and p <0.001, respectively: analysis of variance).

Conclusions: Ultrasonography and nerve conduction studies effectively diagnosed CTS with good sensitivity but were not effective enough to rule out a suspicion of CTS.

Keywords: carpal tunnel syndrome, diagnostic accuracy, diagnostic practices, clinical diagnosis, surgical treatment, ultrasonography, ultrasound, nerve conduction studies, electrodiagnostic testing, electromyograph.
Complications in severe upper limb open injury treated by a Katsaros flap

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Objectives / Interrogation: Flap described by KATSAROS (1983) combines latissimus dorsi musculocutaneous flap merged with groin flap as a long thoracoabdominus skin island. It allows extensive coverage of upper limb including arm, elbow, forearm, wrist and even hand. There is primary donor site closure; proximal transferred portion is acutely inserted on arm. Distal flap portion works as "jumping flap" and needs revascularization before cutaneous pedicle division.

Flap never reach popularity between reconstructive surgeons. We aim to demonstrate a single case report with post-operative complications in its application, some of them related to flap.

Methods: The subject was a 40 years old male that has sustained an accident with hot plastic industry machine device. Upper limb was tractioned and trapped into 3 cilinders in very high temperature. The mechanics of trauma included crush and burn. On emergency patient developed compartment syndrome and 3rd and 4th (injury deeper than skin) degrees burn. On emergency surgery fasciotomy and desbridement. On second look: distal thumb amputation and desbridement. Transferred to our hospital there was bone and joint exposure at left elbow and left thumb. We made a Katsaros flap and associated an external fixator at iliac crest and forearm as made in some of isolated groin flaps.

Katsaros flap
At 2nd postoperative we noticed a Schantz pin loosed and compressed distal pedicle of flap. It caused vascular suffering on limitrophe area of flap intersection. At infirmary, after nine days of surgery, brachial artery sustained suddenly rupture. Patient was emergently taken to the theatre and stumps were ligated keep hand perfused (hemoglobin reached 4). Post operative was uneventfull, part of groin flap was reconnected to thumb and hand dorsum. Sucessive partial skin graft in staged surgeries until discharge.

**Results and Conclusions:** Despite vascular ligation, patient keep a functional upper limb. Our sugestion is avoid external fixation in Katsaros flap. Always be carefull with burns on antecubital fossa and late brachial artery injury. The authors believe it is an underrated big flap for upper limb.

**Keywords:**
upper limb, flaps, burns
Arthroplasty of the First Carpo-metacarpal Joint: a randomized, double blinded clinical trail

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Objectives / Interrogation: Thumb pain secondary to arthritis at the basal joint of the thumb is a common condition, especially in women, and can be quite disabling. The present study was the first to use and evaluate early outcomes of Moovis prosthesis for arthroplasty of the first CMC in patients with Eaton-Littler stage III osteoarthritis.

Methods: In total, 50 patients were randomised to either Moovis prosthesis (n=23) or Epping-plastic procedure (n=27) and examined between 2014 and 2017. Beside patient characteristics, clinical outcomes concerning functional abilities and pinch strength were obtained preoperatively and at 6 weeks, 3, 6 and 12 months Follow-Up. In addition DASH-Score, Visual analog scale and SF-36 were assessed at the same time points. The mean and standard deviation were analyzed and t-tests and Mann-Whitney U-Tests were conducted to determine significant differences.

Results and Conclusions: Clinical outcomes showed statistical significant differences with higher scores in radial abduction (62.2° vs. 53.3°; p=0.008) 6 weeks postoperatively and in retropulsion of kapandji (2.8 vs. 2.3; p=0.007) 12 months postoperatively among patients with prosthesis compared to those with epping-plastic procedure. Mean DASH-score (p=0.001; p=0.023) and pain (p=0.013; p=0.029) was lower in the prosthesis group 6 weeks and 3 months postoperatively. Regarding quality of life, significant differences were found at 6 weeks, 3 and 6 months postoperatively but diminish after 12 months of operation.

The new carpometacarpal prosthesis Moovis have reliable Outcomes and a low complication rate also compared to the standard procedure.

Keywords:
Arthroplasty, Carpo-metacarpal Joint, prosthesis
Developing a Core Outcome Set for the Research and Treatment of Thumb Carpometacarpal Osteoarthritis: A Delphi Study

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**Objectives / Interrogation:** We aim to establish a multidisciplinary consensus in developing a minimum core set of outcomes (COS) with research and clinical relevance for thumb carpometacarpal (CMC) osteoarthritis (OA). Comparative studies of treatment and clinical tools are lacking, since uniform outcome measures specific to CMC OA do not exist. Meaningful outcome measurements will minimize bias in both study design and interpretation of results. Agreed-upon outcomes similarly impact the robust design of clinical trials.

**Methods:** 32 experts in CMC OA treatment & research participated in the 2nd round of the CMC OA COS Delphi survey. Participants included hand surgeons, therapists, and scientists. The areas were: clinical record keeping (N=17); observational studies (N=29); clinical trials investigating symptom modification (N= 23); and clinical trials investigating structure modification (N=20). Outcomes were derived from the first Delphi round and a thorough review of the CMC OA literature. All outcomes were listed and categorized according to the OMERACT framework. The survey contained a list of 59 individual outcome measures, and an open text field to add missing outcomes perceived by participants. Using an anonymous online survey, participants scored each outcome on a 7-point Likert scale. A score of 1-3 represented an outcome of limited importance; 4-6, an important but not critical outcome, and a score of 7-9, a critically important outcome. Consensus was reached if at least 70% of total respondents rated the outcome critical (7-9) and less than 15% of respondent rated the outcome not-important.

**Results and Conclusions:** 32 of 46 stakeholders responded to this online survey. After the 2nd round consensus was reached for 5 outcomes in Clinical Record Keeping, 8 outcomes for Observational Studies, 6 outcomes for Clinical Trials - Symptom Modification, and 9 outcomes for Clinical Trials - Structure Modification. No consensus was reached for the 16 outcomes representing the economic impact of health condition for the individual, society, in the presence of a health impairment, and the resource use incurred by treatment of this condition.

In this second round of the CMC OA COS Delphi, participants reached consensus for outcomes in each of the clinical/study domains. Patient derived surveys are in process, and we will incorporate these findings in the final round of consensus of primary stakeholders. We will report on the final round, being held in November 2018 (Palo Alto, CA).

**Keywords:**
Evidence of microcirculatory effects of postoperative exercise therapy after partial fasciectomy in patients with Dupuytren’s Disease using Hyperspectral Imaging

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Objectives / Interrogation: Dupuytren's disease (MD) affects 4-6 % of the caucasian population common connective tissue disorder of the hand. Without surgical treatment MD can lead to relevant loss of function of hands. Due to high recurrence rates and risk of contractures caused by scar tissue, patients usually receive early exercises of the finger joints supported by occupational therapists. But stretching of skin and connective tissue might disturb local blood flow and therefore may increase the risk of postoperative complications.

Hyperspectral Imaging (HSI) allows the quantitative evaluation of tissue perfusion by planar measuring oxygen saturation and tissue water content.

The aim of the work is to quantify the microcirculatory effects of direct postoperative exercises therapy after partial fasciectomy in MD using HSI.

Methods: In five MD patients spatial distribution of oxygen saturation and tissue water content of the palm were measured pre-operatively and on the first 2 post-operative days before and 20 min after of exercise using HSI.

Results and Conclusions: After exercise therapy, all patients showed a relative increase of oxygen saturation compared to the preoperative measurement values of 1.4 % - 23 % and a reduction of tissue water of 2.3 % - 16.7 %.

Using HSI increased oxygen saturation together with reduction of tissue water in the operated area could be demonstrated after partial fasciectomy following exercise therapy. This suggests a potential beneficial role in the prevention of postoperative complications what has to be evaluated in further studies.

Keywords:
Feasibility of a new pulley repair for multiple pulley ruptures: a cadaver study

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Objectives / Interrogation: As a consequence of the growing number of climbers and the increase in difficulty in this sport, the number of pulley injuries, and complex pulley ruptures in particular, has grown significantly. In multiple pulley ruptures various repair techniques are described. Mostly used are encircling techniques around the phalanx using a free tendon graft. While these provide a strong repair a bone loss to the proximal phalanx was recently described. In this study, the feasibility of a new pulley reconstruction in which the tendon graft is pulled through a tunnel in the proximal phalanx was evaluated using a cadaver model, with particular attention paid to the weakening of the bone structure by the drill hole.

Methods: 9 fingers from 6 cadaver hands presenting intact pulley systems were compared to 9 fingers from 6 cadaver hands with missing A2 to A4 pulleys, but which featured a repair using the new surgical technique. Each finger was then fixed to an isokinetic loading device which loaded the finger until repair failure or a fracture (first event) occurred. The forces in the flexor tendons were recorded for each finger.

Results and Conclusions: Comparing the forces recorded at the moment of the first event, the forces in the control group were significantly higher (292.4 N) for FDP than in the group with the operated fingers (212.4 N). Although the forces recorded for FDS at the moment of failure were also higher in the control group, the difference did not reach significance (216.3 N vs. 158.2 N). The most common event in the operated fingers was a graft failure. A fracture of the bone due to the drill hole was never observed.

The new pulley reconstruction could represent an alternative to existing reconstructive techniques. The cause for the higher forces recorded in the control group could be attributed to sutures used in the operated fingers. The new pulley reconstruction method may enable reduced extensor tendon irritation as it avoids contact with the extensor hood, and will hopefully prohibit cortical bone loss, a serious side effect in the "one and one half loop" technique.

Keywords:
Ultrasound diagnostics of A3 pulley injuries in multiple pulley injuries to define indication for a surgical repair

List of authors:
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Objectives / Interrogation: The pulley rupture is the most common injury in sport climbing. Ruptures of the A2 and A4 pulleys have been studied extensively, and ultrasound has proven to be a highly sensitive and specific tool for their diagnosis. The diagnostics of an adjunct A3 pulley injury is crucial in suspected multiple pulley injuries to define a indication for a surgical repair. As the correct diagnosis of A3 pulley rupture remains a challenge we investigated a novel approach to this pathology.

Methods: fingers from 6 cadaver hands presenting intact pulley systems were compared to 9 fingers from 6 cadaver hands with missing A2 to A4 pulleys, but which featured a repair using the new surgical technique. Each finger was then fixed to an isokinetic loading device which loaded the finger until repair failure or a fracture (first event) occurred. The forces in the flexor tendons were recorded for each finger.

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Keywords:
Long-term Radiographic Adaptations to the Stress of High-Level and Recreational Rock Climbing in young Athletes

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Objectives / Interrogation: In the past few years, competition climbing has grown in popularity and younger people are being drawn to the sport. While the radiographic changes in long-term climbers are known, there is little data available on young climbers. The question arises as to whether climbing at high levels at a young age leads to radiographic changes and possibly an early onset of osteoarthritis of the finger joints.

Methods: 19 members of the German Junior National Team (GJNT) and 18 recreational climbers (RC) were examined clinically and through radiographs 1999. In 2011 we re-examined the members of the long-term study for a follow up (mean follow up: 11.3 +/-1.2 years). Radiographs were evaluated using a standard protocol searching for physiological adaptation as cortical thickness of the middle phalanx and an increased Barnett Nordin Index as well as for early onset osteoarthritic changes of the hand.

Results and Conclusions: Overall 15 out of 19 (follow up 78.9%) climbers of the GJNT and 13 out of 18 climbers of the RC team (follow up 72.2%) with a mean age of 26.8 years could be examined for the 11 year follow up. In 80% of GJNT members and 46% of RC group members radiographic stress reactions of the hand could be found: Cortical hypertrophy (73% GJNT, 23% RC), subchondral sclerosis (80% GJNT, 31%RC), broadened joint base PIP (67% GJNT, 38% RC), and broadened joint base DIP (53% GJNT, 31% RC), respectively. Training intensity in 1999 (p<0.05) and body weight in 1999 were significant (p<0.05) for the development of radiographic stress reactions in 2011. Signs of an early stage of osteoarthritis were seen in 6 climbers, 4 climbers (27%) of the GJNT group and 2 climbers of the RC group (15%). Significant statistical influences for the development of early onset osteoarthritis could be found for the overall sum of training-years (p=0.024), use of campusboard training in 1999 (p=0.033) and the climbing level (p=0.030).

One quarter of climbers who performed at a high level in their youth showed a "mild" form of osteoarthritis (Kellgren II), being less than 30 years old. Following the training regimes of our climbers for more than 10 years we may conclude, that intensive finger training e.g. campus board training can lead to early onset osteoarthritis of the hand. We could also demonstrate, that a high UIAA climbing level correlates with the risk for early onset osteoarthritis of the hand and therefore must be seen as a risk factor for developing early onset osteoarthritis of the finger joints.

Keywords:
Management of Proximal Interphalangeal Joint Repetitive Stress Epiphyseal Fractures in Sport Climbers

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Objectives / Interrogation: Repetitive stress fracture of the middle phalanx epiphysis is an injury specific to elite adolescent sport climbers. As sport climbing becomes increasingly popular in younger age groups, an increased number of these injuries have been reported in recent years. To date, treatment of these fractures has been nonsurgical, with strict rest and physiotherapy prescribed until fracture union. However, when these patients present in a delayed fashion with an established nonunion, nonsurgical treatment may fail, leading to disabling chronic pain and/or digital deformity in some cases.

Methods: Adolescent patients with typical complaints after climbing were investigated using a questionnaire to analyze circumstances leading to the injury. After initial ultrasound and radiography, MRI of all fingers with a proven or highly suspected growth plate fractures were performed. CAT scans were performed in prolonged cases with suspected sclerosis of the growth plate exclusively. All 24 patients (n=28 fingers) were then treated conservatively as previously published. In five of these 24 cases, this conservative approach did not cause sufficient healing; therefore a new percutaneous spot drilling epiphysiodesis technique was used to stimulate bony healing.

Results and Conclusions: Of the 28 injured fingers, 95% concerned the middle finger; in 64.3% the crimp grip led to the injury and was the preferred handhold (71.4%). While 75% of the injured adolescents were male, the average age was 14.1 years and all of the adolescent athletes were within the year of their peak velocity growth. Half of the injuries occurred during bouldering competitions. 81% of the injuries were Salter Harris grade 3, only two were grade 1 and 5 respectively. Conservative approach led to full finger function in 19 adolescents, while 5 athletes (n=5 fingers) underwent the surgical procedure. All athletes regained their pre-injury climbing level and had full finger function.

Adolescent climbers are at a high risk for epiphyseal fractures especially during their growth spurt. While most cases show sufficient healing under rest, a surgical procedure is needed in cases refractory to this conservative approach. Percutaneous spot drilling epiphysiodesis is a quick and minimally invasive promising technique that needs to be considered.

Keywords:
Can Patterned Osteophyte Growth about the First Carpometacarpal Joint Provide Any Insight into the Etiology of Thumb Osteoarthritis?

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Objectives / Interrogation: Osteophyte formation is a critical part of the degeneration of a joint with osteoarthritis (OA). While often qualitatively described, few studies have succeeded in quantifying osteophyte growth over time. In a longitudinal, observational study of thumb carpometacarpal (CMC) OA, our aim was to quantify osteophyte growth volume and location over a three-year period in men and women.

Methods: Ninety patients with early thumb OA were recruited and assessed at baseline, 1.5 years and 3 years. CT volume images were collected and the osteophyte volume and location on the trapezium and metacarpals were determined using 46 healthy controls as a reference database. Changes in growth over time and between sexes were assessed with two-way repeated ANOVA.

Results and Conclusions: There was a significant increase in osteophyte volume in both women and men over the three-year follow-up. At year three, after accounting for the larger bones, men still had larger osteophyte growth than women. The location of osteophyte growth initiation was consistent and non-opposing on each bone. Osteophyte growth occurred on the radial and ulnar margins of the trapezial facet, while on the MC1, growth occurred principally on the volar and dorsal margins of the facet.

Osteophyte growth occurred in early thumb osteoarthritis over three years. Growth was localized in non-opposing regions on the trapezium and on the metacarpal, raising questions about the etiology underlying osteophyte initiation and growth in osteoarthritis. Men having greater osteophyte growth may cause motion constraint and thereby less pain when compared to women.
Osteophyte growth progressed on the first metacarpal and on the trapezium in non-opposing directions. Growth is described by the volume within 5° segments about each respective facet, scaled by the median bone volume, and plotted as a function...

Keywords:
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14th IFSSH Congress
Index of topics (English)

• Scaphoid Hemi-Resection and Arthrodesis of the Radio-Carpal Joint (the SHARC Procedure) for Isolated Radio-Carpal Arthritis Provides Biomechanically and Clinically Functional Outcomes

Arthroscopy

• "Stepwise" method of arthroscopic reduction and plate fixation of intra-articular distal radius fractures - an evolution of technique and instrumentation

• Postoperative immobilization in forearm pronation protects any scapholunate surgical repair. A kinetic study in cadavers.

• Wrist traction interferes with the arthroscopic evaluation and surgical repair of the scapholunate misalignment. A kinetic study in cadavers.

• All-Inside Arthroscopic Dermal Allograft Reconstruction of Massive TFCC Tears

• All-through 6R single portal repair of superficial TFCC tear

• Arthroscopic reconstruction of chronic unstable scaphoid nonunion

• Arthroscopic-assisted capsuloplasty in scapholunate tears: The role of the dorsal capsulo-scapholunate septum

• Arthroscopically assisted Sauvé-Kapandji procedure for distal radioulnar joint (DRUJ) disorders

• Arthroscopic Anatomic Allinside (3A) reconstruction of the TFCC

• Arthroscopic assisted reduction versus fluoroscopic reduction in treatment for AO type C intra-articular distal radius fracture. A review of functional and radiological outcome between two methods.

• Arthroscopic assisted tendon reconstruction for TFCC irreparable tears

• Arthroscopic assisted treatment of distal radius fractures combined with TFCC injuries

• Arthroscopic diagnosis of TFCC peripheral tears using "Trampoline Test" and "Hook test"

• Arthroscopic distal scaphoid resection for STT arthritis

• ARTHROSCOPIC EVALUATION OF LIGAMENT INJURIES ASSOCIATED TO INTRAARTICULAR DISTAL RADIUS FRACTURES

• Arthroscopic Lunocapitate Fusion with Scaphoid Excision for Treatment of SLAC or SNAC wrists

• ARTHROSCOPIC PRE-OPERATIVE PLANNING IN WRIST OSTEO-ARTHRITIS

• Arthroscopic reduction/Internal Fixation for common articular fractures of the Metacarpophalangeal joints

• Arthroscopic Resection Arthroplasty for Scapholunate Advanced Collapse Wrists

• Arthroscopic resection of volar wrist ganglion: surgical technique description and a prospective series of 39 patients

• Arthroscopic Scaphoid Excision and 4-corner Fusion of Scaphoid Nonunion Advanced Collapse or Scapho-lunate Advanced Collapse Wrist

• Arthroscopic spiral tenodesis reconstruction for SL instability

• Arthroscopic Staging and Treatment of Stage III Scaphoid Instability with and without Carpal...
<table>
<thead>
<tr>
<th>Title</th>
<th>IFSSH19-XXXX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chondromalacia</td>
<td></td>
</tr>
<tr>
<td>• ARTHROSCOPIC STT OSTEOARTHROSIS TREATMENT</td>
<td>IFSSH19-1552</td>
</tr>
<tr>
<td>• Arthroscopic surgery for recurrence after wrist ganglion excision, a series of 12 procedures</td>
<td>IFSSH19-1292</td>
</tr>
<tr>
<td>• Arthroscopic Suspension Arthroscopy using PL tendon for Osteoarthritis of the Thumb Carpometacarpal Joints</td>
<td>IFSSH19-392</td>
</tr>
<tr>
<td>• Arthroscopic treatment for isolated traumatic lunotriquetral ligament injury without triangular fibrocartilage complex lesion</td>
<td>IFSSH19-275</td>
</tr>
<tr>
<td>• Arthroscopic treatment of chronic wrist pain after distal radius fractures</td>
<td>IFSSH19-399</td>
</tr>
<tr>
<td>• ARTHROSCOPIC TREATMENT OF DORSAL WRIST GANGLIA: INFLUENCE OF DORSAL CAPSULODESIS</td>
<td>IFSSH19-1776</td>
</tr>
<tr>
<td>• Arthroscopic Treatment of Scaphoid Non-union: A Case Report</td>
<td>IFSSH19-1597</td>
</tr>
<tr>
<td>• Arthroscopic Treatment of Thumb Basal Joint Arthritis</td>
<td>IFSSH19-1894</td>
</tr>
<tr>
<td>• Arthroscopic wafer resection for ulnar impaction syndrome</td>
<td>IFSSH19-276</td>
</tr>
<tr>
<td>• Arthroscopy Assisted Partial Wrist Fusion without using Bone Graft</td>
<td>IFSSH19-1910</td>
</tr>
<tr>
<td>• CMC OSTEOARTHRITIS ARTHROSCOPICALLY TREATED BY HEMITRAPECECTOMY AND MINI TIGHT ROPE SUSPENSION</td>
<td>IFSSH19-1240</td>
</tr>
<tr>
<td>• CMC thumb replacement with Touch implant, a comparative case series with CMC excision arthroplasty</td>
<td>IFSSH19-1001</td>
</tr>
<tr>
<td>• Comparison between dorsal capsuloplasty techniques for chronic injuries of the scapho-lunate ligament: Viegas vs Berger.</td>
<td>IFSSH19-649</td>
</tr>
<tr>
<td>• Comparison of Clinical Outcomes after Ulnar Shortening Osteotomy for Ulnar Impaction Syndrome With or Without Arthroscopic Debridement</td>
<td>IFSSH19-457</td>
</tr>
<tr>
<td>• Complications and Reoperations After Triangular Fibrocartilage Complex (TFCC) Debridement</td>
<td>IFSSH19-587</td>
</tr>
<tr>
<td>• Concealed TFCC Tears Revealed- Role of Wrist Arthroscopy in the Diagnosis &amp;Treatment of Occult Chronic TFCC Injury</td>
<td>IFSSH19-1906</td>
</tr>
<tr>
<td>• Corrective Osteotomy Arthroscopically assisted of Intra-Articular Distal Radius Malunions with out-in technique</td>
<td>IFSSH19-1943</td>
</tr>
<tr>
<td>• Dorsal wrist ganglion in teenager: what else is there?</td>
<td>IFSSH19-1523</td>
</tr>
<tr>
<td>• Do we need to treat a Grade 3 scapholunate ligament injury according to Geissler classification in acute Distal Radius Fractures? Results of rearthroscopy at the time of Implant removal.</td>
<td>IFSSH19-1826</td>
</tr>
<tr>
<td>• Efficacy of endoscopic neurolysis for the motor (recurrent) branch of the median nerve during endoscopic carpal tunnel release surgery using the USE system</td>
<td>IFSSH19-117</td>
</tr>
<tr>
<td>• Endoscopic anatomy in carpal tunnel surgery.</td>
<td>IFSSH19-1186</td>
</tr>
<tr>
<td>• Evaluation and management of TFCC injuries</td>
<td>IFSSH19-1786</td>
</tr>
<tr>
<td>• Functionality After Arthroscopic Debridement of Central Triangular Fibrocartilage Tears With Central Perforations</td>
<td>IFSSH19-27</td>
</tr>
<tr>
<td>• Immobilization after a TFCC operation</td>
<td>IFSSH19-1852</td>
</tr>
</tbody>
</table>
• Long-term follow-up of scapho-lunate reconstruction with the DRAW technique

• Mid- and Longterm Results after Transosseous TFCC Refixation

• Modified Arthroscopic Resection Arthroplasty for isolated STT osteoarthritis

• New Arthroscopic Classification of TFCC injuries

• Percutaneous neutralisation screw fixation with scaphoid arthroscopic bone grafting

• Prognostic Factors Affecting Clinical Outcomes of Arthroscopic Assisted Reduction and Volar Plating Through Pronator Quadratus Preservation for Intra-Articular Distal Radius Fracture

• Prognostic factors for simultaneous arthroscopic repair of deep and superficial TFCC portion for Atzei class 2 tear: prospective one-year follow-up study

• Quantitative Analysis of Surface Contouring with bipolar Radiofrequency on chondromalacic cartilage

• Repair of injuries of the triangular Fibrocartilage complex with foveal avulsion by transosseous tunnels

• Scaphoid non-unions - should we treat it arthroscopically?

• Should we repair TFCC in distal radius fracture

• TFCC foveal tear with distal radius fracture

• TFCC Repair: Long-term follow-up after arthroscopic transosseous refixation

• The Arthroscopic Hook Test is Not Pathognomonic for a Foveal Tear of the Triangular Fibrocartilage

• The Learning Curve in Arthroscopic Scaphoid Resection and Midcarpal Arthrodesis

• The Safety of the Volar Midcarpal Portals in Wrist Arthroscopy

• Triangular fibrocartilage complex repair in pediatric patients

• Ulnotriquetral Split Tear Repair: Is It Myth or Fact?

• Wrist Arthroscopy - lessons learnt from the first 100 cases

Assessment in Upper Extremity

• A comparison of hand function in Colles and Scaphoid casts using a technologically updated Jebsen Hand Function test

• A Single Score as a Comprehensive Outcome Measure for the Wrist

• Carpal tunnel syndrome: Recurrence Assessment SCORE (RASc)

• Case Report: Acute calcific periartthritis of metacarpophalangeal Joint presented with acute pain and swelling.

• Clinical, surgical and imagistic correlations in the carpal tunnel syndrome

• Clinically relevant outcome thresholds to enhance indication quality in patients with thumb carpometacarpal osteoarthritis

• Clinical vs. operative findings in hand trauma using our online eHands system

• Comparing the Responsiveness and Validity of the Patient-Reported Outcome Measurement Information System (PROMIS) domains to Region- and Condition-Specific Patient-Reported
## Outcome (PRO) Tools in Carpal Tunnel Release

- **Comparisons of MRI and Arthroscopic Findings of Elbow Synovial Plica**
  - IFSSH19-1014
- **Cross-Sectional International Multicenter Study on Quality of Life and Reasons for Abandonment of Upper Limb Prostheses**
  - IFSSH19-168
- **Determining Minimal Clinically Important Differences (MCIDs) in Patient-Reported Outcome Measurement Information System (PROMIS) Physical Function (PF), Upper Extremity (UE), and Pain Interference (PI) in Carpal Tunnel Release**
  - IFSSH19-522
- **Dynamic Carpal Tunnel. Association of the excursion of the lumbrical muscles in the carpal tunnel as an etiological factor**
  - IFSSH19-1620
- **Engineering Drawing Analysis Applied to Complex Radiographs**
  - IFSSH19-1990
- **Establishing National Diagnostic Reference Levels for Mini C-arm Use, St John's Hospital Livingston**
  - IFSSH19-998
- **Evaluation of altered little finger sensation in patients with carpal tunnel syndrome treated with median nerve surgical release**
  - IFSSH19-122
- **Examining the Accuracy of the Hand Examination**
  - IFSSH19-1384
- **Functional Outcomes after Single-Bone-Forearm Surgery: A 3-Dimensional Analysis and Clinical Assessment**
  - IFSSH19-1408
- **High pressure trauma of the upper limb: clinical patterns and review**
  - IFSSH19-1945
- **HISS SCORE AND MODIFIED VASCULAR HISS SCORE CORRELATION WITH SHORT AND LONG-TERM OUTCOMES IN COMPLEX HAND INJURIES: A RETROSPECTIVE PRELIMINARY STUDY.**
  - IFSSH19-1233
- **Improving management of NORSE hand referrals by introducing one-click digital advice template: A study of 100 cases in a tertiary hand trauma unit**
  - IFSSH19-1281
- **Incision directly above versus Distal incision in Open Carpal Tunnel Release. Does the incision, which is avoided directly above the flexor retinaculum, lead to faster relief of the carpal pain? - A prospective randomized controlled trial -**
  - IFSSH19-119
- **Intraoperative NCS During Open Carpal Tunnel Release: A Pilot Study**
  - IFSSH19-734
- **Is night pain the most disturbing symptom for patients with carpal tunnel syndrome?**
  - IFSSH19-1765
- **Mallet Finger Splinting - No Skin Irritation, No PIP Stiffness**
  - IFSSH19-1073
- **Operative Versus Non-Operative Outcomes Of Middle Clavicle Fractures: A Systematic Review And Meta-Analysis**
  - IFSSH19-1920
- **Pianists most common hand and wrist disorders as effect of forearm muscle overload**
  - IFSSH19-1261
- **Playing-related disorders among professional violinist**
  - IFSSH19-1403
- **Preoperative Two Point Discrimination Predicts Response to Carpal Tunnel Release**
  - IFSSH19-802
- **Price of a finger**
  - IFSSH19-1279
- **Radiographic characteristics of wrists in idiopathic carpal tunnel syndrome patients.**
  - IFSSH19-149
- **resection of dorsal wrist ganglion by assited emptying technique , description of surgical technique**
  - IFSSH19-1016
- **Survival analysis of the replantation for avulsion of upper arm**
  - IFSSH19-100
• The Hypothenar Fat Pad Flap Surgery for End Stage Carpal Tunnel Syndrome IFSSH19-77
• The key clinical symptoms that differentiates cervical radiculopathy from cubital tunnel syndrome IFSSH19-528
• The Patient Specific Functional Scale in Dupuytren's disease; a more responsive outcome measure than standardized PROMS? IFSSH19-407
• The Role of Positive Psychology in Understanding Pain Intensity and Disability Among Hand and Upper Extremity Patients IFSSH19-588
• The structural changes of carpal tunnel and median nerve in MRI before and 2 years after endoscopic carpal tunnel release IFSSH19-544
• The usefulness of Disability of the Arm, Shoulder and Hand (DASH) in patients with shoulder disorders. IFSSH19-724
• Title: Wide awake local anaesthesia no tourniquet technique (WALANT) for hand surgery: an observational study for patient agreement IFSSH19-1609
• Ultrasound diagnostics of A3 pulley injuries in multiple pulley injuries to define indication for a surgical repair IFSSH19-2006
• Validity and responsiveness of strength measurements in the assessment of Distal radioulnar joint arthroplasty IFSSH19-594
• Variation Amongst Pediatric Orthopedic Surgeons in the Use of Pre-operative Antibiotics in Percutaneous Pinning Procedures of the Upper Extremity IFSSH19-917

Avascular Necrosis
• 3D finite elements study of stresses in the wrist and effect of different osteotomies used in Kienböck's disease. IFSSH19-661
• A new combined treatment for Kienböck's disease: bone leveling procedure with bone marrow mesenchymal stem cell administration IFSSH19-1112
• Dorsolateral biplane closing radial osteotomy for Kienböck's disease: long-term follow up. IFSSH19-1423
• Long-term follow-up of partial intercarpal arthrodesis after excision of the lunate for advanced Kienböck disease IFSSH19-533
• Lunate preserving pronator quadratus pedicled bone graft in the treatment of Kienböck's Disease IFSSH19-671
• Management of avascular necrosis of the carpal bones- a clinical study IFSSH19-1471
• PRELIMINARY RESULTS OF LUNATE PIROCARBON PROSTHESIS - Multicentric Study IFSSH19-876
• Surgical Anatomy of Medial Femoral Based Vascularized Bone Graft Arterial Pedicle IFSSH19-1533
• Vascularized bone graft (VBG) from distal radius in the treatment of scaphoid nonunions associated to proximal pole osteonecrosis IFSSH19-1072

Burns
• Burn depth determination by Hyperspectral Imaging IFSSH19-1568
• Classification of Electrical burns injuries of the Upper Limb IFSSH19-595
• Does enzymatic debridement allow us to perform conservative treatment on clinically deep hand burns? A retrospective review. IFSSH19-623
• Enzymatic Debridement for Hand Burns: Function and Quality of Life One Year After Trauma IFSSH19-874
<table>
<thead>
<tr>
<th>Index of topics (English)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>14th IFSSH Congress</td>
<td></td>
</tr>
<tr>
<td><strong>Congenital and Pediatric Trauma</strong></td>
<td></td>
</tr>
<tr>
<td>• A case of atypical phenotype of bilateral polysyndactyly in Joubert syndrome</td>
<td>IFSSH19-798</td>
</tr>
<tr>
<td>• A Comparative Analysis of 150 Thumb Polydactyly Cases from the CoULD Registry Using the Wassel-Flatt, Rotterdam, and Chung Classifications</td>
<td>IFSSH19-613</td>
</tr>
<tr>
<td>• Application of vascular grafting in syndactyly release of Poland syndrome</td>
<td>IFSSH19-1020</td>
</tr>
<tr>
<td>• A rare case of thumb polydactyly with metacarpophalangeal joint symphalangism</td>
<td>IFSSH19-579</td>
</tr>
<tr>
<td>• A rare cause for distal bone resorption of the fingers and drumstick deformity. The Hajdu-Cheney syndrome.</td>
<td>IFSSH19-1729</td>
</tr>
<tr>
<td>• Aspects of toe to hand transfers in children with the macrodactyly of the hand</td>
<td>IFSSH19-1572</td>
</tr>
<tr>
<td>• Bilateral Symmetrical Congenital Trigger Thumb and Middle Finger in a 2-Year-Old Child: A Case Report</td>
<td>IFSSH19-810</td>
</tr>
<tr>
<td>• Bilobed Flap in Hand Clinodactyly Reconstruction: Technique Description and Result Appraisal</td>
<td>IFSSH19-669</td>
</tr>
<tr>
<td>• CHRONIC POST TRAUMATIC TRIANGULAR FIBROCARLILAGE COMPLEX (TFCC) LESIONS IN CHILDREN AND ADOLESCENTS</td>
<td>IFSSH19-566</td>
</tr>
<tr>
<td>• COMPLETE COMPLEX TYPE-4 SYNDACLY OF ALL DIGITS WITH ASD(L&gt;R) : A Rare Case Report</td>
<td>IFSSH19-60</td>
</tr>
<tr>
<td>• Complications of Hardware Removal in Pediatric Upper Limb Surgery - Is It Safe?</td>
<td>IFSSH19-853</td>
</tr>
<tr>
<td>• Congenital hand anomalies in patients with polydactyly of the foot - a single unit experience.</td>
<td>IFSSH19-1494</td>
</tr>
<tr>
<td>• Convergent Validity of PODCI and PROMIS domains in Congenital Upper Limb Anomalies</td>
<td>IFSSH19-452</td>
</tr>
<tr>
<td>• Correction of Radially Deviated Wassel Type III Thumb Polydactyly using Modified Open-Wedge Osteotomy vs Conventional Closed-Wedge Osteotomy in 51 Children</td>
<td>IFSSH19-1654</td>
</tr>
<tr>
<td>• Correction of the postoperative deviation deformity in duplicated thumbs</td>
<td>IFSSH19-887</td>
</tr>
<tr>
<td>• Correction of Thumb Duplication: A Systematic Review of Surgical Techniques</td>
<td>IFSSH19-1904</td>
</tr>
<tr>
<td>• Corrective osteotomy at the distal radius without bone graft for Madelung deformity</td>
<td>IFSSH19-1730</td>
</tr>
<tr>
<td>• Cosmetic appearance of congenital upper extremity anomalies</td>
<td>IFSSH19-1691</td>
</tr>
<tr>
<td>• Development of a Mobile App Based on the Oberg Manske Tonkin (OMT) classification to increase its utilization in clinical practice</td>
<td>IFSSH19-1035</td>
</tr>
<tr>
<td>• Digit preservation treatment for type IIIB or IV hypoplastic thumb using a non-vascularized metatarsal transfer and staged reconstruction</td>
<td>IFSSH19-1539</td>
</tr>
<tr>
<td>• Does intra-articular and extra-articular soft tissue procedures can improve global shoulder function and glenohumeral deformity in OBPP patients? Retrospective cohort of 17 patients.</td>
<td>IFSSH19-1915</td>
</tr>
<tr>
<td>• Does operative timing of pediatric supracondylar humerus fractures affect postoperative early complications?</td>
<td>IFSSH19-548</td>
</tr>
<tr>
<td>• Does the Use of a Parent's Cell Phone Reduce Anxiety During Cast Removal?</td>
<td>IFSSH19-1309</td>
</tr>
<tr>
<td>• Epiphyseal stress fracture of the base of the middle phalanx in adolescent sport climbers</td>
<td>IFSSH19-865</td>
</tr>
<tr>
<td>• Fate Mapping the Developing Limb Bud to Decipher the Origin of Congenital Hand</td>
<td>IFSSH19-723</td>
</tr>
</tbody>
</table>
Differences

- FREE FLAPS RECONSTRUCTION IN PEDIATRIC PATIENTS FOR LIMB DEFECTS  
  IFSSH19-1086

- Global First Web Release in Clasped Thumb - An Anatomical Approach to Treatment  
  IFSSH19-1517

- Growth of transplanted bone after reconstruction for severely hypoplastic thumb  
  IFSSH19-405

- How Important is the Understanding of Embryology for Parents of Children Born with Congenital Hand Differences?  
  IFSSH19-384

- Jeffery type II radial neck fracture in a child: lesion description and method for closed reduction  
  IFSSH19-1626

- KAPLAN DISLOCATION IN CHILDREN: A RARE PATHOLOGY AND A NEW REDUCTION TECHNIQUE  
  IFSSH19-1156

- Late shoulder anterior release in birth brachial plexus injury sequelae. Prospective study  
  IFSSH19-883

- Long-term results of thumb polydactyly we operated.  
  IFSSH19-1148

- Long Term Outcomes of Congenital Hand Reconstruction Using Free Toe Phalanx Transfer Results in Minimal Donor Site Morbidity  
  IFSSH19-756

- Long term results of dynamic tenodesis for management of camptodactyly as an intrinsic minus deformity.  
  IFSSH19-1094

- Macrodactyly: literature review and author's experience.  
  IFSSH19-743

- Madelung's deformity - long-term results of ulnopalmar correction osteotomies in 12 wrists  
  IFSSH19-1417

- Making five fingered hand in Type III B thumb hypoplasia  
  IFSSH19-352

- Management of Proximal Interphalangeal Joint Repetitive Stress Epiphyseal Fractures in Sport Climbers  
  IFSSH19-2008

- Management of scaphoid fractures in the skeletally immature age 10: Case series and literature review test  
  IFSSH19-1591

- Melorheostosis of the hand.  
  IFSSH19-1766

- Modified dorsal rotational advancement flap for reconstruction of congenital spade hand combined with one-stage opponensplasty  
  IFSSH19-1010

- Morphologic characteristic of the first web space in congenital thumb duplication in infants  
  IFSSH19-700

- Neurovascular Island Flap for Thumb Duplication Reconstruction- a Novel Treatment with Long Term Outcomes  
  IFSSH19-1055

- New simple technique for syndactyly separation  
  IFSSH19-624

- Novel Technique of Vascularized Longitudinal Hemi-Metatarsal Second Toe Transfer for Reconstruction of Congenital Hand Differences  
  IFSSH19-1400

- On-Top-Plasty combined Modified Bilhaut-Cloquet Procedure for Complicated Radial Polydactyly  
  IFSSH19-1018

- Open wedge phalanx osteotomy for correction of Wassel type IV-D thumb duplication with zigzag deformity  
  IFSSH19-1058

- Outcome in radial polydactyly at the interphalangeal and metacarpophalangeal level: An international multicenter study  
  IFSSH19-1274
<table>
<thead>
<tr>
<th>Topic</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcome of 32 pollicisations for thumb hypoplasia or aplasia during the period 1987-2016</td>
<td>IFSSH19-702</td>
</tr>
<tr>
<td>Outcomes of Syndactyly Reconstruction using Hyaluronic Acid Matrix</td>
<td>IFSSH19-425</td>
</tr>
<tr>
<td>Paediatric Carpal Injuries: Injury Pattern, Radiological Findings and Patient Care Pathway</td>
<td>IFSSH19-607</td>
</tr>
<tr>
<td>Paediatric Peripheral Nerve Injury: Long term Sensorimotor Recovery following Primary Surgical Repair</td>
<td>IFSSH19-1913</td>
</tr>
<tr>
<td>Palmar and complex distal flap in macrodactyly surgery</td>
<td>IFSSH19-1095</td>
</tr>
<tr>
<td>Pathologic Adipose Infiltration in Macrodactyly: the Mechanisms and Treatment Options</td>
<td>IFSSH19-879</td>
</tr>
<tr>
<td>Pathology and treatment of deviation deformity of thumb after radial polydactyly resection</td>
<td>IFSSH19-922</td>
</tr>
<tr>
<td>Pediatric fingertip replantation: minimum 10-year follow-up</td>
<td>IFSSH19-1573</td>
</tr>
<tr>
<td>PIK3CA somatic mutation in a patient with Aberrant Muscle Syndrome and Lymphatic Malformation</td>
<td>IFSSH19-1450</td>
</tr>
<tr>
<td>Pollicization: new ideas of the biomechanics of the new thumb</td>
<td>IFSSH19-592</td>
</tr>
<tr>
<td>Proximally based pedicled first dorsal interosseous muscle flap for index finger pollicisation in children: an anatomical study of the vascular and innervation patterns and surgical technique.</td>
<td>IFSSH19-1266</td>
</tr>
<tr>
<td>Radial Dysplasia: Intrinsic soft tissue changes and their effect on disease progression.</td>
<td>IFSSH19-1863</td>
</tr>
<tr>
<td>Radial longitudinal deficiency. Analysis of clinical and radiological results</td>
<td>IFSSH19-1641</td>
</tr>
<tr>
<td>Radial Nerve Palsies Associated with Paediatric Supracondylar Humeral Fractures: A Caution in the Interpretation of Neurophysiological Studies</td>
<td>IFSSH19-1789</td>
</tr>
<tr>
<td>Radial Polydactyly: The not so innocent floating radial duplicate</td>
<td>IFSSH19-1510</td>
</tr>
<tr>
<td>Radiographic remodeling of the proximal phalangeal head using a stretching exercise in patients with camptodactyly</td>
<td>IFSSH19-453</td>
</tr>
<tr>
<td>Ray amputation for the treatment of foot macrodactyly in children</td>
<td>IFSSH19-1249</td>
</tr>
<tr>
<td>Reasons to consult for late surgery and functional status of patients with congenital upper limb deformities persisting beyond childhood</td>
<td>IFSSH19-1847</td>
</tr>
<tr>
<td>Reconstruction of Blauth type IIIb hypoplastic thumb with half 2nd metacarpal and tendon transfer</td>
<td>IFSSH19-1119</td>
</tr>
<tr>
<td>Reconstruction of fingertip amputations in children with composite autograft and semi-occlusive dressing: CASOD, new technique</td>
<td>IFSSH19-1052</td>
</tr>
<tr>
<td>Reconstruction of Severely Hypoplastic Thumb by Non-vascularized Metatarsal Graft with Abductor Digiti Minimi Opponensplasty</td>
<td>IFSSH19-552</td>
</tr>
<tr>
<td>Reversed Vascularized Second Metatarsal Flap for Reconstruction of Type IIIb and IV Thumb Hypoplasia with Reduced Donor Site Morbidity</td>
<td>IFSSH19-726</td>
</tr>
<tr>
<td>Short term results of the adapted Mennen technique of pollicization (no detachment of intrinsic musculature)</td>
<td>IFSSH19-1318</td>
</tr>
<tr>
<td>Single-stage radialization and pollicization for radial longitudinal deficiency with thumb hypoplasia</td>
<td>IFSSH19-247</td>
</tr>
<tr>
<td>Social Deprivation and Congenital Hand Anomalies - An assessment using PROMIS</td>
<td>IFSSH19-451</td>
</tr>
</tbody>
</table>
• Subtypes of Radial Polydactyly bifurcating at the Metacarpophalangeal Joint Level IFSSH19-1354
• Successful treatment of paediatric lower limb CRPS by continuous epidural anaesthesia: a report of 2 cases IFSSH19-442
• Surgical Outcomes following Syndactyly Reconstruction - using JSSH Evaluation Form IFSSH19-518
• Surgical reconstruction for congenital thumb hypoplasia: a retrospective review of long-term results IFSSH19-1890
• Surgical strategy for angular deformity correction in thumb polydactyly reconstruction IFSSH19-37
• Surgical Treatment of congenital camptodactyly, multicenter study IFSSH19-1743
• The classification and treatment of the polysyndactyly of middle finger IFSSH19-1042
• The clinical results of Kirschner wire fixation after closed reduction for Gartland type II and III supracondylar humerus fractures in children IFSSH19-942
• The postoperative dressing regime in congenital hand surgery - Is frequent dressing change necessary? IFSSH19-1741
• The surgical treatment strategy of congenital clasped thumb according to pathological characteristics IFSSH19-103
• THE TURNER SCIENTIFIC RESEARCH INSTITUTE FOR CHILDREN'S ORTHOPEDICS IFSSH19-1985
• Thumb Duplication Classifications - Still Need Improvement? IFSSH19-1456
• Thumb strength and manual ability in radial polydactyly at the interphalangeal and metacarpophalangeal joint level IFSSH19-1036
• Toe to hand transfer for five digit hand reconstruction in congenital thumb's hypoplasia IFSSH19-1715
• Trans-scaphoid perilunate dislocation in a pediatric patient: a 10-month follow up IFSSH19-194
• Treatment of artificial dermal template to release congenital syndactyly without skin graft IFSSH19-1012
• Treatment of congenital upper limb muscular hypertrophy in hand IFSSH19-668
• Treatment of length discrepancy after posttraumatic radial growth arrest IFSSH19-1724
• Treatment of pink pulseless hand following supracondylar humeral fractures in children at our hospital IFSSH19-1865
• Treatment of Prolonged Chronic Monteggia Lesion by Corrective Osteotomy of Ulna with Radial Shortening IFSSH19-242
• Ulnar dimelia with mirror hand - Current treatment strategies IFSSH19-1905
• UPPER TRAPEZIUS TO TRICEPS TRANSFER A NOVEL TECHNIQUE FOR RESTORATION OF ELBOW EXTENSION IN PATIENTS WITH BIRTH BRACHIAL PLEXUS PALSY IFSSH19-1431
• Use of Processed Human Nerve Allograft in Reconstruction of Brachial Plexus Birth Injuries IFSSH19-1782
• Volar approach of “On-Top Plasty” for reconstruction of radial polydactyly IFSSH19-1732
• Web creep control with a novel orthosis IFSSH19-1238
• ZASH: The Zurich appearance score for hands. A validated instrument to assess appearance of hands with and without malformations. Preliminary results IFSSH19-897

Diagnostic Value
- Active von Frey filament test: new technique for evaluation of hand tactile sensation measuring in continuous variable units
- A Modern Adaptation to the Ten Test for the assessment of Digital Nerves
- An ultrasonic diagnostic method by multiple plane scanning and side-to-side comparing for unilateral peripheral nerve entrapment disease.
- Autoregulation of Lmx1b during limb development: A role in Nail-Patella Syndrome?
- Collateral ligament injuries of the metacarpophalangeal joint in long fingers. Results of a series of 20 patients. Presentation of a new clinical test.
- Contusion Neuropraxia of Cutaneous Sensory Nerves: Early Diagnosis and Treatment Reduces Chronic Pain Syndromes (Early Diagnosis Shortens Recovery Time)
- Correlation between ultrasound image and surgery in De Quervain's tenosynovitis
- Correlation of Tinel sign and site of ulnar nerve compression in cubital tunnel syndrome
- Distal Radio-ulnar Joint Configurations in Patients with Idiopathic Ulnar Impaction Syndrome: A New Classification System
- Do national randomised controlled trials change international clinical practice?
- Do we need electrophysiological measurements for the diagnostics of carpal tunnel syndrome
- Examination on the clinical test of de Quervain's disease through tendon excursion of each test
- External Validation of the 2nd Metacarpal Cortical Index As A Simple Screening Tool for Osteopenia
- intraneural ganglion of the distal ulnar nerve- a case report
- Is it worth operating severe, old carpal tunnel syndrome? Which technique?
- Is skyline view accurate for detecting protruded screw in volar plate fixation of distal radius fracture? : Compared with intraoperative mobile-mini CT
- Measuring Quality in Hand Surgery using Patient Reported Experience Measures
- Outcomes of De Quervain's release from a patient's perspective
- Patient radiation exposure in fluoroscopically guided injections
- Severity diagnosis of carpal tunnel syndrome using sagittal view of MRI
- Sonoelastography in carpal tunnel syndrome diagnosis: A Systematic Review of diagnostic value
- Sonographic diagnosis of closed pediatric finger injuries
- The Cone Beam Computed Tomography: An alternative imaging modality for the hand surgery
- The reliability of tomosynthesis for Heberden's node
- The role of nerve conduction studies in diagnosing and staging of the carpal tunnel syndrome
- The United Kingdom experience of trainee led multicentre prospective studies in hand
surgery

• The utility of the mangled extremity severity score (MESS) for decision-making in treating mangled upper extremities? A meta-analysis

• Traumatic Brachial Plexus palsy: How Accurate is the Pre-operative Diagnosis?

• Ultrasound in carpal tunnel syndrome - the inlet and outlet ratio

• Use of ultrasonography in carpal tunnel syndrome diagnosis

• VALIDITY OF THE “SCRATCH COLLAPSE TEST” FOR THE DIAGNOSIS OF THE CARPAL TUNNEL SYNDROME.

Dupuytren

• ACTUALIZATION RESULTS OF OUR PROSPECTIVE STUDY WITH COLLAGENASE CLOSTRIDIUM HISTOLYTICUM: SERIE OF 100 CASES, 5 YEARS FOLLOW-UP

• Advanced Techniques in Percutaneous Needle Fasciotomy and Collagenase - Going Beyond the MP Joint

• Anatomy, frequency and distribution pattern of plantar fibromatosis (Ledderhose's disease)

• A new finger-preserving procedure as an alternative to amputation in recurrent severe Dupuytren's contracture of the small finger

• A successful use of collagenase injection multiple fingers contractures in a child in the course of a generalized collagenopathy and Arnold Chiari Malformation Type I

• Collagenase dose related correction of flexion deformity in Dupuytren's contracture: A prospective randomized study

• DOCUMENTARY PHOTOGRAPHY IN DUPUYTREN'S DISEASE SURGERY

• Dupuytren's contracture: Long term results after treatment with excision of the contracted palmar fascia

• Echogenicity of palmar Dupuytren nodules is not a predictor of disease progression in terms of increase in nodule size

• Ethnic differences in prevalence of Dupuytren disease can be explained by known genetic risk variants

• Evidence of microcirculatory effects of postoperative exercise therapy after partial fasciectomy in patients with Dupuytren's Disease using Hyperspectral Imaging

• EXTERNAL FIXATOR WITH DISTRACTER FOR TREATMENT OF THE RETRACTION IN FLEXION OF FINGERS

• FATGRAFTING IN DUPUYTREN DISEASE

• Is the use of whole vial of collagenase Clostridium histolyticum dissolved in 1.0 ml of solvent safe and effective?

• Needle fasciotomy for Dupuytren's contracture- a prospective cohort study of 58 fingers with a median follow-up time of 6.5 years

• New Developments in the Minimal invasive Treatment of Severe Dupuytren's Recurrences

• Open palm vs closed technique for treatment of multiple digit involvement with Dupuytren's contracture: A prospective randomized study.

• Ossification of a Dupuytren's Cord Following Xiapex (collagenase clostridium histolyticum)
Injection. A Case Report

- Outcomes of Repeated Treatment in Dupuytren's Disease; a Comparison with Initial Treatment
  IFSSH19-1306

- Percutaneous needle fasciotomy in Dupuytren disease: A follow up of the direct outcomes considering recurrence and complications
  IFSSH19-354

- Progressive palmar contracture of Dupuytren in a 6-year-old boy.
  IFSSH19-1716

- Prospective study of needle fasciotomy for Dupuytren's contracture with four years follow-up
  IFSSH19-1223

- Randomized controlled trial of limited fasciectomy with injection of lipoaspirate adipose graft in the treatment of Dupuytren's disease
  IFSSH19-342

- Results on Dupuytren disease course from a five-year follow-up cohort study
  IFSSH19-1429

- Satisfaction with collagenase for Dupuytren contracture disease A patient related outcome analysis
  IFSSH19-1696

- Severe Dupuytrens Contracture treated by the McCash Technique (open palm) and Full Thickness Skin Grafts to the Involved Fingers: Results and Complications.
  IFSSH19-1891

- Single cell analysis of the fibrotic landscape in Dupuytren's Disease
  IFSSH19-78

- The evaluation of Dupuytren's contracture with ultrasonography for safety of Collagenase Clostridium Histolyticum injection
  IFSSH19-508

- The Influence of reactive oxygen species on pathophysiological mechanisms of Dupuytren's disease
  IFSSH19-1940

- The reliability of sonographic measurement of early palmar Dupuytren nodules
  IFSSH19-820

- THE ROLE OF NEW REHABILITATION PROTOCOL IN DUPUYTREN'S DISEASE
  IFSSH19-1244

- What PROMs measure in Dupuytren's disease: unrecognised issues unmasked by combining PROMs with the Aachen item banking protocol
  IFSSH19-1206

- Wide-Awake versus General Anesthesia Results in Patients with Dupuytren's Disease Surgery: Preliminary Results
  IFSSH19-1665

Elbow and Forearm

  IFSSH19-381

- Advances in Ulnar Collateral Ligament Reconstruction of the Elbow: A Biomechanical comparison.
  IFSSH19-223

- A Novel Technique for the Surgical Management of Chronic Lateral Epicondylitis
  IFSSH19-1919

- Bilateral Elbow Extension Contracture in a Child with Arthrogryposis A VERY RARE OCCURRENCE
  IFSSH19-361

- Bilateral idiopathic radioulnar synostosis
  IFSSH19-1675

- Clinical Manifestation of Symptomatic Fishtail Deformity
  IFSSH19-221

- Clinical outcome of the radial head and neck fracture treated by headless screw fixation
  IFSSH19-239

- Complications of semi constrained total elbow arthroplasty in non-rheumatoid patients: lessons learned with application in an active population with biomechanically restrictive implants
  IFSSH19-752
<table>
<thead>
<tr>
<th>Title</th>
<th>IFSSH Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrective Osteotomies of Forearm Bones in Distal Radioulnar Joint Instability by Three-dimensional Analysis and Surgical Navigation</td>
<td>IFSSH19-76</td>
</tr>
<tr>
<td>Development of three dimensional digital preoperative planning software for the distal humerus fractures</td>
<td>IFSSH19-604</td>
</tr>
<tr>
<td>Diaphyseal and proximal ulnar non-union: anatomical and epidemiological risk factors.</td>
<td>IFSSH19-1491</td>
</tr>
<tr>
<td>Distal radio-ulnar replacement: our early experience with a constrained prosthesis</td>
<td>IFSSH19-1962</td>
</tr>
<tr>
<td>Distribution of sensory nerve endings in the interosseous membrane of the forearm</td>
<td>IFSSH19-516</td>
</tr>
<tr>
<td>Does an Associated Elbow Dislocation Lead to Worse Outcomes in Medial Epicondyle Fractures?</td>
<td>IFSSH19-1311</td>
</tr>
<tr>
<td>Does Degeneration of Triangular Fibrocartilage Complex Improve after Ulnar Shortening Osteotomy?</td>
<td>IFSSH19-565</td>
</tr>
<tr>
<td>Early pin removal for pediatric radial neck fracture treated by percutaneous pin fixation</td>
<td>IFSSH19-1275</td>
</tr>
<tr>
<td>Effects of hand amputation surgery procedures on phantom limb sensation</td>
<td>IFSSH19-1688</td>
</tr>
<tr>
<td>Effects of hand amputation surgery procedures on sEMG activity to control robotic hand prostheses</td>
<td>IFSSH19-1689</td>
</tr>
<tr>
<td>Endoscopically assisted distal biceps tendon repair</td>
<td>IFSSH19-126</td>
</tr>
<tr>
<td>Epidemiology of postoperative elbow contracture release and associated factors</td>
<td>IFSSH19-1140</td>
</tr>
<tr>
<td>Essex Lopresti Fracture-Dislocation</td>
<td>IFSSH19-1195</td>
</tr>
<tr>
<td>Factors associated with operative treatment of enthesopathy of the extensor carpi radialis brevis origin</td>
<td>IFSSH19-989</td>
</tr>
<tr>
<td>Factors associated with removal of a radial head prosthesis placed for acute trauma</td>
<td>IFSSH19-308</td>
</tr>
<tr>
<td>First Clinical Experience with a Novel Injectable rhCollagen scaffold combined with Autologous Platelet-Rich Plasma for the Treatment of Lateral Epicondylar Tendinopathy (Tennis Elbow)</td>
<td>IFSSH19-297</td>
</tr>
<tr>
<td>Forearm Corrective Osteotomy pitfalls: What Can Go Wrong Will Go Wrong!</td>
<td>IFSSH19-1850</td>
</tr>
<tr>
<td>Forearm diaphyseal bone strength recovers three months after plate removal</td>
<td>IFSSH19-929</td>
</tr>
<tr>
<td>Frailty is a Predictor of Unplanned Reoperation in Management of Forearm Fracture</td>
<td>IFSSH19-1469</td>
</tr>
<tr>
<td>Free Gracilis Muscle Transfers Compared with Non-Free Muscle Transfer for Elbow Flexion Reanimation: A Meta-Analysis</td>
<td>IFSSH19-20</td>
</tr>
<tr>
<td>FUNCTIONAL ASSESSMENT, QUALITY OF LIFE AND ASSOCIATED COMPLICATIONS OF RADIAL HEAD PROSTHESIS. EXPERIENCE OF OUR CENTER</td>
<td>IFSSH19-870</td>
</tr>
<tr>
<td>Functional outcome of stage surgical treatment of nonunions of the distal humerus</td>
<td>IFSSH19-824</td>
</tr>
<tr>
<td>Histological examination of osteochondritis dissectans of the elbow</td>
<td>IFSSH19-1321</td>
</tr>
<tr>
<td>In Idiopathc Cubital Tunnel Syndrome, Ulnar Nerve Length and Instability Can Be Reduced by Repairing Osborne's Ligament after Simple Decompression</td>
<td>IFSSH19-825</td>
</tr>
<tr>
<td>Intraoperative Technique for Evaluation of the Interosseous Ligament of the Forearm</td>
<td>IFSSH19-973</td>
</tr>
<tr>
<td>Involvement of the lesser sigmoid notch in elbow fracture dislocations</td>
<td>IFSSH19-488</td>
</tr>
<tr>
<td>Topic</td>
<td>Code</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>Length changes of distal accessory band of Interosseous membrane during forearm rotation - a 3D CT study in vivo</td>
<td>IFSSH19-683</td>
</tr>
<tr>
<td>Long term outcome of open reduction and internal fixation of distal humeral nonunions in the older age patient.</td>
<td>IFSSH19-300</td>
</tr>
<tr>
<td>Long Term Outcomes of Medial Epicondylectomies</td>
<td>IFSSH19-787</td>
</tr>
<tr>
<td>Magnetic Resonance Imaging Correlate Clinical Features of Medial Epicondylitis</td>
<td>IFSSH19-332</td>
</tr>
<tr>
<td>Medial Elbow Exposure: A Comparison of 5 Approaches</td>
<td>IFSSH19-269</td>
</tr>
<tr>
<td>Mini-operative treatment of tennis elbow using bipolar radio-frequency</td>
<td>IFSSH19-712</td>
</tr>
<tr>
<td>Minimal endoscopic release procedure of ulnar nerve in the cubital tunnel</td>
<td>IFSSH19-1234</td>
</tr>
<tr>
<td>One-bone forearm technique for chronic post-traumatic forearm instability: a case report.</td>
<td>IFSSH19-1492</td>
</tr>
<tr>
<td>Open Reduction and Internal Fixation with Headless Compression Screws for Coronal Shear Fractures Dubberley Type 3. Outcomes at a Mean Follow-up of 7 Years.</td>
<td>IFSSH19-1465</td>
</tr>
<tr>
<td>Open treatment of the recalcitrant lateral epicondylitis: Clinical outcome and postoperative ultrasonographic change of the ECRB tendon status</td>
<td>IFSSH19-1161</td>
</tr>
<tr>
<td>OUTCOME OF A CONSTRAINED ARTHROPLASTY OF THE DISTAL RADIOLUNAR JOINT</td>
<td>IFSSH19-316</td>
</tr>
<tr>
<td>Outcome of terrible triad injury of the elbow: do concomitant fractures make a difference?</td>
<td>IFSSH19-1781</td>
</tr>
<tr>
<td>Patient characteristics in cubital tunnel syndrome at a referral centre and predictive factors for outcome of simple decompression versus subcutaneous transposition of the ulnar nerve</td>
<td>IFSSH19-1297</td>
</tr>
<tr>
<td>Pedicled Vascularized Bone Graft Versus Induced Membrane Technique for Reconstruction of Forearm Medium Size Bone Defects</td>
<td>IFSSH19-1474</td>
</tr>
<tr>
<td>Portal placement in elbow arthroscopy by novice surgeons: cadaver study</td>
<td>IFSSH19-540</td>
</tr>
<tr>
<td>Posteromedial dislocation of the elbow with lateral humeral condyle fracture in children; Arthrography is useful for distinguishing between dislocation or epiphyseal separation</td>
<td>IFSSH19-1685</td>
</tr>
<tr>
<td>Predictive factors for severe post-operative chronic pain after surgery for cubital tunnel syndrome</td>
<td>IFSSH19-1335</td>
</tr>
<tr>
<td>Predictive factors for union time in adult diaphyseal forearm fractures</td>
<td>IFSSH19-158</td>
</tr>
<tr>
<td>Professional violinist biomechanical and electrophysiological wrist and forearm muscles evaluation</td>
<td>IFSSH19-1445</td>
</tr>
<tr>
<td>Prognostic factors of radial head arthroplasty outcomes</td>
<td>IFSSH19-555</td>
</tr>
<tr>
<td>Radial head Resection and Hemi-interposition vs &quot;functional radial head resection&quot; with a computerized ring fixator in patients with chronic missed Monteggia pathology: a prospective analysis.</td>
<td>IFSSH19-357</td>
</tr>
<tr>
<td>Radiocapitellar prosthetic arthroplasty: short-term to midterm results of 19 elbows</td>
<td>IFSSH19-306</td>
</tr>
<tr>
<td>Radiofrequency Microtenotomy Treatment of Lateral Epicondylitis</td>
<td>IFSSH19-868</td>
</tr>
<tr>
<td>Radiological analysis to determine risk factors for aseptic loosening in the linked-type total elbow arthroplasty</td>
<td>IFSSH19-1978</td>
</tr>
<tr>
<td>Reconstruction of distal oblique bundle of the interosseous membrane of the forearm by percutaneous ligamentoplasty.</td>
<td>IFSSH19-1489</td>
</tr>
</tbody>
</table>
- Reinsertion of distal biceps tendon through a mini invasive anterior approach: our experience
- Results of fascia lata interposition arthroplasty for elbow ankylosis
- Results of Fascia Lata Soft Tissue Interposition Elbow Arthroplasty for Chronic Neglected Posterior Dislocations of the Elbow of more than 1 year duration
- Revision arthroscopic surgery for tennis elbow
- Role of an Adjustable Hinged Elbow Orthosis in the Rehabilitation of a Lateral Collateral Ligament Deficient Elbow: An In Vitro Biomechanical Study
- Role of Anconeus in the Stability of a Lateral Ligament Deficient Elbow: An In Vitro Biomechanical Study
- Role of the interosseous membrane and TFCC in distal radioulnar joint instability in Galeazzi fracture: Anatomical and biomechanical study
- Short-term results of Revision Cubital Tunnel Release Treated With Neurolysis and Procine Submucosa Extracellular Matrix
- Simultaneous bilateral distal biceps tendon avulsions: Simultaneous versus staged repairs. A report of two cases and literature review.
- Surgery for cubital tunnel syndrome in patients with diabetes - a prospective study of patient reported outcome measurements using national quality registries
- Surgical Dislocation and Cancellous Bone Graft is Alternative Operative Treatment in Capitellar and Trochlea Fracture with Elbow Instability
- The bony anatomy of the radius and ulna : A Computed Tomography study for implant design and related research.
- The effect of the coronoid nonunion on the terrible triad of the elbow.
- The Effect of Torsional Moment of Forearm Weight on the Posterolateral Rotatory Instability of a Lateral Ligament Deficient Elbow: An In Vitro Biomechanical Investigation
- The flexion-pronation provocation test. A new test for distal biceps tendon pathology
- The Importance of the Distal Oblique Band in Forearm Longitudinal Stability: A Biomechanical Comparative study
- The incidence of distal ulna fractures by classification
- Three-dimensional MRI-CT fusion images of osteochondritis dissecans of the elbow: A novel technique for preoperative evaluation and surgical planning
- Three-dimensional planning of corrective osteotomies for paediatric malunited diaphyseal forearm fractures: do we achieve the desired functional gain and the planned correction?
- Total arthroplasty in the treatment of previous infection of the elbow. Two-stage surgery
- Treatment of fracture dislocation of the elbow with Regan-Morrey Type I/II coronoid fracture: A retrospective analysis of clinical results
- Type C distal humerus fractures. A 15-year experience in a demanding surgical issue
- Ulnar head offset to restore DRUJ stability
- Ulnar Nerve Entrapment At The Cubital Tunnel. To Transpose Widely Or Not To Transpose At All?
## 14th IFSSH Congress
### Index of topics (English)

- Ulnar neuropathy at the elbow in 413 Japanese patients: an assessment of pathological elbow lesions and neurological severity
- Ulnar shortening osteotomy as treatment for ulnar impaction syndrome. An 8-year follow-up.
- Unusual Case of Persistent Choreiform Movements of the Upper Limb after Elbow Injury
- Usefulness of preoperative MRI in pediatric Monteggia fractures
- Use of Kirschner Wires With Eyelets for Tension Band Wiring of Olecranon Fractures
- Wide awake ultrasound guided percutaneous anterior interosseous nerve release

### Experimental
- Development of method for measuring the thumb pronation and palmar abduction angles during opposition movement using a three-axis gyroscope
- A Mendelian randomisation analysis suggests that skeletal growth is causal in the aetiology of Carpal Tunnel Syndrome
- A Standardized Patient Education Video Program for Improvement of Post-operative Pain Management after Outpatient Upper Extremity Surgery
- A TRIAL COMPARING PAIN DURING LOCAL TUMESCENT INJECTION IN FINGERS USING DIFFERENT SYRINGE-NEEDLE COMBINATIONS
- Biomechanical Analysis of Thumb Ulnar Collateral Ligament Repair with Suture Tape Augmentation
- Biomechanical Analysis of Thumb Ulnar Collateral Ligament Tear Kinematics
- Biomechanical testing of the transosseous fixation of the distal radioulnar ligament
- Characterization of human nail stem cells
- Decellularized vascularized nerve scaffolds for the reconstruction of large peripheral nerve defects
- Delayed nerve repair: experimental treatment with chitosan tubes enriched by fresh skeletal muscle fibers
- Effect of discontinuous low dose FK506 administration on motor recovery after cryopreserved nerve allograft
- Effects of Endoscopic Carpal Tunnel Release on Biomechanical Interactions between the Thenar Muscles and Transverse Carpal Ligament
- Effects of Growth Hormone Therapy on Nerve Regeneration, Functional Recovery, and Allo-Immune Response in Vascularized Composite Allotransplantation
- ELECTROSPUN PLGA NANOFIBERS ON COLLAGEN AS A NERVE CONDUIT
- Evaluation of skin lesion healing in rats submitted to Integra treatment as a dermal substitute.
- Evaluation of the use of collagen membrane in the repair of joint cartilage lesion in an animal model.
- Feasibility of a new pulley repair for multiple pulley ruptures: a cadaver study
- Gene interaction profiles of differentiated and undifferentiated adipose derived mesenchymal stem cells dynamically seeded onto a processed nerve allograft
• Genotype-phenotype insights into familial polydactyly in Chinese people
• Healing of a critical-sized bone defect in the rat with the use of platelet concentrates
• HOW TO IMPROVE AND DIRECT THE NEURONAL GROWTH PROCESS. THE FUTURE FOR PERIPHERAL NERVE REGENERATION
• IGF-1 Nanoparticles to Ameliorate Effects of Chronic Denervation Following Peripheral Nerve Injury
• Inflammatory processes and elevated osteoclast activity chaperon atrophic non-union formation in a murine model.
• Innovations in man-machine interface for control and feedback of bionic prostheses
• International comparison of the current practices of the management of post-axial accessory digits on a stalk
• Investigation into the Complex and Co-ordinated Anatomy of Preaxial Polydactyly
• Investigation of nerve regeneration promoting factor in bioabsorbable nerve conduits coated with induced pluripotent stem cell-derived neurospheres
• Investigation of RARg Signaling in Human Growth-Plate Chondrocytes
• Isolated limb perfusion beyond 24h - a potential avenue for global organ sharing, limb resuscitation and optimization
• Manufacture of PDA/ RGD coated graphene loaded PCL nanoscaffold via integration multilayered printing
• Mutational spectrum and targeted therapy for isolated macrodactyly
• Nanoparticles-coated sutures to provide sustained delivery of growth factors significantly increased tendon healing strengths at multiple time-points
• NERVE DECELLULARIZATION: LOOKING FOR THE MORE RELIABLE METHOD
• Pharmacologic Prevention of Contractures in Neonatal Brachial Plexus Injury
• Postoperative pain management to the patients with distal radial fractures without opioid
• Quantitative relationship between palmar contact forces and carpal tunnel pressure
• Recovery Analysis of Two Point Tactile Discrimination Following Dorsal Cross Finger Flap
• Recruitment efficiency for randomised controlled trials in digital nerve repair
• Regulation of neural stem cell fate by three-dimensional gold nanocomposite channels
• Residual rotation of forearm amputation: Cadaveric study
• Robust genetic diagnosis of split-hand/foot malformation by exome sequencing
• Role of arterial supply and venous drainage of fasciocutaneous pedicle in saphenous artery perforator-plus fasciocutaneous flap in rabbit
• Sonographically guided percutaneous A1 pulley release in trigger finger - preliminary results
• Stimulated Grip Strength Testing: Validation of Novel Method for Functional Assessment
• The abduction system of the fifth finger. An anatomic and electromyographic study
<table>
<thead>
<tr>
<th>Paper ID</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>IFSSH19-50</td>
<td>The effectiveness of engineered miRNAs targeting cyclooxygenases on reducing adhesions and improving strengths of healing flexor tendons</td>
</tr>
<tr>
<td>IFSSH19-869</td>
<td>The effect of nitric oxide-releasing silica nanoparticle on revascularization and functional recovery in rat sciatic nerve crush injury</td>
</tr>
<tr>
<td>IFSSH19-1358</td>
<td>The Effects of Static Cold Storage, Pulsatile Hypothermic Perfusion, and Pulsatile Near-Normothermic Perfusion on the Metabolism and Function of Rat Hind Limb Allografts</td>
</tr>
<tr>
<td>IFSSH19-737</td>
<td>The introduction of human Mesenchymal Stem Cells to clinically available nerve substitutes</td>
</tr>
<tr>
<td>IFSSH19-1174</td>
<td>THE SAFETY USE OF ONE-PER-MIL TUMESCENT INFILTRATION INTO Viable SKIN TISSUES THAT ONCE SUFFERED FROM AN ISCHEMIC INSULTS</td>
</tr>
<tr>
<td>IFSSH19-1515</td>
<td>The stability of intra-articular distal radius fractures using volar locking plate with unicortical and bicortical screws</td>
</tr>
<tr>
<td>IFSSH19-923</td>
<td>Thumbie and other Non-Conventional Treatments</td>
</tr>
<tr>
<td>IFSSH19-612</td>
<td>Trapezio-trapezoid (TT) hypermobility may increase range of thumb movement after trapezio-metacarpal (TMC) arthrodesis</td>
</tr>
<tr>
<td>IFSSH19-1037</td>
<td>Treatment of dorsal synovial ganglion of the wrist with percutaneous sclerotherapy using hypertonic glucose</td>
</tr>
<tr>
<td>IFSSH19-921</td>
<td>Treatment of Painful Neuroma by Nerve Capping Using Nerve Conduits in a Rat Model</td>
</tr>
<tr>
<td>IFSSH19-1558</td>
<td>Validation of a Novel Rabbit Model of Compression Neuropathy in the Setting of Perineural Adhesion</td>
</tr>
<tr>
<td>IFSSH19-554</td>
<td>Vancomycin is superior to Plectasin against Staphylococcus aureus periprosthetic osteomyelitis in rats.</td>
</tr>
<tr>
<td>IFSSH19-230</td>
<td>Visualized identification of the maximal surgical delay effect in a rat flap model</td>
</tr>
<tr>
<td>IFSSH19-229</td>
<td>Visualizing the pharmacological delay effect of botulinum toxin A on the flap donors by the infrared thermography in a rat pedicled flap model</td>
</tr>
<tr>
<td>IFSSH19-884</td>
<td>Volumetric, cellular and genic expression modifications of FDP striated muscle following flexor tendon division in a rodent model.</td>
</tr>
</tbody>
</table>

### Fractures and Dislocations Hand

- "The role of Magnetic Resonance Imaging (MRI) and Ultrasound (US) in the diagnosis of the thumb Stener lesion" |
- A comparison of functional outcomes of conservatively and surgically treated metacarpal neck fractures with angulation greater than 50 degrees |
- Acute scapholunate dissociation, "A" assembly an effective option for its treatment. |
- A Decision Aid Decreases Decisional Conflict in Patients Undergoing Plate Fixation for a Distal Radial Fracture |
- A nationwide registry study on the epidemiology of scaphoid fractures in Sweden. |
- An early experience on the use of intramedullary headless screws for hand fractures |
- A new strategy with locked-wire type external fixator (the Ichi-Fixator) for hand fractures |
- A prospective randomized trial comparing clinical outcomes of treatment with buddy taping of 4th and 5th metacarpal vs closed reduction and cast immobilization in fifth metacarpal neck fractures with less than 70° of volar angulation.
• A Rare Case of Seymour Fracture in an Adult with Non-Fused Growth Plates
• Association between radiological results and functional long-term (6.8 years) outcome in conservatively treated AO Type-C distal radius fractures
• Augmented Mini External Fixation Provides Biomechanically Stable Support of Ulnar Sided CMC Fracture Dislocation
• Availability of radiographs in suspected hand fractures - a tertiary referral center experience.
• A Weak Part Of The Strong Hand: Hook Of Hamate Fractures
• Biomechanical characterization of ulnar styloid fracture size for instability of the distal radio ulnar joint
• Biomechanical effects of ulnar styloid fracture repair techniques on distal radio-ulnar joint stability
• Bone Grafting for the Correction of Nonunion or Malunion of Long Bones in the Upper Extremity: A Systematic Review
• Bony mallet thumb: Our experience with 9 patients treated surgically
• Case report of a complex fracture (C3-3 distal radius - Gustilo Type II - Type 3 DRUJ) associated with a B2 scaphoid fracture at the dominant arm and resorption bone edema with scaphoid fracture at the contralateral wrist.
• Causes of procedural failures of closed reductions using an extension-block pin for bony mallet finger
• Cerclage wiring and its modification for long oblique/spiral fracture of the metacarpal shaft
• CHRONIC DISLOCATION/INSTABILITY OF THE BASE OF THE FIFTH METACARPAL - MULTILIGAMENTARY RECONSTRUCTION TECHNIQUE
• Closed screw fixation versus open reduction and bone grafting in delayed union scaphoid fractures
• COLLATERAL LIGAMENT INJURIES OF METACARPOPHALANGEAL JOINTS IN ATHLETES
• Comminuted Jersey's finger (flexor digitorum profundus avulsion fracture) treated by plate fixation
• Comparison among plate fixation, K-wire pinning, and conservative treatment for distal metacarpal fractures
• Comparison of radiological outcomes of closed reduction and percutaneous pinning through or not through the proximal first metacarpal in treatment of Bennett fractures
• Comparison of SCAphoid fracture osteosynthesis by MAGnesium-based headless Herbert screws with titanium Herbert screws: protocol for the randomized controlled SCAMAG clinical trial
• Computer-assisted Fragment Reduction of Distal Radius Fractures Depends on Surgical Planning Experience
• Conservative Therapy of the Proximal Phalangeal Fracture: Adaptation and Limitation
• Conservative treatment for refracture of post-operative mallet fractures. 2 case reports.
• Corrective intra-articular osteotomy after malunion in Bennett fractures: surgical technique and first results

• Delayed surgery for bony mallet finger - a retrospective comparative study - IFSSH19-380

• Displaced scaphoid type B2 waist fractures stabilized by one or two headless compression screws IFSSH19-995

• DISTAL PHALANX FRACTURES MENAGEMENT WITH 23 GAUGE PERCUTANEOUS NEEDLES VS KIRSCHNER WIRES. IFSSH19-1239

• Dorsal Transosseous Reduction and locking plate fixation for Articular Depressed Middle Phalangeal Base Fracture IFSSH19-834

• Early Active Vector Adjustable Skin Traction (EAVAST) for phalangeal fractures of the hand IFSSH19-1797

• Early internal fixation combined with free flaps for the treatment of Gustilo type IIIB forearm open fractures with soft tissue defects IFSSH19-970

• EARLY STIMULATION OF BONE CONSOLIDATION IN PATIENTS WITH PATHOLOGICAL PHALANGES FRACTURE: THE ROLE OF BIOPHYSICS STIMULATION IFSSH19-1428

• Efficacy analysis of the dorsal approach into the double miniature locking plate in a comminuted fracture unstable dorsally displaced distal radius fractures IFSSH19-80

• Evaluation for fracture type of mallet finger IFSSH19-1804

• Evaluation using the preoperative three-dimensional computed tomography and clinical results for surgical treatment of mallet fractures IFSSH19-1231

• Factors related poor outcomes in the extension block pinning of mallet fractures IFSSH19-486

• FIFTH FINGER COMMINUTED SPIRAL FRACTURE IN HORSE RIDERS RELATED TO REIN HOLD TECHNIQUE IFSSH19-912

• Fifth Metacarpal Neck Fractures in the United States: Trends in Current Management IFSSH19-1585

• Flexor Pollicis Longus Tendon Rupture after Volar Plate Fixation of Distal Radius Fracture. IFSSH19-927

• Fractures of the pisiform bone- is osteosynthesis useful? IFSSH19-1982

• Free osteochondral graft from ipsilateral hand for treatment of partial finger joint defects in adult IFSSH19-531

• Hand injuries in sports - A retrospective analysis of 286 cases IFSSH19-547

• Haptic assisted and VR-based training for minimally invasive K-wire drilling IFSSH19-572

• Headless screws versus Bouquet in intramedullary fixation in unstable neck metacarpal Fractures in active patients: A Randomized Study IFSSH19-675

• INTRAMEDULLARY CANNULATED HEADLESS COMPRESSION SCREWS OSTEOSYNTHESIS FOR METACARPAL AND PHALANGEAL FRACTURES IFSSH19-1901

• Intraosseous tension-band wiring for displaced Bennett’s fracture IFSSH19-699

• Irreducible dislocations of the metacarpophalangeal joints - history and 24 cases IFSSH19-1506

• Irreducible palmar dislocated isolated fracture to the styloid process of second metacarpal - a unique fracture mechanism. IFSSH19-1961

• Isolated dorsal radiocarpal dislocation with volar opening treated with external fixator and percutaneous pinning IFSSH19-1725
• Loading the pronator quadratus improves distal radio-ulnar joint stability in the setting of an ulnar styloid fracture

• Locked metacarpophalangeal joint - a simple approach

• Long-term outcomes after the intra-articular distal radius fractures with volar locking plate

• Long-term Outcomes of Surgically Treated Metacarpal Fractures Using Bioabsorbable Plates.

• Long-term Patient Reported Functional Outcomes following Bennett's Fracture Repair

• Management of Scaphoid Fractures at a Tertiary Center in the UK: The University Hospital North Midlands Experience

• Metabolic Syndrome is an Independent Predictor of Unplanned Re-Operation After Operative Fixation of Forearm Fractures

• Minimally invasive corrective osteotomy of the proximal phalanx: A biomechanical study

• Minimally invasive screw fixation versus extension block pinning for mallet fracture

• Modified proximal capitate ostetotomy in a chronic isolated lunate dislocation - a new perspective in treatment of Kienbock disease?

• Modified thumb CMCJ stabilisation, accounting for contemporary biomechanical evidence: a case report applying systematic review findings

• New method for operative treatment of bony mallet fractures without transfixation of the distal interphalangeal joint - a biomechanical study

• Open CMC-1 fracture dislocation with avulsion of the thumb and laceration of first web space - severe hand trauma

• Open reduction and internal fixation for dorsal fracture dislocation of the proximal interphalangeal joint: a series of 35 cases

• Operative Treatment Options For Treating Pediatric Hand Fractures and Presentation of Results

• Outcome of modified hemihamate arthroplasty in patients presenting after six weeks of injury

• Outcome of partial excision arthroplasty of fifth carpometacarpal joint

• Percutaneous corrective osteotomy for malunited metacarpal and phalangeal fractures

• Persistent Medial Subluxation of the Ulna with Radiotrochlear Articulation

• Phalangeal neck fractures with volar displacement: description of the injury, and open reduction and internal fixation with interfragmentary screws

• Preliminary experience with the litos/ dynamic finger distractor for proximal interphalangeal joint fracture dislocations

• Preservation of metacarpophalangeal joint function in traumatic defects by metatarsophalangeal osteochondral transplantation

• Proximal phalangeal fractures - Is it worth fixing them?

• RADIOCARPAL FRACTURE DISLOCATIONS: A NEW CLASSIFICATION PROPOSAL

• Reconstruction of the collateral ligament for old dislocation of the DIP joint
• Regjoint disc spacer use in traumatic trans MCP joint amputation of index finger - CASE REPORT

• Relationship between width of volar locking plate and loss of reduction in distal radius fracture.

• Rotation correction plate in the hand - experience of 51 cases

• SAILOR FINGER

• Secondary dislocation after osteosynthesis of first metacarpal fractures - A retrospective analysis

• Stability of the distal radio-ulnar joint provided by the remnant distal radio-ulnar ligaments following ulnar styloid fracture including the fovea: A cadaveric biomechanical study

• Stunt specific traumata of the hand and wrist at professional stuntwomen and stuntmen

• Supplemental Method for Reduction of Irreducible Mallet Finger Fractures by the Two Extension Block Technique: The Dorsal Counterforce Technique

• Surgical outcome of mallet fracture using bone suture anchor

• Surgical repair of dorsal capsulo-ligamentous complex for dislocation of the thumb carpometacarpal joint

• Surgical technique to improve the reduction of fractures of distal radius by "Screw Post". Technique and patient follow-up

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• Surgical treatment for patients who fail to conserve the complete rupture of the collateral ligament in the proximal interphalangeal joint.

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• The outcome of bone graft surgery for non-union of fractures of the scaphoid

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• THE USE OF JOSHI EXTERNAL FIXATOR (JESS: JOSHI EXTERNAL STABILIZATION SYSTEM) IN HAND FRACTURES: THE BEST COST-BENEFIT RATIO

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• Treatment of closed unstable proximal phalangeal fractures in the long fingers with a reusable and inexpensive external fixation system

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• Treatment of mallet fractures with a transverse two-hole mini plate

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• Use of codilar mini plates for metacarpal fractures

• Volar fracture subluxation of PIP joint: A rare injury with a novel technique for treatment

• Volar plate buttress on bended Kirschner wire fixation for the displaced volar rim fragment of distal radius comminuted fracture

Humanitarian Aid

• A sustainable model for teaching the management of upper limb conditions in Low and Middle Income Countries - experience from the British Foundation of International Reconstructive Surgery and Training (BFIRST)

• Can we make a difference? The impact of handsurgery in chronic humanitarian conflicts and violent crisis

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• HAND SURGERY IN A FIELD HOSPITAL IN COX’S BAZAR, BANGLADESH

• Handsurgery under limited Conditions - Sense or Nonsense?

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• A free vascularized tibia graft for the infectious bony defect of upper limb

• APPLICATION OF CURRENT CONCEPTS IN HANDLING EXPOSED FRACTURE OF THE HAND; EXPERIENCE AND LOCAL RESULTS

• A review of 1000 upper limb infections and their management in a tertiary hand unit

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• Cat Bite: an underrated injury

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• Functional Outcome for Arthroscopic Treatment of Septic Arthritis of the Wrist

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• Impact of delayed presentation of patients with hand infections to hand surgeons: A retrospective study with 379 patients

• Infection rates following carpal tunnel decompression in the community. Experience from the
U.K.

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- Mycetoma of the upper extremity caused by Norcadia brasiliensis- Casereport
- Non-Tuberclous Mycobacterial tenosynovitis of the hand
- open arthrolysis on tuberculosis oriented elbow stiffness
- Propionibacterium acnes infection: a first reported case in the native wrist joint
- Pyoderma gangrenosum of the Hand. Case Report
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- Spread of hand infections: A Retrospective trial single center study
- Tetanus Prophylaxis in Open Hand Injuries: are the guidelines fit for purpose?
- Tetanus Quick Stik - is the NHS missing a trick?
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- The diagnosis and treatment for extra-pulmonary tuberculosis in the wrist and hand
- Treatment for flexor tendon tenosynovitis with rare non-tuberculous Mycobacteriosis (M. haemophilum) : A case report
- Treatment of Pyogenic Arthritis with Drainage Sinus in Digits
- Tree Man Syndrome: World's Third Reported Case

Innovation

- 10-year-follow-up after implantation of a custom made wrist prosthesis in a patient with giant cell tumor oft he distal radius
- Allogenic upper extremity transplantations - opportunities and limitations
- A new computational approach for fully automatic 3D preoperative planning of forearm osteotomies
- A new minimally invasive technique of the bone marrow concentrate injections improves hand function and reduces pain in the selected scaphoid nonunions
- A new non-invasive device in the treatment of severe finger contractures
- A NEW TECHNIQUE TO VERY CHRONIC UCL INJURY WITHOUT ARTHROSIS - AUGMENTATION WITH FIBER TAPE
- ANIMAL EXPERIMENTAL ASSESSMENT OF NERVE REGENERATION WITH A PROCESSED HUMAN UMBILICAL VESSEL USED AS A REGENERATION CHAMBER
- Application of a Porcine SIS Nerve Cap for Prevention of Neuromas and Associated Pain
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• Cell-loaded custom made fibrin glue nerve conduits optimize the repair of peripheral nerves in a sciatic nerve graft model in rats

• Comparison of radiation exposure of major organs between mobile CBCT and MDCT in hand and foot

• Complex osteotomies with patient specific guides

• CoNNECT: 6 month follow up data for a randomised controlled trial in digital nerve repair

• Efficiency, setup, impact and distribution of the procedures in a wide-awake surgical theater built within the department ward: a review of surgical procedures in a year period

• Eliminating Opioid Use for Postoperative Pain Management following Soft Tissue Surgery Produces Acceptable Outcomes When Performed Using Wide Awake Local Anesthesia No Tourniquet (WALANT)

• Endoscopic Cubital Tunnel Decompression - A True "Keyhole Technique" Using the Tulip ® Endoscope System.

• Extending application of wide-awake surgery: flap harvest and transfer in the hand in 39 patients

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• FREE VASCULARIZED INTERDIGITAL JOINT TRANSFER OF THE HAND: TWO CASES SERIES

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• Ligamentoplasty of the palmar ulnoral radial ligament at the distal radioulnar joint by bone ligament transplant from the extensor retinaculum - technique and preliminary results

• Maximum utility and certain safety for WALANT Technique in Hand Surgery

• MICROSURGERY TRAINING WITH SMARTPHONE

• Modified Bilhaut-Cloquet procedure: meticulous nail plasty, bone reconstruction and radial side incision

• Motor Imagery and Mental Practice as an augment for surgical training

• Myo electricity and 3D printing: a resource for revolutionary hand prosthetics

• NERVE REPAIR AND REGENERATION BY BIOLOGICAL TUBULIZATION OF AMNION MUSCLE COMBINED GRAFT (AMCG): FROM BENCH TO BEDSIDE

• NEW TECHNIQUE FOR RECONSTRUCTION OF DRUJ IN CHRONIC INSTABILITY WITHOUT ARTHROSIS

• New technologies in thumb base osteoarthritis: case report.

• Opportunities of distraction osteosynthesis in eliminating post-traumatic defects of middle
and distal finger phalanges

- Origami Medial Femoral Condyle Flap for Finger Joint Reconstruction  
  IFSSH19-66

- Painful end-neuromas of the upper limb treatment with fat graft. Evidences from an Italian multicentric stud  
  IFSSH19-1702

- Palmar oblique ligamentodesis for articular rescue in Bennet's fractures (P.O.L.A.R Technique)  
  IFSSH19-772

- Philological role of the upper limb and other parts of the body  
  IFSSH19-1896

- REDUCTION OF DELAYED PRESENTED MALUNITING FRACTURE BOTH BONES FOREARM IN A YOUNG CHILD USING JESS FIXATOR - AN INNOVATIVE TECHNIQUE  
  IFSSH19-62

- Reversed Dorsal Metacarpal Adipofascial Flap Resurfacing the Metacarpophalangeal Joint Capsule after Dorsal Capsulotomy in Posttraumatic Contractures  
  IFSSH19-930

- Severe PIP joint flexion contracture release by External Fixator - importance of post-operative management -  
  IFSSH19-397

- SL reconstruction with fibertape- a possibility of a gentle SL reconstruction? First experience with a new surgical technique  
  IFSSH19-1874

- Stress behavior in CMC thumb in Bennet's fracture: Finite element analysis  
  IFSSH19-784

- study of muscle redistribution technique in signal recognition of intelligent bionic hand  
  IFSSH19-193

- Surgical technique: about a new total and isoelastic wrist implant (Prosthelast®)  
  IFSSH19-160

- Technical tips for managing pilon proximal interphalangeal joint fractures.  
  IFSSH19-1886

- The classification of mutilated injuries of the hand and the methods and the clinical outcomes of such injuries reconstructed.  
  IFSSH19-175

- THE USE OF AUGMENTED REALITY AND ENHANCED TECHNOLOGIES IN HAND SURGERY: A SYSTEMATIC REVIEW  
  IFSSH19-781

- TIP FINGER TRAUMATIC INJURY.TREATMENT WITH SEMI-PERMEABLE MEMBRANE  
  IFSSH19-1146

- TREATMENT OF RADIOCUBITAL DISTAL INSTABILITY WITH ENDO BUTTON SYSTEM  
  IFSSH19-926

- Ultrasound-guided carpal tunnel release - a new technique by using a tissue-preserving cutting device  
  IFSSH19-1819

- Utility of Image Fusion System for 3D Preoperative Planning in the Osteosynthesis of Distal Radius Fractures  
  IFSSH19-402

- VERSATILITY OF THE HYBRID DINAMIC MINIFIX AND ITS MODIFICATION TECHNIQUE FOR METHACARPAL AND PHALANX FRACTURES: REVIEW OF 83 CASES.  
  IFSSH19-1433

- WALANT or Bier Block? A Prospective Cohort Study for Patients' Perspective on Anesthesia Type for Carpal Tunnel Surgery  
  IFSSH19-1069

- What is wrong with the total wrist arthroplasty? The alternative understanding of wrist biomechanics according to the mathematical conversion of a non-linear biomechanical system to linear one.  
  IFSSH19-167

- Wide Awake Local Anesthesia No Tourniquet (WALANT) versus General Anesthesia for Plating Distal Radius Fractures  
  IFSSH19-375

- WristArt is the new concept of the total wrist joint prosthesis based on a fractal theory of the biomechanics of the wrist joint.  
  IFSSH19-124
<table>
<thead>
<tr>
<th>Miscellaneous</th>
<th>IFSSH19-xxxx</th>
</tr>
</thead>
<tbody>
<tr>
<td>The musicians' hand - A survey focusing on the challenges in diagnostics and</td>
<td>IFSSH19-1756</td>
</tr>
<tr>
<td>therapy</td>
<td></td>
</tr>
<tr>
<td>Acquired hemophilia A as a rare cause of nontraumatic compartment syndrome and</td>
<td>IFSSH19-1621</td>
</tr>
<tr>
<td>hematoma formation</td>
<td></td>
</tr>
<tr>
<td>An increasing burden of bureaucracy due to health insurances in Swiss hand</td>
<td>IFSSH19-1190</td>
</tr>
<tr>
<td>surgery practice: a comparative study over 5 years</td>
<td></td>
</tr>
<tr>
<td>Cancellations in emergency plastic surgery: A three month experience in a</td>
<td>IFSSH19-1505</td>
</tr>
<tr>
<td>tertiary referral centre</td>
<td></td>
</tr>
<tr>
<td>Comparison of Hand Surgery Exposure in U.S. Plastic and Orthopaedic Residency</td>
<td>IFSSH19-1796</td>
</tr>
<tr>
<td>Programs</td>
<td></td>
</tr>
<tr>
<td>Effect of Insurance Status on Rate of Operative vs. Non-operative Management</td>
<td>IFSSH19-1356</td>
</tr>
<tr>
<td>of Clavicle Fractures</td>
<td></td>
</tr>
<tr>
<td>EXTRAVASATION OF RADIOGRAPHIC CONTRAST MATERIAL IN THE HAND: CASE REPORT AND</td>
<td>IFSSH19-896</td>
</tr>
<tr>
<td>LITERATURE REVIEW</td>
<td></td>
</tr>
<tr>
<td>HAND AND WRIST INJURIES FOLLOWING MOTORCYCLE TRAFFIC ACCIDENTS IN MEDAN,</td>
<td>IFSSH19-1840</td>
</tr>
<tr>
<td>NORTH SUMATRA, INDONESIA</td>
<td></td>
</tr>
<tr>
<td>HAND HOT CLINIC - WHAT do Patients think?</td>
<td>IFSSH19-1313</td>
</tr>
<tr>
<td>HAND INJURIES OF COAL MINERS IN SOUTHERN WEST VIRGINIA WITH A FOCUS ON INJURY</td>
<td>IFSSH19-327</td>
</tr>
<tr>
<td>LOCATIONS AND DISTANCE ANALYSIS TO TREATMENT FACILITIES</td>
<td></td>
</tr>
<tr>
<td>HAND IN STREET ART AROUND THE WORLD</td>
<td>IFSSH19-915</td>
</tr>
<tr>
<td>Knife Crime-related Injuries: Clinical, Operational and Financial Impact</td>
<td>IFSSH19-1706</td>
</tr>
<tr>
<td>Negative pressure suction treatment (NPST) of closeable wound using</td>
<td>IFSSH19-1248</td>
</tr>
<tr>
<td>disposable 50cc syringe</td>
<td></td>
</tr>
<tr>
<td>Pathology distribution of upper limb emergency cases admitted in plastic and</td>
<td>IFSSH19-1420</td>
</tr>
<tr>
<td>reconstructive surgery department of SCUB - eighteen months retrospective</td>
<td></td>
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<tr>
<td>study</td>
<td></td>
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<tr>
<td>Physical and Occupational Hand Therapy for Musicians - A Retrospective Study</td>
<td>IFSSH19-1102</td>
</tr>
<tr>
<td>of Patient-Perceived Outcome and Comparison to Symptomatic Treatment</td>
<td></td>
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<tr>
<td>PSYCHOLOGICAL IMPACT OF HAND INJURIES AMONG FOREIGN WORKERS IN SINGAPORE</td>
<td>IFSSH19-227</td>
</tr>
<tr>
<td>Radioscapholunate fusion under Wide Awake Surgery</td>
<td>IFSSH19-148</td>
</tr>
<tr>
<td>The 100 Most Impactful Papers in Hand and Upper Extremity Surgery over the</td>
<td>IFSSH19-21</td>
</tr>
<tr>
<td>Last 25 Years: A Bibliometric Analysis</td>
<td></td>
</tr>
<tr>
<td>The economic impact of anaesthesia methods used in hand surgery: global costs</td>
<td>IFSSH19-355</td>
</tr>
<tr>
<td>and operating room's throughput</td>
<td></td>
</tr>
<tr>
<td>The Effect of Financial and Material Support on Research Quality in Upper</td>
<td>IFSSH19-1939</td>
</tr>
<tr>
<td>Extremity Surgery: A Bibliometric Analysis of the Journal of Hand Surgery</td>
<td></td>
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<tr>
<td>Over a 10-Year Period</td>
<td></td>
</tr>
<tr>
<td>The experience of psychological distress in hand injured patients</td>
<td>IFSSH19-252</td>
</tr>
<tr>
<td>Habits of Surgeons</td>
<td></td>
</tr>
<tr>
<td>THERAPEUTIC APPROACH FOR ULNAR NERVE ENTRAPMENT IN PERFORMING MUSICIANS</td>
<td>IFSSH19-1089</td>
</tr>
<tr>
<td>The Safety of Hand and Upper-Extremity Surgical Procedures at a Freestanding</td>
<td>IFSSH19-1897</td>
</tr>
<tr>
<td>Ambulatory Surgery Center: An Updated Review of 41,751 Cases</td>
<td></td>
</tr>
</tbody>
</table>
• Treatment of acute forearm compartment syndrome after transradial coronary intervention IFSSH19-398

• USE OF BOTULINUM TOXIN A IN MANAGEMENT OF A COMPLEX VOLAR THUMB WOUND IN A SYSTEMIC SCLEROSIS PATIENT: CASE REPORT IFSSH19-253

• Validation of digital tourniquet pressures: T-Ring compared with conventional surgical glove IFSSH19-1291

• Wide-Awake Local Anesthesia No Tourniquet (WALANT) Versus Local or Intravenous Regional Anesthesia with Tourniquet In Elective Hand Surgeries: A Systematic Review And Meta-Analysis IFSSH19-1668

• Wide-aware surgical operations performed over a 25-month period in Tianjin: Analysis of applications and technical extension IFSSH19-19

• Wide Awake surgery, team work between surgeon, anesthetist and patient. IFSSH19-1122

**Nerve - Thoracic-Outlet-Syndrom**

• Learning curve and risks in carpal tunnel release ultrasounds guided versus endoscopy procedure, a comparative pilot study between a senior surgeon and a junior surgeon, 30 cases IFSSH19-585

• carpal tunnel and median nerve volumes changes before and after carpal tunnel surgery (Comparision of endoscopic and mini open tecnique ) IFSSH19-1763

• Clinical efficacy of collagen wrap following neurorrhaphy IFSSH19-85

• Diagnosis and treatment of median nerve entrapment at the elbow by isolated section of the lacertus fibrosus IFSSH19-1446

• Distribution and Surface Projections of Nerve Fascicles Innervating Lumbrical and interosseous Muscles IFSSH19-35

• Effectiveness of ultrasonography and nerve conduction studies in the diagnosing of carpal tunnel syndrome: clinical trial on accuracy IFSSH19-1995

• Functional outcome after endoscopic assisted release of the ulnar nerve for cubital tunnel syndrome: mid-to-long term results IFSSH19-26

• Implementation of a finger stump database after traumatic finger amputation - Concept evaluation and clinical consequences IFSSH19-1656

• Interest of endoscopic release in recurrent carpal tunnel syndrome IFSSH19-665

• Intra-operative Subluxation of the Ulnar Nerve: Use of a Triceps Sling Reconstruction to Avoid Transposition IFSSH19-526

• Multidisciplinary neuropathic pain management improves differential diagnosis considering thoracic outlet syndrome IFSSH19-470

• Neurogenic Thoracic Outlet Syndrome: Results from 52 surgically treated patients IFSSH19-1918

• Pedicled dectopectoral adipofascial flap and lipofilling techniques for management of recurrent thoracic outlet syndrome IFSSH19-1963

• Recurrent Compressive Neuropathies Treated with Neurolysis and Porcine Extracellular Matrix Nerve Wrap IFSSH19-324

• Smoking as risk factor for carpal tunnel syndrome: a birth cohort study IFSSH19-947

• Smoking is associated with ulnar nerve entrapment: a birth cohort study IFSSH19-762

• Surgical Management of Thoracic Outlet Syndrome: A Single-Centre Review IFSSH19-1044
14th IFSSH Congress
Index of topics (English)

- The Role of Neurolysis for Hourglass Constrictions in Chronic Parsonage-Turner Syndrome
  IFSSH19-788
- The Thoracic Outlet Syndrome - a new surgical approach
  IFSSH19-1393
- THORACIC OUTLET AND INTERSCALENE TRIANGLE VARIATIONS - ANATOMIC RESEARCH
  IFSSH19-1582

Nerve - Transfer

- 'WALANT Carpal Tunnel Release: Technical Considerations and Pain Outcomes
  IFSSH19-1310
- 10 years' single center experience over different surgical techniques in treatment of carpal tunnel syndrome.
  IFSSH19-1366
- 1015 peripheral nerve injuries of the upper extremity - Epidemiology and Cost analysis
  IFSSH19-1584
- Acute Compression of the Median Nerve at the Elbow by the Lacertus Fibrosus: Biomechanical Translation from Partial Rupture of the Biceps at the Myotendinous Junction.
  IFSSH19-749
- Age, pathogenesis and the period from onset to surgery significantly affects the severity of cubital tunnel syndrome
  IFSSH19-426
- Analysis of Brachial plexus injury following median sternotomy in cardiac surgery.
  IFSSH19-826
- An analysis of patient's and disease related factors predictive of the outcomes of surgery for carpal tunnel syndrome
  IFSSH19-438
- An analysis of the course of carpal tunnel syndrome before operation
  IFSSH19-439
- Anatomic distribution of the axillary nerve and its implications in the treatment of the paralytic shoulder
  IFSSH19-1849
- Anatomic Study of the Endoscopic Carpal Tunnel release
  IFSSH19-428
- Another neurotisation of n.axillaris
  IFSSH19-863
- Assessment of surgical treatment for carpal tunnel syndrome. Endoscopic vs Open release.
  IFSSH19-1783
- Bilateral Endoscopic Carpal Tunnel Release versus unilateral carpal tunnel release
  IFSSH19-1462
- Brachial Plexus Birth Injury: An Epidemiological State Level Analysis of Trends and Risk Factors
  IFSSH19-1070
- Brachial plexus injury associated with thoracic surgery
  IFSSH19-838
- BRAQUIAL PLEXUS: NEW ADULT AND CHILDREN DIAGRAM OF DIVISIONS AND CORDS.
  IFSSH19-1795
- Can cross sectional area of median nerve predict the prognosis of local steroid injection for carpal tunnel syndrome?
  IFSSH19-806
- Carpal Tunnel Syndrome - Should we treat it mini-open or endoscopic ?
  IFSSH19-1101
- Comparison between supercharged ulnar nerve repair by anterior interosseous nerve transfer and isolated ulnar nerve repair in proximal ulnar nerve injuries: A pilot study
  IFSSH19-1650
- Comparison between with or without axillary nerve neurotization for the management of upper brachial plexus palsy.
  IFSSH19-1175
- Comparison of ultrasound-guided versus blind corticosteroid injection for carpal tunnel syndrome: a prospective randomized trial
  IFSSH19-460
- Concomitant Ipsilateral Endoscopic Carpal and Cubital Tunnel Release: A Single-Center Review of 103 Consecutive Cases
  IFSSH19-1954
- CONNECT : CONduit Nerve approximation versus Neurorrhaphy Evaluation of Clinical
  IFSSH19-1454
14th IFSSH Congress
Index of topics (English)

outcome Trial

- Current algorithms for obstetric palsy are too aggressive. A practical and conservative approach using triceps and wrist extension assessment. IFSSH19-262
- Diagnosis und therapy of isolated flexor pollicis longus fascicle lesions IFSSH19-1907
- Diagnostic Significance of Median Nerve Strain and Applied Pressure Measurement after Carpal Tunnel Release IFSSH19-111
- Does timing of carpal tunnel release influence the results? IFSSH19-1888
- Do we need an opioid for the pain control after carpal tunnel release? : a randomized controlled study IFSSH19-1514
- Effectiveness of operative treatment in chronic long-lasting carpal tunnel cases IFSSH19-1761
- Endoscopic Assisted Exploration of the Axillary Nerve through a Posterior Open Approach: first clinical experience IFSSH19-214
- EPINEPHRINE-LOCAL ANESTHESIA - NO TOURNIQUET FOR CARPAL TUNNEL RELEASE - 66 CASES IFSSH19-646
- Excellent functional recovery of posterior interosseous nerve injury after periprosthetic radial fracture by using antebrachial cutaneous nerve graft IFSSH19-1547
- Exploring the Axillary Nerve through the Deltopectoral and Axillary approaches: Is there a true "Blind Spot"? IFSSH19-758
- Familial occurrence of carpal tunnel syndrome IFSSH19-440
- Histological Evaluation of Processed Nerve Allograft Following Nerve Banking in Revision Limb Salvage Procedure. IFSSH19-676
- How does thenar atrophy influence the outcome of carpal tunnel release? IFSSH19-1092
- How successful are intercostal nerve transfers to restore elbow flexion in plexus palsy? IFSSH19-1934
- How to deal with Selective Nerve Transfers - An Animal Study IFSSH19-1937
- How trapeziometacarpal arthritis and scaphotrapeziotrapezoidal arthritis affect the postoperative recovery of carpal tunnel syndrome. IFSSH19-632
- Iatrogenic Injuries of Motor or Mixed Motor/Sensory Nerves IFSSH19-1130
- Iatrogenic nerve injury following steroid injection for thumb basal joint arthritis - A rare complication IFSSH19-774
- Is Carpal Tunnel Syndrome (CTS) two different diseases? A Joint Analysis of 2 Longitudinal Cohort Studies from USA and England Totalling 935,000 Cases IFSSH19-557
- Is it necessary to use the entire root as donor when doing contralateral C7 nerve transferring to median nerve? IFSSH19-12
- LONG HEAD OF TRICEPS TRANSFER TO GAIN ELBOW FLEXION in 25 PATIENTS IFSSH19-850
- Longterm outcome after Ulnar Tunnel Release IFSSH19-1437
- Lower Trapezius Transfer for Triceps Function in Obstetric Palsy ; Review of Other Methods and Presentation of 15 Cases. IFSSH19-846
- Management of shoulder internal rotation limitation in obstetrical palsy. IFSSH19-851
• Median-to-radial nerve transfer - our experiences IFSSH19-1720
• Median Nerve Motor Branch Transfer for Treatment of Severe Cubital Tunnel Syndrome IFSSH19-1251
• Motor innervation pattern of C7 nerve root and clinical study of its reinnervation in BPAI IFSSH19-360
• Nerve Diameter of the Hand: A Cadaveric Study IFSSH19-1412
• Nerve transfer for brachial plexus injuries: new surgical technique IFSSH19-1844
• Nerve transfer for recovery of protective sensitivity in the radial aspect of the hand. IFSSH19-1627
• Nerve transfer for recovery of protective sensitivity in the ulnar aspect of the hand. IFSSH19-1628
• Nerve transfers for non traumatic diseases in children IFSSH19-466
• Nerve transfers to the deltoid: Evolution of a surgical technique IFSSH19-1976
• NERVE TRANSFER TO RESTORE THENAR MUSCLE IN LOW MEDIAN NERVE PALSY IFSSH19-1109
• Neural Perforasomes of the Upper Extremity IFSSH19-18
• Non-vascularized ulnar nerve graft reconstruction as an efficient treatment for brachial plexus paralysis IFSSH19-681
• Oberlin technique assisted with intraoperative nerve recording IFSSH19-1107
• Outcomes of Isolated Spinal Accessory to Suprascapular Nerve Transfers for Brachial Plexus Birth Injury: A Multi-Center Study IFSSH19-1917
• Outpatient neuromodulation may avert the need for surgery in patients with painful cutaneous neuromas IFSSH19-390
• Peripheral nerve torsion IFSSH19-695
• Porcine submucosa extracellular matrix nerve wrapping of scarred nerves IFSSH19-1953
• Posterior interosseous nerve to the superficial terminal branch of the ulnar nerve transfer at the distal third of the forearm through a single anterior approach: Anatomical feasibility study IFSSH19-162
• Predictors of outcome in untreated carpal tunnel syndrome: results of a longitudinal cohort study IFSSH19-144
• Prevalence of neuropathic pain in patients who underwent Carpal Tunnel Release (CTR) and outcomes of surgery on neuropathic pain IFSSH19-1031
• Recovery of Infraclavicular Brachial Plexus Injury after Anterior Shoulder Dislocation IFSSH19-1241
• Results of finger extension reconstruction in hemiplegic patients after stroke by transferring the flexor carpi radialis branch to the posterior interosseous nerve IFSSH19-291
• Return to employment after carpal tunnel release (REACTS): a prospective cohort study IFSSH19-657
• Risk Factors of Carpal Tunnel Syndrome for Male Patient Undergone Carpal Tunnel Release IFSSH19-188
• Secondary Traumatic Stress and Depression in Obstetrical Providers After Shoulder Dystocia and Brachial Plexus Birth Palsy Deliveries IFSSH19-1314
• Short-term Course of Artificial Nerve Graft for Old Digital Nerve Injury. A Report of 2 Cases. IFSSH19-1228
• Simultaneous Multiple Long Sural Nerve Cable Graft with Saphenous Vein Graft and Staged Tendon Transfer for Brachial Plexus Injury with Ischemic Injury IFSSH19-1269
<table>
<thead>
<tr>
<th>Topic</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Socioeconomic Factors predicting Outcome after Open Carpal Tunnel Release</td>
<td>IFSSH19-881</td>
</tr>
<tr>
<td>Surgical treatment of proximal nerve entrapment at the elbow by release of the lacertus fibrosus release with ultra sound guided surgery and WALANT</td>
<td>IFSSH19-1889</td>
</tr>
<tr>
<td>Targeted Muscle Reinnervation at the Time of Amputation Reduces Pain Severity and Behavior in Upper Extremity Amputations</td>
<td>IFSSH19-512</td>
</tr>
<tr>
<td>The effects of porcine extracellular matrix nerve wrap as an adjunct to primary epineurial repair</td>
<td>IFSSH19-906</td>
</tr>
<tr>
<td>The Endoscopic Carpal Tunnel Release in 175 Patients: Learning Curve, Complications and 1.5 Year Review</td>
<td>IFSSH19-1884</td>
</tr>
<tr>
<td>The Neurophysiology of Peripheral Nerve Transfers</td>
<td>IFSSH19-1006</td>
</tr>
<tr>
<td>THE USE OF RADIAL SENSITIVE NERVE GRAFT IN NEUROTIZATION OF MUSCULOCUTANEOUS NERVE FOR TREATMENT OF BRAQUIAL PLEXUS AVULSIONS</td>
<td>IFSSH19-682</td>
</tr>
<tr>
<td>The use of the hipotenar fat flap for recurrence of the carpal tunnel syndrome surgery</td>
<td>IFSSH19-862</td>
</tr>
<tr>
<td>Topographical analysis of Pacinian corpuscle in the pulp of human cadaver finger tip pulp: A pilot cadaver study</td>
<td>IFSSH19-1048</td>
</tr>
<tr>
<td>Transfer of contralateral C7 nerve to upper trunk via prespinal route for neuropathic pain after total brachial plexus avulsion: A novel and effective approach to relieving the intractable pain</td>
<td>IFSSH19-928</td>
</tr>
<tr>
<td>TRANSFER OF THE TRAPEZIUM MUSCLE FOR EXTERNAL SHOULDER ROTATION GAIN IN PATIENTS WITH BRACHIAL PLEXUS INJURIES</td>
<td>IFSSH19-1792</td>
</tr>
<tr>
<td>Treatment for iatrogenic spinal accessory nerve injury by a part of ipsilateral posterior C7 root transfer</td>
<td>IFSSH19-1551</td>
</tr>
<tr>
<td>Triple nerve transfers for the C5/6 Brachial Plexus injury</td>
<td>IFSSH19-1000</td>
</tr>
<tr>
<td>Ulnar nerve decompression or transposition under wide-awake local anesthesia without tourniquet management of cubital tunnel syndrome</td>
<td>IFSSH19-1859</td>
</tr>
<tr>
<td>Use of reverse end-to-side suture to create a supercharge in spinal accessory nerve transfer to suprascapular nerve</td>
<td>IFSSH19-1103</td>
</tr>
<tr>
<td>Very distal sensory nerve transfers in high median nerve lesions</td>
<td>IFSSH19-1639</td>
</tr>
<tr>
<td>Wartenberg's Syndrome: Case Series</td>
<td>IFSSH19-127</td>
</tr>
<tr>
<td>What factors influence the need for revision surgery? A 19-year longitudinal cohort study of 855,832 carpal tunnel decompression surgeries in England.</td>
<td>IFSSH19-658</td>
</tr>
<tr>
<td>Which factors affect the rate of surgery performed in patients with carpal tunnel syndrome?</td>
<td>IFSSH19-542</td>
</tr>
<tr>
<td>Wide Awake and ultrasound guided release of the lacertus fibrosis for chronic exertional compartment syndrome of the forearm. A prospective study.</td>
<td>IFSSH19-1802</td>
</tr>
</tbody>
</table>

**Osteoarthritis**

- 5 to 7 years results using a mini-TightRope (Arthrex) alone to suspend the thumb metacarpal after a trapeziectomy in the treatment of thumb carpometacarpal osteoarthritis: proving the 5-year successful outcomes of this method. | IFSSH19-1113|
- Addition-subtraction osteotomy with ligamentoplasty for symptomatic trapezial dysplasia with metacarpal instability: a 10-year follow-up. | IFSSH19-216|
- Advantages of Arthroplasty vs Trapeziectomy for the Treatment of Thumb Carpometacarpal OA | IFSSH19-1499|
Joint Osteoarthritis.

• An alternative direction of the borehole for ligament reconstruction after resection of the trapezium in basal joint osteoarthrosis: a comparative study in 32 cadaver hands
  IFSSH19-729

• Analysis of BSSH UK Hand Registry shows no difference in outcomes between simple trapeziectomy and trapeziectomy plus LRTI
  IFSSH19-918

• A new type of silicone implant for the thumb CMC joint osteoarthritis in grade III and IV. Four years follow-up.
  IFSSH19-1695

• Annual trends in surgery for osteoarthritis of carpometacarpal joint of the thumb: Analysis of a national database in Japan
  IFSSH19-463

• ARPE-prosthesis: Clinical and radiographic relevance of intra-operative fluoroscopy guided orientation of the cup. Comparison to retrospective data with a minimal follow-up of ten years.
  IFSSH19-1738

• Arthroplasty of the First Carpo-metacarpal Joint: a randomized, double blinded clinical trail
  IFSSH19-2001

• Arthroscopic distal hemitrapeziectomy versus open distal hemitrapeziectomy without interposition in osteoarthritis of the first CMC joint: Two year follow up results of a randomized controlled trial
  IFSSH19-733

• Arthroscopic partial resection arthroplasty and allograft tendon interposition in stage III trapeziometacarpal osteoarthritis
  IFSSH19-1867

• Arthroscopy in thumb carpometacarpal joint osteoarthritis.
  IFSSH19-1466

• Articular complications after modern wrist arthroplasty surgery
  IFSSH19-993

• Basilar thumb arthritis: early mobilization versus splinting after trapeziectomy with ligament reconstruction and tendon interposition
  IFSSH19-1235

• Biomechanical Comparison of Trapeziectomy and Suture button suspension-plasty versus Trapeziectomy and FCR ligamentous reconstruction for Thumb Carpometacarpal Arthritis
  IFSSH19-656

• Can Patterned Osteophyte Growth about the First Carpometacarpal Joint Provide Any Insight into the Etiology of Thumb Osteoarthritis?
  IFSSH19-2009

• Changes in joint distance during flexion and abduction of the thumb carpometacarpal joint
  IFSSH19-358

• Clinical and Radiological Outcomes of a Trapeziometacarpal Interposition Implant
  IFSSH19-799

• Clinical characteristics of primary and post-traumatic osteoarthritis of the distal radioulnar joint
  IFSSH19-1155

• Clinical Results of Interposition Arthroplasty with or without Intermetacarpal Ligament Reconstruction for Thumb Carpometacarpal Osteoarthritis: a retrospective comparison study
  IFSSH19-559

• Cost-utility analysis of surgery for trapeziometacarpal osteoarthritis
  IFSSH19-539

• Costochondral interposition arthroplasty in treatment of basal thumb arthritis
  IFSSH19-1050

• Costs of productivity loss after surgery for first carpometacarpal osteoarthritis (CMC-1 OA)
  IFSSH19-1566

• Current Trends in Operative Treatment of Carpometacarpal Osteoarthritis: A Survey of European Hand Surgeons
  IFSSH19-97

• Current Trends in Operative Treatment of Scaphotrapeziotrapezoid Osteoarthritis: A Survey among European Hand Surgeons
  IFSSH19-98

• Darrach's procedure in total wrist arthroplasty
  IFSSH19-660
14th IFSSH Congress
Index of topics (English)

- Denervation of the MCP and the PIP joint - An effective treatment of osteoarthritis in the hand
- Denervation of the thumb carpometacarpal joint in the case of osteoarthritis: results of a controversial treatment option
- Determinants of subjective and clinical outcomes one year after proximal interphalangeal joint surface replacement
- Developing a Core Outcome Set for the Research and Treatment of Thumb Carpometacarpal Osteoarthritis: A Delphi Study
- Distal interphalangeal joint arthrodesis using the ADS memory staple - The London Experience
- Distal interphalangeal joint osteoarthritis: Silicone arthroplasty versus screw arthrodesis
- DISTAL RADIOLUNAR JOINT REPLACEMENT WITH WRIST ARTHRODESIS A LONG TERM FOLLOW UP
- Does Ligament Reconstruction and Tendon Interposition (LRTI) destabilise the carpus?
- Does pre-operative depression and anxiety affect outcome after trapeziectomy?
- Earlier Intervention for Osteoarthritis of the Basal Joint Is Reflected to More Optimal Outcome
- Early result of Pyrodisc interposition arthroplasty for advanced thumb CMC joint osteoarthritis
- Early results of first patients with Motec wrist arthroplasty in Latin America
- Effective Period of Conservative Treatments in Patients with Acute Calcific Periarthritis of the Hand
- Effect of proximal interphalangeal (PIP) joint fusion on grip force and load distribution of the hand
- Expectations and illness perceptions influence the success of non-operative treatment of first carpometacarpal osteoarthritis (CMC-1 OA)
- Factors associated with surgical intervention in osteoarthritis of the thumb carpometacarpal joint
- Fat graft interposition arthroplasty as a source of stem cells in radiocarpal arthrofibrosis treatment. A Case report of a novel technique.
- Functional outcome of distal interphalangeal joint arthrodesis
- High reoperation rate in 13 total wrist arthroplasties after 4 years
- Ideal cup position in trapeziometacarpal joint arthroplasty: a biomechanical cadaver study
- Injection therapy for base of thumb osteoarthritis: a systematic review and meta-analysis
- In Vivo Changes of Subchondral Bone and Cartilage in First Carpometacarpal Joint Osteoarthritis Across Severity Stages
- Is hand dominance and a history of hand injury associated with a higher prevalence of hand pain and osteoarthritis in cricketers?
- JOINT SPACER - A NOVEL THERAPEUTIC OPTION FOR RHIZARTHRROSIS
- Ligament constraint of the first carpometacarpal joint
• Ligament Reconstruction and Tendon Interposition and Partial Trapezoidectomy for Pantrapezial Arthritis

IFSSH19-782

• Long-term Radiographic Adaptations to the Stress of High-Level and Recreational Rock Climbing in young Athletes

IFSSH19-2007

• Long-term results after total wrist fusion using the AO-plate

IFSSH19-980

• LONG-TERM RESULTS OF TREATMENT OF SCAPHO-TRAPEZIUM-TRAPEZOID (STT) ARTHRITIS BY USE OF PYROCARBON IMPLANT (STPI)

IFSSH19-1778

• May be the arthroplasty with spacer the best solution of CMC arthrosis in under seventy patients.

IFSSH19-1772

• Medium to long term outcomes of pyrocarbon total PIP joint arthroplasty

IFSSH19-692

• Midterm results of scaphoid excision and bicolumnar carpal fusion using retrograde headless screws

IFSSH19-1150

• Modified Eaton-Littler’s reconstruction for chronic instability of the carpometacarpal joint of the thumb: A report of 2 cases

IFSSH19-56

• Nitinoll Intramedullary Fixation for DIP Arthrodesis Restores Biomechanically Stable Pinch and Grasp

IFSSH19-866

• Our results with distal radioulnar joint hemiarthroplasty

IFSSH19-663

• Patient-reported outcomes and utility of trapeziectomy with ligament reconstruction and tendon interposition

IFSSH19-90

• PIP joint lateral stability in healthy joints compared to surface replacement and silicone arthroplasty

IFSSH19-537

• Prospective Cohort Study of the NuGrip CMC Implant for Carpometacarpal Osteoarthritis

IFSSH19-115

• Prospective study of Stage III Thumb Carpometacarpal Joint Osteoarthritis Treated with Arthroscopic Arthrodesis

IFSSH19-1208

• Prothetic Arthroplasty of the proximal interphalangeal joint using a modular surface gliding implant: A retrospective study

IFSSH19-271

• Proximal Interphalangeal Joint(PIPJ) Arthroplasty for Osteoarthritis(OA) of the Index Finger

IFSSH19-1563

• Psychological factors are more strongly related to pain in CMC-1 osteoarthritis patients than radiographic features

IFSSH19-847

• Pyrocarbon disc interposition for CMC thumb joint osteoarthritis; Difference in use of the FCR or APL tendon?

IFSSH19-1562

• Pyrocarbon Interposition Arthroplasty for The Thumb Carpo-Metacarpal Joint Osteoarthritis - mid to long term outcome analysis

IFSSH19-1293

• Pyrocarbon Interposition with PyroDisk Implant for Trapeziometacarpal Osteoarthritis: A Ten-Year Follow-Up study

IFSSH19-909

• RADIOCARPAL WRIST ARTHRODESIS WITH CANNULATED SCREWS, CASE REPORT

IFSSH19-778

• Restoring Functional Motion in the Arthritic Wrist through Circumduction

IFSSH19-864

• Revision of trapeziometacarpal prosthesis by replacement with another prosthesis: a report of 8 cases.

IFSSH19-464

• Risk factors and outcomes of revision trapeziometacarpal arthroplasty

IFSSH19-538
• Scaphoidectomy and double column arthrodesis for SLAC and SNAC wrist

• Shorter versus longer immobilization after surgery for thumb carpometacarpal osteoarthritis: a propensity score matched study

• Short to mid-term result of Pyrocarbon implant in the TMC 1 joint for osteoarthritis

• Stage III basal joint arthritis of the thumb: Clinical and radiological outcome after total trapeziectomy and ligament reconstruction and tendon interposition (LRTI) with partial Flexor carpi radialis (FCR) tendon

• Surgical technique of the trapeziometacarpal and scapho-trapezoid-trapezoidal pyrocarbon "burger arthroplasty"

• Surgical Treatment of DIP Ganglion by Excision and DIP Synovectomy without skin flap: 10 cases

• Survival of Apts Distal Radioulnar Joint (DRUJ) Implant Arthroplasty.

• Suture button suspensioplasty vs Sigfusson-Lundborg ligamentoplasty for basilar thumb arthritis treatment

• Ten-year outcomes of the Arpe prosthesis to treat osteoarthritis of the trapeziometacarpal joint

• The management of thumb base osteoarthritis - A multicentre service evaluation project

• Therapeutic interventions for osteoarthritis of the wrist: a systematic review

• The Results of Surgical Treatment for Osteoarthritis of the Thumb Trapeziometacarpal Joint: The Correlation With Tenosynovitis

• The Results of Surgical Treatment for Osteoarthritis of the Thumb Trapeziometacarpal Joint: The Correlation With Trapezial Space Height

• Thumb IP joint arthroplasty with a surface gliding implant: One-year follow-up

• TOTAL ARTHROPLASTY OF THE PROXIMAL INTERPHALANGEAL JOINT USING SEMI CONSTRAINED PROSTHESIS: CASE SERIES

• Total Thumb Trapeziometacarpal Joint Arthroplasty: A Retrospective Study of 12 Prostheses Implanted with WALANT Technique.

• Total Wrist replacement using the MOTEC® PEEK Cup

• Trapeziometacarpal and scapho-trapezoid-trapezoidal pyrocarbon "burger arthroplasty" for early peritrapezial osteoarthritis

• Trapeziometacarpal arthroplasty, Case report with Ball and socket type prostheses.

• Trapezium bone resection arthroplasty and suspension with suture-button for the treatment of trapezium-metacarpal osteoarthritis: long-term follow-up in a Colombian cohort

• Treatment of osteoarthritis of the carpometacarpal joint of the thumb with trapeziectomy and tendon allograft interposition.

• What is the role of psychological distress, pain catastrophizing and illness perceptions in pre-operative pain of CMC-1 patients?

• Wide-awake local anesthesia no tourniquet (WALANT) proximal row carpectomy

• Wrist replacement of keramik implantates
### Rheumatoid

- A new approach in treatment of rheumatoid arthritis in metacarpophalangeal and interphalangeal joints
- Boutonniere deformity of the rheumatoid thumb - Radiographic evaluation of Swanson hinge toe implant arthroplasty
- Combined Total Wrist Arthroplasty with Ulna Head Prosthesis in a Rheumatoid Patient with gross Distal Radio-Ulnar Joint instability using Interosseous Membrane Reconstruction with Brachioradialis tendon graft
- Computed tomography-based three-dimensional preoperative planning for total wrist arthroplasty
- Functional and radiographic assessment in rheumatoid patients submitted to total wrist arthroplasty - 4 years of follow up
- Interposition arthroplasty with the Amandys pyrocarbon implant in rheumatoid wrist
- Mid-term results of K now total elbow arthroplasty
- Mid-to-long term Outcomes of Convertible Total Elbow Arthroplasty for Patients with Rheumatoid Arthritis
- Multiple flexor tendon rupture in a 34-year old patient with rheumatoid arthritis.
- Reconstruction of Extensor Tendons in Multiple Subcutaneous Rupture of Rheumatoid Fingers
- Risk factors contributing to the early implant fracture of AVANTA silicone implant for the treatment of MP joint arthroplasty
- Soft tissue reconstruction for preserving metacarpophalangeal joints in the rheumatoid hand
- Study of independent extension of little finger after reconstruction of extensor tendon rupture of ring and little fingers in rheumatoid arthritis
- Ten-year follow-up results of rheumatoid wrist surgery without prosthesis.
- Total wrist arthroplasty in rheumatoid and post traumatic wrist: long term follow-up.
- **ULNAR HEAD PROSTHESIS IN RHEUMATOID ARTHRITIS**

### Scar and Aesthetics

- Aesthetic reconstruction of fingers with re-shaped 2nd toe in one-stage operation
- Bilhaut-Cloquet procedure: the type and aesthetic evaluation of nail deformity
- Endoscopic carpal tunnel release with or without a suture. Is there a difference?
- Functional and aesthetic reconstruction of the digital flexion contracture with full-thickness plantar skin grafting in children
- nail unit matrix transplantation- aesthetic surgery after traumatic amputation of the distal phalanx
- Precision in the design and division of the thenar flap:Achieving a good result without donor complications or PIPJ contracture
- The reconstruction of lateral nail fold in radial polydactyly with a common nail
- **USE OF BIOLOGICAL THERAPY IN POST-SURGICAL SCAR ADHERENCES IN PERFORMING MUSICIANS**
<table>
<thead>
<tr>
<th>Soft Tissue Reconstruction and Microsurgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>• &quot;Less than ten&quot; - Amputation injuries among surgeons</td>
</tr>
<tr>
<td>• &quot;Spare parts surgery&quot; - functional saving for long segmental defects. A ten years long follow up study for the cross hand replantation.</td>
</tr>
<tr>
<td>• Advancement of Homodigital Neurovascular Island Flaps</td>
</tr>
<tr>
<td>• Aesthetic and functional Reconstruction after fingertip injuries: Pivot flap technique</td>
</tr>
<tr>
<td>• Aesthetic reconstruction of palmar soft tissue defects with medial plantar artery perforator flap</td>
</tr>
<tr>
<td>• Aesthetic reconstruction of thumb or finger partial pulp defect with free lateral great toe flap</td>
</tr>
<tr>
<td>• Analysis of the risk factors that determine composite graft survival for fingertip amputation</td>
</tr>
<tr>
<td>• Anatomical study of dorsal hand vascular network and clinical application of a new multiple intermetacarpal perforators flap.</td>
</tr>
<tr>
<td>• Anatomical Study of Periosteal Vascularization of the Forearm: Design of Periosteal Vascularized Flaps and Clinical Application</td>
</tr>
<tr>
<td>• A novel method of finger tip reconstruction with composite graft</td>
</tr>
<tr>
<td>• Application of reverse homodigital flap from the dorsolateral aspect of proximal finger based on a digital artery perforator in the middle phalanx</td>
</tr>
<tr>
<td>• Artery-only fingertip replantation distal to lunula: A retrospective analysis of clinical results</td>
</tr>
<tr>
<td>• A Study of Impact of Prolonged Repetitive Training on Microsurgical Skills of Residents in a Laboratory Setting</td>
</tr>
<tr>
<td>• a treatment of the severed palm with degloved or avulsed skin</td>
</tr>
<tr>
<td>• Avoiding vein grafts for arterial repair in avulsion amputations of thumb - Case series</td>
</tr>
<tr>
<td>• Biomechanical Assessment of Suture Pullout Strength: A Comparison of the Anchor Suture and the Modified Kessler Techniques</td>
</tr>
<tr>
<td>• Capitellum fracture sequelae treatment</td>
</tr>
<tr>
<td>• Choosing the Flap in Complex Injuries of the Hand</td>
</tr>
<tr>
<td>• Clinical studying on the reconstruction of extremity skin defect by free iliogroin skin flap</td>
</tr>
<tr>
<td>• Combination foot flaps for digit reconstruction: A prospective analysis of 37 cases</td>
</tr>
<tr>
<td>• Combination of two vascularized bone grafts for closing a huge defect of humerus. A case presentation.</td>
</tr>
<tr>
<td>• Combined thenar and hypothenar hammer syndromes in a professional baseball player: a case report</td>
</tr>
<tr>
<td>• Comparative study on two models of arterialized venous flap in minipigs</td>
</tr>
<tr>
<td>• Comparison of clinical and functional outcomes of two type of homodigital neurovascular flaps for fingertip reconstruction: a six year follow up.</td>
</tr>
<tr>
<td>• Comparison of surviving rates of digital replantation after more than 10 hours of delay versus immediate replantation</td>
</tr>
<tr>
<td>• Complications in severe upper limb open injury treated by a Katsaros flap</td>
</tr>
<tr>
<td>Topic</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Composite Graft and Temporary Dermo-dermal Fusion to the Palm - A Treatment Option of Fingertip Amputation in Children</td>
</tr>
<tr>
<td>Direct coaptation in the microsurgical reconstruction of obstetric brachial plexus lesions</td>
</tr>
<tr>
<td>Distal Digital Nerve Repair Using Nerve Allograft with a Dermal Substitute</td>
</tr>
<tr>
<td>Distally based sural neuro-fasciocutaneous perforator flap for foot and ankle reconstruction: surgical modifications for flap pedicle and donor site closure without skin graft</td>
</tr>
<tr>
<td>Does a vascularized proximal interphalangeal emi-joint transfer worth the efforts?</td>
</tr>
<tr>
<td>Donor site morbidity after sural nerve graft harvesting</td>
</tr>
<tr>
<td>Dorsal hand coverage. Aesthetic and functional outcome.</td>
</tr>
<tr>
<td>Early Amputation vs Limb Salvage: Characterization of Procedural Management for Limb Threatening Upper Extremity Injuries in Hospital Days 1 to 30</td>
</tr>
<tr>
<td>Early Experience with a Novel Synthetic Scapholunate Ligament Construct</td>
</tr>
<tr>
<td>Evaluation of Factors Influencing Nerve Recovery after Reconstruction of Nerve Transection Injuries with Processed Nerve Allograft</td>
</tr>
<tr>
<td>Evaluation of Nerve Reconstruction in the Hand by Gap Length with Processed Nerve Allograft</td>
</tr>
<tr>
<td>Evolution of skin lesion healing in rats submitted to treatment with sterile plastic as a dermal substitute.</td>
</tr>
<tr>
<td>Experience with the use of semi-occlusive dressing and splint caps for the management of fingertip amputation injuries</td>
</tr>
<tr>
<td>Fascia flaps: local and pedicled alternatives</td>
</tr>
<tr>
<td>FIBULO SCAPHO LUNATE ARTHRODESIS: an option in case of important loss of substance of the distal radius.</td>
</tr>
<tr>
<td>Fingertip Amputation - Different Injuries, Different solutions</td>
</tr>
<tr>
<td>Fingertip reconstruction with V-Y advance flaps combined with bone and nail bed grafts after amputation</td>
</tr>
<tr>
<td>First web-space commissure reconstruction with a precisely designed morphometric free flap</td>
</tr>
<tr>
<td>Flap reconstruction and salvage of the diabetic foot - early results of a single surgeon.</td>
</tr>
<tr>
<td>Free flap transfers to repair the defects of fingers using the proper digital artery and volar digital veins</td>
</tr>
<tr>
<td>Frozen Amputated fingers - Replantation and Other treatments</td>
</tr>
<tr>
<td>Frozen thumb replantation: cases report</td>
</tr>
<tr>
<td>Full-Length Finger Reconstruction for Proximal Amputation With Expanded Wraparound Great Toe Flap and Vascularized Second Toe Joint</td>
</tr>
<tr>
<td>Functioning lymphatics transfer for treatment of severe upperarm lymphedema</td>
</tr>
<tr>
<td>HAND REANIMATION: FREE FUNCTIONAL GRACILIS VERSUS TRANSFER OF THE BICEPS TO THE LONG FLEXORS OF DIGITS AND THE FLEXOR POLlicis LONGUS</td>
</tr>
<tr>
<td>Harvesting the sural flap with covered pedicle: outcomes and advantages in 7 cases</td>
</tr>
</tbody>
</table>
• Hybrid vascularized bone and soft tissue transfer for massive bone and skin defect of the digit. -Surgical Technique and mid-term follow up-

IFSSH19-1154

• Identification of perforant to the realization of hypothenar fat flap in the management of the recidivant carpal tunnel syndrome

IFSSH19-1503

• Improving Functional and Aesthetical Result of Radial Forearm Flap

IFSSH19-972

• Incidence of peripheral nerve trauma in England between 2006-2016 - time to increase resources for peripheral nerve trauma of the hands and upper limb?

IFSSH19-1118

• Innervated Reverse Digital Artery Island Flap through Bilateral Neuorrhaphy using Direct Small Branches of the Proper Digital Nerve

IFSSH19-1216

• Late outcomes after hand replantation

IFSSH19-441

• LONG-TERM OUTCOME OF INNERVATED DIGITAL ARTERY PERFORATOR FLAP

IFSSH19-1430

• Long Term Results of First Major Upper Extremity Replantations In Turkey: A Replantation Under Direct Vision of 42 Years versus Another With Microsurgery of 37 Years

IFSSH19-1672

• MICROSURGICAL FLAPS IN GENERAL ORTHOPAEDIC SURGERY: INDICATIONS AND RESULTS

IFSSH19-1081

• Modified abdominal flaps for reconstruction of degloving injuries of multiple fingers

IFSSH19-195

• Modified arterialized venous flap for the reconstruction of 12 digits

IFSSH19-553

• Modified reconstruction of the defect of the distal thumb

IFSSH19-174

• Multi-lobed groin flaps for coverage of extensive soft tissue defects involving multiple digits and palm or dorsal hands

IFSSH19-599

• Nailbed regeneration in Pediatric Patients

IFSSH19-519

• Nailbed trauma: a review of 76 cases

IFSSH19-517

• Non-Contrast Magnetic Resonance Imaging of Perforators in Preoperative Evaluation of Anterolateral Thigh Flaps

IFSSH19-600

• Online patient information on Hand Transplantation: How reliable is it for facilitating shared decision making?

IFSSH19-409

• Opinion of surgeons worldwide on management of fingertip injuries

IFSSH19-414

• Osseointegrated thumb prosthesis as an alternative for microsurgical thumb reconstruction

IFSSH19-1930

• Our experience of surgical treatment of old instability of finger joints

IFSSH19-1635

• Outcomes after Long Gap Allograft Reconstruction in the Upper and Lower Extremities: A Retrospective Review

IFSSH19-672

• Outcomes after Long Nerve Gap Reconstructions in the Upper Extremity with Processed Nerve Allograft

IFSSH19-1041

• Outcomes and impact of fingertip amputation injuries in a local tertiary hospital in Singapore

IFSSH19-417

• Palmar mutilation of the hand - a case report

IFSSH19-1498

• Partial excision of volar plate and dorsal capsulotomy in patients with post-traumatic ankylosis of finger joint in the hand

IFSSH19-622

• Proximal Interphalangeal Joint Adipofascial Flap (PIPJAF) Resurfacing Improves the Active Motion of the Proximal Interphalangeal Joint after Contracture Release

IFSSH19-910
14th IFSSH Congress
Index of topics (English)

- Reconstruction both of hand and donor foot with a variety of wrap around flaps and free perforator flaps respectively
  - IFSSH19-958

- Reconstruction of a Nail Unit Using a Free Composite Flap Harvested from the Great Toe with Nerve Repair in 25 patients
  - IFSSH19-903

- Reconstruction of fingertip injuries using the homodigital island flap
  - IFSSH19-435

- Reconstruction of large volar skin and soft tissue defects of the digits using the radial artery superficial palmar (RASP) branch free flap: Case report and literature review
  - IFSSH19-1448

- Reconstruction of Long Tibia Bone Defect using Free Vascularized Fibula Graft and Locking Plate
  - IFSSH19-1409

- Reconstruction of multiple adjacent large finger pulps with the modified sensate free proximal ulnar artery perforator flap
  - IFSSH19-637

- Reconstruction of the dorsal and palm defects of hand with anterolateral thigh flaps from one donor site
  - IFSSH19-196

- RECONSTRUCTION OF THE RADIO ULNAR COLUMN WITH THIRD METATARSIAN FREE FLAP AND COMPUTED 3D PLANNING
  - IFSSH19-1972

- RED BLOOD CELL TRANSFUSION AND ITS ASSOCIATION WITH FREE FLAP THROMBOSIS
  - IFSSH19-686

- REIMPLANT OF TRAUMATIC HAND: CASE REPORT RESOLVED IN FUSAT CLINIC.
  - IFSSH19-1435

- Repairing donor site of foot after improved Toe-to-thumb reconstruction utilizing superficial circumflex iliac artery perforator chimeric flap
  - IFSSH19-978

- repairing skin defect of the finger with the free flap which with tendon pedicled on the palmar branch of the supracarpal perforator of ulnar artery
  - IFSSH19-976

- Repairing small soft tissue defect in the hand with various free micro-skin flaps
  - IFSSH19-1289

- Repairing the donor site of the free anterolateral thigh flap.
  - IFSSH19-172

- Repair of a long finger defect with transfer of a great toe flap combined with second toe joint and iliac bone graft
  - IFSSH19-644

- Replantations in Norway 2010-2017
  - IFSSH19-817

- Restoration of elbow active flexion via monopolar latissimus dorsiis transfer in patients with arthrogryposis
  - IFSSH19-343

- Salvaging the Congestion or Stasis Compromised Free Perforator Flaps based on a new classification
  - IFSSH19-966

- Section of 2nd to 5th flexor tendons in zone 2 of the hand with interdigital nerve injury: case report
  - IFSSH19-1507

- Significance of tissue savage and sensory recovery in avulsed finger replantation
  - IFSSH19-1178

- Spare-part surgery for reconstructing a basic hand function
  - IFSSH19-1519

- Split thickness skin graft from the instep region: no recommendation in pediatric palmar burn
  - IFSSH19-1355

- Stener Lesion: A Comparison Between Two Methods Of Primary Repair
  - IFSSH19-1340

- Subjective and Objective Assessment of First Dorsal Metacarpal Artery Flaps Used in Traumatic Defects of Thumb and Dorsum of the Hand
  - IFSSH19-1488
14th IFSSH Congress
Index of topics (English)

- Subjective and Objective Assessment of Homodigital Neurovascular Direct Flow Flaps Used in Distal Phalangeal Amputations
- Suppression of finger tremor using dynamic vibration absorbers
- Survival rates and outcomes for digital replantation
- Syndactyly of the index and thumb, "functional limitation and frustration".
- Tamai zone I and II replantation functional and cosmetical results versus conservative treatment: retrospective analysis
- The application of Freestyle concept in anterolateral thigh flap with oblique branch
- THE CHIMERIC SUPERFICIAL CIRCUMFLEX ILIAC ARTERY PERFORATOR FLAP IS AN EFFECTIVE OPTION FOR RECONSTRUCTION OF OSTEO CUTANEOUS DEFECTS OF THE HAND OR FOOT
- The clinical application of type I venous flap of volar forearm in complicated replantation of fingers To evaluate the clinical curative effect of the type I venous flap transplantation of volar forearm for complicated digital replantation.
- The Digital Artery Perforator Flaps and Dorsal Metacarpal Artery Perforator Flaps for Treatment of a Soft Tissue Defect of the Finger: Versatile Coverage Options to Avoid the Use of a Skin Graft.
- The distally based and free microvascular interosseous anterior flap in the treatment of hand injuries. Our experience.
- The impact of coagulation disorders on complex hand trauma management
- THE MANGLED HAND AND FOREARM - ALGORITHM FOR TREATMENT
- The medial femoral condyle free flap: An excellent option for difficult cases
- The outcomes of the avulsed thumb's reconstruction
- The sural flap for "off-label indications". Retrospective comparative study with the sural flap for classic indications.
- The use of Integra® Dermal Regeneration Template (IDRT) in the reconstruction of post-traumatic soft-tissue defects of the dorsum aspect of the hand and/or fingers
- The use of modified Kutler method for the treatment of amputation of the fingertip.
- Three-year (2014-2016) activity report of the Replantation Service for hand amputations in a Mid-European country
- Thumb and finger reconstruction using vascularized half-big toenail flap with minimum donor site morbidity
- Training in microsurgery.
- Transplanting the posterior interosseous artery perforator lobulated flap to repair soft tissue defect on fingers
- Treatment of dorsal defect finger with modified fibular free flap of great toe
- Treatment of fingertip injuries with the semi-occlusive dressing
- Treatment of mutilated hands with multiple finger amputation by means of a free flap transfer with digital replantation or revascularization
- Treatment of severe traumatic hand injuries
• Type of "gloves" - tractional damage of fingers
  IFSSH19-541
• Upper extremity amputations in Germany
  IFSSH19-494
• Upper Extremity Free Flap Transfers: An Analysis of the National Surgical Quality Improvement Program Database
  IFSSH19-19
• Use and Advantages Of An Anticoagulation Therapy Based In Non-Fractioned Heparin In A Case Series Of Extremity Reconstruction With Free Flaps
  IFSSH19-1569
• Use of a Distal Ulnar Artery Perforator-Based Bilobed Free Flap for Repairing Complex Digital Defects
  IFSSH19-1684
• Use of giant-sized flow-through venous flap for simultaneous reconstruction of dual or multiple major arteries in salvage therapy for complex upper limb traumatic injury
  IFSSH19-1682
• Use of medial femoral condyle flap for treatment of non-union and avascular necrosis of the upper limb. Cadaveric study and morbidity analysis of 18 cases.
  IFSSH19-811
• Use of negative-pressure wound therapy to overcome venous congestion in fingertip reimplantation.
  IFSSH19-1425
• Using Abdominal Fasciocutaneous Flap to Salvage the Compromised Replantation
  IFSSH19-1202
• Utilization of a Dermal Substitute (Hyalomatrix) in Pediatric Upper Extremity Procedures
  IFSSH19-1288
• Vascularised bone graft from distal femur in upper extremity reconstruction
  IFSSH19-1866
• Vascularized Bone Flaps in Upper Extremity Reconstruction: A Case Series
  IFSSH19-1343
• Versatility of medial femoral condyle flap for phalangeal and metacarpal bone reconstruction
  IFSSH19-1518
• Versatility of oblique Neurovascular flap for fingertip amputations with rapid healing and return to work
  IFSSH19-32
• VERSATILITY OF SURAL FLAP FOR LOWER MEMBER OSTEOCUTANEOUS INJURIES: REVISION OF 40 CASES.
  IFSSH19-1135
• Which are the Limits Nowadays for Indication to Replantation?
  IFSSH19-1718

Tendon
• Aging Affects Tenogenic and Chondrogenic Gene Expression in Mouse Intrasynovial Tendons
  IFSSH19-370
• Anatomic Rationale and Clinical Results for Relative Motion Flexion Management of Acute and Chronic Boutonniere Deformity, Permitting Immediate Active Motion and Functional Use
  IFSSH19-1009
• A Novel Procedure for Chronic Sagittal Band Rupture, Permitting Immediate Active Motion and Hand Use During Recovery
  IFSSH19-1025
• Asymmetric 6-Strand Flexor Tendon Repair - Biomechanical Analysis using Barbed Suture
  IFSSH19-611
• Basic operative informations in three main aetiological causes which necessitate tendon transfers in upper extremity
  IFSSH19-1673
• Biomechanical Analysis of the Tendon with Z-lengthening (TWZL) Construct: An Alternative Reconstructive Technique
  IFSSH19-576
• Brachioradialis to Extensor carpi ulnaris transfer to address the radial deviation deformity in posterior interosseous nerve palsy
  IFSSH19-1440
• CAMPER’S CHIASM: ANATOMICAL STUDY AND CLINICAL IMPLICATIONS IN FLEXOR TENDONS SURGERY
  IFSSH19-1136
- Can we make tendon transfers shorter? Biomechanical comparison of different suture techniques
  IFSSH19-650

- Clinical Outcomes of Zone 1 Flexor Tendon Injuries Treated With Bone Anchor
  IFSSH19-1645

- clinical trial of comparing the effects of active and passive rehabilitation on flexor tendons repair outcomes in Zone 2
  IFSSH19-310

- Comparison of extension splint and temporary pinning for acute tendon mallet injury
  IFSSH19-261

- Comparison of healing strengths of flexor tendons repaired with two multi-strand configurations in a chicken model
  IFSSH19-689

- Comparison of open surgical release versus ultrasound-guided percutaneous release using new instrument for trigger finger
  IFSSH19-932

- Comparison of the efficiency between the extrinsic and intrinsic extensor muscles for extension of the proximal interphalangeal joint of the finger
  IFSSH19-1325

- Complex thumb metacarpophalangeal joint dislocation caused by ulnar collateral ligament entrapment in a 6 year old.
  IFSSH19-1883

- Contribution of the integrity of the vincula tendinum in the delay of the repair of the flexor digitorum profundus tendon in zone II
  IFSSH19-1479

- Cost Analysis of Trigger Finger Release Performed in Clinic versus in the Operating Room
  IFSSH19-1529

- Delayed zone 2 flexor tendons repair with less fatigue of the operators had better outcomes than primary repairs: An analysis of 83 fingers
  IFSSH19-404

- Development and biomechanical analysis of a new 4-strand suture for transosseous flexor tendon repairs in zone 1
  IFSSH19-1082

- Differential Effectiveness for Trigger Thumb and Finger Injections
  IFSSH19-1117

- Does A1 Pulley Release for Trigger Finger Have an Effect on Grip and Pinch Strengths?
  IFSSH19-1091

- Early active mobilization after flexor tendon grafts using extrasynovial tendons
  IFSSH19-155

- Extensor pollicis longus tendon reconstruction by extensor indicis proprius transfer or free tendon graft using a novel 2 cm retroposition tension method
  IFSSH19-131

- Extensor tendon rupture in non-traumatic osteoarthritis of distal radioulnar joint - A rare case report
  IFSSH19-63

- Factors influencing the results of flexor tendon repair
  IFSSH19-1284

- Factors of distal ulnar morphology to affect symptomatic ECU subluxation and clinical results of anatomic ECU tendon sheath reconstruction
  IFSSH19-617

- Failure of Percutaneous A1 pulley release in Trigger Digits
  IFSSH19-1147

- Flexor Digitorum Superficialis Tendon Transfer for Multiple Finger Extensor Tendon Reconstruction
  IFSSH19-197

- Functional muscle transfer of the low trapezius portion for paralytic shoulder, ipsilateral and contralateral
  IFSSH19-1629

- Functional outcome after a surgical reconstruction of a chronic extensor pollicis longus tendon rupture - a case report
  IFSSH19-1332

- Gouty arthritis of hand: tendon and joint involvement.
  IFSSH19-1416
• Half Extensor Digiti Minimi Transfer for Thumb Extension Reconstruction
  IFSSH19-198
• Helical tendon repair: description of a new technique and comparative biomechanical analysis with two standard techniques
  IFSSH19-1106
• Immediate controlled active motion following Zone 5-7 Extensor Tendon Repair
  IFSSH19-1602
• Immobilization Versus Early Active Mobilization After Surgical Repair of Injured Extensor Tendon of Hand and Forearm.
  IFSSH19-1177
• Informed Consent for trigger finger release - our experience with video consent for trigger finger release.
  IFSSH19-1262
• Injection into both compartments is more effective than an extensor pollicis brevis compartment alone in de Quervain disease?
  IFSSH19-1045
• Intrasynovial tendon grafting for finger flexor tendon reconstruction
  IFSSH19-96
• INTRINSIC TENDINOPATHIES IN THE HAND
  IFSSH19-754
• It is never late to perform flexor tendon reconstruction for zone 2 injuries
  IFSSH19-468
• Late primary FDP tendon repair under walant
  IFSSH19-509
• Long Term Functional Results of Camitz opponensplasty in Severe Carpal Tunnel Syndrome with Severe Thenar Atrophy
  IFSSH19-1882
• Mallet finger Treatment with temporal finger arthrodesis
  IFSSH19-431
• Modified Brunelli technique for flexor tendons repair in zone II
  IFSSH19-715
• Non-surgical treatment for symptomatic carpal tunnel syndrome: a randomized clinical trial comparing corticoid injection versus night splint.
  IFSSH19-1853
• NUMBER OF WEAVES IS AN IMPORTANT FACTOR IN THE TENSILE STRENGTH OF THE PROXIMAL WEAVE IN TENDON GRAFTING
  IFSSH19-974
• ONE STAGE FLEXOR TENDON RECONSTRUCTION USING A SILASTIC ACTIVE TENDON IMPLANT. TEN YEARS OF EXPERIENCE.
  IFSSH19-1170
• Outcome of Stretching for Treatment of Trigger Finger in Patients on Hemodialysis
  IFSSH19-685
• Outcome of Tendon Transfer Around Shoulder with Erb's Palsy Internal Rotation Deformity
  IFSSH19-477
• Outcomes of flexor tendon repairs in zones 2 under wide-awake local anesthesia no tourniquet
  IFSSH19-1861
• Outcomes of flexor tendon repairs of 99 fingers in zones 1 and 2 using a multi-strand core suture repair followed by early active mobilization
  IFSSH19-420
• Outcomes of FPL tendon primary repair in zone 1 and zone 2 by using M-Tang core suture followed with early active mobilization
  IFSSH19-567
• Outcomes of release of the entire A4 and partial A2 pulleys for distal zone 2 primary flexor tendon repair in 27 fingers
  IFSSH19-1165
• Percutaneous advancement of proximal tendon stump with the pull-out technique for the treatment of acute mallet fingers
  IFSSH19-1851
• Posttraumatic boutonnière deformity of the thumb: A case report
  IFSSH19-58
• Prognostic factors for conservatively treated sagittal band injuries of the metacarpophalangeal joint
  IFSSH19-455
<table>
<thead>
<tr>
<th>Title</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reconstruction of Low-Hand Syndrome with Tendon Transfer in Patients Injured in Syrian Civil War</td>
<td>IFSSH19-137</td>
</tr>
<tr>
<td>Reconstruction of the Extensor Tendon of the Proximal Interphalangeal Joint (PIP) using a distally based slip of Flexor Digitorum Superficialis (FDS)</td>
<td>IFSSH19-943</td>
</tr>
<tr>
<td>Rupture rate, functional outcome and patient satisfaction after primary flexor tendon repair using the Arthrex FiberLoop® and Tsuge suture technique with early active motion rehabilitation</td>
<td>IFSSH19-1624</td>
</tr>
<tr>
<td>Shorter Rehabilitation after Extensor Pollicis Longus Reconstruction Combining Modern Suture Technique and New Rehabilitation Protocol</td>
<td>IFSSH19-362</td>
</tr>
<tr>
<td>Single incision for tendon transfer in Radial Nerve Palsy</td>
<td>IFSSH19-351</td>
</tr>
<tr>
<td>Single Incision Repair of Distal Biceps Tendon Ruptures- Results &amp; Complications</td>
<td>IFSSH19-1925</td>
</tr>
<tr>
<td>Sonographical parameters of the finger pulley system in healthy adults</td>
<td>IFSSH19-25</td>
</tr>
<tr>
<td>Surgical management of complex hand's contractures with blended use of mini-invasive procedures and wide awake surgery: case series</td>
<td>IFSSH19-1017</td>
</tr>
<tr>
<td>Suture Technique with strain relief for repair of flexor tendons of the zone II of the hand</td>
<td>IFSSH19-674</td>
</tr>
<tr>
<td>Tendon Healing Strengths after Repair with Three Different Configurations in a Chicken Model</td>
<td>IFSSH19-688</td>
</tr>
<tr>
<td>Tendon transfer and wide awake: innovation and high functional result</td>
<td>IFSSH19-514</td>
</tr>
<tr>
<td>Tendon transfer surgery after contralateral C7 nerve transfer to reconstruct the finger extension function in spastic arm paralysis patients after central neurological injury</td>
<td>IFSSH19-497</td>
</tr>
<tr>
<td>Teno-arthrolysis is more Effective than Splinting in the Management of the Stiff Proximal Interphalangeal Joint - A Systematic Review</td>
<td>IFSSH19-1330</td>
</tr>
<tr>
<td>TENSIL RESISTANCE IN A TENORRAPHY OF FLEXORS OF THE HAND ACCORDING TO THE DISTANCE OF THE GRIP: Pilot study in pigs</td>
<td>IFSSH19-1708</td>
</tr>
<tr>
<td>The Clinical Outcome of The Novel Hand Therapy Protocol That Based on Staged Outcome Assessment for Zone 1 and 2 Flexor Tendon Injuries -a preliminary study-</td>
<td>IFSSH19-1185</td>
</tr>
<tr>
<td>The effects of Adipose derived stem cell on optimizing Achilles tendon repair in rat</td>
<td>IFSSH19-313</td>
</tr>
<tr>
<td>The lumbrical plus disease: a review of our experience</td>
<td>IFSSH19-1294</td>
</tr>
<tr>
<td>The Pennington's modification of the Kessler repair: unexpected observations through 3-D modelling</td>
<td>IFSSH19-1570</td>
</tr>
<tr>
<td>The Prevalence of the Linburg-Comstock anomaly in a Multiracial Population Sample.</td>
<td>IFSSH19-454</td>
</tr>
<tr>
<td>The relationship between positional contracture of proximal interphalangeal joint on trigger finger and metabolic syndrome</td>
<td>IFSSH19-485</td>
</tr>
<tr>
<td>The Thompson procedure for treating chronic mallet finger with swan neck deformity</td>
<td>IFSSH19-183</td>
</tr>
<tr>
<td>The treatment of the chronic lateral epicondylitis by denervation of the lateral humeral epicondyle: technique and results</td>
<td>IFSSH19-483</td>
</tr>
<tr>
<td>The use of Carboxymethylcellulose (Dynavisc®) to prevent adherences after WALANT flexor tendons repair</td>
<td>IFSSH19-1947</td>
</tr>
<tr>
<td>TRANSFER OF THE EXTENSOR INDICIS TO EXTENSOR POLLICIS LONGUS IN CASES OF INJURY OF THE EXTENSOR TENDON, SEQUEL OF FRICTION WITH SCREW OF VOLAR PLATE OF DISTAL</td>
<td>IFSSH19-1114</td>
</tr>
</tbody>
</table>
RADIO.

- Traumatic Subluxation of Extensor Carpi Ulnaris System
- Treating women with De Quervain tenosynovitis in puerperium: is the corticoid infiltration effective?
- Treatment for PIP joint flexion contracture in stenosing tendovaginitis using resection of the flexor digitorum superficialis.
- Trigger Digit Incidence after Carpal Tunnel Release: Z-Plasty Reconstruction Vs Traditional Carpal Tunnel Release
- Trigger finger at the distal A2 pulley with extension locking of proximal interphalangeal joint: category of the idiopathic trigger finger
- Trigger finger in ocean rowing - a hindrance to performance
- Trigger Finger Percutaneous Release - Safe, Effective and Less days Off
- Trigger finger secondary to a neglected flexor tendon rupture
- Using wide-awake local anesthesia in the secondary reconstructive surgery after wrist replantation
- Volar transfer of the lateral band with transverse retinacular ligament is effective for the correction of swan-neck deformity caused by volar plate injury of the PIP joint.
- WALANT in tendon transfers in the forearm and hand. Our experience
- What are the ultrasound features of the trigger finger that may guide management?

Tetraplegic and Spastic

- Analysis of Large Cohort of Spastic Arm Paralysis Patients after Contralateral Seventh Cervical Nerve Transfer: A Retrospective Study
- Botulinum toxin injection as a prediction of surgical outcomes in cerebral palsy patients with upper limb deformities
- Deltoid to triceps transfer in tetraplegic patients: The Stoke Mandeville experience
- Functional reinnervation of the lower limb after contralateral lumbar to sacral nerve transfer for hemiplegic patients
- Grift Hand Spastic, tetraplegic, and obstetric paralysis
- Hyperselective neurectomy (HSN) in the treatment of the spastic upper limb: a prospective study
- Managing Painful Wrist and Trapezio-Metacarpal Arthritis in Patients with SCI Using Surgical Joint Denervation
- Patient and Carer Satisfaction Post Wrist Arthrodesis in Cerebral Palsy
- Posterior deltoid to triceps transfer to restore active elbow extension in tetraplegic patients
- Spasticity-reducing hand surgery for patients with upper motor neuron injuries: a prospective study of 30 patients with a one-year follow-up
- Spasticity surgery/What we learned in three years of practicing it.
- Stroke-Hand Surgery Service: the development of an outpatient care pathway
• Surgery for the tetraplegic upper limb: Initial experience and early results

• Suspension of the humerus to the acromion provides stability to the shoulder following a brachial plexus palsy

• Tetraplegia Hand Surgery. The Cypriot Perspective

• The reserve option for the thumb abduction

• UPPER LIMB SURGERY FOR NON-COMMUNICATIVE PATIENTS WITH SEVERE SPASTICITY: THE ROLE OF THE CARER BURDEN SCORE

• Wrist Arthrodesis in Patients with Cerebral Palsy

Tumor

• Acquired vascular malformation on fingertips: a report of three cases

• A multinomial logistic regression analysis on characteristics of hand and wrist tumours: A multi-ethnic study

• AN UNUSUAL LUMP IN THE HAND: DESMOPLASTIC FIBROBLASTOMA

• A Significant Neuralgia caused by An Epidermoid Cyst: A Case Report

• Bizarre Parosteal Osteochondromatous Proliferation: a serie of cases.

• Bone tumors of the upper extremities. A case series.

• Case Report: Lipofibromatous hamartoma of the digital branches of median nerve

• CASE REPORT PYOGENIC GRANULOMA INTRAVASCULAR

• Castleman's Tumor associated brachial plexus, literature review a propos a case

• Characteristics of hand and wrist benign fatty tumours. A study of 32 cases and literature review.

• CLASSIFICATION OF DISTAL FINGER TUMOURS

• Deep Lipomas of the Elbow

• Encapsulated Hematoma in hand secondary to cutting wound, in non-hemophilic patient

• Examination of soft tissue tumors in the hand

• Fibro - adipose vascular anomaly in the forearm, a new and rare disorder.

• Fixed Flexion Deformity of the Middle and Ring Fingers in Adult Caused by Intramuscular Hemangioma of the Forearm.

• GANGLIONS IN THE HAND AND WRIST: A NEW CLINICAL AND SURGICAL APPROACH

• Giant cell tumor of the tendon sheath on the digits - functional outcome in tumor recurrence

• Giant cell tumors of the tendon sheaths in the hand

• Histologic Analysis of the Nail Apparatus in Regard to Subungual Melanoma: Anatomical Study in 21 Cadavers

• Intraneural hemangioma of a digital nerve: a case report

• Large Schwannoma of the Median Nerve at the Distal Third of the Forearm-Case Report
• Lipofibroma Hamartoma of the peripheral nerves of the upper extremity. Analysis of twelve cases. IFSSH19-1805

• Management and outcome of acral soft tissue sarcoma IFSSH19-365

• MULTIPLE TUMOURS ON THE THUMB IFSSH19-108

• Nerve Compression due to Benign Tumors or Ganglion Cysts in the Upper Limb-Case Series IFSSH19-1452

• Onychomatricoma in the hand - three cases IFSSH19-1912

• Osteoid osteoma of the hand and wrist - a report of 5 cases IFSSH19-1383

• Osteoid osteoma of the third metatarsal bone: A case report IFSSH19-1145

• Pacinian neuromas and neurofibromas: an uncommon cause of pain in the hands and fingers. Literature review. IFSSH19-1774

• Pediatric Median Nerve Neurofibroma IFSSH19-1502

• Primary melanoma of the hand - experiences and review of the literature. IFSSH19-382

• Radioscapholunate Fusion following Resection of Giant Cell Tumours of the Distal Radius IFSSH19-951

• Radius metastasis: an unusual form of presentation IFSSH19-855

• RARE TUMOURS IN HAND AND FOREARM: A SERIES OF 18 CASES. IFSSH19-920

• Recurrent Masson's Tumor of the finger: A Case Report IFSSH19-412

• SARCOMA SINOVIAL OF THE HAND: DIAGNOSIS AND TREATMENT. A RARE CASE REPORT AND LITERATURE REVIEW IFSSH19-894

• Solitary lesion of Molluscum contagiosum of the finger in an Immunocompetent Individual : A Case Report and review of literature. IFSSH19-1936

• Squamous cell Carcinoma - "The most common Hand malignancy" IFSSH19-1108

• Subcutaneous spread of squamous cell carcinoma in the digit in association with primary radiotherapy IFSSH19-1407

• Subungual exostosis of the fingers IFSSH19-1935

• Surgically Treated Brachial Plexus Tumours: the Oxford University Hospitals 20-Year Experience IFSSH19-1405

• The diagnosis and treatment of aneurysmal bone cyst of the metacarpals and phalanges of the hand#12288; IFSSH19-504

• The Threat of Longitudinal Cracking after Distal Radius Fracture Treatment with Volar Locking Plate IFSSH19-240

• Tumors of the palm - clinical and imagistic diagnosis IFSSH19-1197

• Unplanned excisions of soft tissue sarcomas of the upper extremity IFSSH19-1184

• Upper Extremity Reconstruction Following Sarcoma Extirpation: A Case Series IFSSH19-1387

• Usefulness of Eppikajutsuto for lymphatic malformation IFSSH19-1229

Wrist - Carpus

• 3D printing assisted accurate arthroscopic treatment of scaphoid fracture and nonunion IFSSH19-1373
• 10 Questions About Scaphoid Fractures - Revisited: A case based discussion  
  IFSSH19-933
• Forearm rotation modifies the scapholunate joint muscle control. A kinetic study in cadavers.  
  IFSSH19-89
• Percutaneous stabilization of scapholunate fractures with headless compression screw fixation  
  IFSSH19-232
• Accessory Palmaris Longus causing carpal tunnel syndrome  
  IFSSH19-422
• A different perspective on the aetiology of hook of hamate fractures and the high association with other carpal fractures  
  IFSSH19-481
• Advantages of radiolucent PEEK-circular plates in midcarpal arthrodeses  
  IFSSH19-1495
• Algorhythmical approach in Ulnar Impactation Syndrome and presentation of a special case: UIS with DRUJ instability  
  IFSSH19-1346
• A new entity of carpal instability non dissociative after wrist fractures  
  IFSSH19-1162
• A new way to screw the scaphoid?  
  IFSSH19-345
• Anteromedial release for post-traumatic flexion pronation contracture of the wrist.  
  IFSSH19-1798
• Arthroscopically assisted bone grafting reduces time to healing of scaphoid non-unions compared to percutaneous screw fixation alone  
  IFSSH19-1455
• Autologous Cancellous Bone Graft and Headless Compression Screw Fixation for Treatment of Scaphoid Waist Nonunion  
  IFSSH19-113
• Bilateral bipartite carpal scaphoid: a case report and comparison with bilateral scaphoid nonunion found on incidental radiography.  
  IFSSH19-1721
• BILATERAL CARPAL TUNNEL SYNDROME: A COMPARATIVE STUDY BETWEEN THE RELEASE OF THE SIMULTANEOUS MEDIAN NERVE AND IN TWO STAGES BY LOCAL ANESTHESIA WITH EPINEPHRINE  
  IFSSH19-1138
• Biomechanical evaluation of wrist flexors and extensors function after arthroscopic treatment of triangular fibrocartilage lesions  
  IFSSH19-1263
• Can We Use Clinical Radiographs and Three-dimensional Computer Tomography (CT) Scans to Evaluate Intracarpal Measurements?  
  IFSSH19-145
• carpectomy the proximal row vs arthrodesis four corner in patient with SNAC and SLAC  
  IFSSH19-792
• Changes in the morphology of the triangular fibrocartilage complex (TFCC) on magnetic resonance arthrography related to disruption of ulnar foveal attachment  
  IFSSH19-831
• Changes in Ulnar Variance after a Triangular Fibrocartilage Complex Tear  
  IFSSH19-1258
• Chronic, isolated lunotriquetral instability Biomechanical testing of the Bernese surgical treatment and review of the literature  
  IFSSH19-626
• Chronic Scapholunate Instability in Carpal Anomaly: Proposed Surgery Treatment  
  IFSSH19-474
• Clinical outcomes in revision carpal tunnel decompression using the AxoGuard nerve protector  
  IFSSH19-1803
• Clinical Outcomes With the Amandys® Wrist Implant: Results of Seven Patients  
  IFSSH19-142
• COMBINED IPSILATERAL FRACTURE OF DISTAL RADIUS AND SCAPHOID TREATED WITH LOCKING PLATES. WHEN IS IT NECESSARY? CASE REPORT AND LITERATURE REVIEW  
  IFSSH19-898
• Comparative Analysis of Three Techniques of Scapholunate Reconstruction for Dorsal Intercalated Segment Instability  
  IFSSH19-1490
<table>
<thead>
<tr>
<th>Paper Number</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>IFSSH19-1709</td>
<td>Comparing Functional Outcomes of Endoscopic and Open Carpal Tunnel Release from the Patient's Perspective</td>
</tr>
<tr>
<td>IFSSH19-1974</td>
<td>Comparing non-vascularized scaphoid reconstruction for scaphoid nonunion with or without an intraoperative, single shock wave therapy (ESWT) - preliminary results</td>
</tr>
<tr>
<td>IFSSH19-1929</td>
<td>Comparison of standard wrist CT and HR-pQCT (High Resolution Peripheral Quantitative Computed Tomography) in scaphoid nonunion after avascular bone graft and percutaneous screw fixation</td>
</tr>
<tr>
<td>IFSSH19-1060</td>
<td>Computer navigated reduction of scaphoid non-unions and displaced scaphoid fractures- a cadaveric study</td>
</tr>
<tr>
<td>IFSSH19-793</td>
<td>DESCRIPTION AND OUTCOMES OF SURGICAL TECHNIQUE FOR TREATMENT OF SCAPHOID NONUNION WITH OLECRANON BONE GRAFT.</td>
</tr>
<tr>
<td>IFSSH19-1280</td>
<td>Determination of correct length in total trapeziometacarpal arthroplasty</td>
</tr>
<tr>
<td>IFSSH19-1457</td>
<td>Does Reconstruction of Proximal Pole Scaphoid Nonunions With Hamate Autograft Restore Carpal Kinematics ?</td>
</tr>
<tr>
<td>IFSSH19-625</td>
<td>Dorsal bone-ligament-bone reconstruction of chronic, isolated lunotriquetral instability Technique and clinical results</td>
</tr>
<tr>
<td>IFSSH19-741</td>
<td>Dynamic wrist radiographs in wrists with and without ganglion cysts</td>
</tr>
<tr>
<td>IFSSH19-1923</td>
<td>Dysplasia Epiphysealis Hemimelica (Trevor's Disease) of the scaphoid in a 9 year-old boy.</td>
</tr>
<tr>
<td>IFSSH19-1173</td>
<td>Effectiveness of median nerve decompression in carpal tunnel syndrome in the early postoperative period</td>
</tr>
<tr>
<td>IFSSH19-1211</td>
<td>EVALUATION OF SCAPHO TRAPEZIUM TRAPEZOID JOINT AFTER THE IMPLANTATION OF A TRAPEZIUM METACARPAL PROSTHESIS.</td>
</tr>
<tr>
<td>IFSSH19-1338</td>
<td>Factors affecting union rate when treating scaphoid nonunion using non-vascularized bone grafting with internal fixation: preliminary report</td>
</tr>
<tr>
<td>IFSSH19-321</td>
<td>Factors Associated with Conversion to Wrist Fusion after Proximal Row Carpectomy or Four Corner Arthrodesis</td>
</tr>
<tr>
<td>IFSSH19-1252</td>
<td>Factors Associated with Surgeon Recommendation For Additional Cast Immobilization of a Nondisplaced Scaphoid Waist Fracture</td>
</tr>
<tr>
<td>IFSSH19-785</td>
<td>Four-corner fusion in SLAC &amp; SNAC wrist surgery: Does method of fixation really make a difference?</td>
</tr>
<tr>
<td>IFSSH19-1757</td>
<td>Free vascularized osteocartilaginous and osteoperiosteal medial femoral condyle graft for recalcitrant scaphoid non-union - Clinical and radiological outcome</td>
</tr>
<tr>
<td>IFSSH19-990</td>
<td>Functional outcome following headless compression screw fixation for hamate fractures</td>
</tr>
<tr>
<td>IFSSH19-1078</td>
<td>FUNCTIONAL RESULT OF WRIST ARTHRODESIS IN SEVERE INJURIES OF BRAQUIAL TRAUMATIC PLEXUS. INITIAL EXPERIENCE</td>
</tr>
<tr>
<td>IFSSH19-1970</td>
<td>Guyon canal syndrome: a not so common cause of cubital nerve entrapment</td>
</tr>
<tr>
<td>IFSSH19-181</td>
<td>Histopathology findings of the lunate in stage III Kienböck's disease</td>
</tr>
<tr>
<td>IFSSH19-746</td>
<td>Hypertrophic nonunion after ulnar shortening osteotomy with low profile ulnar shortening plate</td>
</tr>
<tr>
<td>Index of topics (English)</td>
<td></td>
</tr>
<tr>
<td>---------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>IFSSH19-736</strong> • In-vivo 3D motion analysis of the wrist during dart-throwing motion after 3-corner fusion and RSL fusion</td>
<td></td>
</tr>
<tr>
<td><strong>IFSSH19-1169</strong> • Internal brace augmentation of the scapholunate interosseous ligament reapir: A biomechanical study</td>
<td></td>
</tr>
<tr>
<td><strong>IFSSH19-1246</strong> • Interpretation of Ulnocarpal Stress Test in Different Forearm Rotation</td>
<td></td>
</tr>
<tr>
<td><strong>IFSSH19-857</strong> • Investigation of preoperative image and pathological necrotic findings in scaphoid fracture pseudarthrosis</td>
<td></td>
</tr>
<tr>
<td><strong>IFSSH19-545</strong> • In vivo implantation and characterisation of a novel 3D-printed multiphasic scaffold in the rabbit knee for scapholunate ligament reconstruction</td>
<td></td>
</tr>
<tr>
<td><strong>IFSSH19-338</strong> • In vivo kinematics of the thumb carpometacarpal joint during flexion and abduction</td>
<td></td>
</tr>
<tr>
<td><strong>IFSSH19-1856</strong> • In Vivo Length Changes of Scapholunate Int erosseous Ligament during Wrist Flexion-Extension</td>
<td></td>
</tr>
<tr>
<td><strong>IFSSH19-1438</strong> • Is MRI better than CT in the diagnosis of occult wrist fractures?</td>
<td></td>
</tr>
<tr>
<td><strong>IFSSH19-1623</strong> • Is there a correlation between duration of scaphoid fracture non-union and degenerative changes of the wrist?</td>
<td></td>
</tr>
<tr>
<td><strong>IFSSH19-1467</strong> • Labral Tape suture as an Internal Brace Augmentation for a subacute scapholunate injuries</td>
<td></td>
</tr>
<tr>
<td><strong>IFSSH19-263</strong> • Long-term (5-15 years) clinical outcome after titanium lunate arthroplasty for Kienböck's disease</td>
<td></td>
</tr>
<tr>
<td><strong>IFSSH19-1426</strong> • Long-term follow-up after CMI® Prosthesis for failed trapeziectomy with suspension arthroplasty</td>
<td></td>
</tr>
<tr>
<td><strong>IFSSH19-1775</strong> • LONG-TERM RESULTS OF TREATMENT OF RADIO-SCAPHOID ARTHRITIS AND SNAC WRIST BY USE OF PYROCARBON IMPLANT (APSI)</td>
<td></td>
</tr>
<tr>
<td><strong>IFSSH19-1468</strong> • Lunocapitate arthrodesis in a young adolescent. Long term results.</td>
<td></td>
</tr>
<tr>
<td><strong>IFSSH19-1701</strong> • Medial femoral condyle to reconstruct the scaphoid: Did we improve in 8 years of experience? Comparison of our first and last 20 cases</td>
<td></td>
</tr>
<tr>
<td><strong>IFSSH19-586</strong> • Midcarpal Arthrodesis in Patients with Advanced Carpal Collapse</td>
<td></td>
</tr>
<tr>
<td><strong>IFSSH19-1630</strong> • Midcarpal instability after hemitrapeziectomy, total trapeziectomy and distal resection of the scaphoid pole</td>
<td></td>
</tr>
<tr>
<td><strong>IFSSH19-478</strong> • Midterm follow up of volar plate fixation for chronic unstable scaphoid nonunion</td>
<td></td>
</tr>
<tr>
<td><strong>IFSSH19-935</strong> • Midterm outcome of costo-osteochondral graft reconstruction of proximal pole of scaphoid fractures</td>
<td></td>
</tr>
<tr>
<td><strong>IFSSH19-992</strong> • Midterm results of scaphoid reconstruction using a free vascularised osteochondral medial femoral condyle flap</td>
<td></td>
</tr>
<tr>
<td><strong>IFSSH19-1964</strong> • New ligament reconstruction for midcarpal instability- a case report</td>
<td></td>
</tr>
<tr>
<td><strong>IFSSH19-1611</strong> • Interosseous SL Reconstruction for Chronic Scapholunate Dissociation augmented DIC stabilized by RASL vs SwiveLock as internal splint</td>
<td></td>
</tr>
<tr>
<td><strong>IFSSH19-939</strong> • OPEN CARPAL TUNNEL RELEASE WITH LOCAL ANESTHESIA: ISQUEMIA VS WALANT COMPARATIVE STUDY</td>
<td></td>
</tr>
<tr>
<td><strong>IFSSH19-1540</strong> • Osteoid Osteoma of the Carpal bones</td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Reference</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Outcome of Proximal Row Carpectomy in a cohort study with 12 months follow up</td>
<td>IFSSH19-249</td>
</tr>
<tr>
<td>Outcomes after scaphoid excision and midcarpal arthrodesis for SNAC and SLAC wrist arthritis</td>
<td>IFSSH19-445</td>
</tr>
<tr>
<td>Outcomes of local bone graft and fixation of proximal pole scaphoid non-unions</td>
<td>IFSSH19-1556</td>
</tr>
<tr>
<td>OUTCOMES OF POSTERIOR INTEROSSEOUS NERVE NEURECTOMY IN ACUTE TRAUMA</td>
<td>IFSSH19-1922</td>
</tr>
<tr>
<td>Pathways to Nonunion of a Scaphoid Fracture</td>
<td>IFSSH19-1760</td>
</tr>
<tr>
<td>Patient specific surgical implants and prosthesis made of 3D printed PEEK</td>
<td>IFSSH19-1671</td>
</tr>
<tr>
<td>Pattern of arthritis noted during the surgery for stage 3 B Keinbock's disease basis for classification &amp; its clinical implication</td>
<td>IFSSH19-1443</td>
</tr>
<tr>
<td>PERILUNATE FRACTURE-DISLOCATIONS: CLINICAL AND RADIOLOGICAL RESULTS WITH A MINIMUM 2-YEAR OF FOLLOW-UP</td>
<td>IFSSH19-1784</td>
</tr>
<tr>
<td>Perilunate fractures and perilunate dislocations in polytrauma</td>
<td>IFSSH19-1946</td>
</tr>
<tr>
<td>Post-traumatic deformities around wrist: two-stage treatment</td>
<td>IFSSH19-1651</td>
</tr>
<tr>
<td>Preliminary report for capitulunate arthrodesis for SNAC wrists: radial approach and robot-assist screw insertion</td>
<td>IFSSH19-1021</td>
</tr>
<tr>
<td>Preliminary result of simultaneously bilateral perilunate dislocation- A Case report</td>
<td>IFSSH19-95</td>
</tr>
<tr>
<td>Preliminary results after ulnar shortening osteotomy using a “low-profile” locking plate with an ulnopalmar approach</td>
<td>IFSSH19-744</td>
</tr>
<tr>
<td>Pyrocarbon Hemi- Wrist arthroplasty: 16 cases; Mean follow up two years.</td>
<td>IFSSH19-1560</td>
</tr>
<tr>
<td>Pyrocarbon Interposition Arthroplasty (Amandys Â® ) for the Wrist: A Prospective Case Series</td>
<td>IFSSH19-179</td>
</tr>
<tr>
<td>Radioscapholunate (RSL) fusion for posttraumatic osteoarthritis (PTRO) or type II scapholunate advanced collapse (SLAC). Functional results for both etiologies.</td>
<td>IFSSH19-1047</td>
</tr>
<tr>
<td>RECONSTRUCTION OF THE DISTAL RADIOULNAR INSTABILITY BY USING THE EXTENSOR RETINACULUM</td>
<td>IFSSH19-1788</td>
</tr>
<tr>
<td>Recurrent and persistent carpal tunnel syndrome: predicting clinical outcome of revision surgery</td>
<td>IFSSH19-491</td>
</tr>
<tr>
<td>Relationship between ulnar variance and shape of the midcarpal joint.</td>
<td>IFSSH19-1762</td>
</tr>
<tr>
<td>Resting Forearm Position and its Relevance to the Dart Thrower's Motion</td>
<td>IFSSH19-780</td>
</tr>
<tr>
<td>Results of dorsal and volar reconstruction of scapholunate ligament with FCR tendon</td>
<td>IFSSH19-693</td>
</tr>
<tr>
<td>Retrograde headless screw fixation for proximal scaphoid non-union with the guidance of preoperative 3D simulation</td>
<td>IFSSH19-1561</td>
</tr>
<tr>
<td>Revision-Arthrodesis after Failed Total Wrist Arthroplasty</td>
<td>IFSSH19-1899</td>
</tr>
<tr>
<td>Robot-Assisted of Volar Percutaneous Scaphoid Screw Placement: initial clinical experience</td>
<td>IFSSH19-259</td>
</tr>
<tr>
<td>Salvage of the proximal scaphoid: A retrospective comparison of Medial Femoral Trochlear Osteocartilaginous graft and Costa-osteochondral graft with a minimum 2 year follow-up</td>
<td>IFSSH19-500</td>
</tr>
<tr>
<td>Scaphoidectomy with four-corner fusion using dorsal locking plates: a retrospective study with mid-term follow-up</td>
<td>IFSSH19-1179</td>
</tr>
</tbody>
</table>
• Scaphoid Fracture Classification: a Three-Dimensional Computed Tomography Analysis
  IFSSH19-505

• Scaphoid fractures with scapho-lunate ligament involvement: instability or ligamentous laxity?
  Role of arthroscopy and pinning
  IFSSH19-651

• Scaphoid Skyline View (SSV): A Useful Method to Detect Intraarticular Screws at the Proximal Pole of the Scaphoid During Retrograde Fixation
  IFSSH19-1079

• Scapholunate Ligament Reconstruction with Internal Brace Technique Provides Biomechanically Equivalent Fixation Compared to the Percutaneous Pin Fixation in a Cadaveric Model
  IFSSH19-450

• Short to mid-term results of a 360 degree technique for reconstruction of the scapho-lunate ligament
  IFSSH19-476

• Surgery and Rehabilitation Following Revision Open Carpal Tunnel Release with Hypothenar Fat-pad Flap
  IFSSH19-783

• Surgical approach to management of perilunate dislocations - Volar or Dorsal or Combined?
  IFSSH19-536

• The avascular proximal pole nonunion treatment with NVBG from radius, open or arthroscopically: a role for core decompression and biophysics.
  IFSSH19-1820

• The Choice of Operation for Young Patients of Kienböck’s Disease: A Case Series.
  IFSSH19-334

• The Critical Ligamentous Stabilizers of the Intercalated Segment. A Cadaveric Study
  IFSSH19-1176

• The Effect of Carpal Alignment on Post-Operative Range of Motion After Four Corner Fusion in Wrist with Type 1 Lunates
  IFSSH19-679

• The Effect of Radioscapholunate Fusion with and without Distal Scaphoid and Triquetrum Excision on Capitolunate Contact Pressure
  IFSSH19-1822

• The effect of surgery for base of thumb osteoarthritis on range of dart thrower’s motion at the wrist in cadavers.
  IFSSH19-893

• The impact of illness perceptions, psychological distress and pain catastrophizing on self-reported symptom severity and functional status in patients with carpal tunnel syndrome
  IFSSH19-827

• The role of arthroscopy in the treatment of a fracture of the body of the hamate
  IFSSH19-1753

• The Twist X-ray - A Novel Test for Dynamic Scapholunate Instability
  IFSSH19-36

• The Ulnar Plus Variance Does Not Adversely Affect the Outcomes of Arthroscopic Repair for Triangular Fibrocartilage 1b Tear
  IFSSH19-558

• The Validity of PRWHE and QuickDASH as Outcome Measures Following Surgery to Treat Scapholunate Ligament Dissociation
  IFSSH19-821

• Three dimensional kinematic analysis of scapholunate joint during axial-loaded extended wrist position
  IFSSH19-495

• Total Wrist Arthroplasty in Rheumatoid and Posttraumatic Arthritis: Highly different survival rates
  IFSSH19-1812

• Total Wrist Arthroplasty - Complications Management
  IFSSH19-845

• Transversal morphology of the sigmoid notch
  IFSSH19-860

• Trapeziectomy versus joint replacement in basal thumb osteoarthritis. Prospective study.
  IFSSH19-1225

• Treatment of coronal fracture of the hamate with fixation of titanium miniplate crossing
  IFSSH19-177
Index of topics (English)

carpometacarpal joint

- Treatment of Proximal Pole Scaphoid Nonunion with Capsular-Based Vascularized Distal Radius Graft IFSSH19-525
- Treatment of scaphoid non-unions by an anterior graft of the 1,2-intercompartmental supraretinacular artery vascularized bone graft IFSSH19-185
- Treatment of scaphoid nonunion by one, two headless compression screws or plate with or without Extracorporeal Shock Wave Therapy IFSSH19-988
- Treatment of scapholunate dissociation with arthroscopic ligamentoplasty reconstruction IFSSH19-1644
- Treatment of Unstable Scaphoid Nonunion Using Volar Locking plate IFSSH19-1144
- Triquetral fractures - a retrospective, multi-centre study of incidence, management and outcomes IFSSH19-419
- Triquetral motion is limited in vivo after lunocapitate fusion. IFSSH19-102
- TRIQUETRUM CONTROVERSIES IN LIMITED CARPAL FUSIONS IFSSH19-1093
- Vascularized Thumb Metacarpal Periosteal Flap for Scaphoid Nonunion in Adolescents: An Anatomical Study and Prospective Cohort Study of 16 Patients IFSSH19-960
- Vascularized versus non-vascularized bone grafts for scaphoid non-union: evidence and new findings IFSSH19-1745
- VOLAR PLATE RETENSIONING AFTER TRAPEZIECTOMY AND LIGAMENT RECONSTRUCTION TENDON INTERPOSITION IN BASAL THUMB ARTHRITIS WITH HYPEREXTENSION METACARPONALGEAL INSTABILITY IFSSH19-875
- WALANT Surgery, Advanced techniques in wrist surgery IFSSH19-931
- Wrist proprioception and forearm muscles biomechanical parameters dependency in DISI cases IFSSH19-1257
- Zaidenberg's pedicled vascularized bone-grafting for reconstruction of scaphoid-nonunions - effects and functional outcome in a series of 49 cases IFSSH19-999

Wrist - Radius

- 4D CT scans of the DRUJ - a novel method in identifying and describing instability IFSSH19-1483
- Active Wrist Mobilization after operatively treated distal radius fractures by volar locking plate - a prospective randomized trial IFSSH19-982
- Acute Loge de Guyon Syndrome in distal forearm fracture - a case report IFSSH19-461
- Adaptive 2 plate used as a monoxial locking plate has sufficient fixation stability for osteoporotic distal radius fracture equal to Acu-Loc 2 IFSSH19-312
- Analysis of Carpal Malalignment in Distal Radius Fractures Following Volar Locking Plate Fixation IFSSH19-254
- An anatomical study of the ulnar footprint of the distal radio-ulnar ligaments in relation to the ulnar styloid and the ulnar head IFSSH19-1447
- Anatomical correlation between the presence of a distal oblique bundle and the type of radioulnar joint according to the classification of Tolat. IFSSH19-1401
- A new pattern of extremely distal articular fragments in distal radius fractures IFSSH19-1316
- A New technique for the treatment of the Distal ulnar fractures associated with distal radial
<table>
<thead>
<tr>
<th>Topic</th>
<th>ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>An Innovative Approach to Preoperative Planning and Performing Corrective Osteotomy of the Radius.</td>
<td>IFSSH19-1933</td>
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<tr>
<td>Arthroscopic-assisted reduction and internal fixation with pin-plate construct for distal radius volar rim fracture</td>
<td>IFSSH19-1219</td>
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<tr>
<td>Artificial Intelligence Based Distal Radius Fracture Detection</td>
<td>IFSSH19-844</td>
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<tr>
<td>A systematic review of the quality of distal radius systematic reviews: Methodology and reporting assessment</td>
<td>IFSSH19-1858</td>
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<td>A Trial for effective subchondral support during volar locking plate fixation for distal radial fractures with cannulated screws</td>
<td>IFSSH19-742</td>
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<td>Biomechanics of External Fixator of Distal Radius Fracture, a new approach: Mutifix Wrist</td>
<td>IFSSH19-653</td>
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<td>Can the radiologic progression during 1st follow-up visit after closed reduction of distal radius fracture predict the radiologic outcome?</td>
<td>IFSSH19-320</td>
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<td>Clinical and ultrasonographical follow-up after early removal of distal radius volar plates positioned distal to the watershed line</td>
<td>IFSSH19-1902</td>
</tr>
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<td>Clinical Outcome of Fixation Versus Conservative Management of Basal Fractures of the Ulnar Styloid Following Volar Plate Fixation of the Distal Radius</td>
<td>IFSSH19-1345</td>
</tr>
<tr>
<td>Comfortable Cast to restrict pronation and supination. Is it possible?</td>
<td>IFSSH19-1700</td>
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<tr>
<td>Comparison of conservative versus operative treatment of peripheral TFCC tear after acute distal radius fractures.</td>
<td>IFSSH19-456</td>
</tr>
<tr>
<td>Comparison of Isokinetic power between Pronator quadratus sparing technique and conventional technique in simple Distal radial fracture using Volar plate fixation</td>
<td>IFSSH19-1527</td>
</tr>
<tr>
<td>Complications after distal radius fractures stabilized by volar locking plate in 392 patients</td>
<td>IFSSH19-985</td>
</tr>
<tr>
<td>COMPLICATIONS IN PATIENTS WITH FRACTURES OF THE DISTAL RADIUS</td>
<td>IFSSH19-1579</td>
</tr>
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<td>Computer-assisted preoperative planning of corrective osteotomy for extra-articular distal radius malunions: Surgical technique and a case series of 10 patients</td>
<td>IFSSH19-1214</td>
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<td>Computer Assisted Double Osteotomy (CADO) for Madelung Disease, A New Approach of Treatment</td>
<td>IFSSH19-1377</td>
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<tr>
<td>Computer Guided Templating for Osteotomy and Fixation of Complex Distal Radius Deformity Provides Cost-Effective and Anatomic and Biomechanically Superior Results to &quot;Free-Hand&quot; Surgery</td>
<td>IFSSH19-753</td>
</tr>
<tr>
<td>Concurrent endoscopic carpal tunnel release and volar locking plate osteosynthesis for distal radius fractures</td>
<td>IFSSH19-954</td>
</tr>
<tr>
<td>Corrective osteotomies of the radius: Grafting or not?</td>
<td>IFSSH19-1807</td>
</tr>
<tr>
<td>CORRECTIVE OSTEOTOMY AND DISTRACTION TECHNIQUE USED IN DISTAL RADIUS MALUNION TREATMENT</td>
<td>IFSSH19-1424</td>
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<tr>
<td>Defining displacement thresholds for surgical intervention for distal radius fractures - a Delphi study</td>
<td>IFSSH19-602</td>
</tr>
<tr>
<td>DISPLACED DORSAL LUNATE FACET FRACTURE TREATED WITH A VOLAR LOCKING PLATE. IS IT ADVANTAGEOUS TO CAPTURE THE FRAGMENT WITH A FULL LENGTH LOCKING SCREW?</td>
<td>IFSSH19-282</td>
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<td>Distal radius decompression osteotomy for ulnar impingement syndrome</td>
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<td>DISTAL RADIUS FRACTURE NONUNION: SERIE OF COMPLICATIONS IN A CASE REPORT</td>
<td>IFSSH19-899</td>
</tr>
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<td>DISTAL RADIUS FRACTURES: INTERNAL FIXATION USING VOLAR LOCKING PLATES AND CORRELATION OF CLINICAL FINDINGS WITH PATIENTS' SATISFACTION. EXPERIENCE OF OUR CLINIC</td>
<td>IFSSH19-761</td>
</tr>
<tr>
<td>Distal radius fractures: is rotation an important factor in fixation?</td>
<td>IFSSH19-919</td>
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<td>Distal Radius Nonunion: Subjective Hand Functional Impairment and Mid term Results after Radial Consolidation</td>
<td>IFSSH19-1576</td>
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<td>Distraction osteosynthesis in treatment of acute distal radius fractures</td>
<td>IFSSH19-1376</td>
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<td>Do post-operative radiographs change the management following internal fixation of distal radius fractures?</td>
<td>IFSSH19-797</td>
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<td>DORSAL CAPSULOPLASTY FOR POST-TRAUMATIC INSTABILITY OF THE DISTAL RADIOLUNAR JOINT</td>
<td>IFSSH19-444</td>
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<td>Dorsal fracture-dislocations of the distal radius: a new classification and proposal of a standardized surgical treatment</td>
<td>IFSSH19-395</td>
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<tr>
<td>Dynamic Distal Radioulnar Stabilization for Acute Triangular Fibrocartilage Complex Injury</td>
<td>IFSSH19-1873</td>
</tr>
<tr>
<td>Early Outcome of AO type C2 &amp; C3 Distal Radius Fractures Treated with Single Broad Dorsal Plate Fixation. A Case Series.</td>
<td>IFSSH19-892</td>
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<tr>
<td>Effect of wrist injury and treatment on the dart throwing motion</td>
<td>IFSSH19-895</td>
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<td>Fixation of Dorsal Ulnar Corner Fractures of the Distal Radius Through an Anterior Approach A Prospective Study with CT Documentation</td>
<td>IFSSH19-299</td>
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<td>Flexor pollicis longus excursion and irritation following plating of distal radius articular volar lip fractures</td>
<td>IFSSH19-473</td>
</tr>
<tr>
<td>Fragment-Specific Fixation versus Volar Locking Plates in non-reducible or redisplaced distal radius fractures. A long-term follow-up of a prospective and randomized study in 50 patients</td>
<td>IFSSH19-1011</td>
</tr>
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<td>Functional outcomes after corrective osteotomy of symptomatic distal radius malunions in children</td>
<td>IFSSH19-401</td>
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<tr>
<td>Functional outcomes of the Adams-Berger Ligament Reconstruction for the Distal Radioulnar Joint Instability in 95 Consecutive Cases</td>
<td>IFSSH19-828</td>
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<tr>
<td>Herbert ulnar head implant arthroplasty: 47 cases; mean follow-up 6,5 years</td>
<td>IFSSH19-1604</td>
</tr>
<tr>
<td>High Velocity Distal Radius Fractures - a cohort study</td>
<td>IFSSH19-1217</td>
</tr>
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<td>Hook Plate for volar rim fractures of the distal radius: review of the first 45 cases and focus on dorsal radiocarpal dislocation</td>
<td>IFSSH19-386</td>
</tr>
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<td>How can we avoid complications following ORIF of Distal Radius Fractures with a palmar locking plate?</td>
<td>IFSSH19-1824</td>
</tr>
<tr>
<td>Impact of Plate Design on Contact Force Between Flexor Tendons and Distal Radius Volar Plates</td>
<td>IFSSH19-1605</td>
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<tr>
<td>Intramedullary fixation using artificial bone block for comminuted distal radius fractures suppresses the reduction loss after the surgery</td>
<td>IFSSH19-448</td>
</tr>
<tr>
<td>Intramedullary nail fixation for displaced and unstable distal radial fractures in patients fifty</td>
<td>IFSSH19-30</td>
</tr>
</tbody>
</table>
years of age and older

- MANAGEMENT OF ANTERIOR COMMINUTION OF A DISTAL RADIO FRACTURE WITH A SCREW BAR FOR PALMAR FIXING: A CASE REPORT IFSSH19-1707
- Measurement of the distance between a line extending along the volar aspect of the radial shaft and the lunate rotation center on lateral view X-ray of the wrist IFSSH19-872
- Mechanics of a smith's fracture. -Caused by falling on the palm of the hand with wrist dorsal flexion- IFSSH19-645
- Minimally invasive plate fixation of distal radial fractures IFSSH19-128
- Operative Treatment of Intra-Articular Distal Radius Fractures With versus Without Arthroscopy: RADAR Trial IFSSH19-400
- Outcome assessment of closed distal radius fracture and ulnar styloid fracture treatment with volar plate and screw fixation IFSSH19-1509
- Outcomes of Endoscopic release for Patients with de Quervain's Tenosynovitis: Retrospective Review of 181 cases IFSSH19-1664
- Outcomes of Supplemental Bridge Plate Fixation of Highly Comminuted Distal Radius Fractures Treated by Open Reduction Internal Fixation IFSSH19-1204
- Pain as the main predictor of the one-year outcome in distal radius fractures IFSSH19-1751
- Percutaneous K-wires vs palmar-locking-plate fixation for distal radial fractures: a comparison of the outcomes of two methods used according to the accepted guidelines. IFSSH19-446
- Plate fixation for unstable displaced distal radius fractures in children IFSSH19-705
- Polyaxial locking plate fixation for volar-displaced distal radius fractures including marginal fractures IFSSH19-1064
- Polyaxial Locking Plating for Volarly Displaced Intra-articular Fractures of the Distal Radius IFSSH19-369
- Preliminary results of vein wrapping for treating hyperaesthesia of the superficial sensory radial nerve. IFSSH19-740
- Preliminary Study Using A Synthetic Ligament in DRUJ reconstruction IFSSH19-925
- Prevalence of Flexor Carpi Radialis Brevis in Chinese Patients with Volar Wrist Plating Performed for Distal Radius Fracture IFSSH19-986
- Prevalence of Osteoporosis in Patient with Distal Radius Fracture from Low-Energy Trauma IFSSH19-125
- Revisiting "Sandwich" Plating of AO type C3 Distal Radius Fractures - Our Friend or Foe? A case series. IFSSH19-267
- Should I stay or should I go - how safe is the routine removal of volar locking plates after healed fractures of the distal radius? IFSSH19-1777
- Stainless steel versus titanium volar multi-axial locking plates for fixation of distal radius fractures: a randomised trial IFSSH19-800
- Surgically treated Closed Distal Radius Fractures in adult working patients - Outcome analysis in occupational vs nonoccupational injuries IFSSH19-1513
- Technique for Intramedullary Stabilization of Ulnar Neck Fractures with Headless Compression Screw IFSSH19-1694
- Teriparatide can enhance bony union of beta-tricalcium phosphate in cases of corrective IFSSH19-794
osteotomy post distal radius malunion: a case series

- The agreement rate and accuracy of classification of distal radius fracture by plain roentgenography.
  IFSSH19-1633

- The Dorsal Barton Fracture Revisited
  IFSSH19-304

- The effect of articular tilt on carpal alignment in acute distal radius fractures
  IFSSH19-1661

- The effect of social deprivation on fragility fracture of the distal radius
  IFSSH19-603

- The influence of arthroscopy, arthrotomy and conventional fluoroscopy in palmar locking plate fixation of intra-articular unstable distal radius fractures - a prospective randomized trial
  IFSSH19-1829

  IFSSH19-283

- The use of dorsal butters wire in treatment of distal radio fracture
  IFSSH19-1892

- THE VALUE OF INITIAL RADIOGRAPHIC CHARACTERISTICS OF DISTAL RADIUS FRACTURE IN PREDICTION OF ASSOCIATED LESION OF TRIANGULAR FIBROCARTILAGE COMPLEX
  IFSSH19-1476

- The Vascularized Dorsal Periosteal Curtain for Corrective Osteotomy of the Distal Radius
  IFSSH19-823

- The vitamin D receptor expression in skeletal muscle of women with distal radius fracture
  IFSSH19-170

- The WALANT approach to distal radius ORIF
  IFSSH19-53

- Transverse Incisional Approach to Distal Radius Fractures: A Case Series
  IFSSH19-471

- Treatment of Distal Radius Fractures by Wrist Prosthesis
  IFSSH19-1522

- Treatment of marginal rim fracture of the distal radius using a new fragment-specific plate
  IFSSH19-1927

- Ulnar shortening osteotomy: using a novel compression technique
  IFSSH19-1799

- Variable Angle LCP Volar Rim Plate fixation for volar displaced distal radius fracture with volar lunate facet fragment
  IFSSH19-833

- Volar locking fixation for distal radius fracture in patients with concurrent hip fractures: A matched pair analysis of elderly patients
  IFSSH19-1015

- Volar locking plate fixation for distal radius fractures assisted by intraoperative computed tomographic navigation
  IFSSH19-1004

- Volar Locking Plate for AO Classification Type C Distal radius Fracture in the Elderly
  IFSSH19-1693

- Volar Plating of Distal Radius Fractures: Comparison of the Functional Outcomes of the Pronator Quadratus Muscle Repair, Non-repair, and Preserving Techniques
  IFSSH19-955

- Worse outcome (DASH) at 12 months in 128 patients with combined radius-ulna metaphyseal fracture than radius fracture alone. A register study of 3666 patients. Need for Evidence Based Treatment Guidelines?
  IFSSH19-1272
<table>
<thead>
<tr>
<th>Keyword</th>
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<tr>
<td>1st CMCJ osteoarthritis</td>
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</tr>
<tr>
<td>1st rib resection</td>
<td>IFSSH19-1393</td>
</tr>
<tr>
<td>3-corner fusion</td>
<td>IFSSH19-604</td>
</tr>
<tr>
<td>3D</td>
<td>IFSSH19-1214</td>
</tr>
<tr>
<td>3D-CT</td>
<td>IFSSH19-683</td>
</tr>
<tr>
<td>3D printing</td>
<td>IFSSH19-1373</td>
</tr>
<tr>
<td>3D computed tomography</td>
<td>IFSSH19-505</td>
</tr>
<tr>
<td>3D displacement analysis</td>
<td>IFSSH19-1845</td>
</tr>
<tr>
<td>3D fabrication</td>
<td>IFSSH19-205</td>
</tr>
<tr>
<td>3D modeling</td>
<td>IFSSH19-1933</td>
</tr>
<tr>
<td>3D motion capture</td>
<td>IFSSH19-736</td>
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<tr>
<td>3D motion capture analysis</td>
<td>IFSSH19-1408</td>
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<tr>
<td>3D planning</td>
<td>IFSSH19-410</td>
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<td>IFSSH19-1671</td>
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<td>IFSSH19-207</td>
</tr>
<tr>
<td>3D simulation</td>
<td>IFSSH19-1561</td>
</tr>
<tr>
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<td>IFSSH19-1008</td>
</tr>
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<td>IFSSH19-1394</td>
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<td>4D CT scan</td>
<td>IFSSH19-1483</td>
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<td>A1 pulley release</td>
<td>IFSSH19-1091</td>
</tr>
<tr>
<td>A2 annular pulley</td>
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<td>IFSSH19-1809</td>
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<td>IFSSH19-1103</td>
</tr>
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<td>Accidental falls</td>
<td>IFSSH19-125</td>
</tr>
<tr>
<td>Achilles tendon</td>
<td>IFSSH19-313</td>
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<td>IFSSH19-1965</td>
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<td>IFSSH19-365</td>
</tr>
<tr>
<td>Acro-osteolysis</td>
<td>IFSSH19-1729</td>
</tr>
<tr>
<td>Across joint</td>
<td>IFSSH19-501</td>
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<td>IFSSH19-696</td>
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<td>IFSSH19-1038</td>
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<td>IFSSH19-910</td>
</tr>
<tr>
<td>Adipose derived stem cells</td>
<td>IFSSH19-313</td>
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<tr>
<td>adipose tissue</td>
<td>IFSSH19-342</td>
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</tr>
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</tr>
<tr>
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<td>IFSSH19-456</td>
</tr>
<tr>
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<td>IFSSH19-1867</td>
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<td>IFSSH19-1940</td>
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<td>IFSSH19-1770</td>
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<tr>
<td>Anatomical TFCC reconstruction</td>
<td>IFSSH19-1737</td>
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<td>Index of keywords (English)</td>
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</tr>
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<td>IFSSH19-1552</td>
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<td>AXIATION</td>
<td>IFSSH19-1896</td>
</tr>
</tbody>
</table>

**B**

Baker's cyst                               | IFSSH19-1668 |
Ball and Socket Prostheses                 | IFSSH19-775 |
ballottment test                           | IFSSH19-1786 |
Barb-wire of Jennings                      | IFSSH19-1340 |
basal joint                                | IFSSH19-656 |
| Index of keywords (English) |  |
|----------------------------|  |
| boimechanics              | IFSSH19-358 |
| boimechanics              | IFSSH19-1985 |
| Bone/diagnostic imaging   | IFSSH19-1692 |
| Bone Age                  | IFSSH19-664 |
| Bone anchor               | IFSSH19-1645 |
| Bone atrophy              | IFSSH19-929 |
| bone avascular necrosis   | IFSSH19-1112 |
| bone defect               | IFSSH19-1518 |
| bone graft                | IFSSH19-552 |
| bone grafting             | IFSSH19-1338 |
| bone ligament graft       | IFSSH19-1389 |
| bone marrow               | IFSSH19-1090 |
| bone marrow cells         | IFSSH19-1112 |
| bone marrow concentrate   | IFSSH19-1104 |
| bone marrow mesenchymal stem c. | IFSSH19-207 |
| bone marrow stem cells    | IFSSH19-1111 |
| Bone mass loss            | IFSSH19-1729 |
| bone reconstruction       | IFSSH19-1343 |
| bone suture anchor        | IFSSH19-1518 |
| bone tumor                | IFSSH19-1667 |
| Bone Tumours              | IFSSH19-108 |
| bony defect               | IFSSH19-173 |
| bony mallet finger        | IFSSH19-380 |
| bony mallet finger        | IFSSH19-1181 |
| bony mallet finger        | IFSSH19-827 |
| Boston carpal tunnel问卷 | IFSSH19-491 |
| Boston carpal tunnel问卷 | IFSSH19-62 |
| botulinum toxin           | IFSSH19-229 |
| botulinum toxin A         | IFSSH19-253 |
| Botulinum toxin A         | IFSSH19-1914 |
| Boutoniére deformity      | IFSSH19-1846 |
| boxer's fracture          | IFSSH19-1585 |
| boxer's fractures         | IFSSH19-675 |
| brace                     | IFSSH19-606 |
| brachial injury            | IFSSH19-1865 |
| brachial plexus           | IFSSH19-12 |
| brachial plexus           | IFSSH19-347 |
| brachial plexus avulsion injury | IFSSH19-360 |
| brachial plexus birth injury | IFSSH19-1070 |
| brachial plexus birth palsy | IFSSH19-1917 |
| Brachial Plexus Injury    | IFSSH19-1314 |
| C5                        | IFSSH19-838 |
| C5 root injury            | IFSSH19-1241 |
| C7 nerve root             | IFSSH19-1269 |
| cadaver                   | IFSSH19-1792 |
| cadaveric dissection      | IFSSH19-192 |
| cadaveric study           | IFSSH19-1162 |
| Cadaver study             | IFSSH19-585 |
| Calcific periartthritis   | IFSSH19-596 |
| Camembert                 | IFSSH19-661 |
| Camptodactyly             | IFSSH19-453 |
| Camptodactyly - Tendon transfer - L. | IFSSH19-1094 |
| Cancellous bone graft     | IFSSH19-113 |
| cancellous graft          | IFSSH19-1255 |
| cancer                    | IFSSH19-1643 |
| cannulated screw          | IFSSH19-742 |
| cannulated screws         | IFSSH19-675 |
| Capaf flexible             | IFSSH19-193 |
| CapFlex-PIP               | IFSSH19-535 |
| capillary Hamangioma      | IFSSH19-537 |
| capitate                  | IFSSH19-1997 |
| capitate osteotomy        | IFSSH19-145 |
| carotid artery flap       | IFSSH19-145 |
| Carotid artery flap       | IFSSH19-1255 |
| Carotid artery flap       | IFSSH19-1241 |
| Capilary Hamangioma       | IFSSH19-1269 |
| Capsulodese               | IFSSH19-1241 |
| Capsuloplasty             | IFSSH19-1269 |
| Capsulotomy               | IFSSH19-1917 |
| Carotid artery flap       | IFSSH19-921 |
| carotid artery flap       | IFSSH19-1667 |
| carotid artery flap       | IFSSH19-1667 |
| carpal                     | IFSSH19-1176 |
| carpal                     | IFSSH19-1537 |
Index of keywords (English)

- Carpal alignment
  - IFSSH19-1712
  - IFSSH19-254
  - IFSSH19-679

- Carpal anomaly
  - IFSSH19-474

- Carpal bones
  - IFSSH19-1540
  - IFSSH19-419

- Carpal fracture dislocations
  - IFSSH19-1909

- Carpal fusion
  - IFSSH19-1150
  - IFSSH19-1162
  - IFSSH19-1176
  - IFSSH19-1523
  - IFSSH19-1630

- Carpal implant
  - IFSSH19-545
  - IFSSH19-1150

- Carpal instability
  - IFSSH19-947

- Carpal malalignment
  - IFSSH19-1661

- Carpal necrosis
  - IFSSH19-1471

- Carpal pain
  - IFSSH19-119

- Carpal release
  - IFSSH19-939

- Carpal scaphoid
  - IFSSH19-1721

- Carpal transverse ligament
  - IFSSH19-585

- Carpal tunnel
  - IFSSH19-1620

- Carpal Tunnel
  - IFSSH19-522
  - IFSSH19-524
  - IFSSH19-585
  - IFSSH19-783
  - IFSSH19-1069
  - IFSSH19-1186
  - IFSSH19-1310
  - IFSSH19-1503
  - IFSSH19-1765
  - IFSSH19-1882

- Carpal Tunnel Compression
  - IFSSH19-1803

- Carpal tunnel pressure
  - IFSSH19-1545

- Carpal tunnel release
  - IFSSH19-188
  - IFSSH19-542
  - IFSSH19-544
  - IFSSH19-557
  - IFSSH19-657
  - IFSSH19-734
  - IFSSH19-1382
  - IFSSH19-1709
  - IFSSH19-1819

- Carpal tunnel release surgery
  - IFSSH19-422

- Carpal tunnel syndrome
  - IFSSH19-77
  - IFSSH19-111
  - IFSSH19-117
  - IFSSH19-119
  - IFSSH19-122
  - IFSSH19-149
  - IFSSH19-188
  - IFSSH19-324
  - IFSSH19-422
  - IFSSH19-438
  - IFSSH19-439
  - IFSSH19-440
  - IFSSH19-460
  - IFSSH19-491
  - IFSSH19-542
  - IFSSH19-544
  - IFSSH19-557
  - IFSSH19-635
  - IFSSH19-657

- Carpectomy
  - IFSSH19-792

- Carpo-metacarpal Joint
  - IFSSH19-2001

- Carpometacarpal
  - IFSSH19-54

- Carpo metacarpal
  - IFSSH19-97

- Carpo metacarpal joint
  - IFSSH19-1240

- Cartilage
  - IFSSH19-1164

- Casereport
  - IFSSH19-1542

- Cast
  - IFSSH19-1468

- Cast immobilization
  - IFSSH19-1252

- Cast removal
  - IFSSH19-1309

- Catalase
  - IFSSH19-1940

- CBCT
  - IFSSH19-815

- CCEF
  - IFSSH19-1428

- Cell biology
  - IFSSH19-879

- Central neurological injury
  - IFSSH19-497
<table>
<thead>
<tr>
<th>Term</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>central slip</td>
<td>IFSSH19-943</td>
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<tr>
<td>central slip fracture</td>
<td>IFSSH19-1703</td>
</tr>
<tr>
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<td>IFSSH19-114</td>
</tr>
<tr>
<td>cerclage wiring</td>
<td>IFSSH19-1877</td>
</tr>
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<td>cerebral palsy</td>
<td>IFSSH19-984</td>
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<td>IFSSH19-1551</td>
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<td>IFSSH19-1870</td>
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<td>IFSSH19-361</td>
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<td>IFSSH19-1271</td>
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<td>IFSSH19-399</td>
</tr>
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<td>IFSSH19-1335</td>
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<td>IFSSH19-873</td>
</tr>
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<td>IFSSH19-1341</td>
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<td>IFSSH19-1490</td>
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<td>conservative ........................ IFSSH19-456</td>
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<td>Conservative Therapy ............ IFSSH19-1323</td>
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<tr>
<td>conservative treatment ........ IFSSH19-192</td>
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<tr>
<td>consolidation .................... IFSSH19-616</td>
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<tr>
<td>contraction ........................ IFSSH19-788</td>
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<tr>
<td>contracture ........................ IFSSH19-347</td>
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<tr>
<td>contralateral C7 ................. IFSSH19-12</td>
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<td>Contralateral C7 nerve transfer  IFSSH19-497</td>
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<td>contralateral C7 transfer ....... IFSSH19-1295</td>
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<td>contusion ........................... IFSSH19-873</td>
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<td>Core suture ........................ IFSSH19-1708</td>
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<td>coronoid fracture ................ IFSSH19-738</td>
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<tr>
<td>correction .......................... IFSSH19-1024</td>
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<td>corrective osteotomy .............. IFSSH19-480</td>
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<td>corticoid ........................... IFSSH19-610</td>
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<td>corticosteroid .................... IFSSH19-163</td>
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<tr>
<td>corticosteroid injection .......... IFSSH19-460</td>
<td></td>
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<tr>
<td>corticosteroid injections ......... IFSSH19-989</td>
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<tr>
<td>cost-effectiveness ............... IFSSH19-539</td>
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<tr>
<td>cost-utility ........................ IFSSH19-539</td>
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<td>cost analysis ...................... IFSSH19-1529</td>
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<td>Cost effectiveness ............... IFSSH19-753</td>
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<td>Cricket ................................ IFSSH19-498</td>
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<td>Cross finger flap .................. IFSSH19-858</td>
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<td>cross hand replantation .......... IFSSH19-1719</td>
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<td>cross sectional area ............. IFSSH19-806</td>
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<td>Cryo-preservation .................. IFSSH19-1638</td>
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<td>IFSSH19-1090</td>
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**DIAGNOSTIC ACCURACY**

- Diagnostic Accuracy | IFSSH19-184 |
- diagnostic criteria | IFSSH19-1501 |
- diagnostic practices | IFSSH19-1995 |
- Diagnostic Reference Level | IFSSH19-998 |
- Diagnostics | IFSSH19-1087 |
- diameter | IFSSH19-1708 |
- diaphyseal ulnar shortening osteotomy | IFSSH19-746 |
- dicheirie | IFSSH19-1905 |
- Differentiated MSCs | IFSSH19-748 |
- differentiation | IFSSH19-1159 |
- difficult cases | IFSSH19-1229 |
- digit | IFSSH19-403 |
- digital artery | IFSSH19-1215 |
- digital artery perforator | IFSSH19-549 |
- digital ischemia | IFSSH19-843 |
- digital nerve | IFSSH19-434 |
- digital nerve repair | IFSSH19-1949 |
- digital nerve suture | IFSSH19-465 |
<table>
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<th>IFSSH19-1169</th>
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<td>Direct Small Branch</td>
<td>IFSSH19-588</td>
<td>IFSSH19-1214</td>
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<td>IFSSH19-532</td>
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<td>IFSSH19-995</td>
<td>IFSSH19-320</td>
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<td>IFSSH19-1128</td>
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<td>IFSSH19-1248</td>
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<td>IFSSH19-1023</td>
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<td>IFSSH19-1925</td>
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<td>IFSSH19-128</td>
<td>IFSSH19-705</td>
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<td>Distal Nerve Injury</td>
<td>IFSSH19-1925</td>
<td>IFSSH19-742</td>
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<td>IFSSH19-129</td>
<td>IFSSH19-794</td>
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<td>IFSSH19-1639</td>
<td>IFSSH19-812</td>
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<td>IFSSH19-1182</td>
<td>IFSSH19-833</td>
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<td>IFSSH19-1369</td>
<td>IFSSH19-833</td>
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<td>distal pole of scaphoid excision</td>
<td>IFSSH19-1401</td>
<td>IFSSH19-927</td>
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<tr>
<td>Distal radial fracture</td>
<td>IFSSH19-1489</td>
<td>IFSSH19-954</td>
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<td>IFSSH19-1122</td>
<td>IFSSH19-982</td>
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<td>IFSSH19-1239</td>
<td>IFSSH19-985</td>
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<td>IFSSH19-192</td>
<td>IFSSH19-986</td>
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<td>IFSSH19-1489</td>
<td>IFSSH19-1004</td>
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<td>IFSSH19-1122</td>
<td>IFSSH19-1011</td>
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<td>IFSSH19-1380</td>
<td>IFSSH19-1015</td>
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<td>IFSSH19-1476</td>
<td>IFSSH19-1015</td>
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<td>IFSSH19-1639</td>
<td>IFSSH19-1528</td>
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<td>IFSSH19-1636</td>
<td>IFSSH19-1528</td>
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Index of keywords (English)

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<tr>
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<td>IFSSH19-50</td>
</tr>
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</table>

| Keyword                                                                 | IFSSH19-1736|
| flexor pollicis longus (FPL)                                           | IFSSH19-1211|
| flexor tendon repair                                                   | IFSSH19-1829|
| flexor tendon injuries                                                 | IFSSH19-1330|
| flexor tendon repair                                                   | IFSSH19-1624|
| flexor tendons                                                         | IFSSH19-1170|
| flexor tendon sheath                                                  | IFSSH19-161|
| flexor tendon sheath                                                  | IFSSH19-674|
| flexor tendons reconstruction                                         | IFSSH19-96|
| flexor tenosynovitis                                                   | IFSSH19-423|
| flow-through flap                                                     | IFSSH19-598|
| flow-through venous flap                                              | IFSSH19-1682|
| fluorescopy                                                           | IFSSH19-402|
| follow-up                                                             | IFSSH19-320|
| follow up                                                             | IFSSH19-478|
| foot                                                                  | IFSSH19-365|
| football players                                                       | IFSSH19-1834|
| foot polyductyly                                                      | IFSSH19-1494|
| forearm                                                               | IFSSH19-316|
| forearm                                                               | IFSSH19-970|
| forearm                                                               | IFSSH19-398|
| forearm                                                               | IFSSH19-1860|
| forearm                                                               | IFSSH19-1508|
| forearm corrective osteotomy pitfall                                   | IFSSH19-1850|
| forearm diaphysis fracture                                             | IFSSH19-929|
| forearm fracture                                                       | IFSSH19-158|
| Forearm Fractures                                                     | IFSSH19-1469|
| forearm influence on scapholunate joint                                | IFSSH19-89|
| Forearm Non-union                                                     | IFSSH19-1276|
| Forearm Osteotomy                                                     | IFSSH19-356|
| Forearm Periosteal Flap                                               | IFSSH19-1276|
| Forearm torque                                                        | IFSSH19-594|
| forearm                                                                | IFSSH19-1495|
| forearm                                                                | IFSSH19-586|
| forearm                                                                | IFSSH19-679|
| forearm                                                                | IFSSH19-785|
| four-corner-fusion                                                    | IFSSH19-62|
| four-corner-fusion                                                    | IFSSH19-128|
| four-corner-fusion                                                    | IFSSH19-212|
| four-corner-fusion                                                    | IFSSH19-259|
| four-corner-fusion                                                    | IFSSH19-487|
| four-corner-fusion                                                    | IFSSH19-515|
| four-corner-fusion                                                    | IFSSH19-651|
| four-corner-fusion                                                    | IFSSH19-653|
| four-corner-fusion                                                    | IFSSH19-664|
| four-corner-fusion                                                    | IFSSH19-673|
| four-corner-fusion                                                    | IFSSH19-699|
| four-corner-fusion                                                    | IFSSH19-704|
| four-corner-fusion                                                    | IFSSH19-797|

22. August 2019, 11:37 CEST
<table>
<thead>
<tr>
<th>Index of keywords (English)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fracture-dislocations</td>
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<tr>
<td>Fracture dislocation</td>
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<td>Fractures</td>
</tr>
<tr>
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<tr>
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</tr>
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</tr>
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</tr>
<tr>
<td>Index of keywords (English)</td>
</tr>
<tr>
<td>-----------------------------</td>
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<tr>
<td>Insurance .......................... IFSSH19-1404</td>
</tr>
<tr>
<td>integra ................................ IFSSH19-1483</td>
</tr>
<tr>
<td>Intelligent bionic hand ........ IFSSH19-1537</td>
</tr>
<tr>
<td>intercarpal ligament injury .... IFSSH19-1873</td>
</tr>
<tr>
<td>intercompartmental suprapatella . intercostal nerve transfer ....... IFSSH19-1356</td>
</tr>
<tr>
<td>interface ................................ IFSSH19-1160</td>
</tr>
<tr>
<td>intermediate scalenes ........... IFSSH19-193</td>
</tr>
<tr>
<td>intermetacarpal artery .......... IFSSH19-1467</td>
</tr>
<tr>
<td>internal ................................ IFSSH19-185</td>
</tr>
<tr>
<td>internal fixation .................. IFSSH19-1934</td>
</tr>
<tr>
<td>internal rotation contracture ... IFSSH19-1908</td>
</tr>
<tr>
<td>Intersosseus muscles ............ IFSSH19-1582</td>
</tr>
<tr>
<td>Intersosseous ligament ........ IFSSH19-1038</td>
</tr>
<tr>
<td>Intersosseous membrane .......... IFSSH19-177</td>
</tr>
</tbody>
</table>

| interosseous membrane reconstruct. . interosseous muscles .......... IFSSH19-94 |
| interphalangeal arthrodesis .... IFSSH19-1116 |
| Interphalangeal joint ............ IFSSH19-35 |
| Interplast ........................ IFSSH19-431 |
| interposition ...................... IFSSH19-777 |
| interposition arthroplasty ...... IFSSH19-220 |
| interposition arthroplasty elbow IFSSH19-654 |
| Interval ............................ IFSSH19-1293 |
| intra-articular ..................... IFSSH19-1562 |
| intra-articular comminuted fracture IFSSH19-1779 |
| intra-articular distal radius fracture .... IFSSH19-1127 |
| intra-articular distal radius fractures .. IFSSH19-1227 |
| intraarticular ..................... IFSSH19-1827 |
| intraarticular fracture ........ IFSSH19-1892 |
| intracarpal measurements .... IFSSH19-1829 |
| intra focal pinning .............. IFSSH19-1834 |
| intramedullary .................... IFSSH19-1829 |
| intramedullary fixation ........ IFSSH19-1892 |

| intramedullary headless screw ...... IFSSH19-1024 |
| Intramedullary nail ............... IFSSH19-675 |
| Intramedullary wiring ............ IFSSH19-1694 |
| Intramuscular Hemangioma .... IFSSH19-1901 |
| intraneural ganglion ............. IFSSH19-415 |
| Intraneural hemangioma ........ IFSSH19-30 |
| Intraoperative .................... IFSSH19-1142 |
| Intraoperative nerve recording ... IFSSH19-840 |
| intrasynovial tendon ........... IFSSH19-1959 |
| intrinsic .......................... IFSSH19-1587 |

| intrinsic muscle ................ IFSSH19-1325 |
| intrinsic musculature .......... IFSSH19-1356 |
| in vivo ............................ IFSSH19-1160 |
| irreparable tears ............... IFSSH19-1873 |
| IOM Rupture ....................... IFSSH19-1537 |
| irreducible dislocation metacarpoph. IFSSH19-181 |
| irreducible fracture dislocation IFSSH19-1959 |
| ischemia .......................... IFSSH19-1934 |
| isoeelastic ........................ IFSSH19-1908 |
| isolated .......................... IFSSH19-1970 |
| Jumped runners ................ IFSSH19-1582 |
| K .................................. IFSSH19-973 |
| Kwire fixation .................. IFSSH19-973 |
| Kaarela's arthroplasty .......... IFSSH19-973 |
| KAPLAN DISLOCATION ........ IFSSH19-973 |
| Keywords: Integra ............... IFSSH19-516 |
| Keywords: Kessler ............... IFSSH19-1973 |
| Keywords: Tendinopathies ...... IFSSH19-973 |
| Keywords: Wrist ganglia .... IFSSH19-973 |
| Kienbock's disease ........ IFSSH19-478 |
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| kinematic .......................... IFSSH19-973 |
| kinematic analysis ............ IFSSH19-973 |
| kinematics ........................ IFSSH19-973 |

| Kirchner Wire .................. IFSSH19-973 |
| Kirchner wires ................ IFSSH19-973 |
| Kirchner wire ............... IFSSH19-973 |
| Kj classification ........ IFSSH19-973 |
| Knife assaults ............... IFSSH19-973 |
| Knife crimes ................ IFSSH19-973 |

22. August 2019, 11:37 CEST
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### Index of keywords (English)

<table>
<thead>
<tr>
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<tr>
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nerve transfer#65307  .......... IFSSH19-1849
nerve transfers for C5./6 nerve root.  .......... IFSSH19-1976
nerve tubulization  .......... IFSSH19-1551
nerve wrap  .......... IFSSH19-1000
neuroma  .......... IFSSH19-1439
Neuragen nerve guide  .......... IFSSH19-906
Neuralgia of the finger  .......... IFSSH19-1247
neurectomy  .......... IFSSH19-1803
neuritis  .......... IFSSH19-1953
Neuro-fasciocutaneous flap  .......... IFSSH19-601
neurofibroma  .......... IFSSH19-605
neurolysis  .......... IFSSH19-788
neuroma formation  .......... IFSSH19-1186
neuroraftt formation  .......... IFSSH19-1247
neuropathic pain  .......... IFSSH19-1251
Neuroma formation  .......... IFSSH19-1446
neuroma prevention  .......... IFSSH19-1656
neuromodulation  .......... IFSSH19-1702
neuropathic pain  .......... IFSSH19-1714
neuropathies  .......... IFSSH19-1745
neuropathies  .......... IFSSH19-1757
nerve transfers for C5./6 nerve root.  .......... IFSSH19-1803
nerve wrap  .......... IFSSH19-1953
Neuragen nerve guide  .......... IFSSH19-601
Neuralgia of the finger  .......... IFSSH19-1405
neurectomy  .......... IFSSH19-774
neuritis  .......... IFSSH19-921
Neuro-fasciocutaneous flap  .......... IFSSH19-1656
neuroma formation  .......... IFSSH19-1702
nerve transfers for C5./6 nerve root.  .......... IFSSH19-846
nerve transfers for C5./6 nerve root.  .......... IFSSH19-851
nerve transfers for C5./6 nerve root.  .......... IFSSH19-321
nerve transfers for C5./6 nerve root.  .......... IFSSH19-1853
Neuragen nerve guide  .......... IFSSH19-774
Neuralgia of the finger  .......... IFSSH19-921
neurolysis  .......... IFSSH19-928
neuroma formation  .......... IFSSH19-1031
nerve transfers for C5./6 nerve root.  .......... IFSSH19-1335
nerve transfers for C5./6 nerve root.  .......... IFSSH19-127
Neuroregeneration  .......... IFSSH19-127
neurorrhaphy  .......... IFSSH19-1638
neuromodulation  .......... IFSSH19-85
nerve transfers for C5./6 nerve root.  .......... IFSSH19-1969
neurolysis  .......... IFSSH19-906
nerve transfers for C5./6 nerve root.  .......... IFSSH19-1175
nerve transfers for C5./6 nerve root.  .......... IFSSH19-1934
Neuroma formation  .......... IFSSH19-1413
neuropathic pain  .......... IFSSH19-32
Neurovascular island  .......... IFSSH19-1808
neuropathic pain  .......... IFSSH19-1055
neurorrhaphy  .......... IFSSH19-1224
new clinical test  .......... IFSSH19-236
new instrument  .......... IFSSH19-932
neurolysis  .......... IFSSH19-874
night pain  .......... IFSSH19-1765
NIS  .......... IFSSH19-1356
nitric oxide  .......... IFSSH19-1432
nocturnal pain  .......... IFSSH19-869
non-consolidation fractures  .......... IFSSH19-1220
Non-Contrast MRI  .......... IFSSH19-1428
Non-Fused  .......... IFSSH19-600
non-operative treatment  .......... IFSSH19-664
non-inflammatory  .......... IFSSH19-987
non-linear biomechanical system  .......... IFSSH19-993
non-operative treatment  .......... IFSSH19-167
non-rheumatoid patients  .......... IFSSH19-1252
non-surgical treatment  .......... IFSSH19-752
non-traumatic  .......... IFSSH19-847
Non-tuberculous mycobacterium  .......... IFSSH19-208
non-union  .......... IFSSH19-1168
Non-tuberculous mycobacterium  .......... IFSSH19-185
non-union  .......... IFSSH19-811
Non-tuberculous mycobacterium  .......... IFSSH19-960
Non-tuberculous mycobacterium  .......... IFSSH19-988
Non-tuberculous mycobacterium  .......... IFSSH19-1276
Non-tuberculous mycobacterium  .......... IFSSH19-1714
Non-tuberculous mycobacterium  .......... IFSSH19-1771
Non-tuberculous mycobacterium  .......... IFSSH19-1745
Non-tuberculous mycobacterium  .......... IFSSH19-1757
Non-tuberculous mycobacterium  .......... IFSSH19-1903
Non-tuberculous mycobacterium  .......... IFSSH19-681
non-tuberculous mycobacterium  .......... IFSSH19-1745
nonunion  .......... IFSSH19-975
Non-vascularized  .......... IFSSH19-113
Non-vascularized  .......... IFSSH19-738
Non-vascularized  .......... IFSSH19-899
Non-vascularized  .......... IFSSH19-933
Non-vascularized  .......... IFSSH19-1076
Non-vascularized  .......... IFSSH19-1144
Non-vascularized  .......... IFSSH19-1643
Non-vascularized  .......... IFSSH19-1857
Non-vascularized  .......... IFSSH19-1974
Non-vascularized  .......... IFSSH19-158
Non-vascularized  .......... IFSSH19-1760
Non-vascularized  .......... IFSSH19-824
Non-vascularized  .......... IFSSH19-1929
Non-vascularized  .......... IFSSH19-1872
Non-vascularized  .......... IFSSH19-1358
No Tourniquet  .......... IFSSH19-34
No Tourniquet  .......... IFSSH19-53
No Tourniquet  .......... IFSSH19-939
No tourniquet carpal tunnel release.  .......... IFSSH19-646
Novel Technique  .......... IFSSH19-471
NPS  .......... IFSSH19-1267
NSAIADS  .......... IFSSH19-1919
NSAIADS  .......... IFSSH19-391
NSAIADS  .......... IFSSH19-596
NSAIADS  .......... IFSSH19-19
NSAIADS  .......... IFSSH19-1461
NSAIADS  .......... IFSSH19-1469
NSAIADS  .......... IFSSH19-1903
Nylon monofilament assessment  .......... IFSSH19-1976
O  .......... IFSSH19-1245
OA  .......... IFSSH19-1488
Obertelin technique  .......... IFSSH19-1477
oberlin transfer  .......... IFSSH19-1246
objective  .......... IFSSH19-1466
objective sensory status  .......... IFSSH19-1466
objective sensory status  .......... IFSSH19-1107
objective sensory status  .......... IFSSH19-1399
objective sensory status  .......... IFSSH19-1934
objective sensory status  .......... IFSSH19-696
objective sensory status  .......... IFSSH19-1399
objective sensory status  .......... IFSSH19-1488
objective sensory status  .......... IFSSH19-1477
oblique branch  .......... IFSSH19-1782
OBPI  .......... IFSSH19-262
obstetrical brachial plexus injury  .......... IFSSH19-262
obstetrical brachial plexus injury  .......... IFSSH19-1915
obstetrical brachial plexus injury  .......... IFSSH19-465
obstetrical brachial plexus injury  .......... IFSSH19-1314
obstetrical shoulder contracture  .......... IFSSH19-851
obstetrical tendon transfer triceps  .......... IFSSH19-846
Index of keywords (English)

- Obstetric tendon transfer triceps bic.
- Occupational therapy
- Ocean rowing
- OCTR
- Office surgery
- Offset
- Old dislocation
- Olecranon Fracture
- Olecranon osteotomy
- On-Top-Plasty
- OMT
- Open wedge osteotomy
- Operative
- Opioid
- Opioids
- Opposition reanimation
- Optimization
- ORIF
- Orthosis
- Orthopaedic surgery
- Orthopaedic Surgery: Plastic and Re.
- Orthosis
- Osborne ligament reconstruction
- Osteoporosis
- Osseointegration
- Osteoarthritis of DIPJ
- Osteoarthritis
- Osteoarthritis of DRUJ
- Osteoarthritis of the thumb carpom.
- Osteoarthritis of the Thumb Trapezii
- Osteoarthritis of thumb carpometac.
- Osteoarthritis scaphotrapezium
- Osteoarthritis
- Osteochondral flap
- Osteochondral graft
- Osteochondral transplants
- Osteochondritis dissecans
- Osteoclast
- Osteocutaneous defect
- Osteoid ostema
- Osteomyelitis
- Osteonecrosis
- Osteopenia
- Osteoporosis
- Osteoporosis of hand
### Index of keywords (English)

<table>
<thead>
<tr>
<th>Term</th>
<th>Page Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>osteosyntheses</td>
<td>IFSSH19-603</td>
</tr>
<tr>
<td>Osteosynthesis</td>
<td>IFSSH19-1902</td>
</tr>
<tr>
<td>osteosynthesis in the hand</td>
<td>IFSSH19-191</td>
</tr>
<tr>
<td>Osteotomy</td>
<td>IFSSH19-180</td>
</tr>
<tr>
<td>outcome</td>
<td>IFSSH19-235</td>
</tr>
<tr>
<td>outcome measures</td>
<td>IFSSH19-425</td>
</tr>
<tr>
<td>outcomes</td>
<td>IFSSH19-451</td>
</tr>
<tr>
<td>outcomes measure</td>
<td>IFSSH19-441</td>
</tr>
<tr>
<td>overgrowth syndromes</td>
<td>IFSSH19-1450</td>
</tr>
<tr>
<td>overlengthening</td>
<td>IFSSH19-555</td>
</tr>
<tr>
<td>overload</td>
<td>IFSSH19-1403</td>
</tr>
<tr>
<td>over the top</td>
<td>IFSSH19-269</td>
</tr>
<tr>
<td>P1</td>
<td>IFSSH19-1746</td>
</tr>
<tr>
<td>Pacinian corpuscle neuroma</td>
<td>IFSSH19-1774</td>
</tr>
<tr>
<td>Pacinian hyperplasia</td>
<td>IFSSH19-1774</td>
</tr>
<tr>
<td>Pacinian hypertrophy</td>
<td>IFSSH19-1774</td>
</tr>
<tr>
<td>Pacinian neurofibroma</td>
<td>IFSSH19-1774</td>
</tr>
<tr>
<td>paediatric</td>
<td>IFSSH19-1459</td>
</tr>
<tr>
<td>Paediatric Carpal Fractures</td>
<td>IFSSH19-1523</td>
</tr>
<tr>
<td>paediatric fractures</td>
<td>IFSSH19-607</td>
</tr>
<tr>
<td>Paediatric hand fractures</td>
<td>IFSSH19-1591</td>
</tr>
<tr>
<td>pain</td>
<td>IFSSH19-1183</td>
</tr>
<tr>
<td>Pain control</td>
<td>IFSSH19-812</td>
</tr>
<tr>
<td>painful neuroma</td>
<td>IFSSH19-237</td>
</tr>
<tr>
<td>palmar aponeurosis</td>
<td>IFSSH19-94</td>
</tr>
<tr>
<td>palmar contact force</td>
<td>IFSSH19-1545</td>
</tr>
<tr>
<td>palmar fascia</td>
<td>IFSSH19-434</td>
</tr>
<tr>
<td>Palmaris longus</td>
<td>IFSSH19-422</td>
</tr>
<tr>
<td>palmar locking plate</td>
<td>IFSSH19-1824</td>
</tr>
<tr>
<td>palmar oblique ligament</td>
<td>IFSSH19-772</td>
</tr>
<tr>
<td>palmar plate fixation</td>
<td>IFSSH19-1829</td>
</tr>
<tr>
<td>Palmar subluxation after volar plati.</td>
<td>IFSSH19-1064</td>
</tr>
<tr>
<td>Pantrapezial arthritis</td>
<td>IFSSH19-782</td>
</tr>
<tr>
<td>paralytic shoulder</td>
<td>IFSSH19-1792</td>
</tr>
<tr>
<td>paradoxical extension</td>
<td>IFSSH19-1294</td>
</tr>
<tr>
<td>parsonage</td>
<td>IFSSH19-788</td>
</tr>
<tr>
<td>partial</td>
<td>IFSSH19-1023</td>
</tr>
<tr>
<td>partial carpal fusion</td>
<td>IFSSH19-102</td>
</tr>
<tr>
<td>partial intercarpal fusion</td>
<td>IFSSH19-533</td>
</tr>
<tr>
<td>partial wrist fusion</td>
<td>IFSSH19-1443</td>
</tr>
<tr>
<td>Passive Mobilization</td>
<td>IFSSH19-310</td>
</tr>
<tr>
<td>PAST-technique</td>
<td>IFSSH19-1738</td>
</tr>
<tr>
<td>Pathological characteristics</td>
<td>IFSSH19-103</td>
</tr>
<tr>
<td>pathological lesion</td>
<td>IFSSH19-950</td>
</tr>
<tr>
<td>pathology</td>
<td>IFSSH19-922</td>
</tr>
<tr>
<td>patient's satisfaction</td>
<td>IFSSH19-761</td>
</tr>
<tr>
<td>patient-reported outcome measure</td>
<td>IFSSH19-1206</td>
</tr>
<tr>
<td>Patient-Reported Outcomes</td>
<td>IFSSH19-522</td>
</tr>
<tr>
<td>Patient-specific Instruments</td>
<td>IFSSH19-76</td>
</tr>
<tr>
<td>patient acceptable symptom state</td>
<td>IFSSH19-256</td>
</tr>
<tr>
<td>Patient Centered Care</td>
<td>IFSSH19-407</td>
</tr>
<tr>
<td>patient education</td>
<td>IFSSH19-1875</td>
</tr>
<tr>
<td>Patient perspective</td>
<td>IFSSH19-1032</td>
</tr>
<tr>
<td>patient radiation exposure</td>
<td>IFSSH19-1385</td>
</tr>
<tr>
<td>patient related outcome</td>
<td>IFSSH19-897</td>
</tr>
<tr>
<td>patient reported outcomes</td>
<td>IFSSH19-811</td>
</tr>
<tr>
<td>Patient reported outcome</td>
<td>IFSSH19-1642</td>
</tr>
<tr>
<td>patient reported outcome measures</td>
<td>IFSSH19-1913</td>
</tr>
<tr>
<td>patient satisfaction</td>
<td>IFSSH19-1902</td>
</tr>
<tr>
<td>Patient Specific Functional Scale</td>
<td>IFSSH19-407</td>
</tr>
<tr>
<td>Patient specific implants</td>
<td>IFSSH19-1671</td>
</tr>
<tr>
<td>patient specific osteotomy 3D plann.</td>
<td>IFSSH19-769</td>
</tr>
<tr>
<td>pediatric</td>
<td>IFSSH19-942</td>
</tr>
<tr>
<td>Patient elbow trauma</td>
<td>IFSSH19-221</td>
</tr>
<tr>
<td>pediatric finger injury</td>
<td>IFSSH19-449</td>
</tr>
<tr>
<td>Pediatric Monteggia fracture</td>
<td>IFSSH19-1191</td>
</tr>
<tr>
<td>Pediatric reconstruction</td>
<td>IFSSH19-1086</td>
</tr>
<tr>
<td>pediatrics</td>
<td>IFSSH19-705</td>
</tr>
<tr>
<td>Pediatric surgery</td>
<td>IFSSH19-401</td>
</tr>
<tr>
<td>PEDIATRIC TRAUMA</td>
<td>IFSSH19-1156</td>
</tr>
<tr>
<td>pedicle coverage</td>
<td>IFSSH19-1531</td>
</tr>
<tr>
<td>Index of keywords (English)</td>
<td></td>
</tr>
<tr>
<td>----------------------------</td>
<td></td>
</tr>
<tr>
<td>pedicled and free microvascular int.</td>
<td>IFSSH19-429</td>
</tr>
<tr>
<td>pedicled perforator flap</td>
<td>IFSSH19-229</td>
</tr>
<tr>
<td>PEEK</td>
<td>IFSSH19-1495</td>
</tr>
<tr>
<td>PEEK</td>
<td>IFSSH19-1671</td>
</tr>
<tr>
<td>penetrating injuries</td>
<td>IFSSH19-1706</td>
</tr>
<tr>
<td>Pennington</td>
<td>IFSSH19-1570</td>
</tr>
<tr>
<td>percutaneous</td>
<td>IFSSH19-1353</td>
</tr>
<tr>
<td>Percutaneous coronary intervention</td>
<td>IFSSH19-398</td>
</tr>
<tr>
<td>percutaneous needles</td>
<td>IFSSH19-1239</td>
</tr>
<tr>
<td>percutaneous pinning</td>
<td>IFSSH19-917</td>
</tr>
<tr>
<td>percutaneous release</td>
<td>IFSSH19-1147</td>
</tr>
<tr>
<td>percutaneous scaphoid</td>
<td>IFSSH19-1079</td>
</tr>
<tr>
<td>percutaneous screw fixation</td>
<td>IFSSH19-1361</td>
</tr>
<tr>
<td>percutaneous treatment</td>
<td>IFSSH19-1626</td>
</tr>
<tr>
<td>Perforator flap</td>
<td>IFSSH19-1215</td>
</tr>
<tr>
<td>perforator</td>
<td>IFSSH19-1684</td>
</tr>
<tr>
<td>perforator flap</td>
<td>IFSSH19-172</td>
</tr>
<tr>
<td>perforator nap</td>
<td>IFSSH19-230</td>
</tr>
<tr>
<td>perforator flap &amp;#65307</td>
<td>IFSSH19-601</td>
</tr>
<tr>
<td>perforator flap</td>
<td>IFSSH19-940</td>
</tr>
<tr>
<td>perforator flap</td>
<td>IFSSH19-956</td>
</tr>
<tr>
<td>perforator flap</td>
<td>IFSSH19-958</td>
</tr>
<tr>
<td>perforator flap</td>
<td>IFSSH19-964</td>
</tr>
<tr>
<td>perforator flap</td>
<td>IFSSH19-966</td>
</tr>
<tr>
<td>perforator flap</td>
<td>IFSSH19-968</td>
</tr>
<tr>
<td>perforator flap</td>
<td>IFSSH19-969</td>
</tr>
<tr>
<td>perforator flap</td>
<td>IFSSH19-1289</td>
</tr>
<tr>
<td>perforator flap</td>
<td>IFSSH19-1430</td>
</tr>
<tr>
<td>Perforator flap &amp;#65307</td>
<td>IFSSH19-637</td>
</tr>
<tr>
<td>perforator nap</td>
<td>IFSSH19-978</td>
</tr>
<tr>
<td>perforating musicians disease</td>
<td>IFSSH19-1089</td>
</tr>
<tr>
<td>perforating musicians diseases</td>
<td>IFSSH19-1110</td>
</tr>
<tr>
<td>perilunate dislocation fracture</td>
<td>IFSSH19-95</td>
</tr>
<tr>
<td>perilunate dislocations</td>
<td>IFSSH19-536</td>
</tr>
<tr>
<td>Perilunate fractures</td>
<td>IFSSH19-1784</td>
</tr>
<tr>
<td>Periosteal Flap</td>
<td>IFSSH19-1946</td>
</tr>
<tr>
<td>peripheral</td>
<td>IFSSH19-19</td>
</tr>
<tr>
<td>peripheral nerve</td>
<td>IFSSH19-695</td>
</tr>
<tr>
<td>peripheral nerve injuries</td>
<td>IFSSH19-869</td>
</tr>
<tr>
<td>Peripheral nerve injury</td>
<td>IFSSH19-873</td>
</tr>
<tr>
<td>peripheral nerve regeneration</td>
<td>IFSSH19-921</td>
</tr>
<tr>
<td>peripheral nerve regeneration</td>
<td>IFSSH19-1034</td>
</tr>
<tr>
<td>peripheral nerve repair</td>
<td>IFSSH19-1044</td>
</tr>
<tr>
<td>Peripheral Nerves</td>
<td>IFSSH19-1584</td>
</tr>
<tr>
<td>peripheral nerve injury</td>
<td>IFSSH19-1118</td>
</tr>
<tr>
<td>peripheral nerve regeneration</td>
<td>IFSSH19-205</td>
</tr>
<tr>
<td>peripheral nerve regeneration</td>
<td>IFSSH19-207</td>
</tr>
<tr>
<td>peripheral nerve repair</td>
<td>IFSSH19-1120</td>
</tr>
<tr>
<td>Peripheral Nerves</td>
<td>IFSSH19-1412</td>
</tr>
<tr>
<td>peripheral tear</td>
<td>IFSSH19-1973</td>
</tr>
<tr>
<td>peripheral TFCC tear</td>
<td>IFSSH19-456</td>
</tr>
<tr>
<td>peripheral nerve</td>
<td>IFSSH19-969</td>
</tr>
<tr>
<td>persistent</td>
<td>IFSSH19-1581</td>
</tr>
<tr>
<td>persisting pain</td>
<td>IFSSH19-491</td>
</tr>
<tr>
<td>phalangeal</td>
<td>IFSSH19-1426</td>
</tr>
<tr>
<td>phalangeal bone</td>
<td>IFSSH19-515</td>
</tr>
<tr>
<td>phalangeal fractures</td>
<td>IFSSH19-1353</td>
</tr>
<tr>
<td>phalangeal bone</td>
<td>IFSSH19-1518</td>
</tr>
<tr>
<td>phalangeal fractures</td>
<td>IFSSH19-1433</td>
</tr>
<tr>
<td>phalanx</td>
<td>IFSSH19-1024</td>
</tr>
<tr>
<td>phantom limb pain</td>
<td>IFSSH19-512</td>
</tr>
<tr>
<td>phantom limb sensation</td>
<td>IFSSH19-1688</td>
</tr>
<tr>
<td>PHOTOGRAPHY</td>
<td>IFSSH19-915</td>
</tr>
<tr>
<td>physis arrest</td>
<td>IFSSH19-1724</td>
</tr>
<tr>
<td>physis fracture</td>
<td>IFSSH19-1305</td>
</tr>
<tr>
<td>Physical Examination</td>
<td>IFSSH19-184</td>
</tr>
<tr>
<td>physical therapy</td>
<td>IFSSH19-1102</td>
</tr>
<tr>
<td>physiology</td>
<td>IFSSH19-1006</td>
</tr>
<tr>
<td>PIK3CA</td>
<td>IFSSH19-1450</td>
</tr>
<tr>
<td>pilar pain</td>
<td>IFSSH19-1366</td>
</tr>
<tr>
<td>PIN</td>
<td>IFSSH19-1547</td>
</tr>
<tr>
<td>Pin-related complications</td>
<td>IFSSH19-1171</td>
</tr>
<tr>
<td>pinch strength</td>
<td>IFSSH19-1091</td>
</tr>
<tr>
<td>PIN neurectomy</td>
<td>IFSSH19-1922</td>
</tr>
<tr>
<td>PIN palsy</td>
<td>IFSSH19-1727</td>
</tr>
<tr>
<td>PIP-joints</td>
<td>IFSSH19-1606</td>
</tr>
<tr>
<td>PIP</td>
<td>IFSSH19-1563</td>
</tr>
<tr>
<td>PIP joint</td>
<td>IFSSH19-397</td>
</tr>
<tr>
<td>PIP stiffness</td>
<td>IFSSH19-1073</td>
</tr>
<tr>
<td>Pirocarbon prosthesis</td>
<td>IFSSH19-876</td>
</tr>
<tr>
<td>pivot flap</td>
<td>IFSSH19-1864</td>
</tr>
<tr>
<td>planning experience</td>
<td>IFSSH19-1845</td>
</tr>
<tr>
<td>plastic and aesthetic microsurgery</td>
<td>IFSSH19-541</td>
</tr>
<tr>
<td>plastic surgery</td>
<td>IFSSH19-1796</td>
</tr>
<tr>
<td>plate</td>
<td>IFSSH19-1971</td>
</tr>
<tr>
<td>Plate design</td>
<td>IFSSH19-1605</td>
</tr>
<tr>
<td>plate fixation</td>
<td>IFSSH19-988</td>
</tr>
<tr>
<td>plateau concentrate</td>
<td>IFSSH19-1179</td>
</tr>
<tr>
<td>plate remove</td>
<td>IFSSH19-988</td>
</tr>
<tr>
<td>plating</td>
<td>IFSSH19-834</td>
</tr>
<tr>
<td>playing</td>
<td>IFSSH19-469</td>
</tr>
<tr>
<td>plexus</td>
<td>IFSSH19-929</td>
</tr>
<tr>
<td>plexus</td>
<td>IFSSH19-478</td>
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22. August 2019, 11:37 CEST
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</tr>
<tr>
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<td>IFSSH19-24</td>
</tr>
</tbody>
</table>
14th IFSSH Congress
Index of keywords (English)

- Single incision - tendon transfer - ra.
- Single K-wire
- six-strand repair technique
- skin

Skin defect

- skin defect&65307
- skin flap
- skin graft

- skin irritation
- skin lesion
- skin traction fracture finger ph.
- skyline thumb
- skyline view

- SL
- SL-ligament reconstruction
- SLAC

SLAC Wrist

- SLAC wrists
- SLIL
- SLIL tear
- SL instability
- SLL
- SLL ligament tear
- Slope
- smartphone
- Smith fracture
- smoking

SNAC

SNAC/SLAC-wrist

SNAC. Partial Wrist Fusion

SNAC wrist

social deprivation

socioeconomic factors

Soft-tissue Coverage

Soft-tissue defects

soft tissue

soft tissue defect

Soft tissue defect

soft tissue lesion

Soft tissue reconstruction

soft tissue sarcoma

Soft tissue tumor

Soft tissue tumors

Sonoelastogram

sonography

spastic

spastic hand

spasticity

spinal accessory nerve

Spinal Accessory Nerve Transfer

spinal cord

Spinal cord injury

Spiral reconstruction

split

splinting

split-hand/foot malformation

split thickness graft

sport

Sports Injury

spread

squamous

squamous cell carcinoma

stabilisation

stability

Stab injuries

Stack reconstruction

stage 4 CTS

staging

staples

static 2PD

statistical analysis

steam cells

steinler

stem cells

Stener Lesion

Stener like lesion

Southampton

spade hand

spare-part surgery

spare part surgery

spasm

Spastic arm paralysis

Spastic hand

Spastic arm paralysis

stability

Stab injuries

Stack reconstruction

stage 4 CTS

staging

staples

static 2PD

statistical analysis

steam cells

steinler

stem cells

Stener Lesion

Stener like lesion

Southampton
Index of keywords (English)

<table>
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Tamai zone                                      | IFSSH19-1201 |
Tardieu scale                                   | IFSSH19-1413 |
targeted muscle reinnervation                   | IFSSH19-951  |
targeted therapy                                | IFSSH19-953  |
targeting guide                                 | IFSSH19-345  |
Taylor and Scham                                | IFSSH19-269  |
Tears                                          | IFSSH19-1667 |
technique.                                      | IFSSH19-902  |
ten-test                                        | IFSSH19-1027 |
tendinopathy                                    | IFSSH19-297  |
Tendinous interposition                         | IFSSH19-1867 |
Tendon                                          | IFSSH19-51   |
Tendon Ruptures                                 | IFSSH19-1925 |
tendons                                         | IFSSH19-288  |
tendon surgery                                  | IFSSH19-689  |
tendon transfer                                 | IFSSH19-1915 |
tendon transfers                                | IFSSH19-650  |
tendon transfer Elbow Tetraplegic               | IFSSH19-1662 |
tension band                                   | IFSSH19-514  |
tension transfers                              | IFSSH19-595  |
tennis weave                                    | IFSSH19-952  |
terrible triad injury                           | IFSSH19-1235 |
tenorrhaphy                                     | IFSSH19-1708 |
tenosynovitis                                    | IFSSH19-370  |
tensile strength                                | IFSSH19-974  |
tenoarthrolysis                                 | IFSSH19-1330 |
tenodesis                                       | IFSSH19-1957 |
tenolysis                                       | IFSSH19-1017 |
tenoplasty                                      | IFSSH19-1330 |
tenoplasty                                      | IFSSH19-1368 |
tenoplasty                                      | IFSSH19-1746 |
tenoplasty                                      | IFSSH19-1708 |
tenoplasty                                      | IFSSH19-1708 |
tenoplasty                                      | IFSSH19-1708 |
tenoplasty                                      | IFSSH19-370  |
tenoplasty                                      | IFSSH19-610  |
tenoplasty                                      | IFSSH19-1168 |
tenoplasty                                      | IFSSH19-1342 |
tenoplasty                                      | IFSSH19-974  |
tenoplasty                                      | IFSSH19-1390 |
tenoplasty                                      | IFSSH19-699  |
tenoplasty                                      | IFSSH19-376  |
tenoplasty                                      | IFSSH19-1259 |
tenoplasty                                      | IFSSH19-902  |
tenoplasty                                      | IFSSH19-794  |
tenoplasty                                      | IFSSH19-488  |
tenoplasty                                      | IFSSH19-738  |
tenoplasty                                      | IFSSH19-1781 |
tenoplasty                                      | IFSSH19-1023 |
tenoplasty                                      | IFSSH19-747  |
tenoplasty                                      | IFSSH19-130  |
tenoplasty                                      | IFSSH19-747  |
tenoplasty                                      | IFSSH19-1077 |
tenoplasty                                      | IFSSH19-1077 |
tenoplasty                                      | IFSSH19-1603 |
tenoplasty                                      | IFSSH19-1931 |
tenoplasty                                      | IFSSH19-1931 |
tenoplasty                                      | IFSSH19-1931 |
tenoplasty                                      | IFSSH19-1931 |
tenoplasty                                      | IFSSH19-1931 |
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### 14th IFSSH Congress

**Index of keywords (English)**

<table>
<thead>
<tr>
<th>Keyword</th>
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<tr>
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22. August 2019, 11:37 CEST
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14th IFSSH Congress
Index of keywords (English)

WRIST SURGERY ................................. IFSSH19-931
wrist trauma ................................. IFSSH19-1162
wrist arthroscopy TFCC tear 6R ......... IFSSH19-1754

X
x-ray .................................................. IFSSH19-36
X-ray diagnostic ............................... IFSSH19-1692
Xiapex ............................................ IFSSH19-1129
Xp ....................................................... IFSSH19-149

Z
Z- plasty reconstruction .................. IFSSH19-1382
Zaidemberg ..................................... IFSSH19-185
zigzag deformity ............................. IFSSH19-1058
Zone 2 .............................................. IFSSH19-310
Zone 2 .............................................. IFSSH19-1165
zone II of Verdan ......................... IFSSH19-674
zones 2 ............................................. IFSSH19-1861
Z thumb ............................................ IFSSH19-875
This page is intentionally left blank.
## Index of authors

<table>
<thead>
<tr>
<th>A</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. de Figueiredo, Leandro</td>
<td>ISFH19-677</td>
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<tr>
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<td>IFSSH19-288</td>
</tr>
<tr>
<td>Bergmeister, Konstantin</td>
<td>IFSSH19-1006*</td>
</tr>
<tr>
<td>Berkhout, Merel</td>
<td>IFSSH19-97</td>
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<td>berkooz, omer</td>
<td>IFSSH19-850</td>
</tr>
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<td>BERMUDEZ, JULIO</td>
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<td>Bermúdez, Julio</td>
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<td>Bermudez, Julio Cesar</td>
<td>IFSSH19-1425</td>
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<td>Bernhard, David N</td>
<td>IFSSH19-522</td>
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<td>Berneth, Sylvia</td>
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<td>Bersani, Gustavo</td>
<td>IFSSH19-1915</td>
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<td>Bersani da Silva, Gustavo</td>
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<td>Bertoli, Claudio</td>
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<td>Bertozi, Nicolo</td>
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<td>Bertsch, Matthias</td>
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<td>Best, Cameron</td>
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<td>Betzl, Julia</td>
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<td>Bigazzi, Prospero</td>
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<td>Bignion, Dietmar</td>
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<td>Bigorre, Nicolas</td>
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<td>Billac, Fanny</td>
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<td>Billner, Moritz</td>
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<td>Bindra, Randy</td>
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<td>Bingöi, Alperen</td>
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<td>Biondi, Bruno</td>
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<tr>
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<td>Bishop, Allen T</td>
<td>IFSSH19-1533</td>
</tr>
</tbody>
</table>
Index of authors

Bispo, Catarina ................................... IFSSH19-1332
Black, David .................................... IFSSH19-1340
Blackburn, Julia ............................... IFSSH19-1341
Blaik, James ..................................... IFSSH19-1952
Blake, Julian .................................... IFSSH19-1310
Blanchetiere, Henán ......................... IFSSH19-1944
Blanquier Villar, Jesús ....................... IFSSH19-1089
Blue, Matthew .................................. IFSSH19-1110
Bocanegra, Sergio ............................. IFSSH19-1895
Bochenek, Maciej .............................. IFSSH19-1403*
Bodian, Caitlin ................................ IFSSH19-984*
Bodmer, Elvira ................................ IFSSH19-429
Bodner, Gerd ..................................... IFSSH19-1907
Bodor, Richard ................................. IFSSH19-1250
Böcker, Arne .................................... IFSSH19-1584
Böttcher, Richarda ......................... IFSSH19-1931*
Bohdatyrewicz, Andrzej ................. IFSSH19-1111
Bohn, Deborah ................................. IFSSH19-613
BOIANELLI, ANALIA CLAUDIA ............. IFSSH19-1146
Bolliger Neto, Raúl ......................... IFSSH19-1157
Bollinger, Lilianna ......................... IFSSH19-342
Bolstad, Bjørg .................................. IFSSH19-1404
Bolstad, Inger Helen ...................... IFSSH19-1441
Bommier, Aude ................................ IFSSH19-1451
Boniforti, Barbara ......................... IFSSH19-1453
Bonte, Francis ................................ IFSSH19-1941
Bonucci, Pier Luigi ......................... IFSSH19-222
Boontanapibul, Krit ....................... IFSSH19-474*
Boontanapibul, Krit ....................... IFSSH19-704
Bordeianu, Ion ................................ IFSSH19-791
Borelli, Paolo ................................. IFSSH19-765
Borelli, Pier Paolo ......................... IFSSH19-1901
Boretto, Jorge ................................ IFSSH19-1820*
Borg, Tiffanie-Marie ....................... IFSSH19-1316
Borgstrand, Karl ............................. IFSSH19-1465
Borovkova, Nataliya ...................... IFSSH19-1940
Borsche, André ............................... IFSSH19-1970
Botton, Miguel .............................. IFSSH19-1576
Boudabbou, Sana ............................ IFSSH19-860
boulahouache, abdelaziz ................. IFSSH19-889*
Bowman, Sebastian ......................... IFSSH19-1343
Boyer, Etienne ............................... IFSSH19-1345
Braga Jacques Gonçalves, Lucas ........ IFSSH19-1347
Braga Silva, Jefferson ................. IFSSH19-1349
Brammer, Simone ......................... IFSSH19-1350
Brandacher, Gerald ....................... IFSSH19-1351
Brandolini, Anna .......................... IFSSH19-1352
Branford-White, Harriet .............. IFSSH19-1353
Braun, Marc .................................. IFSSH19-1354
Brauns, Annelien ......................... IFSSH19-1355
Bravo, Cesar ................................ IFSSH19-1356
Breborowicz, Ewa ......................... IFSSH19-1357
Breiter, Sarah .............................. IFSSH19-1358
Brolin, Catarina ............................. IFSSH19-1359
Brody, Yaeli ................................. IFSSH19-1360
Broeckaert, Bart ......................... IFSSH19-1361
Broekstra, Dieuwke ....................... IFSSH19-1362
Broekstra, Dieuwke C. .................. IFSSH19-1363
Brugger, Peter .............................. IFSSH19-1364
Bruinen, Amberg ......................... IFSSH19-1365
Bruinjes, Amber ............................ IFSSH19-1366
Brum de Castro, Ubiratan ............. IFSSH19-1367
Buendia, Luis Antonio ................. IFSSH19-1368
Büren, Carina .............................. IFSSH19-1369
Buijze, Geert .............................. IFSSH19-1370
Buijze, Geert A. .......................... IFSSH19-1371
Buklaev, Dmitry ......................... IFSSH19-1372
Bulstra, Anne Eva ....................... IFSSH19-1373
Buncke, Gregory ......................... IFSSH19-1374
Burdo, Alex ............................... IFSSH19-1375
Burge, Alissa .............................. IFSSH19-1376
Burger, Lisebette ......................... IFSSH19-1377
Burger, Marilize ......................... IFSSH19-1378
Burgos, Felipe ............................ IFSSH19-1379
Burnier, Marion ......................... IFSSH19-1380
Bushuev, Oleg ............................ IFSSH19-1381
Buser, Alain ............................... IFSSH19-1382
Butler, Peter .............................. IFSSH19-1383
Cabrè, Marina ............................. IFSSH19-1384
CADENA, JULIAN ENRIQUE .............. IFSSH19-1385
Cabral, Marisa ............................ IFSSH19-1386
Caballero, Jonathan ..................... IFSSH19-1387
Cabaleiro, Jonathan ..................... IFSSH19-1388
Candeias, Ricardo ....................... IFSSH19-1389
Candian, Marisa .......................... IFSSH19-1390
Cargnelli, Claudio ....................... IFSSH19-1391
Carle, Eveline ............................. IFSSH19-1392
Carlevaro, Peter ......................... IFSSH19-1393
Carniel, Margarida ....................... IFSSH19-1394
Carneiro, Beatriz ......................... IFSSH19-1395
Carneiro, Filipe ......................... IFSSH19-1396
Carneiro, Manuela ....................... IFSSH19-1397
Carneiro, Pedro .......................... IFSSH19-1398
Carneiro, Pedro António ............. IFSSH19-1399
Carneiro, Rafael ......................... IFSSH19-1400
Carneiro, Roman ......................... IFSSH19-1401
Carneiro, Ricardo ....................... IFSSH19-1402
Carneiro, Rui .............................. IFSSH19-1403
Carneiro, Silvia ......................... IFSSH19-1404
Carneiro, Sophie ......................... IFSSH19-1405
Carneiro, Sofia ......................... IFSSH19-1406
Carneiro, Tânia ......................... IFSSH19-1407
Carneiro, Tiago ......................... IFSSH19-1408
Carneiro, Tiago António .......... IFSSH19-1409
Carneiro, Vitor .......................... IFSSH19-1410
Carneiro, Wilma ......................... IFSSH19-1411
Carneiro, William ....................... IFSSH19-1412
Carneiro, Wilson ......................... IFSSH19-1413
Carneiro, Wilson António ......... IFSSH19-1414
Carneiro, Wilson Beautiful ....... IFSSH19-1415
Carneiro, Wilson Fernandes ...... IFSSH19-1416
Carneiro, Wilson José ................. IFSSH19-1417
Carneiro, Wilson Luiz ............... IFSSH19-1418
Carneiro, Wilson Rodrigues ....... IFSSH19-1419
Carneiro, Wilson Xavier .......... IFSSH19-1420
Carneiro, Wilson Youngho ......... IFSSH19-1421
Carneiro, Yolanda ....................... IFSSH19-1422
Carneiro, Yolanda Fernandes ... IFSSH19-1423
Carneiro, Yolanda Pires ......... IFSSH19-1424
Carneiro, Yolanda Rodrigues ... IFSSH19-1425
Carneiro, Yolanda Sá ......... IFSSH19-1426
Carneiro, Yolanda da Silva ... IFSSH19-1427
Carrington, Sarah ....................... IFSSH19-1428
Index of authors

Caekbeke, Pieter .............................. IFSSH19-698
IFSSH19-1023*
IFSSH19-1024
IFSSH19-1280
IFSSH19-1316*
Cafruni, Virginia .............................. IFSSH19-1316*
Cai, Xiaoming ................................. IFSSH19-968
IFSSH19-976
Calcagni, Maurizio .............................. IFSSH19-736
Calvo Crespo, Emilio ............................ IFSSH19-1876
Camacho, Nestor A .............................. IFSSH19-1708
Campillo-Recio, David .......................... IFSSH19-1276
Campos, Emmanuel ............................. IFSSH19-1802*
Camel, JHON FREDY ............................. IFSSH19-1156*
IFSSH19-1167
Castillo, Alexandria ......................... IFSSH19-917
IFSSH19-1128*
Castellanos, Juan ............................. IFSSH19-1225
CASTILLO, FEDERICO ......................... IFSSH19-1146
IFSSH19-1157
Castillon, Pablo ............................... IFSSH19-1492
Cavafy, Ali ............................... IFSSH19-1133
IFSSH19-1430*
Cayón, Fidel ................................. IFSSH19-777
Cayon, Fidel ................................. IFSSH19-773*
IFSSH19-775*
Cederna, Paul ................................. IFSSH19-1485
Celigoj, Vanja ................................. IFSSH19-1771
Celik, Velat ................................. IFSSH19-1399
Celik, Velat ................................. IFSSH19-1488
Cen, Dawn ................................. IFSSH19-819
Cerovac, Sonja ............................... IFSSH19-1293*
Ceruso, Massimo ............................... IFSSH19-386
Chae, Young Ju ............................... IFSSH19-332
Chae, Young Taek ......................... IFSSH19-1008
Chai, Yitong ................................. IFSSH19-971*
Chakrabarti, Indranil ......................... IFSSH19-1206
Challoner, Tom ............................... IFSSH19-1282
Chalmers, Joelle ............................. IFSSH19-895
CHAMON, HENRIQUE ......................... IFSSH19-483
Chamos, Henrique ......................... IFSSH19-610
CHAMPIPIS, APOSTOLIS ................. IFSSH19-761
Chan, Andrea ............................... IFSSH19-269
Chan, Queenie ............................... IFSSH19-1797
Chang, Dun Hao ............................. IFSSH19-1368*
Chang, Ke-Chung ............................. IFSSH19-1202
Chang, Ke Chung ........................... IFSSH19-1368
Chang, Yun-Liang ......................... IFSSH19-1219*
Charayaphan, Boon Han ..................... IFSSH19-1035
Chat, Samantha M ........................... IFSSH19-308
Chatterjee, Urjit ......................... IFSSH19-1968
Chaudhry, Ahmed .............................. IFSSH19-1920
Chaudhry, Tahseen ............................ IFSSH19-1247
Chaves, Camilo .............................. IFSSH19-185*
Chaves, Camilo .............................. IFSSH19-1581*
Carlos Costa, Antônio ......................... IFSSH19-1626
Carlson, Lois ................................. IFSSH19-212
Carmona, Dayanna ............................ IFSSH19-1106
Carpenter, Flossie ......................... IFSSH19-1816*
Carr, Andrew ............................... IFSSH19-163
Carrasco, Marcia ............................. IFSSH19-1662
Carratalá Baixauli, Vicente .................. IFSSH19-529
Carriera, Gaetano ......................... IFSSH19-1772*
Carrillo, Fabio ............................... IFSSH19-76
Carrillo, Fnando ............................. IFSSH19-1340
Carroll, Natalie ............................. IFSSH19-747
Carter, John ............................... IFSSH19-1558
Carvalhal Flesas, Francisco Sebastia ... IFSSH19-1106
Carvalho, Sofia ............................. IFSSH19-1332
Chaes, Young Ju ............................. IFSSH19-1008
Chaes, Young Taek ......................... IFSSH19-1014
Cayon, Fidel ................................. IFSSH19-773*
Cayón, Fidel ................................. IFSSH19-775*
Celigoj, Vanja ................................. IFSSH19-1771
Čelik, Velat ................................. IFSSH19-1399
Celik, Velat ................................. IFSSH19-1488
Cen, Dawn ................................. IFSSH19-819
Cerovac, Sonja ............................... IFSSH19-1293*
Ceruso, Massimo ............................... IFSSH19-386
Chae, Young Ju ............................... IFSSH19-332
Chae, Young Taek ......................... IFSSH19-1008
Chai, Yitong ................................. IFSSH19-971*
Chakrabarti, Indranil ......................... IFSSH19-1206
Challoner, Tom ............................... IFSSH19-1282
Chalmers, Joelle ............................. IFSSH19-895
CHAMON, HENRIQUE ......................... IFSSH19-483
Chamos, Henrique ......................... IFSSH19-610
CHAMPIPIS, APOSTOLIS ................. IFSSH19-761
Chan, Andrea ............................... IFSSH19-269
Chan, Queenie ............................... IFSSH19-1797
Chang, Dun Hao ............................. IFSSH19-1368*
Chang, Ke-Chung ............................. IFSSH19-1202
Chang, Ke Chung ........................... IFSSH19-1368
Chang, Yun-Liang ......................... IFSSH19-1219*
Charayaphan, Boon Han ..................... IFSSH19-1035
Chat, Samantha M ........................... IFSSH19-308
Chatterjee, Urjit ......................... IFSSH19-1968
Chaudhry, Ahmed .............................. IFSSH19-1920
Chaudhry, Tahseen ............................ IFSSH19-1247
Chaves, Camilo .............................. IFSSH19-185*
Chaves, Camilo .............................. IFSSH19-1581*
Carlos Costa, Antônio ......................... IFSSH19-1626
Carlson, Lois ................................. IFSSH19-212
Carmona, Dayanna ............................ IFSSH19-1106
Carpenter, Flossie ......................... IFSSH19-1816*
Carr, Andrew ............................... IFSSH19-163
Carrasco, Marcia ............................. IFSSH19-1662
Carratalá Baixauli, Vicente .................. IFSSH19-529
Carriera, Gaetano ......................... IFSSH19-1772*
Carrillo, Fabio ............................... IFSSH19-76
Carrillo, Fnando ............................. IFSSH19-1340
Carroll, Natalie ............................. IFSSH19-747
Carter, John ............................... IFSSH19-1558
Carvalhal Flesas, Francisco Sebastia ... IFSSH19-1106
Carvalho, Sofia ............................. IFSSH19-1332
IFSSH19-1340
IFSSH19-1341
Casal, Diogo ................................. IFSSH19-1770
CASANAS, JOAQUIM ........................... IFSSH19-1240*
ICSSH19-1552
ICSSH19-1103*
ICSSH19-1107*
ICSSH19-1109
Case, Alexandria ............................. IFSSH19-917
ICSSH19-1288
ICSSH19-1309
ICSSH19-1311
Cassar-Gheiti, Adrian J ....................... IFSSH19-905
CASTAÑEDA, JHON FREDY ..................... IFSSH19-1156*
ICSSH19-1167
ICSSH19-1170*
ICSSH19-1783*
<table>
<thead>
<tr>
<th>Name</th>
<th>IFSSH19-xxxx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chen, Aaron</td>
<td>IFSSH19-600</td>
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<td>Chen, Chao</td>
<td>IFSSH19-1117</td>
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<td>Chen, Frank</td>
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<td>Chen, Jeffrey</td>
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<td>Chen, NC</td>
<td>IFSSH19-137</td>
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<td>Chen, Neal</td>
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<td>Chen, Qing Zhong</td>
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<td>Chen, Shih-Heng</td>
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<td>Chen, Shanlin</td>
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<td>Cheung, Darryl</td>
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</tr>
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<td>Cheuk, Ka-yee</td>
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<tr>
<td>Cheuk, Yung-Jin</td>
<td>IFSSH19-567*</td>
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<tr>
<td>Cheung, Xue Ling</td>
<td>IFSSH19-298*</td>
</tr>
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<td>Cheung, Zhenglin</td>
<td>IFSSH19-467</td>
</tr>
<tr>
<td>Cheung, Zhou</td>
<td>IFSSH19-560</td>
</tr>
<tr>
<td>Cheung, Zhou</td>
<td>IFSSH19-1058*</td>
</tr>
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<td>Cheung, Zhonghao</td>
<td>IFSSH19-1579*</td>
</tr>
<tr>
<td>Cheung, Zhen</td>
<td>IFSSH19-958</td>
</tr>
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<td>Cheung, Zhourong</td>
<td>IFSSH19-165</td>
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<td>Cheung, Zhourong</td>
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</tr>
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<td>Cheung, Zhourong</td>
<td>IFSSH19-501*</td>
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<td>Cheung, Zhourong</td>
<td>IFSSH19-630</td>
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<td>Cheung, Zhourong</td>
<td>IFSSH19-954</td>
</tr>
<tr>
<td>Cheung, Zhourong</td>
<td>IFSSH19-1706</td>
</tr>
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<td>Cheung, Zhourong</td>
<td>IFSSH19-184</td>
</tr>
<tr>
<td>Cheung, Zhourong</td>
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</tr>
<tr>
<td>Cheung, Zhourong</td>
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</tr>
<tr>
<td>Cheung, Zhourong</td>
<td>IFSSH19-873</td>
</tr>
<tr>
<td>Cheung, Zhourong</td>
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</tr>
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<td>Cheung, Zhourong</td>
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</tr>
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<td>Cheung, Zhourong</td>
<td>IFSSH19-724</td>
</tr>
<tr>
<td>Cheung, Zhourong</td>
<td>IFSSH19-532</td>
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<td>Cheung, Zhourong</td>
<td>IFSSH19-635</td>
</tr>
<tr>
<td>Cheung, Zhourong</td>
<td>IFSSH19-168</td>
</tr>
<tr>
<td>Cheung, Zhourong</td>
<td>IFSSH19-1558</td>
</tr>
<tr>
<td>Cheung, Zhourong</td>
<td>IFSSH19-1517</td>
</tr>
<tr>
<td>Cheung, Zhourong</td>
<td>IFSSH19-951</td>
</tr>
<tr>
<td>Cheung, Zhourong</td>
<td>IFSSH19-1277</td>
</tr>
<tr>
<td>Cheung, Zhourong</td>
<td>IFSSH19-1141*</td>
</tr>
<tr>
<td>Cheung, Zhourong</td>
<td>IFSSH19-1915*</td>
</tr>
<tr>
<td>Cheung, Zhourong</td>
<td>IFSSH19-1527*</td>
</tr>
<tr>
<td>Cheung, Zhourong</td>
<td>IFSSH19-1275</td>
</tr>
<tr>
<td>Cheung, Zhourong</td>
<td>IFSSH19-275</td>
</tr>
<tr>
<td>Cheung, Zhourong</td>
<td>IFSSH19-276</td>
</tr>
<tr>
<td>Cheung, Zhourong</td>
<td>IFSSH19-1144</td>
</tr>
<tr>
<td>Cheung, Zhourong</td>
<td>IFSSH19-394</td>
</tr>
<tr>
<td>Cheung, Zhourong</td>
<td>IFSSH19-398</td>
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## Index of authors

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14th IFSSH Congress
Index of authors
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### 14th IFSSH Congress

#### Index of authors

<table>
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22. August 2019, 11:37 CEST
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22. August 2019, 11:37 CEST
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# Index of authors

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Lee, Yo Han ........................................ IFSSH19-542
Lee, Yo-Han ........................................ IFSSH19-596
Lee, Wayne Yuk-wai ......................... IFSSH19-994
Lee, W.P. Andrew ............................... IFSSH19-906
Lee, Tina ............................................. IFSSH19-418*
Lee, Thay ............................................ IFSSH19-622*
Lee, Tae Kyoon ................................... IFSSH19-671
Lee, Suk-Joong .................................... IFSSH19-696
Lee, Tae Kyoon ................................. IFSSH19-671
Lee, Thay ............................................ IFSSH19-1194
Lee, Seung Hoo .................................. IFSSH19-1236
Lee, Seung-Joon .................................. IFSSH19-1338
Lee, Seung Hyun ................................. IFSSH19-1168
Lee, Sang lim ....................................... IFSSH19-456
Lee, Steve ........................................... IFSSH19-957
Lee, Ryan Ka-loc ................................. IFSSH19-994
Lee, Sang-Yun ..................................... IFSSH19-1002
Lee, Jun-Ku .......................................... IFSSH19-188*
Lee, Jong-Gyeong ............................... IFSSH19-696
Lee, Jae Sung ....................................... IFSSH19-1015
Lee, Jasmin ......................................... IFSSH19-611*
Lee, Joo-Yup ........................................ IFSSH19-1246
Lee, Jong-II .......................................... IFSSH19-869
Lee, Kwang .......................................... IFSSH19-1706
Lee, Kwang-Hyun ................................. IFSSH19-1275
Lee, Jung Eun ...................................... IFSSH19-1259
Lee, Jung-Il ......................................... IFSSH19-1721*
Lee, Jung-Hyun ..................................... IFSSH19-1258
Lee, Jung-Hyun ..................................... IFSSH19-1258
Lee, Kwang .......................................... IFSSH19-869
Lee, Kwang-Hyun ................................. IFSSH19-1275
Lee, Leung, Kam Yiu Adrian ............... IFSSH19-1182
Lee, Li ................................................. IFSSH19-357
Lee, Li ................................................. IFSSH19-359
Lee, Li ................................................. IFSSH19-361
Lee, Xianhe ........................................ IFSSH19-1559
Lee, Li ................................................. IFSSH19-335
Lee, Li ................................................. IFSSH19-337
Lee, Li ................................................. IFSSH19-339
Lee, Li ................................................. IFSSH19-341
Lee, Li ................................................. IFSSH19-343
Lee, Li ................................................. IFSSH19-345
Lee, Li ................................................. IFSSH19-347
Lee, Li ................................................. IFSSH19-349
Lee, Li ................................................. IFSSH19-351
Lee, Li ................................................. IFSSH19-353
Lee, Li ................................................. IFSSH19-355
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Lee, Li ................................................. IFSSH19-359
Lee, Li ................................................. IFSSH19-361
Lee, Li ................................................. IFSSH19-363
Lee, Li ................................................. IFSSH19-365
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Lee, Li ................................................. IFSSH19-369
Lee, Li ................................................. IFSSH19-371
Lee, Li ................................................. IFSSH19-373
Lee, Li ................................................. IFSSH19-375
Lee, Li ................................................. IFSSH19-377
Lee, Li ................................................. IFSSH19-379
Lee, Li ................................................. IFSSH19-381
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Lee, Li ................................................. IFSSH19-391
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Macera, Armando .................................... IFSSH19-194
Machado, Filipe ..................................... IFSSH19-1332
Machado, Luis ........................................ IFSSH19-1235
Maciuceneanu-Zarnescu, Mircea Bogd. ................ IFSSH19-1271
MacKay, Brendan .................................... IFSSH19-1344
Mackay, Brendan .................................... IFSSH19-1880
Macleod, Fiona ....................................... IFSSH19-492
MacMahon, Aoife ..................................... IFSSH19-600
Madada-Nyakauru, rudo ............................... IFSSH19-1051*
Mader, Konrad ........................................ IFSSH19-357*
Magalhaes Nunes, Flavia ............................. IFSSH19-1138
Magin, Thomas ....................................... IFSSH19-516
MAHECHA, MARCO TULIO .............................. IFSSH19-1156
Mahmoud, Mostafa ................................... IFSSH19-1754*
Maia, João ............................................. IFSSH19-1122
Maier, Bernhard ..................................... IFSSH19-1946
Maier, Bernhard J. ................................... IFSSH19-232
Maier, Johannes ..................................... IFSSH19-572*
Mak, Michael Chu-kay ................................. IFSSH19-994*
Maki, Yutaka ......................................... IFSSH19-1065
Malapati, Harsha ..................................... IFSSH19-911
Maldonado, Andres A. ................................ IFSSH19-214*
MALDONADO, JUAN CARLOS ...................... IFSSH19-1433
Malizos, Konstantinos ................................ IFSSH19-1184
Malkoch, Michael .................................... IFSSH19-379
Mallarino, Gonzalo ................................... IFSSH19-811*
Mallina, Ravi ......................................... IFSSH19-546
Mallina, Ravikanth .................................. IFSSH19-1499*
Mallina, Ravikanth .................................. IFSSH19-1499*
Maloney, Peter ....................................... IFSSH19-1687
Mandziuk, Agnieszka ................................ IFSSH19-1050*
Mandziuk, Agniezka ................................... IFSSH19-845
Mane, Satish ......................................... IFSSH19-1879
Mane, Satish ......................................... IFSSH19-1879
Mane, Satish ......................................... IFSSH19-1894
Mane, Satish ......................................... IFSSH19-1906
Mane, Satish ......................................... IFSSH19-1910
Mane, Satish ......................................... IFSSH19-1919
Mane, Satish ......................................... IFSSH19-1936
Maniglio, Mauro ..................................... IFSSH19-1119
Maniotis, Ioannis .................................... IFSSH19-434
Mann, Max ............................................. IFSSH19-1036
Mannan, Iftekhmar ................................ IFSSH19-858
MARANHAO, BRUNO ................................ IFSSH19-1343
Marchesini, Andrea ................................ IFSSH19-1201
Marchesini, Cecilia ................................ IFSSH19-1439
Marcheva, Iliiana ................................ IFSSH19-1343
Marcialis, Marcello ................................ IFSSH19-474
Marcos-García, Alberto .............................. IFSSH19-1712
Maree, Michelle ..................................... IFSSH19-262
Mares, Olivier ....................................... IFSSH19-1609*
MARES, OLIVIER ..................................... IFSSH19-585
Margic, Krunoslav .................................. IFSSH19-1441*
Mark, Foster ......................................... IFSSH19-1454
Marques, João ....................................... IFSSH19-1753
Marques, José Alexandre ............................. IFSSH19-1753
Márquez Ambite, Juan Carlos ......................... IFSSH19-194
Marshall, Danielle ................................ IFSSH19-1416
Marteau, Emilie ..................................... IFSSH19-1287
Martín-Ferrero, Miguel Ángel ......................... IFSSH19-1477
Martinez Andrade, Cristobal ......................... IFSSH19-1240
Martinez Catalan, Natalia .......................... IFSSH19-1873
Martinez Cortavartate, Vanessa ..................... IFSSH19-374
Martín Playa, Patricia ............................... IFSSH19-1733*
Martins, Adriano ................................... IFSSH19-1558
Marten, Satish ....................................... IFSSH19-1936
### 14th IFSSH Congress
#### Index of authors

<table>
<thead>
<tr>
<th>Author</th>
<th>IFSSH19-ID</th>
<th>Author</th>
<th>IFSSH19-ID</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mascaraque Ortiz, Rocio</strong></td>
<td>IFSSH19-1321</td>
<td><strong>Mayerson, Joel</strong></td>
<td>IFSSH19-1930*</td>
</tr>
<tr>
<td><strong>Maruyama, Yuichiro</strong></td>
<td>IFSSH19-1180</td>
<td><strong>Mazurek, Tomasz</strong></td>
<td>IFSSH19-443</td>
</tr>
<tr>
<td><strong>Mascaró, Rocio</strong></td>
<td>IFSSH19-194</td>
<td><strong>MAZZER, NILTON</strong></td>
<td>IFSSH19-1515</td>
</tr>
<tr>
<td><strong>Maschino, Nicola</strong></td>
<td>IFSSH19-383</td>
<td><strong>McCann, Fiona</strong></td>
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</tr>
<tr>
<td><strong>Massarella, Massimo</strong></td>
<td>IFSSH19-1416</td>
<td><strong>McCann, Mark</strong></td>
<td>IFSSH19-998</td>
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<tr>
<td><strong>Massoud, Abdel Hakim</strong></td>
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<td><strong>Mc Colgan, Rosie</strong></td>
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<td><strong>Mastacaneanu, Mihaela</strong></td>
<td>IFSSH19-1739</td>
<td><strong>McCombe, David</strong></td>
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</tr>
<tr>
<td><strong>Matsuyama, Yukihiro</strong></td>
<td>IFSSH19-1825</td>
<td><strong>McGarry, Kevin</strong></td>
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<tr>
<td><strong>Matsuda, Takamasa</strong></td>
<td>IFSSH19-1882</td>
<td><strong>McGarry, Michelle</strong></td>
<td>IFSSH19-215</td>
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<tr>
<td><strong>Masuda, Tetso</strong></td>
<td>IFSSH19-1220</td>
<td><strong>McGarry, Michelle</strong></td>
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<td><strong>Masuda, Tetsu</strong></td>
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<td><strong>McKee, Desiree</strong></td>
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<td><strong>Masuyama, Naoko</strong></td>
<td>IFSSH19-459</td>
<td><strong>McGinn, Logan</strong></td>
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<td><strong>Mata Ribeiro, Luis</strong></td>
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<td><strong>McGouther, Duncan Angus</strong></td>
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<td><strong>Mathot, Femke</strong></td>
<td>IFSSH19-1513*</td>
<td><strong>McGuire, Duncan</strong></td>
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<td><strong>Matloub, Hani</strong></td>
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<td><strong>McGuire, Sean</strong></td>
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<td><strong>Matsuda, Shuichi</strong></td>
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<td><strong>McKean, Andrew</strong></td>
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<td><strong>McKee, Desiree</strong></td>
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</tr>
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<td><strong>Matsumoto, Morio</strong></td>
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<td><strong>McKee, Desiree</strong></td>
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<td><strong>McNab, Ian</strong></td>
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<td><strong>McKenzie, Ashley</strong></td>
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</tr>
<tr>
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<td><strong>McManus, Robin</strong></td>
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</tr>
<tr>
<td><strong>Matsumura, Noboru</strong></td>
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<td><strong>McNab, Ian</strong></td>
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</tr>
<tr>
<td><strong>Matsumura, Noboru</strong></td>
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<td><strong>McNary, Sean</strong></td>
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<td><strong>McTeir, Lynn</strong></td>
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<tr>
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<td><strong>Medina, José</strong></td>
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<td><strong>Matsumura, Noboru</strong></td>
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<td><strong>Meier, Rahul</strong></td>
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</tr>
<tr>
<td><strong>Matsumura, Noboru</strong></td>
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<td><strong>Meira de Oliveira, Werley</strong></td>
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</tr>
<tr>
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<td>IFSSH19-339</td>
<td><strong>Meisel, Adam</strong></td>
<td>IFSSH19-756</td>
</tr>
<tr>
<td><strong>Matsumura, Noboru</strong></td>
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<td><strong>Meisel, Julia</strong></td>
<td>IFSSH19-2005</td>
</tr>
<tr>
<td><strong>Matsumura, Noboru</strong></td>
<td>IFSSH19-1199*</td>
<td><strong>MELENDEZ, ROBERTO</strong></td>
<td>IFSSH19-754*</td>
</tr>
<tr>
<td><strong>Matsumura, Noboru</strong></td>
<td>IFSSH19-1207*</td>
<td><strong>Melle, Kai</strong></td>
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</tr>
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<td><strong>Matsumura, Noboru</strong></td>
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<td><strong>Megerle, Kai</strong></td>
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<tr>
<td><strong>Matsumura, Noboru</strong></td>
<td>IFSSH19-426</td>
<td><strong>Menu, Jürgen</strong></td>
<td>IFSSH19-1729</td>
</tr>
<tr>
<td><strong>Matsumura, Noboru</strong></td>
<td>IFSSH19-528</td>
<td><strong>Mende, Konrad</strong></td>
<td>IFSSH19-1786</td>
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<td><strong>Matsumura, Noboru</strong></td>
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</tr>
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<td><strong>Mendelaar, Nienke</strong></td>
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</tr>
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<td><strong>Menn, Ben</strong></td>
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<tr>
<td><strong>Matsumura, Noboru</strong></td>
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<td><strong>Menendez Solana, Guillermo</strong></td>
<td>IFSSH19-896</td>
</tr>
<tr>
<td><strong>Matsumura, Noboru</strong></td>
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<td><strong>Menn, Erich</strong></td>
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</tr>
<tr>
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<td><strong>Menendez Solana, Guillermo</strong></td>
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</tr>
<tr>
<td><strong>Matsumura, Noboru</strong></td>
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<td><strong>Menn, Erich</strong></td>
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<td>Author Name</td>
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<tr>
<td>Merkulov, Maksim</td>
<td>IFSSH19-1866</td>
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<td>Merritt, Wyndell</td>
<td>IFSSH19-1009*</td>
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<td>Messina, Jane C</td>
<td>IFSSH19-1932*</td>
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<tr>
<td>Met, Tobias</td>
<td>IFSSH19-1519</td>
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<td>IFSSH19-1093</td>
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<td>Meuli, Claudia</td>
<td>IFSSH19-1621</td>
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<tr>
<td>Meuser, Stefan</td>
<td>IFSSH19-271*</td>
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<tr>
<td>Meyer, Julius</td>
<td>IFSSH19-1881</td>
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<td>IFSSH19-450</td>
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<tr>
<td>Meyers, Kathleen</td>
<td>IFSSH19-236*</td>
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<tr>
<td>MIEYER ZU RECKENDORF, Gero</td>
<td>IFSSH19-665</td>
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<tr>
<td>MIEYER ZU RECKENDORF, Gero</td>
<td>IFSSH19-1186</td>
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<tr>
<td>Micheli, Alejandro Emilio</td>
<td>IFSSH19-923</td>
<td></td>
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<tr>
<td>Michelitsch, Birgit</td>
<td>IFSSH19-1752</td>
<td></td>
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<tr>
<td>Michihata, Nobuaki</td>
<td>IFSSH19-463</td>
<td></td>
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<tr>
<td>Michidou, Dominika</td>
<td>IFSSH19-201*</td>
<td></td>
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<tr>
<td>Miersch, Cassandra</td>
<td>IFSSH19-1875</td>
<td></td>
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<tr>
<td>Miersch, Cay</td>
<td>IFSSH19-1875</td>
<td></td>
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<tr>
<td>Miettunen, Jouko</td>
<td>IFSSH19-762</td>
<td></td>
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</tr>
<tr>
<td>Mifune, Yutaka</td>
<td>IFSSH19-947</td>
<td></td>
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<tr>
<td>Miguleva, Irina</td>
<td>IFSSH19-468</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miller, Patricia</td>
<td>IFSSH19-469*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miller, Robert</td>
<td>IFSSH19-1904*</td>
<td></td>
<td></td>
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<tr>
<td>Millesi, Hanno</td>
<td>IFSSH19-191</td>
<td></td>
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<tr>
<td>Min, Chia Na</td>
<td>IFSSH19-1504</td>
<td></td>
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<tr>
<td>Minamikawa, Yoshitaka</td>
<td>IFSSH19-397</td>
<td></td>
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<tr>
<td>Mir-Bullo, Xavier</td>
<td>IFSSH19-508</td>
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<td>Mir Bullo, Xavier</td>
<td>IFSSH19-468</td>
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<td>Mizra, Eushah</td>
<td>IFSSH19-452</td>
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<td>Mizraei, leila</td>
<td>IFSSH19-1904*</td>
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<td>Mishra, Anuj</td>
<td>IFSSH19-1504</td>
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<td>Mithani, Suhail</td>
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<td>Mito, Kazuaki</td>
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<td>Mitsuzawa, Sadaki</td>
<td>IFSSH19-1276</td>
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<td>Miyagi, Michihito</td>
<td>IFSSH19-515</td>
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<td>Miyamoto Meirelles, Lia</td>
<td>IFSSH19-1571</td>
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<td>Miyashiro Yamashita, Larissa</td>
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<td>Mizuseki, Takaya</td>
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<td>Moeller, Amy</td>
<td>IFSSH19-613</td>
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<td>Mohamed Saaid, Firdati</td>
<td>IFSSH19-892</td>
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<td>Mohan, Arvind</td>
<td>IFSSH19-597*</td>
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<td>Mohd Hafiah, Hazla</td>
<td>IFSSH19-670</td>
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<td>Mohr, Gustavo</td>
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<td>Moreno, Santiago</td>
<td>IFSSH19-1114*</td>
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</tbody>
</table>
Mrozik, Dawid ..................................... IFSSH19-712*
Mrozik, Dawid* ................................... IFSSH19-358*
Mudgal, Chaitanya ............................... IFSSH19-933
Mudgal, Chaitanya* .............................. IFSSH19-1207
Mudgal, Chaitanya* .............................. IFSSH19-1207
Mudgal, Chaitanya* .............................. IFSSH19-1207
Nakonechny, Dmitry ............................ IFSSH19-1284
Nakonechny, Dmitry* ............................ IFSSH19-1326*
Mühldorfer-Fodor, Marion ..................... IFSSH19-1606
Mühldorfer-Fodor, Marion* .................... IFSSH19-1974*
Mueller, Camillo .................................. IFSSH19-355
Mueller, Hanng .................................... IFSSH19-1670
Mueller, Lars P .................................... IFSSH19-24
Mueller, Lars P* .................................. IFSSH19-1688
Mueller, Lars P* .................................. IFSSH19-1689
Mueller, Lars P* .................................. IFSSH19-921
Mugnai, Raffaele ................................. IFSSH19-1807
Muir, Lindsay ...................................... IFSSH19-53
Mukhamedkerim, Kanat ......................... IFSSH19-541
Mulders, Marjolein .............................. IFSSH19-400
MULH, Robert ..................................... IFSSH19-666*
MULLER, Camillo Theo ......................... IFSSH19-570*
Munaretto, Nick .................................... IFSSH19-385
Munoz, Beau ........................................ IFSSH19-1706
Munz, Giovanni ................................... IFSSH19-1115
Muradov, Mismil ................................. IFSSH19-541*
Muraközy, Katalin ............................... IFSSH19-650*
Muramatsu, Keiichi ............................. IFSSH19-1592*
Murata, Keiichi ................................... IFSSH19-334
Muratore, Gustavo ............................... IFSSH19-942
Muratore, Gustavo* .............................. IFSSH19-1712
Murphy, George .................................... IFSSH19-1863*
Murphy, Ralph .................................... IFSSH19-1118
Murray, Peter ..................................... IFSSH19-184*
Myers, Simon ...................................... IFSSH19-781
N
Naam, Nash ........................................ IFSSH19-480*
Nadama, Hauwau Hayat ......................... IFSSH19-719*
Nadeem, Maheen ................................. IFSSH19-1825*
Naderi, Naghmeh ................................. IFSSH19-1892
Nadja, Naghmeh ................................. IFSSH19-201
Nagao, Soya ........................................ IFSSH19-1877*
Nagao, Soya* ...................................... IFSSH19-1877*
Nagata, Yoshinori ............................... IFSSH19-685
Nagura, Issei ...................................... IFSSH19-508*
Nagura, Shigeki ................................. IFSSH19-261*
Nagya, Ladislav .................................. IFSSH19-76
NAGACHIMA, LUIS RENATO ..................... IFSSH19-454
Nakahita, Luis Renato .......................... IFSSH19-1037
Nakada, Mika ...................................... IFSSH19-338
<table>
<thead>
<tr>
<th>Author</th>
<th>IFSSH19-Number</th>
<th>Author</th>
<th>IFSSH19-Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ng, Chye Yew</td>
<td>IFSSH19-20</td>
<td>Nyman, Erika</td>
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<tr>
<td>Ng, Hannah</td>
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<td>Nyman, Torbjörn</td>
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<td>Ng, Lisa</td>
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</table>
14th IFSSH Congress
Index of authors

Oh, Jin-Chul ......................................... IFSSH19-1002
Oh, Jin-Chul ......................................... IFSSH19-1664
Oh, Jin-Chul ......................................... IFSSH19-1215
Oh, Jin-Chul ......................................... IFSSH19-24
Oh, Jin-Chul ......................................... IFSSH19-652*
Oh, Jin-Chul ......................................... IFSSH19-1125
Oh, Jin-Chul ......................................... IFSSH19-1786
Oh, Jin-Chul ......................................... IFSSH19-1847*
Oh, Jin-Chul ......................................... IFSSH19-1109
Oh, Jin-Chul ......................................... IFSSH19-1412
Oh, Jin-Chul ......................................... IFSSH19-600
Oh, Jin-Chul ......................................... IFSSH19-802
Oh, Jin-Chul ......................................... IFSSH19-1117
Oh, Jin-Chul ......................................... IFSSH19-1140
Oh, Jin-Chul ......................................... IFSSH19-672
Oh, Jin-Chul ......................................... IFSSH19-676
Oh, Jin-Chul ......................................... IFSSH19-1880
Oh, Jin-Chul ......................................... IFSSH19-544
Oh, Jin-Chul ......................................... IFSSH19-1666
Oh, Jin-Chul ......................................... IFSSH19-795
Oh, Jin-Chul ......................................... IFSSH19-1939*
Oh, Jin-Chul ......................................... IFSSH19-1952*
Oh, Jin-Chul ......................................... IFSSH19-1954*
Oh, Jin-Chul ......................................... IFSSH19-829
Oh, Jin-Chul ......................................... IFSSH19-1319
Oh, Jin-Chul ......................................... IFSSH19-1342
Oh, Jin-Chul ......................................... IFSSH19-192
Oh, Jin-Chul ......................................... IFSSH19-1185*
Oh, Jin-Chul ......................................... IFSSH19-1846
Oh, Jin-Chul ......................................... IFSSH19-1043
Oh, Jin-Chul ......................................... IFSSH19-870
Oh, Jin-Chul ......................................... IFSSH19-518*
Oh, Jin-Chul ......................................... IFSSH19-1155
Oh, Jin-Chul ......................................... IFSSH19-221
Oh, Jin-Chul ......................................... IFSSH19-80
Oh, Jin-Chul ......................................... IFSSH19-1561
Oh, Jin-Chul ......................................... IFSSH19-1622
Oh, Jin-Chul ......................................... IFSSH19-1687
Oh, Jin-Chul ......................................... IFSSH19-1146
Oh, Jin-Chul ......................................... IFSSH19-1157
Oh, Jin-Chul ......................................... IFSSH19-923
Oh, Jin-Chul ......................................... IFSSH19-441
Oh, Jin-Chul ......................................... IFSSH19-1430
Oh, Jin-Chul ......................................... IFSSH19-1358*
Oh, Jin-Chul ......................................... IFSSH19-1502
Oh, Jin-Chul ......................................... IFSSH19-846
Oh, Jin-Chul ......................................... IFSSH19-850
Oh, Jin-Chul ......................................... IFSSH19-851
Oh, Jin-Chul ......................................... IFSSH19-1672*
Oh, Jin-Chul ......................................... IFSSH19-1715*
Oh, Jin-Chul ......................................... IFSSH19-1719*
Oh, Jin-Chul ......................................... IFSSH19-1926
Oh, Jin-Chul ......................................... IFSSH19-1456
Oh, Jin-Chul ......................................... IFSSH19-1498
Oh, Jin-Chul ......................................... IFSSH19-1502*
Oh, Jin-Chul ......................................... IFSSH19-1465
Oh, Jin-Chul ......................................... IFSSH19-1470
Oh, Jin-Chul ......................................... IFSSH19-681
Oh, Jin-Chul ......................................... IFSSH19-682
Oh, Jin-Chul ......................................... IFSSH19-793
<table>
<thead>
<tr>
<th>Name</th>
<th>Page Numbers</th>
</tr>
</thead>
<tbody>
<tr>
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<td>IFSSH19-1079</td>
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<td>Petrova, Ekaterina</td>
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<td>Petukhova, Marina</td>
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<td>Pezzei, Christoph</td>
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<td>Pfanner, Sandra</td>
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Prohorenko, Valeriy .................................. IFSSH19-114
Prommersberger, Karl-Josef ..................... IFSSH19-1606
Prommersberger, Karl Josef ..................... IFSSH19-1974
Promny, Dominik .................................. IFSSH19-1568*
Pua, John Hubert .................................. IFSSH19-1597
Pua, John Hubert C. ............................... IFSSH19-1668
Puchalski, Piotr ................................... IFSSH19-439*
Pugliese, Pierfrancesco ......................... IFSSH19-1201*
Puhan, John Hubert ................................. IFSSH19-1597
Puhan, John Hubert C. ............................ IFSSH19-1668
Puchalski, Piotr ................................... IFSSH19-439*
Quinnn, Marcus ................................... IFSSH19-409
Raffoul, Wassim ................................... IFSSH19-719
Raffoul, Wassim ................................... IFSSH19-355
Rafii, Mohsen ...................................... IFSSH19-1924
Rahgizar, Paymon ................................. IFSSH19-557
Rahman, Shakeel .................................. IFSSH19-747
Raimbeau, Guy ..................................... IFSSH19-909
Raimmond, Stefania ............................... IFSSH19-1713
Raisian, Razmik .................................... IFSSH19-1376
Rajaratnam, Vaiikunthan ......................... IFSSH19-227
Raja, Senthoooran ................................. IFSSH19-1397*
Rajeskaran, Kannan ............................... IFSSH19-1483
Rajewska-Majchrzak, Justyna .................. IFSSH19-1112
Ramadan, Mohammad Rachadian ............... IFSSH19-1723*
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Ramalho Silva, Eduardo ......................... IFSSH19-1340*
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Ramirez, Ivan ...................................... IFSSH19-1473
Ramirez, Juan ...................................... IFSSH19-431
Ramirez, Monica ................................. IFSSH19-656*
Ramirez Jaramillo, Andres ..................... IFSSH19-1849
Ramirez, Monica ................................. IFSSH19-656*
Ramalho Silva, Eduardo ......................... IFSSH19-1332*
Randal Pires, Paulo ............................... IFSSH19-681
Raptis, Konstantinos ............................ IFSSH19-1766
Rashid, Mohd Zaim ............................... IFSSH19-925
Rasner, Anne-Sophie ............................. IFSSH19-1656
Rath, Jennifer .................................... IFSSH19-906
Rath, Rebekka .................................... IFSSH19-213*
Rath, Rebekka .................................... IFSSH19-296*
Rath, Rebekka .................................... IFSSH19-1852
Raudasoja, Leena ................................. IFSSH19-1637*
RAVEST, CRISTOBAL ............................. IFSSH19-121
Rayner, Samantha ............................... IFSSH19-800
Rayner, Samantha ............................... IFSSH19-800
Rayk, Aisha ....................................... IFSSH19-1652*
Rbia, Nadia ....................................... IFSSH19-737
Rbia, Nadia ....................................... IFSSH19-737
Rebosura, Cheyenne .............................. IFSSH19-416
Rahgozar, Paymon ............................... IFSSH19-557
Rahman, Shakeel ................................. IFSSH19-747
Raimbeau, Guy .................................... IFSSH19-909
Raimmond, Stefania ............................. IFSSH19-1713
Raisian, Razmik ................................. IFSSH19-1376
Rajaratnam, Vaiikunthan ....................... IFSSH19-227
Raja, Senthoooran ............................... IFSSH19-1397*
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Rajewska-Majchrzak, Justyna ............... IFSSH19-1112
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Shirley, Rebecca ........................................ IFSSH19-1603
Shohat, Noam ........................................... IFSSH19-297
Shojae, Babak ........................................... IFSSH19-973
Shoji, Kristi ............................................. IFSSH19-1556
Shores, Jamile ........................................... IFSSH19-906
Sibbel, Sarah ........................................... IFSSH19-1041
Sicher, Claudia .......................................... IFSSH19-2004
Siddiqui, Shibah .......................................... IFSSH19-666
Siegward, Laura ........................................ IFSSH19-1564*
Siemers, Frank ......................................... IFSSH19-516
Siesing-Mejer, Britt ................................... IFSSH19-554
Sikora, Sheena .......................................... IFSSH19-36*
Silva, César ............................................. IFSSH19-1388
silverio, silvia .......................................... IFSSH19-770
Sim, Jane ................................................. IFSSH19-1101
Simao, Danielle ......................................... IFSSH19-1997
Simeonov, Lyudmil .................................... IFSSH19-709*
Simeonov, Nikola ...................................... IFSSH19-863
Simon, Balazs ........................................... IFSSH19-663
Simon, Kerstin .......................................... IFSSH19-1824
Simon, Martina .......................................... IFSSH19-572
Simonova, Katerina .................................... IFSSH19-114
Simón Pérez, Clarisa .................................. IFSSH19-1477
Simpson, Tina .......................................... IFSSH19-212
Singh, Harvinder ....................................... IFSSH19-1968
Singh, Jagwant ......................................... IFSSH19-1130
Singh, Prateush ......................................... IFSSH19-1241
Singh, Sahiba ........................................... IFSSH19-130
Singh, Anu .............................................. IFSSH19-412
Singh, Darja ............................................. IFSSH19-1870
Siraj, Bassem ........................................... IFSSH19-32
Sirkin, Michael ......................................... IFSSH19-1920
Sisk, Geoffroy ........................................... IFSSH19-912
Sivakumar, Bran ....................................... IFSSH19-1343
Skvortsova, Maria ..................................... IFSSH19-1635
Slater, Karen ............................................ IFSSH19-1044*
Slavin, Benjamin ........................................ IFSSH19-906
Sletten, Ida Neergård .................................. IFSSH19-702*
Slevin, Omer ............................................ IFSSH19-297
Slijper, Harm ............................................ IFSSH19-407
Slijper, Harm P ......................................... IFSSH19-491
SMARRELLI, DAVIDE ................................. IFSSH19-1945*
Smeeton, Benjamin .................................... IFSSH19-467*
Smieja, Sabine .......................................... IFSSH19-1730
Smillie, Robert ......................................... IFSSH19-1029
Smith, Adam ............................................. IFSSH19-919
Smith, Gill .............................................. IFSSH19-1863
Smith, Karen ........................................... IFSSH19-943*
Smith, Kevin .......................................... IFSSH19-1083
Smith, Nicholas ......................................... IFSSH19-1224*
Smith, Shelby .......................................... IFSSH19-1954
Smith, Toby ............................................. IFSSH19-1330
Smrkova, Lucie ........................................ IFSSH19-1695
Sneag, Darryl ........................................... IFSSH19-788
Snedeker, Jess .......................................... IFSSH19-356
sobhani, roohollah ..................................... IFSSH19-310
Sae, Niels Henrik ...................................... IFSSH19-554*
Sogabe, Yusuke ......................................... IFSSH19-312*
Sogabe, Yuusuke ....................................... IFSSH19-1215
Sohrabi, Catrin ........................................ IFSSH19-781
Soldado, Francisco ..................................... IFSSH19-960
Soler, Manuel ........................................... IFSSH19-555
Soliman, Ramy Ahmed ................................ IFSSH19-1703
Sollemann, Christer ................................... IFSSH19-1604
Solomons, Michael .................................... IFSSH19-262*
Sommarhem, Antti .................................... IFSSH19-624
Sonda, Regina .......................................... IFSSH19-1038*
Song, Dajiang .......................................... IFSSH19-467
Song, Marie ............................................. IFSSH19-1603*
Song, Tao ............................................... IFSSH19-80
Sood, Amaan ............................................ IFSSH19-780
Soreide, Endre ......................................... IFSSH19-828*
Sorooshian, Parviz .................................... IFSSH19-1330*
Sorrenti, Luiz .......................................... IFSSH19-1141
Sotereanos, Dean ...................................... IFSSH19-324
Sousa, Antonio ......................................... IFSSH19-855
Spence, Stephanie ...................................... IFSSH19-1760*
Spielvogel, Eva ........................................ IFSSH19-982
Spies, Christian ....................................... IFSSH19-24*
Spielvogel, Eva ........................................ IFSSH19-25*
Sopher, Robert ......................................... IFSSH19-214
Spiteri, Michelle ...................................... IFSSH19-447*
Spiteri, Michelle ...................................... IFSSH19-473*
Sproedt, Julia .......................................... IFSSH19-1361
Sproedt, Julia .......................................... IFSSH19-1426
Spyridonos, Sarantis .................................. IFSSH19-1230
Spyridonos, Sarantis .................................. IFSSH19-1468
Spletten, Ida Neergård ................................ IFSSH19-1839
Spletten, Ida Neergård ................................ IFSSH19-1839
Soomarhem, Antti .................................... IFSSH19-624
Soreide, Endre ......................................... IFSSH19-828*
Sorooshian, Parviz .................................... IFSSH19-1330*
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Sproedt, Julia .......................................... IFSSH19-1426
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Spletten, Ida Neergård ................................ IFSSH19-1839
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<td>IFSSH19-Index</td>
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<td>Uchiyama, Shigeharu</td>
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<td>Uehara, Kosuke</td>
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<td>Uemura, Takuya</td>
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<td>Uhiara, Okezika</td>
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<td>Urahashi, taizen</td>
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<td>Ursu, Sergiu</td>
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<td>Usami, Satoshi</td>
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<td>Ushio, Shigeko</td>
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<td>VALENZUELA, ANDRES</td>
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<td>Valerio, Ian</td>
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<td>van overstraeten, Luc</td>
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<td>van de Heijden, Brigitte</td>
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</table>
### Index of Authors

<table>
<thead>
<tr>
<th>Name</th>
<th>Page Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vela, Viviana</td>
<td>IFSSH19-1016</td>
</tr>
<tr>
<td>Vekens, Lieselot</td>
<td>IFSSH19-1613</td>
</tr>
<tr>
<td>Vechmamontien, Sorasakdi</td>
<td>IFSSH19-810</td>
</tr>
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<td>Vekens, Lieselot</td>
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<td>Vela, Viviana</td>
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<td>Velickikv, Katherine</td>
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<td>IFSSH19-163</td>
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<td>Vercruysse, Loïc</td>
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<td>Vögelin, Esther</td>
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</tr>
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<td>Vollkmer, Elias</td>
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</tr>
<tr>
<td>von Guionneau, Nicholas</td>
<td>IFSSH19-906</td>
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<td>Vrachanski, Desislav</td>
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</tr>
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<td>Vranceanu, Ana-Maria</td>
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</tr>
<tr>
<td>Vuillerm, Carley</td>
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<td>Vulovic, Dejan</td>
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<td>Vusirikala, Anuhya</td>
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<td>Vutescu, Emil</td>
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<td>Wada, Kazuma</td>
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<td>Walahek, Ireneusz</td>
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<td>Walbeehm, Erik</td>
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<td>Wald, Daniel</td>
<td>IFSSH19-1621*</td>
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<td>Walecka, Joanna</td>
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<tr>
<td>Walker-Bone, Karen</td>
<td>IFSSH19-657</td>
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<tr>
<td>Wall, Lindley</td>
<td>IFSSH19-425</td>
</tr>
<tr>
<td>Name</td>
<td>IFSSH19-Page</td>
</tr>
<tr>
<td>-----------------------</td>
<td>--------------</td>
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<td>Wallace, Robert</td>
<td>451</td>
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<td>Wallner, Christoph</td>
<td>452</td>
</tr>
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<td>Warwick, David</td>
<td>407</td>
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<td>Warren Hammert, Warren</td>
<td>522*</td>
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<td>538</td>
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<td>103</td>
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<td>637</td>
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<td>1039</td>
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<td>807</td>
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<td>1251</td>
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<td>Wang, Guheng</td>
<td>48</td>
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<td>1410</td>
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<td>Wang, Qining</td>
<td>193</td>
</tr>
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<td>Wang, Taoli</td>
<td>1238</td>
</tr>
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<td>Wang, Guiheng</td>
<td>1856</td>
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<td>Wang, Guo-Bao</td>
<td>291</td>
</tr>
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<td>WANG, JENTO</td>
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<tr>
<td>Wang, Li</td>
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<td>637</td>
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<td>Wang, Taoli</td>
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<td>637</td>
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<td>956</td>
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<td>Wang, Yansheng</td>
<td>103</td>
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<td>Wang, Zengtao</td>
<td>589</td>
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<td>Wang, Kun</td>
<td>598</td>
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<td>Wang, Guiheng</td>
<td>599</td>
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<tr>
<td>Wang, Long</td>
<td>638</td>
</tr>
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<td>Warhold, Lance</td>
<td>345</td>
</tr>
<tr>
<td>Waris, Eero</td>
<td>538</td>
</tr>
<tr>
<td>Warren Hammert, Warren</td>
<td>522*</td>
</tr>
<tr>
<td>Warwick, David</td>
<td>407</td>
</tr>
<tr>
<td>Watanabe, Kentaro</td>
<td>192</td>
</tr>
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<td>Watanabe, Shimpei</td>
<td>235</td>
</tr>
<tr>
<td>Watanabe, Tatsuo</td>
<td>507</td>
</tr>
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<td>Weber, Daniel</td>
<td>897*</td>
</tr>
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<td>Wei, Corinne</td>
<td>1343*</td>
</tr>
<tr>
<td>Wehrli, Martina</td>
<td>535</td>
</tr>
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<td>Wei, Jiarui</td>
<td>928</td>
</tr>
<tr>
<td>Wei, Teng</td>
<td>1915</td>
</tr>
<tr>
<td>WEIGEL, Gerlinde</td>
<td>1918*</td>
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<td>1946</td>
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<td>Weiland, Andrew</td>
<td>450</td>
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<td>2009*</td>
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<td>2003</td>
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<tr>
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<td>576</td>
</tr>
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<td>Welts, Martin</td>
<td>1113*</td>
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<td>1774</td>
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<td>583</td>
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<td>Werker, Paul M.N.</td>
<td>818</td>
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<td>Werner, Helene</td>
<td>897</td>
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<td>Wessel, Lauren</td>
<td>802*</td>
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<td>West, Julie</td>
<td>512</td>
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<td>1303*</td>
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<td>Westenberg, Ritsaart</td>
<td>1412*</td>
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<td>Wiebel, Annelie</td>
<td>992</td>
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<td>Wiescholke, Stefanie</td>
<td>797*</td>
</tr>
<tr>
<td>Wieser, Simon</td>
<td>539</td>
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