

A-0108 A lactoferrin polypeptide (PXL01) in Hyaluronic Acid is more effective in reducing adhesion formations after flexor tendon surgery than hyaluronic acid alone

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Purpose: Restoration of function after flexor tendon injuries is still a clinical challenge. Complications, including excessive formation of adhesions and rupture of the sutured tendon can lead to impairment of hand function. In an earlier study, we have shown that a single treatment with a lactoferrin-derived peptide, PXL01, in Hyaluronic acid (HA), improved digit mobility after flexor tendon surgery without any negative effect on tendon healing compared to sham-operated digits. The aim of this study was to assess the efficacy of PXL01, formulated in HA, compared to HA alone on post surgical adhesion prevention and tendon healing. PXL01 exhibits anti-bacterial activities, down-regulates pro-inflammatory cytokines and inhibits plasminogen activator inhibitor type 1 (PAI-1). These activities suggest that administration of the peptide should reduce the risk of infections, decrease inflammation, promote fibrinolytic activity, and thereby decrease the formation of scar tissue and adhesions.

Methods: The third deep digital flexor tendon of 12 rabbits hind paws (n=12/group) were cut and repaired. On one side, the PLX01 peptide with HA as a carrier was applied between the tendon and the tendon sheath at the time of surgery. On the other side HA alone was administered. The formation of adhesions was evaluated eight weeks post-surgery by measuring the mobility of the affected digit using custom designed biomechanical equipment. The parameters evaluated were proximal interphalangeal (PIP) joint mobility, metatarsophalangeal (MTP)-claw

distance and load-to-failure testing. Paired t-test was used to compare the two groups. All statistical analyses were conducted at a significance level of $p < 0.05$.

Results: Treatment with PXL01 formulated in HA resulted in a significantly improved mobility of the PIP joint compared to HA alone. The MTP-claw distance, indicated improved toe mobility when treated with PXL01 in HA compared with HA alone, although not statistically significant. There was no difference in tendon healing as assessed by load-to-failure breaking strength between the treatments.

Conclusions: A single dose of PXL01 formulated in HA applied at the time of surgery, significantly improved mobility of the affected digit compared to a digit treated with only HA when used in a flexor tendon rabbit model. There was no difference in tendon healing, as assessed by load-to-failure test, between the two treatments.

A-0142 A comparison of controlled passive motion and early active motion following flexor tendon repair zone 2: a pilot-study

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Purpose: In order to improve function and digital range of motion after zone-2 flexor tendon repair, early active motion programs became increasingly popular. However, early active motion is still associated with increase of ruptures. Subsequently, controlled passive mobilisation (modified Kleinert regime) is related to adhesion formations, and stiffness of finger joints. This pilot-study compared, using controlled randomization, a modified Kleinert regime to an early active mobilisation (Belfast) regimen.

Methods: Patients with zone-II flexor tendon repairs were randomized to either early active motion or a passive motion protocol. At six and twelve weeks postoperatively, outcome measurements were collected: joint mobility, strength, dexterity, rupture rate, return to work and the duration of therapy. The Michigan Hand outcomes Questionnaire and the Quichdash were also applied.

Results: 19 patients (13 males, mean age 28 years) with 20 affected digits were included, of whom 13 patients completed the outcome measurements. At the time of submitting, the pilot-study is still continuing. The, preliminary, results and conclusions will be revealed in May 2011 at the congress.

A-0144 Prospective morphologic and dynamic assessment of deep flexor tendon healing in Zone II by high-frequency ultrasound using a new thread-tracking method

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Purpose: Despite the establishment of early motion protocols in order to obtain tendon gliding in zone II, very little information is available about the real amount of motion at the suture site. However, evaluation of the healing process today still is limited to clinical inspection. The use of ultrasound is constrained by the fact that little data on the sonographic appearance of sutured tendons exist. Therefore it was the aim of this study to prospectively analyse early postoperative morphologic and functional changes during the healing process of the profound flexor tendon (FDP) in Zone II with high-frequency ultrasound.

Methods: Eleven FDP lacerations in Zone II in ten patients were included. Tendon repair was achieved by a four-strand core suture and an epitendinous running suture. Postoperatively a modified Kleinert protocol (place-and-hold) was applied. Tendon morphology was evaluated by B-mode ultrasound after 3 days, 1, 2, 3, 5, 10 and 12 weeks. Analysis of tendon perfusion was performed using power Doppler ultrasound. Fingers II-V were examined with the hand placed in a customized dorsal wrist brace and FDP excursion over the PIP joint was assessed by a newly developed thread-tracking method, which employs the visible hyperechogenic core sutures as orientation point during full range passive motion of the DIP joint. Data are given as means \pm SEM.

Results: Morphologically all tendons exhibited a spindle-like appearance of the suture zone after 1 week, of which 50% developed a normal band-like appearance after 12 weeks. Interestingly, a persisting spindle-like structure after 12 weeks corresponded with a significantly increased FDP excursion at the PIP joint (2.86 ± 0.61 mm vs. 1.14 ± 0.27 mm; $p < 0.05$; CI 95% [0.20-3.25]). Fluid along the epitendineum was present in 36% after 12 weeks which did not correlate with FDP excursion or total active finger motion. Power Doppler analysis depicted an increased signal intensity in 40% of

tendons at day 3 which persisted until week 12. Tendons with increased perfusion exhibited a significantly better FDP excursion after 12 weeks (3.13 ± 0.70 mm vs. 1.25 ± 0.60 mm; $p < 0.05$ CI 95% [-3.33;-0.41]). Excursion of the FDP tendon at PIP level was 1.48 ± 0.3 mm at day 3 and increased steadily to 2.28 ± 0.75 mm after 12 weeks ($p = 0.2$; CI 95% [-0.55; 3.25]).

Conclusions: The results of the present study indicate a reliable assessability of morphology and dynamics of flexor tendon healing in Zone II by high-resolution ultrasound using a simple and not invasive thread-tracking method. Correlation of ultrasonic morphology and flexor tendon excursion suggest a better tendon movement, if the tendon maintains a spindle-like structure and shows hyperperfusion at 12 weeks. This suggests an increased activity within the tendon and might indicate a predominantly intrinsic healing pattern with less adhesion formation. Further studies are needed to investigate this relationship. Additionally, this new method may be a promising tool to rate the process of tendon healing in order to establish new suture techniques or rehabilitation protocols.

A-0153 What is Secondary Flexor Tendon Surgery?

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Introduction: Very little thought has been directed towards secondary surgery during the last thirty years, although it is an important part of our flexor tendon workload. Patients undergoing what we call "secondary flexor tendon surgery" are a heterogenous group of patients with a variety of pathological problems requiring surgical correction. The aim of this study was to assess the intraoperative findings of a series of patients undergoing secondary surgery for loss of normal digital movement as a result of dysfunction of the flexor tendon system to identify the frequency of occurrence of recognisable pathological changes in the various structures on the flexor aspect of the digits.

Methods: The intraoperative findings of 35 patients undergoing secondary flexor tendon surgery were collected prospectively and reviewed retrospectively. All patients had either undergone primary flexor tendon repairs which had suffered complications or presented late after a flexor tendon injury in Zones 1 and 2 of the fingers. The involved digits were examined in respect of pathologies of the skin and subcutaneous tissues, the flexor sheath and pulleys, the tendons themselves and the underlying joints to determine how pathologies of each of these impinged on and reduced normal flexion and extension of the fingers.

Necessary surgical corrections of problems occurring in any of the four were also recorded. Results Of the 35 patients, undergoing secondary flexor tendon surgery between 2003 and 2009, 23 presented after previous flexor tendon surgery and 10 presented late after lacerations to the flexor tendons or ruptures/bony pull-offs of the FDP tendons. Two patients presented after operative treatment for flexor sheath infections. Intraoperatively, 13 of the patients showed longitudinal shortage of the palmar skin and subcutaneous tissue contributing to flexion contracture of the fingers and needed local flap corrections of the extension deficits. Thirteen patients required reconstruction of missing pulleys. Twelve patients needed extensive tenolysis and eight more had scar tethering of the tendons to the tendon sheath under the pulleys which required release. Of the 35 patients, 17 underwent insertion of a silastic rod, then two-stage flexor tendon grafting. Four patients required Le Viet lengthening of the flexor tendons at the musculocutaneous junctions. Thirteen patients had scarring and contracture of the volar plate of the PIP joint, requiring release.

Conclusions: The term "secondary flexor tendon surgery" is a generic name which encompasses a multitude of pathological changes not only of the flexor tendons themselves but also of the other tissues of the flexor aspect of the digits which summate to hinder digital movement in a number of ways. Surgical correction of all of the changes present in any one finger is necessary to improve movement and terms relating only to the tendon changes, such as 'tenolysis' and 'secondary tendon grafting', which are seen regularly on operation lists, underestimate the complexity of this surgery. Use of an algorithm dividing the pathological findings into those of the individual tissues facilitates appraisal and solution of the various problems in each case.

A-0159 Bow-string After A1 Pulley Release of Trigger digits: Comparison of Open Versus Percutaneous Surgery

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Introduction: Trigger digit is characterized by painful catching or popping as the patient flexes and extends the finger or loss of active interphalangeal joint movement. The triggering is caused by a disproportion in size between the flexor tendon and its retinacular A1 pulley. Surgical release of A1 pulley is widely accepted method of treatment of trigger digit, but effects of bow-string as one of complications of surgical treatment have not poorly defined. The purpose of this study was to assess the bow-string after A1 pulley release of trigger digit and compare two surgical procedures: open versus percutaneous surgery.

Materials and Methods: Forty-three patients with 47 trigger digits were divided into 2 prospective cohorts: open (19 digits) versus percutaneous (28 digits) release of the A1 pulley. There are 23 thumbs, 15 middle fingers, and 9 ring fingers. Average age of the patients was 55 years old (range, 27-67). All digits underwent ultrasonographic evaluation of volar displacement of flexor tendon during active flexion at preoperation and postoperative 6 months. The distance between the flexor tendon and the metacarpal head was measured in both positions of the metacarpophalangeal joint with 0 degree and 30 degree flexion during active grasp a probe and was carefully quantified in millimeters.

Results: After A1 pulley release, the average flexor tendon displacement during active flexion of the digit was measured 0.88 ± 0.54 mm, which was significant different compared to 0.34 ± 0.24 mm of preoperative measurement ($p=0.00$). Postoperative flexor tendon displacement of open procedure was averaged 1.44 ± 0.57 mm compared with 0.61 ± 0.22 mm of percutaneous technique. This difference is statistically significant ($p = 0.001$).

Conclusions: This study suggests that surgical release of the A1 pulley for the treatment of trigger digits leads to bow-string of the flexor tendon during active flexion. With regard to only bow-string as a complication, percutaneous release is considered as more safe procedure than open release.

A-0190 Comparison of modified Kessler and Yotsumoto-Dona suture: a biomechanical study on porcine tendons

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Purpose: There is a need for a strong suture technique allowing early active mobilization after flexor tendon repair; however the best method is yet to be found. The aim of this study was to compare the modified Kessler suture with a newer 2-strand method biomechanically.

Methods: Eighteen porcine tendons were cut and repaired according to either the grasping modified Kessler suture or the combined side-locking loop technique (Yotsumoto) and interlocking horizontal mattress suture (Dona). The specimens were tested linearly to failure. 2 mm gap force, yield force, ultimate force, stiffness, energy to yield and failure, the early yielding rate for the groups and the mode of failure were recorded.

Results: Both the 2 mm gap force, yield force, ultimate force, stiffness, energy to yield and energy to failure were significantly higher ($p<0.05$) in the Yotsumoto-Dona group (median values: 30.9 N, 82.7 N, 82.7 N, 12.5 N/mm, 0.45 J and 0.45 J respectively) than in the modified Kessler group (25.8 N, 35 N,

50.9 N, 7 N/mm, 0.09 J and 0.21 J). All Yotsumoto-Dona specimens performed a yield force exceeding 35 N while in the Kessler group only four did. The early yielding rate was 6/9 and 2/9 in the modified Kessler and the Yotsumoto-Dona group, respectively ($p=0.15$). The Kessler sutures began to yield by pull-out but finally all the core sutures failed by suture breakage at the knot except for three Yotsumoto knot loosening. All the simple running and six of the Dona epitendinous sutures failed predominantly by pull-out, and by breakage at the intersections in three of the latter.

Conclusions: The relatively easy-to-perform 2-strand Yotsumoto-Dona repair is likely to withstand the loads of active finger flexion whereas the Kessler repair is probably not.

A-0194 The Effects of 5-Fluorouracil on Flexor Tendon Healing by Using a Biodegradable Gelatin Slow Releasing System: Experimental Study in a hen Model

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Purpose: Adhesion after tendon injury is a challenging problem for hand surgeons. Recent studies focus on various methods in preventing such adhesions. Topical application of 5 Fluorouracil shows promising results in preventing adhesions.

Methods: In this study, 5 Fluorouracil was applied via a slow releasing gelatin system and its effects were investigated. Gelatins prepared 10X20X1 mm in size were loaded with 10, 20 and 30 mg 5 drug. 30 adult white Leghorn chickens were used. The tendon to the third and fourth toe were severed and primarily repaired. Study groups were: Group 1 (n=6); randomly selected from 30 animals, six non-operated left lower extremities. Group 2 (n=6); operative control. Group 3 (n=6); repaired tendons with null gelatins. Group 4(n=6); gelatin loaded with 10 mg, Group 5(n=6); gelatin loaded with 20 mg and Group 6(n=6); gelatin loaded with 30 mg of 5 Fluorouracil respectively. The repaired extremities were casted for 3 weeks. After sacrificing animals, tendons were examined with light and electron microscopy to evaluate the adhesions and with biomechanical angular rotation test to assess tendon excursion.

Results: revealed that group 4 showed apparent decrease in adhesion formation when compared with operative control group ($p=0.009$, $p < 0.05$). In electron microscopy, group 4 showed active fibroblast cells and collagen synthesis with uniformly oriented collagen fibrils. In group 2, collagen fibrils were disorganized. Group 6 showed severe inflammation. In biomechanical angular rotation test, results of group 4 in comparing to group 2 were statistically different ($p=0.002$, $p < 0.05$). The mean angular values of group 4 (76.3° , SD: 3.01) were approaching mean values of control group (80.8° , SD: 2.3) (group 6).

Conclusions: This study showed that low dose application of 5 Fluorouracil via the slow releasing gelatin system have a promising effect on flexor tendon healing in regarding adhesion formation and functional results after injury. Key words: 5 Fluorouracil, Gelatin, Tendon, Slow releasing, Adhesions

A-0205 Testing the first extensor compartment for diagnostic purposes: a new specific test for De Quervain tenosynovitis

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Objective: Between June 2007 and June 2010 we prospectively evaluated a new diagnostic test in 100 patients (88 women/12 men - mean age 53 y (11-88)) suspected of De Quervain's tenosynovitis with positive Clinical examination (painful radial styloid and positive Finkelstein's test). In case of positive clinical examination for De Quervain tenosynovitis, the new test was evaluated: full flexion of the wrist, abduction of the thumb with full resisted active extension of the MP and IP joints against the examiner's index finger. It was interpreted as positive if the patient felt a painful exacerbation of the symptomatology when putting his thumb under tension, negative in the other case. Patients were then sent to the radiology department for X-ray of the wrist and Ultrasound of the 1st extensor compartment. The new diagnostic test of De Quervain's tenosynovitis has a better Specificity and a better sensitivity as compared to the Finkelstein's test. We believe that this test is a very useful tool in the diagnosis of De Quervain tenosynovitis. Moreover it is an essential tool to find the reason (volar subluxation of the APL and EPB) of persistent pain around the first compartment following surgical release of the sheath of the first compartment following De Quervain tenosynovitis. Comparative Ultrasound with

and without the test allows a careful diagnosis of the instability.

A-0248 Our therapeutic strategy for digital stiffness

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Purpose: Digital stiffness affects motion at the metacarpophalangeal, proximal and distal interphalangeal joints, leading to serious problems, especially in manual workers. In some cases, surgery can improve this situation. However, stiffness may result from many different anatomical causes and it can be difficult to ensure intra operatively that hand function has been restored. After that, proper and early rehabilitation, especially during first postoperative month, is critical to achieve good results. In 2008, we designed a therapeutic strategy involving surgery, nurse and physical therapists care to improve functional outcome.

Methods: Since 2008, we perform surgical treatment of these patients under local anesthesia. In this way, we can verify improvement of active function of the fingers during intervention and we can decide when to finish it. Local anesthesia does not alter proprioception of the patient's hand, so, we can get interactive cooperation with him and even evaluate his subjective functional improvement (We show per operative videos). In addition, we do not use per operative ischemia. It's technically more demanding because of the bleeding, but we do not alter muscle function by hypoxia and the mandatory hemostasia decreases the incidence of edema and hematoma. Patient stays at hospital at least for 5 days and begins rehabilitation 12 hours after surgery, twice a day. We have a post-op rehabilitation protocol which includes manual therapy, passive and active joint mobilization of the wrist and hand, CPM, and proprioception rehabilitation (We show videos). Elastic dressings are changed twice a day, too. We use intravenous analgesic and anti-inflammatory drugs, as well as diuretics in order to reduce pain and swelling. After discharge, patients remain in daily outpatient rehabilitation for about 4 weeks. Since the year 2008, 39 patients consulted for stiffness hand. 35 patients were treated surgically during years 2008 and 2009. We analyze the cause of stiffness, surgical procedures they needed, functional improvement obtained (we show it presenting videos of the preoperative, and final function of the hand) and degree of patient satisfaction. We also report the complications.

Results: Surgical treatment of fingers stiffness is not always indicated; the cause and the patient must always be considered (4/39 patients). It can involve serious complications (3/35 patients) and final result can be quite disappointing (5/35 patients). It requires close monitoring of

pain, edema and wounds. It needs of intense postoperative rehabilitation and good patient cooperation.

Conclusions: Systematization of surgical procedures using local anesthesia without ischemia has improved our results in the last 2 years. Physical therapists and nurse involvement from the first day post-op, has become central.

A-0258 Anatomy, histology and histomorphometrics of the thumb carpometacarpal ligaments

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Purpose: To investigate the anatomy of the supporting ligaments of the thumb carpometacarpal joint (CMCI) ligaments in relation to histologic and histomorphometric findings.

Methods: Under loupe magnification, the supporting ligaments of the CMCI were visualized after excising all superficial and capsular tissue in thirty-five fresh adult cadaveric hands (19 male, 16 female). In 30 of 35 specimens, articular wear was minimal or absent with no evidence of previous trauma. The remaining five specimens were excluded secondary to osteoarthritis. We assessed the ligaments between the first metacarpal and trapezium with regard to orientation, restraint to passive motion and morphometric characteristics. Five ligaments from five cadavers were additionally studied using hematoxylin-eosin for morphology and DAPI stain for histomorphometrics. 12 representative sample areas/ligament (60 total/specimen) were photographed and the number of nuclei counted. The total number of nuclei were compared between the 5 ligaments using student's t-test.

Results: A consistent ligamentous anatomy was seen in all 30 specimens. A stout deltoid-shaped dorsal ligament complex, with a central portion not previously described, emanates from the dorsoradial tubercle of the trapezium proximally. It fans out to insert on the dorsoradial, dorsocentral, and dorsoulnar aspects of the first metacarpal, respectively. These three components correspond to the dorsoradial ligament (DRL), a newly described dorsal central ligament (DCL), and a posterior oblique ligament (POL). Collectively, this deltoid ligament complex prevents dorsal translation and stabilizes the joint in supination and abduction. A compact dorsal ulnar trapeziometacarpal (duT-MC I) ligament stabilizes the dorsoulnar aspect of the CMC, ulnar to the POL, originating from the dorsoulnar rim of the trapezium and inserting onto the proximal ulnar rim of MC I. The insertion site location allows this ligament to act as a true ulnar collateral ligament, limiting abduction of the CMC. The volar structures visualized include the

anterior oblique (AOL) and ulnar collateral ligaments (UCL), both attenuated, thin ligaments providing marginal volar and pronation stability. The dorsal ligaments were consistently thicker than the volar ligaments ($p < 0.05$). Histological analysis showed that the dorsal ligaments had a typical ligamentous appearance with grouped collagen bundles, whereas the AOL consisted of disorganized connective tissue with sparse presence of collagen fibers. The histomorphometric analysis furthermore revealed that the dorsal deltoid ligament complex was consistently and significantly ($p < 0.05$) more cellular than the volar ligaments. The AOL was the least cellular of the ligaments analyzed.

Conclusions: The dorsal aspect of the CMCI consists of three stout ligaments, the DRL, DCL and POL, emanating from the dorsal tubercle of the trapezium. In contrast, the volar ligaments, especially the purportedly important AOL, are thin and attenuated. Morphometric, histologic and histomorphometric analysis of the CMCI ligaments reveal that the dorsal ligaments are true collagenous structures whereas the AOL should be considered a capsular reinforcement rather than a true ligament, given its lack of organized collagen and low cellularity. Our results also suggest that the stout dorsal deltoid ligament complex is the primary ligamentous stabilizer of the CMCI, while the diaphonous volar ligaments are dependent on the thenar musculature for stability.

A-0259 Immunofluorescent analysis of the innervation patterns of the thumb carpometacarpal ligaments

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Purpose: To investigate the innervation pattern of the five primary ligaments stabilizing the thumb carpometacarpal (CMC I) joint using immunofluorescent staining technique and fluorescence microscopy.

Methods: The dorsal radial (DRL), dorsal central (DCL), posterior oblique (POL), ulnar collateral (UCL) and anterior oblique (AOL) ligaments were excised in their entirety from ten fresh-frozen cadavers (4 female/6 male, mean age 65). Each ligament was suture-marked for orientation and fixed in 4% formaldehyde. The ligaments were paraffin-sectioned in 8µm thick sections and mounted on glass slides. The slides were primarily stained using markers for low-affinity neurotrophic receptor p75, S-100 protein and Protein Gene Product (PGP) 9.5. All slides were secondarily stained with fluorescent marker Alexa 488. Following staining, the slides were analyzed using

fluorescence microscopy (Observer Z1, Zeiss) and AxioVision software. The presence of nerve fascicles and/or mechanoreceptors was semi-quantitatively analyzed in all ligaments and graded on a scale from 0 to 3, where 0 indicated no presence of mechanoreceptors or nerve fascicles, and 3 indicated several nerve endings in every section studied. Results Using immunofluorescent microscopy, Ruffini endings, Pacini corpuscles and nerve fascicles were seen in variable degrees in the CMC I ligaments. The Ruffini ending was the most predominant mechanoreceptor identified. In general, the distal half of each ligament had a greater presence of mechanoreceptors than the proximal half. The DCL and DRL had the greatest innervation of all ligaments studied, with mechanoreceptors present in all sections analyzed in 10/10 and 9/10 ligaments, respectively. The POL was intermediately innervated with mechanoreceptors in 8/10 ligaments. The volar ligaments were sparsely innervated, with mechanoreceptors found in only 4/10 UCL specimens and in none of the AOL specimens.

Conclusions: The dorsal ligaments are in general richly innervated with mechanoreceptors found in the majority of specimens analyzed. The volar ligaments, especially the purportedly important AOL, had little to no innervation with mechanoreceptors, indicating that these ligaments are of minor importance in the proprioception of the CMC joint. A greater number of mechanoreceptors close to the distal insertion of the ligaments as compared to the proximal insertion correlates with the overall greater motion of the first metacarpal as compared to the motion of the trapezium. The variations in innervation found in the CMC I ligaments might imply different roles in the stability of the CMC I joint, where ligaments without innervation may act as structures of passive restraint, whereas ligaments with rich innervation are proposed to also provide proprioceptive information. In conclusion, our findings of sensory nerve endings in the CMC I ligaments indicate that the thumb CMC joint has a proprioceptive function. Additional studies are needed to investigate the proprioceptive and neuromuscular stability of both the normal and the osteoarthritic CMC I joint.

A-0269 Risk factors for ruptures after operative treatment of injured flexor tendons

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Purpose: The purpose of this study was to identify factors affecting early ruptures, aiming to improve the results after tendon surgery.

Method: In a retrospective cohort study, we analysed 395 fingers (dig I-V) in 364 patients who were surgically treated for flexor digitorum profundus (FDP) tendon injuries in zone I-II between 2000-2006 at Uppsala University Hospital. Patients who suffered from a postoperative tendon rupture were compared with non-ruptures using logistic regression. Results Age was significantly associated with tendon rupture (RR=1.04 per year, 95% CI 1.01-1.06, $p=0.002$). Patients with a coexisting nerve injury were found to have a lower risk for postoperative tendon rupture (RR=0.37, 95% CI 0.16-0.90, $p=0.03$). Tsuge suture technique showed less rupture rate than modified Kessler suture technique (RR=0.24, 95% CI 0.06-1.05, $p=0.06$), but no differences between different suture material were found. A binary variable coding for social factors (alcohol or drug abuse, criminality, mental or psychological disabilities) was found to be significantly associated with a higher risk for postoperative tendon rupture (RR=6.10 95% CI 1.13-32.78, $p=0.04$). Surgical repair within 24 hours showed no significant advantages compared to surgery day 2-7 ($p=0.99$).

Conclusions: In this study we found the risk for postoperative tendon rupture to increase with increasing age. The patient's age should be considered when discussing relevance of different suturing techniques and prognosis. A coexisting nerve injury seems to be associated with a lower risk for postoperative tendon rupture. If this depends on more careful postoperative mobilisation regime due to impaired nerve function or if other factors are relevant needs to be studied further. We found Tsuge suturing technique to be a potentially safer alternative than modified Kessler suture technique, but choice of suture material indifferent. This difference may be due to mechanics of the suture technique or may depend on the surgeon's suturing skills. Tsuge suturing technique might be easier to perform and may therefore be recommended as first choice when trainees learn to repair flexor tendons. We found social factors to be significantly associated with ruptures. This may be explained by a reduced ability to comply postoperative instructions. Interaction effects between postoperative rehabilitation regime (Kleinert, active hold, plaster) and social factors were however not significant. Rehabilitation regime does thus not seem to affect the risk for postoperative tendon rupture within the group with social factors. It is conventional to suture a flexor tendon within 24 hours, however in this study we did not see an increased risk for rupture when comparing flexor tendons sutured within 24 hours with those sutured on day 2-7.

A-0306 Presentation of an improved novel injection technique that enhances resolution of de Quervain syndrome

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Purpose and Introduction: Persistent De Quervain's tenosynovitis (DQT) usually responds well to non-surgical treatment with either anti-inflammatory medication and thumb spica or cortisone injections. We introduce a novel four point injection technique (PFT) showing that PFT further enhances a quicker therapeutic outcome, showing superiority over the older two point and one point injection technique.

Methods: We treated two groups of 24 patients suffering from persistent DQT that had not responded well to treatment with NSAIDs and splinting. Group A received one point injection while Group B was treated with PFT. Follow up was in 2/52, 4/52, 8/52 and 52/52. Parameters evaluated included need for repeated injections, quicker successful dismissal from treatment, effect on daily activities, DASH score, relapse, side effects and the lack or presence of surgical decompression after failure of non-surgical treatment.

Results: 2/52: Seven Group A patients were symptoms free and dismissed from treatment while all patients in this group scored better than their Group B counterparts where only 1 was released from treatment. 4/52: 6 Group A patients were symptoms free in contrast to 4 from Group B. 8/52: one Group B patient relapsed while 4 opted for surgical decompression. 52/52: 21 patients in Group A were symptoms free, one was operated on and two relapsed, while in Group B 12 were symptoms free, 9 were operated on and 3 relapsed.

Conclusions: Our results suggest that PFT is more successful even in recalcitrant forms of DQT that do not respond well to non-surgical treatment with NSAIDs and splinting.

A-0320 An Analysis Of The Tendon Holding Capacity Of Six Suture Loop Configurations

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Purpose: New stronger suture materials have been introduced to flexor tendon surgery. The advantage of these materials can be lost if the suture loop pulls out from the tendon. The purpose of this study was to compare the biomechanical differences between the different loops in terms of their ability to take grip from the tendon tissue.

Methods: Four different standard and two experimental locking loops with 200 um NiTi wire were inserted to human cadaveric FPD tendons. The standard loops were: 1) cruciate; 2) Pennington modified Kessler; 3) cross loop; 4) Lim-Tsai: The experimental loops were: 5) a composition of pennington modified Kessler and a cross loop and 6) a locking Kessler type of loop with superficial transverse component. Every group had 10 specimens. Subsequently, a pull out test was performed. The failing mechanism of the loop was observed during the pull out test.

Results: The cruciate loop had the weakest holding capacity (20N). Cross loop, Lim-Tsai loop and modified Kessler loop performed similarly (36N, 37N and 39N, respectively). The experimental loops developed for this study had the highest holding capacity sometimes exceeding the material strength (group 5: 59N and group 6: 60 N). The mode of failure was pull-out for the standard loops but 13/20 experimental loops held until the suture ruptured.

Conclusion: There are substantial differences in the biomechanical behaviour under tension between the different locking loops. These differences manifest with stronger suture materials. We propose that loops that take better grip of the tendon should be used with new suture materials to fully benefit from their tensile properties.

A-0336 Reconstruction of wrist extension in obstetric brachial plexus palsy using tendon transfer

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Purpose: The use of a tendon transfer in the wrist is a standard surgical procedure to improve hand function in patients with obstetrical brachial plexus palsy. Although most overall results make this an effective procedure to improve wrist extension, large variation in individual results is found. This study reviews transfer of the flexor carpi ulnaris or flexor carpi radialis to the extensor carpi

radialis brevis and/or longus to reconstruct wrist extension in 21 patients with obstetric brachial plexus injury.

Methods: Over a 8-year period, 21 patients with obstetrical brachial plexus palsy who underwent a tendon transfer for improved wrist extension were identified and retrospectively reviewed. The mean age at the time of the tendon transfer was 7 years. The mean follow-up was 3 years and 4 months. In 18 patients the flexor carpi ulnaris was selected for the transfer, in 3 patients the flexor carpi radialis was used. After dissection, the flexor tendon was sutured to the extensor tendon. The choice of acceptor tendon was made during the surgical procedure. The extensor carpi radialis brevis was selected in 9 patients, the extensor carpi radialis longus in 7 patients and transfer to both tendons was performed in 5 patients. Wrist extension was measured pre- and postoperative and during follow-up by a hand therapist.

Results: Preoperatively, there was no active wrist extension with an average wrist extension lag of 38.1 degrees. Postoperatively, there was an active wrist extension with an average of +11.7 degrees. Overall, the average gain of active wrist extension was 49.8 degrees. Four patients were unable to reach the neutral wrist position postoperatively, of which two patients had no increased wrist extension at all. Tendon transfer to the extensor carpi radialis brevis showed more gain in wrist extension than transfer to the extensor carpi radialis longus or transfer to both tendons. Wrist extension increased by 66 degrees in the extensor carpi radialis brevis transfers, opposed to 36 and 39 degrees increase in transfers to the extensor carpi radialis longus or both tendons, however this difference was not significant ($p=0.09$).

Conclusions: This study demonstrates that the use of wrist flexors to provide wrist extension in children with obstetric brachial plexus palsy produces good results in almost all patients. Although average gain in wrist extension was 49.8 degrees, individual increase varied between 0 and 100 degrees. The patient and his parents should be carefully advised on the expected results.

A-0342 Biomechanical comparison of failure mechanism between two suture techniques for tendon transfer surgery

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Purpose: The biomechanical optimization of the repair technique on tendon transfer surgery, through a stronger tendon to tendon attachment, could result to a better

functional outcome due to early postoperative mobilization. The purpose of this study is the comparison between Pulvertaft suture technique and a new one the side to side running suture technique.

Methods: For the in vitro comparison between Pulvertaft and side to side repair technique have been used flexors and extensors of the sheep front foot. The tensile test was performed placing the tendons in a testing machine pre-conditioned and stretched to failure. Seven Pulvertaft and seven side to side repairs were performed. The overlap length of the tendons was 5cm for both techniques, and the suture type, Tichron 3-0.

Results: The results of the performed load to failure tensile tests, showed that the side to side repair is significant stronger and stiffer than the Pulvertaft. The failure mechanism between the two techniques is quite different. Failure for the Pulvertaft repair technique occurred in the repair region, with suture knots breaking and pulling of the donor tendon through the recipient tendon. The (SS) repairs failed by the longitudinal shearing of the collagen fibers within the donor tendon, whereby fibers that were locked down with the running sutures stayed attached to the recipient tendon.

Conclusions: The tensile tests performed on sutured tendons in order to assess the best suture type from the mechanical point of view, showed highest values concerning the applied load and the elongation of the specimen, for the side to side suture group, respecting to the Pulvertaft suture group. This in vitro study demonstrated that the method of side to side tendon repair used for tendon transfer can influence the immediate strength of repair and therefore, the ability to pursue postoperative rehabilitation protocols that use early motion and load the repair with a minimum risk of damage thus preventing oedema and adhesions formation on peripheral nerve palsy and tetraplegia surgery.

A-0357 Suture of flexor digitorum superficialis improves the results of primary tendon surgery in zone 2. A retrospective study

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Purpose: The handling of the flexor digitorum superficialis (FDS) tendon during treatment of zone 2 injuries is controversial. Some authors advocate reconstruction of both tendons, others promote reconstruction of the flexor digitorum profundus (FDP) tendon only, leaving the former untreated or excised. We compared retrospectively the results of suture of both tendons with suture of just the FDP tendon.

Methods: All patients operated in our department between 1st January 2005 and 31st May 2010 with flexor tendon suture after total laceration of both tendons in zone 2

were included. The handling of the FDS occurred after the surgeon's preference. Replantation, immobilization, delay exceeding 14 days and less than 8 weeks of follow up were exclusion criteria. We included 60 fingers in 50 patients with suture of both tendons (reconstruction group) and 91 fingers in 79 patients with the FDS resected or left untreated (resection group). The two groups did not differ significantly in age, gender, side, dominance, which finger, single or multiple finger injury, severity of soft tissue damage, associated injuries or delay of surgery, but there were significant differences in subdivision of zone 2 (more FDS resected in the middle zone 2), FDP suture type, tendon sheath release and rehabilitation program. There were insignificantly more smokers in the resection group ($P=0.07$). The combined PIP and DIP joint total active range of motion (ROM) was registered and the outcome was evaluated according to Strickland and Glogovac as "excellent or good" or not, both at 8 weeks and at the last follow up at a mean of 7 months in both groups. Complications, reoperations and secondary treatment with splinting were also recorded. The results for each finger were statistically analysed with a significance level of 5%.

Results: The mean ROM was 107 (SD 42) and 84 (SD 41) degrees at 8 weeks, 129 (SD 36) and 99 (SD 36) degrees at last follow up in the reconstruction and the resection groups, respectively. "Excellent or good" function was found in 29/56 and 16/86 fingers at 8 weeks and 41/60 and 27/91 at the last control. Complications were registered in 12/60 and 34/91 fingers; 18/60 and 51/91 fingers needed secondary splint treatment. All of the above mentioned differences favoured statistically significantly the reconstruction group. 3/60 and 12/91 sustained rerupture of the FDP tendon ($p=0.16$), and totally 7/60 and 22/91 fingers were reoperated ($p=0.06$); these differences favouring the reconstruction group as well, but insignificantly. In a regression model we found significantly better results in the reconstruction group with respect to ROM at the last control; "excellent or good" function at both 8 weeks and the last control; and significantly fewer overall complications, adjusted for age, gender, smoking and other factors in which the two groups were different.

Conclusions: Our results showed that primary suture of both flexor tendons in zone 2 leads to significantly better functional results and fewer complications, reruptures, reoperations and secondary splint treatments than suture of just the FDP tendon.

A-0411 Predicting risk of Flexor Pollicis Longus tendon rupture after volar plating - The role of post operative radiographs

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Purpose: Flexor Pollicis Longus (FPL) rupture has been described as a relatively common complication following volar plating of distal radius fractures. The aim of the study was to investigate the possible relation between parameters measured on post-operative radiographs and the occurrence of FPL ruptures. There is no current literature on this subject to our knowledge.

Methods: 11 patients with FPL ruptures after volar plating with 4 different plate systems were identified. These were case matched to 22 control patients, treated with the same plate systems, with no flexor tendon symptoms or signs at one year post surgery. Five assessors, who were all blinded to the patient groups, assessed all 33 post-operative radiographs. Fracture reduction was assessed using volar tilt, radial tilt, radial height and ulna variance. Plate position was assessed using angulation of the plate, distance of plate from the joint and translation from mid-line. All of these were calculated using a template.

Results: In relation to fracture reduction; volar tilt and radial tilt were statistically significantly different between the FPL rupture and normal groups while radial height and ulna variance were not. In relation to plate position; the plate angle and the length of the plate from the joint were statistically significantly different while translation was not.

Conclusions: The accuracy of fracture reduction and plate placement are related to the likelihood of FPL rupture. These are under the control of the operating surgeon. Less than perfect post-operative radiographic appearances warrant close surveillance and consideration of early metalwork removal.

A-0430 The effect of 2, 4, 6, core tendon sutures on flexor tendon excursion through the pulley system; a cadaveric study

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Purpose: To investigate the extent to which placement of flexor tendon sutures affects their excursions through the pulley system.

Methods: Flexor compartments were dissected out on the index and little fingers of 5 cadavers. A 2, 4 and 6 core tendon suture of 4/0 nylon and standard 6/0 epitendinous sutures were placed by a consultant hand surgeon on the intact FDP tendon in Zone 2, distal to the A1 pulley on the index finger and distal to the A2 pulley on the little finger. Placement of sutures was standardised for all tendons over a pre-marked distance of 1 centimetre. The tendons were then loaded proximally in the palm to assess the excursion of the involved tendon through the relevant annular pulley system. The increase in volume of the

tendon by placement of the suture was then calculated. Further flexor compartments were dissected, with measurements taken of the tendon and pulley dimensions. This measured space between tendon and pulley in the flexor sheath was compared with digital measurements calculated from high resolution photographs.

Results: The study showed complete obstruction of the tendon passage through the pulley system after the placement of sutures, as demonstrated by high resolution video. Full details of the calculations and measurements will be provided at presentation, demonstrating significant limitations in tendon excursion secondary to standard flexor tendon repair techniques.

Conclusion: These findings highlight the need for the consideration of alternative suture techniques, or alternatively the effects of pulley venting during flexor tendon repair in Zone 2 injuries.

A-0435 Analysis of effects of combinations of pulley resections in flexor tendon bowstringing of digits

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Objective: To analyse effects of combinations of pulley resections in flexor tendon bowstringing of digits in the cadaveric digits.

Material and Methods: The flexor tendon system was examined using a human cadaver model. 5 hands were utilised from standard formalin 4 cadavers (two male and two female, 62 - 87 years of age at death). Only the index finger was analysed in each case. Pulley combinations were methodically sectioned longitudinally. Uniform amount of tension was applied proximally to FDP + FDS to simulate active tendon digital flexion. The degree of bowstringing of the flexor tendon was accurately measured using vernier callipers in each case.

Results: When a single minor pulley (A1,A3, A5) was cut, no significant bow stringing was measured. Cutting all minor pulleys (A1,A3,A5) demonstrated minimal bowstringing (<1mm) on flexion. Cutting one of the major pulleys (A2 and A4) did not in fact lead to major bow stringing, demonstrating only a <1mm with respect to A2 and a 2.5mm increase with respect to A4. But cutting the major pulleys with the pulley immediately distally (A2+A1 and A4+A3) demonstrated the greatest bow stringing, 7.4 and 6.9 mm respectively. But cutting the major pulleys with their proximal neighbours (A2+A3 and A4+A5) demonstrated a significant reduction in bow stringing, 1.6 and 3.4 mm respectively.

Conclusions: Of the five annular pulleys (A1-A5) A2 and A4 are believed to be of fundamental importance for

stabilising the flexor tendons during flexor tendon function. Our results demonstrate that in this model, with the influence of the skin removed, A2 and A4 absence did not produce major bowing if adjacent annular pulley are intact. This has significant impact during flexor tendon surgery in zone 1 and 2 and the practice of venting of A2 and A4 pulleys. In fact they only produced 1.1mm and 4mm of bowing. And as long as the minor pulleys on either side of the major pulleys remained intact bow stringing was minimal.

A-0448 In vitro comparative study of non absorbable and long term absorbable suture materials in flexor tendon sutures

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Purpose: Nowadays the generally accepted suture material in flexor tendon surgery is the non absorbable, monofilamentous material, the polypropylene [Prolene]. In latest years long term absorbable monofilamentous materials, (with 50-60 days of tensile strength) are used in increasing percentage. These absorbable materials are the polydioxanone [PDS II] and the polyglactin [Maxon] Our purpose was: -to determine and compare the tensile strengths and the elongation of the materials mentioned above -to determine and compare the tensile strengths of the flexor tendon sutures with different techniques and materials -to demonstrate that absorbable suture materials and flexor tendons sutured with these materials present at least the same or even better mechanical properties as in the case of the "golden standard" non absorbable suture materials at the time of the repair!

Methods: For our experimental study we used fresh canine flexor tendons. Mechanical determinations were performed with a specially constructed electronically driven cyclic loaded device with digital and graphic display. First the tensile strength of the different suture materials was measured. Cyclic loading was performed with 20 loadings per minute. With every tenth loading the pulling force was increased with 0,5 Newtons. Every technique with every material was used and tested 6 times and an average of these 6 measurements was considered. A total of 162 tendon tests and more than 250 mechanical tests were done. The force needed for 1 mm gap formation was observed and registered. After this we continued till the final breakage of the tendon suture. First core sutures, (Kessler, Tsuge sgl, Tsuge dbl) with 5/0 suture materials were tested. Second time circumferential sutures (Silverskjöd cross stitch and deep bite) performed with 6/0 suture materials were tested. Finally the combined core suture (5/0) and circumferential sutures(6/0) were tested.

Results: Tensile strengths of the 5/0 and 6/0 materials demonstrated the mechanical superiority of the absorbable materials. Core tendon sutures results in an early gap formation. Circumferential sutures alone gave significantly better mechanical results. In case of combined sutures all results were superior to previous methods. Using two core sutures (four strands) we observed an augmentation of the force necessary for gap formation and breaking. Considering all techniques PDS II gave the highest mechanical results followed by Maxon and Prolene.

Conclusions: Long term absorbable materials have their place in flexor tendon repair. The absorbable materials proved a superior mechanical property. Core sutures alone are insufficient for tendon repair. Combined sutures are mandatory for flexor tendon repair. A long term in vivo study would be the next step to compare these data within the biological process of healing in order to prove that the diminution in time of the strength of the suture material is compensated by the tendon healing process.

A-0537 The treatment of Zone 1 flexor tendon injuries using micro bone anchors

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Aim: to evaluate the outcome of zone 1 flexor tendon injuries using micro bone anchors placed in the distal phalanx.

Methods: During the period of 2003 to 2008, forty-six consecutive patients (22 lacerations and 24 closed avulsions) with zone 1 flexor tendon injuries were treated using Mitek micro anchors. The tendon was sutured using a modified Bunnell pattern using 3-0 braided suture (ethibond). Patients were rehabilitated using a controlled active movement (CAM) protocol from the first post operative day. The range of motion (ROM) at the distal interphalangeal joint (DIPJ) was assessed using Moimen's classification.

Results: 51% of patients demonstrated excellent or good results for ROM at the DIPJ and 25% had a poor outcome. There were no significant differences in outcome between the lacerations vs. the closed avulsion group. 97% of patients returned back to work during the follow up period. There was one case of suture rupture from the anchor at time of tendon repair and one tendon rupture during a mean follow up period of five months. There was one case of osteomyelitis.

Conclusions: This is the largest clinical study on the use of bone anchors for zone 1 tendon injuries. It is a relatively simple technique to learn and does not damage the specialized nailbed tissues. Our study demonstrated a low rate of complications and outcomes that compare favorably with other techniques documented in the literature.

A-0019 Treatment of Kienbock's disease by Shortening Osteotomy of the radius - Results in Lichtman stages IIIA and IIIB

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Purpose: Comparing the results of shortening osteotomies of the radius in Kienbock's disease stages IIIa and IIIb of Lichtman classification performed the last 24 years to update its indications.

Method: The patients charts were reviewed. There were 38 patients, 24 IIIa and 14 IIIb, 21 male and 10 left wrists. 23 cases had a "cubitus minus", 14 a neutral cubital variance and 1 a "radius minus". Age of patients ranged from 15 to 65 years, medium 31.

Results: Patients were reviewed from 1 to 19 years after surgery, medium 5. The clinical results in IIIa and IIIb patients were similar. In patients without carpal collapse (IIIa) we had, according to Nakamura clinical classification, 8 excellent results, 13 good and 3 bad. In patients already with carpal collapse we had 12 excellent and 2 good results. We had no lasting cubital pain in our patients with neutral cubital variance.

Conclusion: Carpal collapse (stage IIIb of Lichtman) or a neutral cubital variance don't seem to be contraindications to a shortening osteotomy of the radius in the treatment of Kienbock's disease.

A-0129 Reconstruction of humeral diaphyseal nonunions with vascularized fibular graft

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Purpose: Treatment of humerus diaphyseal nonunions are technically challenging. This study reviews the results of 5 diaphyseal nonunions which were reconstructed using vascularized fibular grafts.

Methods: Between 2002 and 2007, 6 humeral diaphyseal nonunions were reconstructed using vascularized fibular grafts. There were 3 women and 3 men, with an average

age of 47 years (21 to 57). All patients had one to three prior operations before admission. Average duration of nonunion was 59 (12-156) months. Bony fixation was achieved by intramedullary nails in 3 patients and plates in 3 patients. Among the 6 cases, one patient was lost to follow up at the third postoperative month. Five patients were followed up with an average of 37 months (12 to 53).

Results: In four of the five cases, union was achieved by single operation. A secondary intervention of bone grafting was required for the last patient due to inadequate consolidation of the proximal bone-graft interface. Mean union time was 4.4 months. Radiographic humeral length difference was 3.6 cm (1 to 7cm). Average elbow range of motion was 130 (100 to 145), shoulder flexion was 167.5 (165 to 170), shoulder abduction was 172.5 (170 to 180), external rotation was 92.5 (80 to 100), and internal rotation was 75 (70 to 80) degrees. Mean DASH score was 10 (5 to 19). According to the Tang system, excellent clinical evaluation in 3 patients and good in 2 patients were obtained. Radiologic evaluation revealed four excellent results and one fair result. No donor site morbidity was detected.

Conclusion: Multiple failed surgeries, nonunions with bone defects, and decreased vascularity of soft tissues make vascularized free fibular graft a rationalist solution for treatment. Its constant vascular anatomy, length and diameter properties make fibula an ideal graft for humeral shaft reconstruction. If properly performed, donor site morbidity is minimal.

A-0199 Comparative study: Internal fixation versus radial head resection in isolated Mason type III fractures of the radial head

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Background: Radial head fractures are the most common type of elbow fractures in adult population. Account for approximately one third of the fractures about the elbow and for 1,5 to 5,4 % of the fractures in adults. 85% of them occur in young active individuals ranging in age from 20 to

60 years old. Radial head is an important valgus stabilizer of the elbow, particularly in the setting of an incompetent medial collateral ligament. In addition, up to 60% of the load transfer across the elbow occurs through the radiocapitellar Joint. Important factors to consider when making treatment decisions includes radial head fracture configuration, associated fractures, elbow and forearm ROM, and clinical or radiographic findings suggesting elbow or forearm instability. Treatment options include: non operative treatment, ORIF, radial head resection and arthroplasty.

Purpose: To evaluate long term results of surgical treatment of radial head fractures Mason type III, in absence of associated elbow instability, comparing ORIF versus radial head resection.

Methods: Retrospective Cohort study of patients who had surgery of radial head fracture mason type III in our Hospital, between january 2004 and december 2007. Patients with associated fractures, fracture-dislocation or elbow instability were excluded. 17 patients were included. Outcomes in long term follow up were evaluated according to Mayo elbow performance index (MEPI), Quick Dash, Arc of motion and strength. Radiographic assesment of elbow and whist were performed. Osteoarthritic changes of the elbow were evaluated according to Broberg and Morrey.

Results: A total of 17 patients were evaluated with a mean follow up of 49.8 months. Mean age 36,64 years. 12 male and 5 female. The injured side was the dominant in 10 cases. 9 patients had ORIF and 8 had radial head resection. All patients with ORIF had fracture healing. Hardware removal was necessary in 4 cases. There was no significant difference between groups in the arc of flexo-extension ($p = 0.53$), forearm rotation ($p = 0.71$) and strength ($p = 0.22$). MEPI was 94.3 points for the radial resection group and 97.2 for the ORIF group ($p = 0.64$). Dash was 33 points for the resection group and 13 for the ORIF group. Radiographic Study of the elbows showed 4 patients with Grade II arthritic changes in the resection cohort. No patients complained of elbow or wrist pain.

Conclusion: In our series, excluding the patients with associated elbow instability, both radial head resection and ORIF had excellent and good results in long term follow up in the treatment of radial head fractures mason type III.

A-0206 The tri-ligament tenodesis investigated: A faster way of reaching strength and fixation?

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Purpose: Management of chronic scapholunate (SL) instability remains a controversial subject. The purpose of this prospective study was to evaluate our provisional results at

one year follow-up after performing a 'tri-ligament tenodesis' without use of internal fixation in patients with static or dynamic SL instability.

Methods: Between January 2007 and July 2009 a tri-ligament tenodesis was performed in 32 patients. No type of internal fixation was used and a short arm cast was applied for a total of four weeks only. Range of motion and grip strength were measured on both the injured and non-injured side preoperatively and twelve months after surgery in 24 patients. Functional impairment (DASH questionnaire) and pain (Visual Analogue Scale) were also recorded preoperatively and at 12 months follow-up.

Results: At twelve months follow-up we recorded in our group of 24 patients a mean VAS score of 1.8, a decline of 65% when compared to preoperative scores. Mean DASH score was 14.8, a decline of 53%. We recorded a significant decrease in wrist flexion (56 to 41 degrees, p -value <0.001) with preservation of preoperative values of wrist extension, radial and ulnar deviation. Grip strength was not influenced by surgery. Patient satisfaction was high ($>90\%$) and no major complications occurred.

Conclusion: Results at one year follow-up show that the use of the tri-ligament tenodesis technique with a shortened period of cast immobilisation is an effective treatment for a reducible scapholunate instability when compared to existing methods of treatment. This method results in a significant decrease of pain with preservation of wrist function and with minor complications.

A-0212 Skin cancers of the hand - an analysis of the management and outcome of 417 lesions

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Purpose: The hand is a relatively uncommon site for skin cancer and the natural history of such tumours is poorly documented. However, due to the functional and anatomical intricacies of the hand, tumour management and reconstruction demands special consideration. The purpose of this study was to review a large series of hand skin tumours to determine tumour characteristics and behavior, and to inform future clinical practice.

Methods: We conducted a retrospective review of consecutive patients undergoing surgery for cutaneous hand malignancies at the Oxford Radcliffe Hospital between 1993 and 2010. Case notes were reviewed to determine patient demographics, risk factors and details of surgical management including margins and reconstructive technique. Histopathology reports were accessed from the hospital database to determine tumour characteristics. Outcome parameters included tumour recurrence, metastatic spread and survival.

Results: Over the 17-year study period, 300 patients (mean age 75, 60% male, 40% female) underwent excision of 417 lesions. The most common site was the dorsum of the hand. Lesions involving the nail complex were infrequent and lesions involving the palm were rare. Seventeen percent of patients had multiple hand tumours. Nineteen percent of patients were on immunosuppression for renal transplants. SCC was the most common tumour (n=344) followed by BCC (35), malignant melanoma (MM) (22) and keratoacanthoma (10). In contrast with skin cancer management elsewhere, only 42% of defects closed directly, 40% were resurfaced with a skin graft, 16% required a local flap and 2% were reconstructed with a free flap. Nine percent of patients underwent amputation. Axillary lymphatic spread occurred in 36% of patients with MM and 7% of patients with SCC. Epitrochlear nodal disease occurred in one patient with MM and one with SCC. Sentinel lymph node biopsies were undertaken in six patients (2%); two for SCC were negative and three out of four for MM were positive. Distant metastatic spread occurred in 32% of MM patients and in 0.4% of SCC patients. Death occurred in 4 of 22 patients (18%) with MM and in 3 of 227 patients with SCC (1%).

Conclusions: We present a large series detailing the management and outcome of cutaneous hand malignancies. Most defects required soft tissue reconstruction with a graft or flap. SCC was by far the most common lesion; however, regional and distant spread was rare. BCC occurred infrequently, despite being the most common type of skin cancer. MM was very rare but presented at an advanced stage and was associated with a poor prognosis. The high incidence of nodal disease in MM supports the use of sentinel node biopsy in all hand MMs, but not in SCCs.

A-0226 Microbiologic spectrum in surgically treated hand infections

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Purpose: Infections of the hand are common and can culminate in severe morbidity if not treated promptly and properly. Severe hand infections are treated with early surgical debridement and suitable antibiotic therapy. As severe hand infections demand immediate treatment, the antibiotics for initial therapy must be chosen empirically, before the results of culture are known. This in turn means that the most likely causative organisms should be known. This study was conducted to seek possible relations between history, clinical presentation and microbiologic spectrum.

Methods: We retrospectively reviewed medical records of 212 patients (107 male, 105 female, average age 43.7 years, range 17-98 years) treated for hand infections from 2001 to 2007 at our institution. The analysis included the bacterial spectrum in relation to location, clinical history and clinical presentation.

Results: Idiopathic infections were found in 121 cases, followed by injuries (n=58), bites (n=23) and foreign bodies (n=11). Gram-positive organisms such as staphylococci (n=147) and streptococci (n=83) were most commonly found. Polymicrobial infections (n=72) were present in 34% with a majority of gram-positive and gram-negative mixed infections (n=28) followed by combined gram-positive and anaerobic (n=18) infections. The tissues involved showed a majority of subcutaneous infections followed by perionychial tissue, tendon spaces, joints and bones. Gram-negative organisms such as *Pasteurella* spp. dominated in bite injuries.

Conclusions: Hand infections require prompt surgical and antibiotic treatment. For the initial empirical choice of antibiotics, it is essential to know the spectrum of organisms likely to be found in hand infections. Our results show a variety of pathogens in hand infections regardless of the aetiology, location and clinical presentation. Gram-positive organisms predominated except in bite injuries. Initial antibiotic therapy should therefore cover the spectrum of gram-positive, gram-negative and anaerobic organisms. When culture results are available, the antibiotic therapy should be adjusted accordingly.

A-0345 Dorsal scapho-lunar stabilization with Viegas' capsulodesis

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Purpose: Carpal instability begins generally with a scapho-lunate tear. Its repair is essential to preserve wrist function. Classical techniques, as Blatt's capsulodesis, or Brunelli's tenodesis don't reproduce wrist isometry and produce stiffness. Authors used a capsulodesis that seems to take in account wrist isometry.

Methods: From 2006 to 2009 authors operated prospectively a continuous series. It's composed of 11 women and 11 men of age mean 38 years. Half were working accidents. All patients presented a pain, often a loss of strength, and a half part presented a loss of wrist motion or annoying crackings. The follow-up is 14 months. Viegas' technique consists of a dorsal capsulodesis, using a transverse strip coming from the dorsal intercarpal ligament. This strip is fixed with anchors, and protected with carpal pinning and wrist cast during 8 weeks.

Results: The post-operative data are compared with the preoperative data. The flexion-extension arc decreased of $2,7^\circ$. The radio-ulnar tilt increased of $15,8^\circ$. The grasp improved of 8 kgf, the pain on VAS improved of 3,5 points, the PRWE score of 55 points. Radiologically, the scapho-lunar gap decreased of 0,6 mm and the scapho-lunar angle passed from 33 to 37° . We deplore four CPRS among which three with clinical signs, one abrasion of the EPL, one superficial sepsis. Two unfavourable evolutions were taken back, one by die-punch arthrodesis, one by luno-capitate arthrodesis. In one case the scapho-lunar gap reproduced without DISI. It's logical to propose a repair of the dorsal portion of the scapho-lunar ligament, which is mechanically the most efficient. By proposing a direct axial radio-carpal fixation, the Blatt capsulodesis, or Brunelli's tenodesis, both most used interventions, create an inextensible and not isometric dorsal reinforcement stiffing the wrist. Viegas proposed in 2000 a transverse dorsal scapho-lunar capsulodesis, which does not fix the radio-carpal joint. It uses a portion of the dorsal intercarpal ligament. Its mechanical resistance is superior to that of the dorsal scapho-lunar ligament. It can be used as reinforcement after a scapho-lunar suture. Its realization doesn't contain important technical difficulties. The results show not much change of the flexion-extension arc after the procedure. The radio-ulnar tilt, the grasp force, the pain and the score PRWE are clearly improved. The results are good 20 times on 22. The Viegas capsulodesis doesn't destabilize the carpus and doesn't cut the bridges. The two bad cases were taken back with a partial arthrodesis.

Conclusion: This technique allows to stabilize a non directly repairable scapho-lunate tear, chronic, without fixed carpal instability, corresponding to arthroscopic EWAS stages 3 and 4. Consequences are generally simple, but we must beware of a CRPS, or a pin complication. The results are satisfactory.

A-0364 Kienböck's disease in paediatric and juvenile patients

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Purpose: Kienböck's disease is a rare condition in children or juvenile patients with unique features. This study intends to review the literature on this topic and to evaluate our own patients to help to establish therapeutic guidelines.

Methods: From 1994 until 2010 we treated a total of 30 patients - 4 were not older than 12 years (paediatric) and 26 were juvenile (ranging from 13 to 19 years). Only 6 juvenile patients were lost to follow up. As we changed our therapeutic approach in 2006 we have to consider two

separate groups of patients. Out of the group of patients with traditional treatment which was the same like in adult patients before 2006 the 2 paediatric patients could be followed - one with stage IIIa disease after vascularised transposition of the pisiform and the other one with stage I disease after conservative treatment. 15 out of the 21 juvenile patients could be followed: 9 patients after radial shortening osteotomy, 5 patients after partial wrist fusion and one after arthroscopic debridement. Beginning in 2006 our therapeutic strategy in paediatric and juvenile patients has been changed towards a more conservative approach. Since then 2 paediatric patients, one with conservative treatment of stage I disease and one with temporary transfixation of the scaphotrapezoidal joint in stage IIIb disease could be followed as well as 5 juvenile patients. Out of these 2 patients had a spontaneous healing of the lunate. 2 patients were treated with temporary transfixation of the scaphotrapezoidal joint and one patient had a combination of a radial shortening osteotomy and a temporary transfixation of the scaphotrapezoidal joint. We measured motion, grip strength and pain level in rest and under load using the visual analogue scale, as well as the DASH-Score. Furthermore standard x-rays of the wrist were performed.

Results: All paediatric patients demonstrated a good clinical and radiological result with healing of the lunate bone. The juvenile patients with radial shortening osteotomy had a better motion than those with partial wrist fusion. Reduction of pain level was similar in both groups. Radiologically we found no progression of lunate disease in these patients. The patients treated with temporary transfixation of the scaphotrapezoidal joint demonstrated good clinical and radiological results with the exception of a 17 year old boy with an advanced Kienböck's disease who developed symptomatic progression and finally required proximal row carpectomy.

Conclusions: In paediatric and juvenile patients with Kienböck's disease we find an age related potential for spontaneous remodelling and revascularisation. Therefore in paediatric and in juvenile patients not older than 14 years our method of choice is an immobilisation with regular gadolinium-enhanced MRI-studies. In those who do not improve and in older juvenile patients we prefer temporary transfixation of the scaphotrapezoidal joint. Alternatively in cases of ulnar minus variant radial shortening osteotomy or a combination of these 2 methods are indicated as a primary approach. In our opinion there is no longer an indication for partial wrist fusions as a primary procedure in these patients.

A-0386 The three-ligament Tenodesis for the reconstruction of the Scapholunate Dissociation: Technique and results

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The three-ligament Tenodesis for the reconstruction of the Scapholunate Dissociation: Technique and results The scapholunate ligament injury is a quite common injury in the wrist joint that occurs sometimes after trival trauma. Failure of proper healing of the SL-ligament may leads to an overall carpal dysfunction if the secondary scaphoid stabilizer namely the Scaphotrapezial-trapezoidal ligament (STT) fails.

Patients and methods: The study includes 40 patients, with a mean follow up of 24 months. All the patients complained of wrist pain that increase with activity. History of recognized trauma was positive in only 25 patients. For all the patients complete wrist examination was done followed by P-xray of the wrist joint in 2 views beside Power grip view. Comparative X-ray view for the opposite wrist joint was done. The postoperative evaluation was done using the visual analogue pain score; Mayo modified wrist score and DASH score. The postoperative ROM is compared to the preoperative ROM. The postoperative power grip is compared to the opposite side. Postoperative radiographic analysis includes evaluation for the recurrence of the SL-Diastasis, carpal malalignment and secondary osteoarthritis and correlation is done between the postoperative radiographic outcome and the clinical outcome.

Results and conclusions: are not yet complete as we are still investigating the rest of the patients.

A-0387 Subacute Scapholunate Instability - Our experience with Modified Brunelli Procedure

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The first techniques described for Subacute Scapholunate Instability, Dobyns ligament transfer in 1975 and intra carpal arthrodesis by Watson in 80s, didn't have encouraging results. Brunelli (1995) described a ligament transfer in which a slip of flexor carpi radialis (FCR) is used to stabilize the scapholunate joint. The slip is pulled through the distal pole of the scaphoid and inserted at the dorso ulnar side of the radius. From 1999 to October 2009, 21 patients with scapholunate dissociation were treated by modified Brunelli technique. So that the FCR tendon slip is inserted under the dorsal radiolunotriquetral ligament in such a way that it does not cross the radiocarpal joint. The mean follow up was 4

years and at least 1 year of follow-up The patients were assessed with subjective and functional evaluation, range of motion, grip strength. Radiographs were performed in order to measure the SL gap, the SL and radiolunate angles, and the degenerative changes. With the exception of two, all patients returned to their preinjury labor and sports. Pain assessment in the postoperative period showed that 13 patients had no pain, 5 patients had mild pain, while 3 patients had moderate pain. There was a 17% loss of flexion and 14% of extension, when comparing with opposite side; The loss in grip strength was 18%. One patient suffered from reflex sympathetic dystrophy. In x-ray, 3 patients had degenerative changes. When compared with the preoperative the modified Brunelli technique provided 16° and 12° in SL and radiolunate angles, respectively. We consider subacute, the lesions that have degeneration of scapholunate ligament, but has not yet fixed deformity or osteo-articular changes. These cases are best managed with techniques that stabilize the scaphoid and lunate, and allow motion between them. In our experience, most of patient had good or excellent results, and it seems the technique is efficient on prevention of osteo-articular degenerative changes in most patients

A-0423 Florid reactive periostitis, bizarre parosteal osteochondromatous proliferation, and Turret's exostosis: A continuum of proliferative periosteal processes in the hand

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Purpose: Florid reactive periostitis, bizarre parosteal osteochondromatous proliferation - B.P.O.P. (Nora's lesion), and Turret's exostosis are seemingly a part of a spectrum of reactive lesions. The literature addressing these lesions as a continuum of successive phases is scarce. It has been hypothesized that these lesions constitute separate entities and each has been separately designated. The appearances of these entities depend on temporal factors, breaching of the periosteum, and local anatomic features. We aimed at describing the clinical and radiological features of these lesions, their natural evolution and the surgical outcome.

Methods and Results: A total of 19 cases were reviewed, including three patients with florid reactive periostitis, seven patients with B.P.O.P. (Nora's lesion), and nine with Turret's exostosis.

Conclusions: An initial stimulus, often related to trauma is commonly reported, that leads to hemorrhagic subperiosteal proliferation which then matures. If the reaction remains contained within the periosteum, a localized

fusiform florid periostitis develops in which the underlying cortex remains intact. If the periosteum is violated, the reactive process can then extend and B.P.O.P. may develop. Florid reactive periostitis and Turret's exostosis are painful, whereas the lobular form of B.P.O.P. is generally not. Recurrence is more frequent in the exophytic type of B.P.O.P., and there is no enough body of information

regarding the optimal timing for excision. Differential diagnosis includes malignant lesions such as osteosarcoma and chondrosarcoma. Microscopically, these lesions show overlapping histological features.

A-0012 Madelung's deformity: treatment with osteotomy of the radius and insertion of a trapezoidal wedge

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Purpose: The purpose of this study is describe a osteotomy technique of the radius with insertion of a trapezoidal wedge and present our clinical experience with this method.

Methods: Eight female patients in the 12- to 22-year age range (mean age 15.6 years) with bilateral Madelung's deformity underwent surgery between 1997 and 2008, with a total of 12 operated wrists. The postoperative period varied between 3 and 83 months, with an average of 40.3 months.

Results: An improvement was noticed in all parameters analyzed, with an average increase in the degree of amplitude of the joint in terms of flexion, extension, pronation and supination.

Conclusion: All patients had improvement in gain of motion and reported being satisfied with the improvement in the appearance of their deformities.

A-0039 The rehabilitation of children's with congenital humeroradial synostosis

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The congenital humeroradial synostosis (HRS) is a combined developmental defect of upper limb, characterized by absence of elbow (the humerus continues into the radius without a change in the structure of bone), ulnar deficiency, defects of the hand. HRS may be an occasional finding in some syndromes (Keytel, Antley-Bixler, Nievergelt et al). 63 Patients with HRS 74 limbs were examined. They got surgical reconstruction and prosthetic treatment. All patients were divided into 3 main forms of HRS. Complex technology of surgical reconstructions on

the base of this classification was offered. We made 146 operations: 60% - the reconstructions for shoulder and forearms defects, 29% - reconstructions for anomalies of the hand, 11% - some different operations on the any segments of upper limb. The microsurgical autotransplantation of the first metacarpal joint to position of the absent elbow, we used for making the elbow movements. The prostheses was realized for 21 childs. All of these devices (66) were atypical. The majority of this prostheses (86% cases) were mechanical with cable control system. The results of presented medical abilitation during period from 3 months before 21 years after finishing this abilitation for 55 childs with HRS (66 limbs) were examined.

A-0040 The choice of technology of surgical treatment at congenital club hand

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Purpose: The choice of variants of surgical treatments in different degrees of congenital club hand.

Methods: We treated 48 children in age from 6 months to 18 years (had executed 73 surgical procedures). The choice of method of operation is defined by severity of deformation. We used standard classification with 4 severity levels. In patients with first level we used the transposition of tendon of musculus flexor carpi radialis in position of musculus extensor carpi ulnaris (7 operations). In patients with second level of anomaly we used the heterotopic transposition of growth zone in position of distal metaphysis of radius (3 operations). For correction of deformation in patients with third level of club hand we made transposition of second metatarsal bone with growth zone in position of distal end of radius (6 operations). In cases of fourth level we used 2 variants of surgical treatment: centration of the hand to distal end of ulna (1 operation) or combination of this procedure with pollicization (6 operations); correction of hand displacement with application of Ilizarov frame and then - centration of hand to distal end of ulna (25 operations). During

several years after operation we made the orthoses fitting for fixation of forearm and hand in correct position. Results. There is a dependence of treatment results from severity level and especially from range of motions in elbow. In patients with active flexion restriction the frequency of deformity relapse was rather great. Microsurgical transposition of growth zones considerably reduces a probability of repeated operations.

Conclusions: The variant of surgical treatment depends from severity level of club hand. There is a possibility of using of many different surgical technologies: tendon-muscle transposition, microsurgical technologies, Ilizarov frame or combination of its. The possibility of repeated operations is higher in cases of severe deformity with restriction of elbow flexion.

A-0042 Surgical management of arthrogryposis in the upper extremity

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The purpose of this research is to develop the optimum methods of treatment children with upper limb deformities due to arthrogryposis.

Methods: From 2004 to 2010 we examined and treated 86 patients with upper limb deformities. The age of children was from 5 months till 18 years. It was carried out clinical, radiology, electrophysiology, neurology examination.

Results: The key to success in restoration of upper extremities in patients with arthrogryposis is the early beginning of treatment and the active help of parents. The most important problems are the age of patient for beginning of operative treatment and the sequence of elimination of all deformities. We have analyzed the results of treatment of patients with arthrogryposis and we have determined that the optimum age for the beginning operative treatment is the age of 10-12 months. When the patient has passive flexion in the elbow 90 degrees and more at first we eliminate the wrist deformities. In these cases we performed transposition of m.flexor carpi ulnaris and m.flexor carpi radialis on extensor surface of a hand and forearm in an isolated variant or in a combination with resection of bones of a wrist. When the patient has passive flexion in the elbow less 90 degrees at first we carry out restoration of passive movements by posterior capsulotomy of the elbow with the triceps tendon lengthening or restoration passive and active movements in a joint by posterior capsulotomy of the elbow with the triceps tendon lengthening and transposition of some muscles groups (latissimus dorsii, pectoralis major, triceps brachii). When the patient has flexion contracture in the elbow we prefer to perform extension

osteotomy of the humerus. When the patient has rotation deformities of upper limb or forearm we perform osteotomy of humerus (or radial bone).

The conclusion: The proposed methods of treatment patients with arthrogryposis allow to eliminate deformities and restore their daily activities.

A-0055 The Tunnel Carpal Syndrome in the children

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Carpal tunnel syndrome is a condition rarely encountered in infants, and the majority of the cases are related to genetic conditions. The authors describe their experience in diagnosis and treatment of CTS in children, presenting and discussing a casuistry of 20 patients, 11 males and 9 females, average age of 8,6 years, with a preoperative evaluation and planning within a dedicated multidisciplinary ambulatory service for the overall management of the congenital differences. The described experience ranges over all the great majority of the causes reported in the international literature for the CTS in child. Only 3 patients presented a CTS following a previous trauma (two elbow fractures and one wrist fracture), and 1 haemangioma, in all the other 15 cases (79%) the CTS is related to congenital disorders. With a relevant difference to the described literature, where the mucopolysaccharidosis is less frequent than the mucopolipidosis, in the present casuistry are described 3 patients affected by a type III mucopolipidosis and no other type of these storage diseases. In 4 children was described a Leri Weill syndrome, 4 presented a macrodystrophia lipomatosa, 1 Proteus syndrome (d.d. with the macrodystrophia lipomatosa), 1 Dejerine-Sottas Syndrome, 1 "meander" deformity related to a collagenous disease, 1 soft tissue benign tumour and the last case without a certain diagnosis at this moment. On the other hand, even if described in the literature, no one of the Proteus syndrome affected children presented median nerve disturbances, and one case of hereditary neuropathy spontaneously regressed. The diagnosis is strongly based on the high index of suspicion and knowledge of the surgeon, considering the modest complaints of the young patients. It is important to carefully study the underlying causes through an accurate clinical history and an objective and scrupulous examination aimed at determining the presence of congenital differences and genetic disorders. Clinical symptomatology is vague, the pain is mainly nocturnal one, inducing recurrent crying and reducing sleeping in the infant. At the school or playing time a suspicion may arise from a progressive manual clumsiness and skill and grip losses. The thenar weakness must be

differentiated from primary hypoplasia or induced by congenital anomalies, with no direct relationship with CTS. Provocative tests are often negative, mainly in children with longstanding nerve suffering. Instrumental diagnostic studies, such as ecography and EMG, are recommended and bilaterally performed, being essential to establish diagnosis in many cases. Sedation may be helpful in the smallest children. MRI and Ct are useful in the more complex cases of CTS following genetic disorders. In all the patients open operative release was the effectiveness treatment.

A-0165 Congenital isolated radial nerve palsy: case series and literature review

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Congenital isolated radial nerve palsy is rare. This entity has been described previously and has been thought to be associated with trauma. We have seen at least four cases over the last five years which have been referred to our regional Childrens Hand and Upper Limb Service with a diagnosis of congenital radial nerve palsy. All of the referred patients were noted to have isolated radial nerve palsy at birth in the absence of birth trauma or other congenital malformations. They were seen by the Childrens Hand and Upper Limb Service within three weeks of birth. Irrespective of the mode of birth, none of the neonates had a history of shoulder dystocia or birth related injury. The neonates showed non-specific skin changes and/or swelling around the upper arm but no other underlying pathology was identified. All cases were investigated as clinically indicated and managed expectantly. The palsy was significantly improved at six months and nearly resolved at one year of follow up. Congenital isolated radial nerve palsy does exist. The aetiology is uncertain but a review of the literature indicates a few possible causes. Fortunately, in our experience there is a virtually complete resolution within the first year of life.

A-0183 Role of Krukenberg's operation in rising of possibility of self-service at children

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Purpose: Rehabilitation of patients, children firstly, after ablation of upper extremities at forearm level is an actual problem. The purpose of this report is to define a role of Krukenberg's operation in rising of possibility of self-service at children.

Materials and methods: In practice of surgery rehabilitation of 22 children with upper limbs below elbow stumps from 1960 for 2009 we used 27 the Krukenberg's operation, directed to forming a pinch (20 boys and 2 girls, at the age from 9 till 18 years). The reasons of ablations were traumas and infectious diseases. At the majority of patients there was bilateral lesion. Many patients were repeatedly supplied with cosmetic and-or active prostheses of various designs. The technics of operation meant a locating of postoperative cicatrixes out of zones of loads, and also use of own stocks of a skin; application of free grafts only at the deficiency of soft tissues. Important detail of operation was conservation of the muscles controlling generated "fingers": m. brachioradialis, m. pronator teres, m. supinator and others. In the postoperative period the rehabilitation must include trainings, electrostimulation of muscles and other physiotherapeutic methods. In some cases before Krukenberg's procedure it was required to execute other preparatory stage, for example elongation of the stump of a forearm with Ilizarov frame.

Results: As a result of Krukenberg's operation in all cases have been generated mobile radial and ulnar «new fingers», carrying out the bilateral grasp of subjects. We started training of movements from 2nd day after operation. The qualified physical training provided the maximum function. The opening of new «hand» reached 5-10 cm., depending on length of a stump, with good grasp force provide deduction of serious and volume subjects and thin manipulations, such as capture of a paper or a needle. All patients after carrying out of a course or several rehabilitation courses, and after adaptations in new life conditions children preferred use their own extremities for self-service and game manipulations. In certain situations many patients used cosmetic prostheses.

The conclusion: 1. Krukenberg's operation, despite on unsatisfactory esthetic aspect, allows to raise functionality of the children disabled considerably; 2. The basic indications for carrying out of this procedure are: a male patient, teenage age, bilateral amputating defects at level of a forearm or a combination of amputating defects of a forearm and a shoulder, refusal of use prescribed before prostheses, blindness.

A-0211 Distraction osteosynthesis in the pediatric hand surgery: factors affecting osteoreparation

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Purpose: identify the factors that influence the rate of distraction osteoreparation in pediatric hand surgery.

Methods: The study was conducted based on an analysis of treatment of 40 patients with congenital shortening of fingers. Treatment of all of these patients was carried out by

method of distraction osteosynthesis. In processing the data are taken into account such factors as patient age, anatomical features, the presence of comorbidity, number of previous operations, the data of instrumental tests and especially the treatment of postoperative period.

Results: After statistical processing of the data revealed that the factors most affecting the distraction osteogenesis are age and number of previous operations in this segment of bone. NSAID use in the early postoperative period significantly reduces the activity of bone formation.

Conclusions: Use of anamnestic data and objective examination of the patient to predict the activity of distraction osteogenesis allows you to adjust patient management in the postoperative period.

A-0252 Modified reconstruction of radius in type Bayne III radial club hands using microvascular epiphyseal transfer of second metatarsal bone and joint

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Purpose: To introduce a modified method for wrist and radius reconstruction in radial club hand type III when the existing proximal radius has relatively good length and development.

Methods: We have used a modification of Vilkki method in two radial club hand cases. Instead of incorporating the epiphyseal metatarso phalangeal joint-transplant into contact with distal ulna and forming a Y-formed ulna, we selected to connect the proximal part of the graft directly to existing quite well developed proximal radius. The first patient (girl borne in Sept 2004) had gone through formal centralization previously (March 2007) but due to a recurrence of radial deviation a microvascular MTP II joint graft was used for wrist stabilization and radius reconstruction in March 2009 mimicking normal forearm anatomy. Distally the graft was fixed radially into carpus with two screws and proximally an osteosynthesis with remaining rather long proximal radius part was accomplished with a small 6-hole plate. Second patient (a boy borne in August 2007) went through the normal preoperative distraction procedure in order to align the severely deviated wrist. Thereafter a microvascular metatarso-phalangeal epiphyseal graft was used (April 2010) in similar manner as in first patient. Bone contacts were secured only with K-wires while the original distractor was unloading and all deforming forces were eliminated.

Results: In both cases the healing was uneventful and so far an early postoperative follow-up (2 and 1 years

respectively) can be described. Stability of the wrist has been achieved. The wrist motion has started well and there is a clear possibility to move the forearm in pro-supination plane, which has not been possible in original Vilkki method, when the metatarsal part of the joint graft has been connected to the ulna.

Conclusions: Our modification has an advantage that after reconstruction some pro-supination function can be provided. Also the form of antebrachium will remain broader and external contour of distal forearm looks cosmetically more pleasant when the radius and ulna are clearly separated from each other. The drawback is that our modification is suitable only in the Bayne type III radial club hands and it requires that about 50 % of radius length is present. The available proximal radius is very often too short and hypoplastic to allow the use of this type modification.

A-0267 Thrombocytopenia absent radius (TAR) syndrome: clinical features

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Introduction: Thrombocytopenia absent radius (TAR) syndrome is a rare syndrome observed in 1 in 500,000 to 1 million live births (Greenhalgh et al 2002). It is a clinically characterized by a bilateral radius aplasia in the presence of a thumb and thrombocytopenia accompanied by other more or less frequent accessory symptoms. Knowledge of typical changes of the upper extremity and likely accessory symptoms are essential for a subtle therapy plan.

Material and Methods: Among the 44 TAR patients we examined, 22 were females and 18 males. They were treated from 1976 up to 2010. We checked them for the extent of forearm shortening, wrist deviation, deficiency of the thumb and other fingers, elbow and shoulder girdle alteration, involvement of the lower extremities, and other organic changes.

Results: 39 of the 44 patients had bilateral radius aplasia, 1 a phocomelia, 4 a unilateral radius absence with different changes on the other arm. 17 patients showed an extension deficit of the elbow, 9 a shortened humerus, and 19 a hypoplastic shoulder girdle. 26 children seen in the first year of their lives had a forearm length on average of 7 cm (4 to 10 cm), and 9 children seen in their second year of life presented a length of 8 cm on average. We saw a severe wrist deviation, between 50° and in most patients approximately about 90°. In 80% the thumb was not normal: 44 thumbs were hypoplastic, 27 thumbs had stiff interphalangeal joints, 20 thumbs were clasped, and 12 thumbs adducted. In 50% the other fingers had restricted mobility, mostly

affecting the PIP joints. In half of the patients affected by TAR syndrome the little finger was changed by a clinodactyly, and was stiff or hypoplastic in 15 cases. Hip dysplasia was seen in 8 patients, knee joint deformities in 6 children, heart failure in 7, and genitourinary changes in 7.

Conclusion: Most patients had the severest form of bilateral radius aplasia with very short forearms and a club hand of 60° to 90°. In spite of its aspect as a fully developed thumb strong pathologic changes were found. Clinodactyly also seems to be a typical pathology in TAR syndrome.

A-0268 Treatment of club hands in TAR syndrome: results after radialization versus wrist distraction and radialization

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Introduction: In the severest form of radial club hand due to radius aplasia the positioning of the hand in front of the ulna often required a resection of the carpus and K-wire installation forced under pressure, resulting in possible damage to the physal plate. Consequently, since 1996 the operation technique has been supplemented by wrist distraction prior to radialization. The purpose of this study is to find out whether a longer forearm and better hand position, and possibly better function after wrist distraction and radialization can be achieved.

Method: From 1976 to 2010 we treated 65 club hands in 43 children with TAR syndrome. Up until 1996, 32 hands of 18 patients were corrected by radialization only. From 1996 up to now 33 hands in 25 patients underwent wrist distraction before radialization. Out of the first "old" therapy group 13 patients were seen again 3 to 15 years postop with a mean follow-up of years. In the latter group treated with wrist distraction prior to radialization (33 hands in 25 patients) we included those with a postoperative period of more than 3 years in our study, i.e. 12 hands in 7 patients. We evaluated forearm length, wrist position, and wrist mobility. The radiographs were measured according to the criteria of Manske.

Results: In both groups a number of recurrences occurred. The younger patients of the latter group had longer forearms, and their active wrist flexion was between 0° and 70°. One girl with equally affected arms treated on one side with the old and on the other with the new method showed an aesthetically better arm shape due to a forearm extended by 2 cm, and better wrist position after using the new technique.

Conclusion: The follow-up period and the age of the patients of both groups are different and not directly comparable. Owing to the wrist distraction no resection of carpal bones is necessary, resulting in a longer distal

arm. The huge retracting forces still have an influence on the wrist position in growth.

A-0328 Indications for toe to hand transfer in children with congenital abnormalities of the hand

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Purpose: determine indications for toe transfer in children with congenital anomalies of the hand.

Methods: between January 1998 and December 2009 184 children with congenital differences of the hand underwent transfer of one or more toes to one hand (358 toes in total). We examined motor and sensory recovery, function of the hand, cosmetic appearance of the hand and radiographs.

Results: good functional and cosmetic outcomes were achieved during the reconstruction at proximal phalanx and metacarpophalangeal joint.

Conclusions: when the defect is at distal phalanx is only slightly decreased and the transplant is necessary only for cosmetic reasons. If the defect is at proximal and middle phalanxes, then toe transplant would lead to good functioning and cosmetic results, but elective surgery, alternative method, is distraction lengthening of finger phalanx. If the defect is at the base of proximal phalanx with metacarpophalangeal joint intact and the length of the phalanx is not long enough for distraction lengthening, then toe to hand transfer would lead to the best results. When the defect is at head of the metacarpal, metacarpophalangeal joint is missing, then the toe transfer is done either together with metatarsophalangeal joint, or a new composite joint is formed, if cartilaginous surface of head of the metacarpal is intact. If the defect is at metacarpal itself then the toe transfer is complete with metatarsal. In this case the functional and cosmetic results after toe transfer and prosthesis are comparable. If carpal bones are missing then cosmetic results after toe transfer would be unsatisfactory, so we recommend prosthesis.

A-0355 The scare-less fetal skin repair: possible application in congenital deformities at the hand

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Object: In human fetus dermal wound healing occurs with a minimal inflammatory response and lack of excessive scarring, due to the high presence of Hyaluronic acid in fetal tissue, that inhibits the inflammatory response. So

the main difference between fetal and adult skin wound healing is that in adult we have a tissue healing with scarring, on the other hand in fetus a tissue regeneration without scar. In little child regeneration is limited but possible. Basing on this knowledge, we decide to utilize Hyaluronic acid (Hyalomatrix) to fill skin defects after surgical correction of such congenital hand malformations. The purpose of this prospective observational study was to ascertain if Hyaluronic Acid allows to avoid the use of skin grafts and eventually the age limit of scar-less healing in congenital malformation at the hand.

Materials and methods: From September 2008 to September 2010, 10 children, 7 males and 3 females ranging from 1 to 10 years old, underwent surgery for congenital deformities of the hand. Six children were affected by syndactyly, one by amniotic scarf, 2 arthrogryposis, 1 Apert Syndrome. Children with syndactyly underwent surgical correction according to Eckerot's technique, children with arthrogryposis and Apert Syndrome underwent to first web space's opening recurring to Gana's flap. In all cases the skin defect was filled with Hyaluronic Acid. No rigid immobilization was applied. Dressing was removed at 3 weeks from surgery and a night splint was provided

Results: In 6 cases we had a complete skin healing after 3 weeks, without any complication. In one case wound healing was obtained in ten days (the patient was 1 year old). While in one case wound healing was reached in 5 weeks because of hypertrophic granulation tissue. One case was complicated by an infection. A skin graft was necessary and healing occurred in 3 months. In an other case a (opening of fist space in arthrogryposis), skin graft was necessary because of a wide lack of skin, but Hyaluronic acid application improved quality of subcutaneous tissue and graft aspect.

Conclusions: in 8 patients we obtained wound healing without using skin graft, with minimal scarring. Probably in young children dermal tissue preserves fetal characteristics. So applying Hyaluronic acid on wound we can induce a skin healing process that is more similar to regeneration than to tissue repair.

A-0382 Rotation advancement flap for the correction of narrow web-spaces in congenital hand malformations

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In various types of congenital hand malformations we see narrow first web-spaces, often in combination with different degrees of syndactyly. From the functional point of view a wide and deep first web is important for a good prehension. The rotation advancement flap described by Dieter

Buck-Gramcko is a good option to reconstruct the first web, especially in small children. The main indications are: syndactylies of the first web, narrow first web-spaces and oligosyndactylies. Between 2000 to 2009 we used the rotation advancement flap in 372 cases: symbrachydactyly 83, spoon hand 10, oligosyndactyly 57, constriction ring syndrome 49, cleft hand 53, Apert syndrome 51, thumb hypoplasia 30, radial polydactyly 19, brachydactyly 8, arthrogryposis multiplex congenita 6, Cenani-Lenz syndactyly 1. For the design of the rotation advancement flap it is of great importance to make a wide curved incision with its base at the proximal radial first metacarpal bone and on the dorsal side of the proximal fourth metacarpal bone and its tip at the level of the line between the middle of the proximal phalanges close to the syndactyly. A careful mobilisation of the flap without damage of the intermetacarpal vessels running into the flap as well as of the dorsal digital veins and nerves will prevent circulation problems. A thorough dissection of the structures between the metacarpal bones is necessary to increase the width of the web. With only two superficial necrosis of the tip of the flap, the complication rate was very low. In 23 cases we were able to increase the corrected web-space by a secondary remobilisation. In our experience the rotation advancement flap is a reliable method for the reconstruction of narrow web-spaces, especially of the first web.

A-0420 Evaluation of ulna lengthening in radial club hand

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Radial club hand is severe congenital deformity of the upper limb. It is always a question if long and multiple stage surgical treatment really improves function and length of the forearm and hand. Purpose The aim of the research was to evaluate efficiency of ulna elongation in a comparison to natural history of radial club hand forearm.

Methods: 40 patients aged from 2 to 24 years with 80 forearms were enrolled into retrospective study (23 elongated and 57 non-elongated). Only patients with type III and IV Bayne and Klug deformity were included in which one lengthening procedure was performed. X-rays were collected and scanned, ulna length was measured in a manual computerized way using Heikel method.

Results: The mean age in elongated group was 9 years 8 months and 8 years 1 month in non-elongated (no statistical significant difference). Average elongation was 26mm (24% gain). The length in the first group was significantly higher than in non-elongated group (140mm vs. 105mm $p=0,000014$).

Conclusions: Presented data suggests that lengthening gives real gain in comparison to natural history of radial club hand. More controlled trials with adequate patients selection is needed to get definitive answer.

A-0431 Fingers reconstruction for children with congenital abnormalities by toe to hand transfer

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Purpose: Fingers reconstruction for children is important part of orthopedics and traumatology. Lack of hand's function, beside physical damage, causes a lot of problems in children's intellectual development. In the cases of congenital digital abnormalities, the digits must be reconstructed as soon as possible. The thumb's function is extremely important, because the thumb takes part almost in all hand's catching functions. The most advanced method of digital reconstruction is a microvascular toes transfer, which is not widely used in pediatric practice. It is used usually in finger reconstruction, which is lost as a result of trauma. The benefits of this operation are: reconstruction of good function (movable joints, sensory recovery, possibilities for growth) & good external view (nail plate shape, thickness & size are close to normal digit). This method also has some problems: it is technically complicated; the toe can be lost; a few time is necessary to achieve the normal sensitivity and full volume of movements in graft's joints.

Materials & Methods: During the period from 1990 till 2010 we performed 688 toe to hand transfers for the treatment of children with different types of hand pathologies on the base of the Department of Reconstructive Microsurgery. 423 operations were done to 350 children with congenital hand's abnormalities with following cases: 1) brachydactylia - 164 patient; 2) ectrodactylia - 129 patients; 3) aplasia - 28 patients; 4) hypoplasia - 8 patients; 5) cleft hand (and cleft foot) - 13 patients, macrodactylia - 8 patients. As a microvascular graft we used: second toe, 2-3 toes of foot (double block), fifth toe (in the cases of cleft-foot), additional great toe in congenital foot polydactylia - 1 case.

Results & Conclusions: We studied the treatment's outcome from 1 till 12 years after surgical treatment, evaluating the cosmetic and functional moments, sensory recovery, the longitudinal growth rate and donor's site condition. The cosmetic effect was evaluated by patients themselves and their parents. Functional results were evaluated by the ability of 6 kinds of catch. The sensory recovery was evaluated by discrimination test and ninyhydrine probe. To evaluate the degree of foot's functional impairment after toe transfer was done we did the biomechanical study

including plantography, determination of gravity center position, foot load subdivision, and phase step characters. By they own feeling, no one patient had the limitation of movements or pain during walking. Functional investigation of feet after one or two toes to hand transfer showed us, that children, especially in early childhood, by the time of 6 months after surgery, has positive dynamics, and by the time of 1 year after surgery the static and dynamic parameters become normal. That is why this method of surgical correction can be more widely than adults, indicated in congenital and acquired pathologies. The multicompound evaluation showed us the excellent and good results in 70% of patients. In other patients with severe hypoplasia and aplasia of tendo-muscular structures we achieved only relatively positive functional results.

A-0509 Outcome of Flexor Digitorum Superficialis Opponensplasty for Type II/IIIA Thumb Hypoplasia

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Background: In thumb hypoplasia Type II and IIIA according to Blauth (modified by Manske), thenar hypoplasia, a narrow first web and an unstable MP joint are the usual features. Also extrinsic and intrinsic tendon malformations can occur. Treatment in these conditions comprises generally of first web deepening, stabilising the MP joint and tendon transfer for opposition. Mostly the Abductor Digiti Quinti (ADQ) is used as tendon transfer for opponens plasty. This study reports on the functional outcome of the use of the Flexor Digitorum Superficialis (FDS IV) of the fourth finger to restore opposition combined with stabilisation of the MP joint with a slip of the FDS IV in Type II/ IIIA hypoplastic thumbs. **M&M** We included 22 patients with 27 involved hands; 16 Type II thumbs with an FDS IV, 5 Type IIIA with an FDS IV and 6 unoperated Type II thumbs. The mean age was 18 years (range 5 to 32 years). Median time between surgery and evaluation was 6.4 years (range 2-19 years). Objective outcome was assessed by measuring active range of motion, grip strength, pinch strength, tripod pinch strength, key pinch strength, individual motion strength, sensibility and joint stability. In addition, satisfaction regarding thumb function and aesthetics were scored using a Visual Analog Score (VAS). All results were compared to normative data. Results compared to normative data, range of motion was diminished in all three patients groups. Group means for opposition, radial abduction and palmar abduction were closest to normal

(67-94%), while flexion and extension were more strongly reduced. Opposition strength in Type II thumbs with an FDS IV was significantly better than in unoperated Type II thumbs. Grip strength, pinch strength, tripod strength, and key pinch strength were approximately 50% of normal, in both operated and unoperated Type II thumbs. In Type IIIA thumbs with an FDS IV, these measurements were only 35% of normative data. With an FDS IV tendon transfer, MP joint stability was restored in all Type II thumbs and in 40% of Type IIIA thumbs. As expected, all unoperated thumbs were unstable. Following surgery a mean VAS score of 6.2 to 9.8 respectively was found for satisfaction with thumb function and thumb appearance.

Conclusion: Opposition strength was significantly higher in Type II hypoplastic thumbs with an FDS IV tendon transfer than in unoperated Type II thumbs. MP joint stability was restored in all Type II thumbs and in 40% of Type IIIA hypoplastic thumbs. Patients and their parents were satisfied to very satisfied with function and appearance. Overall, we believe that for Type II and Type IIIA thumb hypoplasia, the FDS IV is a very suitable tendon for restoring MP joint stability and improving opposition strength.

A-0523 A rare congenital disorder: cleft hand, a review of 8 cases

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Background: Cleft hand is a rare congenital disorder which has been defined as a deficiency of the central part of the hand (with or without of absence of the digits). These malformations have been classified with symbrachydactyly and polydactyly into a single category: abnormal induction of digital rays. In this study, we present our experience of patients with cleft hand.

Methods: 11 hands in 8 patients were operated in our clinic between 2007-2010. The main age was 5 years (3-19 years) and the main follow-up was 15 months (3-43 months). To improve the functions and the cosmetic appearance of the hand, different techniques were applied according to the type of the cleft. Transposition of the index ray, corrective osteotomies, syndactyly release, first web space release and closure of the cleft are the examples of the techniques used.

Conclusion: Surgical treatment for patients with central deficiency is challenging but can provide good functional and cosmetic results. Although the patients included the study achieved good functional results, they were not satisfied aesthetically due to their high expectations.

A-0027 Reconstruction of long radial nerve defects due to high energy humerus fractures

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Objectives: The aim of this retrospective study is to evaluate the functional and clinical outcomes of autograft repairs of intermediate-level radial nerve injuries with 8 centimetre or greater defects that have been caused by high energy humerus fractures.

Methods: Eight patients with high energy humerus fractures and 8 centimetre or greater radial nerve defects were treated with a nerve autograft during a 14-year interval from 1994 to 2006. This sample consisted of six men and two women with a mean age of 45 years (range 20-62 years) the radial nerve had gaps of 8 cm in 3 patients, 10 cm in 4 patients and 9 cm in 1 patient. Sural nerve grafts were used in 7 patients and medial cutaneous antebrachial nerve in 1 patient. The cause of these injuries were traffic accidents in 6 patients, working accidents in 2 patients. The duration of time between the injury and surgical management was 89,6 (0-330) day. The power of the wrist and the first digital extension was recorded using the M to M5 classification of the Nerve Committee British Medical Research Council. Assessment of combined extension and abduction of the thumb was measured by the opening angle of the first web space. The results were assessed according to the point scoring system as the modified by Verga. Functional results were assessed the Turkish version of the DASH questionnaire (Disabilities of the Arm, Shoulder and Hand) was administered.

Results: The individual muscles power results according to modified Verga scoring system were excellent in 4, good in 2, poor in 2. The overall DASH final score was a mean of 59,6 (0-80). All fractures were healed at an average of 10.9 weeks.

Conclusions: In cases of long radial nerve defect repairs, it is possible to create a functional extremity in repairs which are performed within 330 days, provided that the patients do not suffer from accompanying injuries. At the end of this period, it was observed that wrist extension was recovered in most cases. Despite the small number of patients, it was

seen that the aim of internal splint treatment can be attained by nerve graft. In addition to wrist extension, the gain of finger extension is a benefit for the patient.

A-0028 Ulnar nerve injury in crossed pin fixation in pediatric supracondylar fractures of the humerus

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In cases of displaced humeral supracondylar fractures closed reduction and crossed pin fixation is the preferred method. Crossed pins provide the greatest biomechanical stability but have the potential to cause iatrogenic ulnar nerve injury. The aim of the present study was to determine whether the ulnarsided K-wire was solely responsible for postoperative ulnar nerve damage. Between 2000 and 2008, 112 children with displaced supracondylar fractures of the humerus (Gartland type-II and -III) were treated surgically. The records of these patients were reviewed. Patients were treated within 6 hours of admission. In all cases closed reduction and crossed medial and lateral K-wire fixation was performed. In 28 cases the medial K-wire was placed percutaneously and in 84 cases through a mini medial approach. The mean age at injury was 6.5 years (range 2-12 years), there were 66 boys and 46 girls. 9 children (8%) were diagnosed as having ulnar nerve palsy following osteosynthesis. The interval between surgery and recognizing the postoperative ulnar nerve lesion lay between the first postoperative day and the 8th postoperative week. In 8 patients neurophysiological tests were performed. 8 children underwent exploration of their ulnar nerve lesions and in 1 child the medial K-wire was removed without exploration. In 3 cases the ulnar nerve was directly damaged by the medial pin: penetration of the nerve, tacking down of the nerve sheath in a nonanatomic position and contusion of the ulnar nerve over a pin. In the other 5 cases we found the nerve sheath trapped at the fracture site, fibrous scar tissue within the cubital tunnel and nerve constriction at the entrance of the cubital tunnel. In all these cases the continuity of the nerve was intact. All but 1 of the 9 were followed up, the

mean follow up time 3.8 years [1.5-6]. Seven patients showed complete neurological recovery, 1 patient had sensory loss at the tip of the little finger. In this study we could show that there are other causes responsible for postoperative ulnar nerve palsy other than direct damage to the nerve by the medial pin. These causes are: nerve entrapment at the fracture site, constriction by the cubital tunnel retinaculum and fibrous scar tissue within the cubital tunnel. We recommend early nerve exploration to avoid potential long-term damage.

A-0075 Secondary thoracic outlet syndrome in patients with clavicle pathology

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Thoracic outlet syndrome (TOS) refers to compression of one or more of the neurovascular structures traversing the superior aperture of the chest. Previously, the name was designated according to the etiologies of compression, such as scalenus anticus, costoclavicular, hyperabduction, cervical rib, or first rib syndromes. We believe that thoracic outlet syndrome is one of the most underrated, overlooked, and misdiagnosed conditions, particularly secondary to clavicle fracture or other space occupying process evolving from clavicle pathology.

Materials and Methods: Since 2007 we treated 31 patients with symptoms of neurogenic thoracic outlet syndrome. 15 patients were treated conservatively while 16 were treated surgically. Most of our patients had TOS secondary to whiplash-type injury, but considerable group - 6 patients had their symptoms due to obvious clavicle pathology.

Results: All patients (100%) with clavicle pathology improved considerably after surgery (clavicle reconstruction, first rib resection and scalenectomy). Only 60% of patients after surgery for whiplash-type injury improved.

Conclusions: True cause of pain - secondary TOS is frequently overlooked by trauma surgeons and orthopedics. This group of patients has much better prognosis if operated comparing to post-whiplash-type TOS.

A-0098 Ultrasonic 3D visualisation of ulnar nerve compression at elbow: Plea for focal decompression

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Background: In a recent survey only 44% of surgeons were satisfied with the results after treatment of ulnar

neuropathy at elbow. Wide endoscopic decompression or transposition has been proposed to improve the results.

Aim: In recent years high resolution ultrasound (HUS) has gained wide acceptance in the diagnosis of peripheral nerve disorders and this imaging technique is now currently used to localise the site of compression. The aim of this study is to compare the images obtained by the HUS and 3D reconstruction with the operative findings.

Methods: Ten patients having clinical and electrolological ulnar neuropathy at elbow were selected. They had dynamic ultrasound examination (M turbo from Sonosite) of the ulnar nerve and axial scan at ten different levels: at the arm (Struther's ligament), at the retrocondylar groove, under the Osborne's ligament and at the midforearm. The aspect and size of the nerve was transferred to a 3D nerve visualisation software (Dassault system). We define evidence of compression when the nerve had an hypoechoic aspect and thinning at the site of compression, with a fusiform swelling proximal to it. Decompressive surgery was carried out under endoscopy and the nerve was explored from 10cm above and 20 cm under the elbow.

Results: In all ten cases the site of compression was found with the HUS and 3D imaging. There was strong correlation with the operative findings: in six cases the compression was in the retrocondylar groove and there was no compression elsewhere. In the remaining four cases compression was distal to the groove under Osborne's ligament or under the aponevrosis of the flexor carpi ulnaris. Endoscopic operative findings showed some bands at the midforearm, but there was no evidence of chronic compression at this level. All patients had good to excellent results.

Conclusion: HUS is a very useful to localise nerve compression site especially in ulnar neuropathy at elbow. In six of our cases in situ decompression would have been sufficient. Short endoscopic release at the forearm would have been enough in the remaining cases. As there was no evidence for compression at the midforearm nor at the arm, we propose to avoid extensive decompression in these cases. In our cases there were no subluxation of the nerve at the elbow.

A-0138 Cross-sectional area of neural fascicles as a guideline in neural transplantation surgery in the upper extremity

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Purpose: The purpose of this study was to determine adequate number of single sural nerve grafts for grafting of

proper and common digital nerves as well as median and ulnar nerves at different levels in the upper extremity using cross-sectional area of neural fascicles (CSA) as parameter.

Methods: The total number of 34 fresh human cadavers were dissected. Dissections were performed at five different levels in the upper extremity (level of proper digital nerves, common digital nerves, level of wrist, level of proximal forearm and distal arm) as well as in the posterior aspect of the calf (sural nerve). Histological specimens were formed and CSA-s of neural fascicles of sural and recipient nerves were measured using "Image J" program. Values of CSA-s of nerve graft and recipient nerves showed positive linear correlation. For all levels with statistically significant differences (Student's t-test) the ratio was calculated and number of single sural grafts for each level of dissection was obtained.

Results: From the total number of 34 cadavers, 25 were male and nine were female. In 23 cadavers dissections were performed in the right side of the body and in 11 in the left side. We found no statistically significant difference between CSA-s according to sex (Student's t-test, $p > 0.05$) and bigger values of CSA-s of ulnar nerve at the level of the wrist and sural nerve in the left side of the body (Student's t-test, $p=0.049$, $p=0.034$, respectively). Positive linear correlation between values of CSA-s of sural and recipient nerves was found (method of linear parametric correlation, $0.000 < p < 0.023$ for all levels). According to this knowledge, Student's t-test was used to investigate statistically significant differences between CSA-s of nerve graft and recipient nerves. The only nerve that did not show significant difference when compared with sural nerve was fourth common digital nerve of the hand ($p = 0.8532$, ideal matching). For all other levels, the differences were statistically significant ($p < 0.01$) and ratio was calculated: Number of sural nerve grafts = CSA of recipient nerve/CSA of sural nerve. The score indicates number of single sural nerve grafts that should be used for grafting of certain nerves at certain level. Only one sural graft is indicated at the level of proper digital nerves, one or two for common digital nerves, 3 and five grafts for ulnar and median nerve at wrist, four and six at the level of proximal forearm and 4 and seven for grafting of ulnar and median nerves at the level of distal arm.

Conclusions: When performing nerve grafting in the upper extremity, usually disproportions between nerve graft and recipient nerve is obvious. To bridge as much neural tissue as possible, we suggest to use calculated number of sural nerve grafts as was shown, based on cross-sectional areas of neural fascicles (as it represents neural tissue itself) for achieving better surgical outcome.

A-0184 Conservative treatment of cubital tunnel syndrome: observational retrospective study

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Purpose: Second only to carpal tunnel syndrome the cubital tunnel syndrome is the most common entrapment neuropathy. Medial epicondylitis is ulnar nerve entrapment most common site at the elbow. The aim of this study is evaluate conservative thermoplastic material brace night positioning treatment effectiveness in patients with cubital tunnel syndrome using a retrospective multicentric analysis. This treatment option has been used both in mild and severe nerve pain stages patients.

Materials and Methods: In Hand Surgery and Rehabilitation Unit of Nursing Home Multimedita IRCCS between 2005-2006, 230 patients with cubital tunnel syndrome diagnosis were conservatively treated with night splint. A 99 patients sample was obtained by the following inclusion and exclusion criteria. Depending on VCM, the sample was divided into 3 groups: -GROUP A = Mild: above-below elbow VCM between diagnosis value limit and 10% less below elbow-wrist VCM value; -GROUP B = Moderate: above-below elbow VCM between mild patients and 20% less diagnostic VCM; -GROUP C = Severe: above-below elbow VCM lower than lower limit moderates patients. Based on electromyographic VCM criteria the sample was composed of: 28 (28.29%) mild, 30 (30.3%) moderate and 41 (41.41%) severe. All patients were assessed by: - Symptom Severity Scale for symptoms extent: pain, tenderness, paresthesia and hand function; - 6 Point Ordinal Scale Transition (6POTS) [3] for global clinical status changes: Patients were evaluated three times: first visit (T0), 3 months (T1) and 6 months after (T2). Night brace use was almost 3 months (3,31). Study variables analysis was obtained by statistical package SPSS 18 use with 95% two-sided. probability level. Sample homogeneity was checked by statistics descriptive: mean, standard deviation, median etc. 2-tailed t-Student were use for paired data before and after treatment. Pearson test was use for pre-and post-tutor symptoms duration and extent analysis.

Results: Symptoms extent SSS comparison between first visit (T0) and conservative treatment end (T1) decreased overall by 30.5%. ($P < 0.001$). All subgroups SSS analysis shown statistically significant symptoms. 6 Transition Point Ordinal Scale clinical patients assesment (Table 3) shown 16.36% slight, 25.45% very improvement and 22.72% disease recovery after using the tutor.

Conclusions: In our series, even patients with electromyographic worst part had significant improvement in symptoms. Patients with mild and moderate had a greater improvement.

A-0214 Ulnar nerve neurotization to biceps motor neurons - a critical evaluation of 19 cases and detailed literature review

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Ulnar nerve neurotization to motor branches of the musculocutaneous nerve, a technique described by Oberlin in 1994, has been used by many surgeons with good results. We evaluated this technique on surgical patients at our institution to identify positive and negative predictors of outcome. We studied 19 patients (18 men and 1 woman), averaging 28.1 years of age. Eight of the 19 had a C5-C6 lesion and the remaining eleven had a C5-C7 lesion. Four had associated cervical fractures. The mean follow-up period was 15.7 months. Eight patients regained M4-level elbow flexion; 2 regained M3; and 9 less than M3 level strength of elbow flexion. There was no deterioration in ulnar nerve function from the procedure. Pre-operative predictors of a poor prognosis were a prolonged time interval between the initial injury and surgical repair; associated cervical or occipital condillar fractures; dysfunction of the C8-T1 roots; and C7 involvement. A post-operative predictor of good outcome was re-innervation within the first 3 months after surgery; periods greater than this usually yielded less favorable outcomes. The results of Oberlin's technique are variable and not always good; but because it is a simple surgical technique with low morbidity, we can consider a good option for restoring elbow flexion after high brachial plexus injuries. Attention to predictive factors can lead to more realistic expectations.

A-0273 The relationship of limb hypoplasia in obstetrical brachial plexus palsy with injury severity, surgery, recovery and growth

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Introduction: Obstetric brachial plexus palsy (OBPP) is a complex neonatal peripheral nerve injury that is transient in the majority of cases, but can have lifelong motor, sensory and developmental consequences in others. Upper limb hypoplasia in OBPP is not well documented. This study evaluates the relationship of upper limb hypoplasia with the extent of plexus injury, effect of surgery, surgical method of repair, degree of neurological recovery, and growth.

Methods: We performed a prospective longitudinal study of OBPP patients between 1997 and 2010. Patient details and upper limb neurological and musculoskeletal examination

results were recorded, noting the extent of plexus injury (Narakas classification), as well as details of any nerve repair or secondary surgery performed. The neurological recovery (range and power of motion, Mallet and Gilbert/Raimondo scores) and detailed measurements of both upper extremities were completed at each visit.

Results: Over the study period, 50 patients with OBPP were identified and measured at routine clinic visits. All those studied had some sequelae from their OBPP. All had a degree of upper limb hypoplasia. Clavicular length was an average of 1 cm shorter than the other side. Scapula length was an average of 1 cm shorter than the other side. Apparent arm length was shorter by varying degrees and this correlated with the degree of elbow flexion, and the severity of the OBPP. Humeral length was shorter according to degree of injury and recovery. Forearm length was normal in some cases and shorter in those with more severe injuries. In general, hand circumference was normal in some and reduced in those with more severe injuries. The degree of hypoplasia tended to be static with growth. The correlations of hypoplasia, growth, degree of recovery and surgery will be presented.

Conclusions: The sporadic and sequential measurements of both upper extremities in a cohort of OBPP patients revealed the degree of hypoplasia suffered by these patients and the correlation of the hypoplasia with severity of the injury, surgery, recovery and time. This data will allow surgeons and therapists increased confidence to inform parents and children of this aspect of their condition.

A-0277 The efficacy of brachial plexus block in diabetic patients: A prospective study

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Introduction: Diabetes mellitus is a systemic disease that is known to affect peripheral nerves. The frequency of diabetic poly-neuropathy ranges from 4% to 8% at the time of initial presentation, to approximately 50% in patients with chronic disease. Nevertheless, diabetic patients, including asymptomatic ones, are likely to have nerve conduction abnormalities that might have an effect on the response of these nerves to regional anaesthesia. Therefore, the use of regional anaesthesia in diabetic patients undergoing surgery could be unpredictable. We investigated the efficacy of brachial plexus block in diabetic patients undergoing upper limb surgery compared to normal individuals. Methodology Four hundred and fifty-two patients were included in the study. There were 221 males and 231 females. Fifty-five patients were diabetic (mean age of 61y, SD 12); 24 were type 1 and 31

were type 2 diabetes. Mean age of non-diabetic patients was 55 (SD15). Senior anaesthetists performed all brachial plexus block under ultra-sound guidance. 20 ml of 0.375% Bupivacaine was used for the block. Post-operative motor and sensory function assessment was conducted at a mean time of 4.57 hours (SD 2.19 hours). The Medical Research Council (MRC) grading system was used to assess motor function while sensory function was assessed subjectively using a graded scale between 0 and 2 with 0 being absent sensation, 1 being altered sensation and 2 indicating normal sensation. The assessment was conducted proximally and distally. Results Brachial plexus block was as efficient in diabetic patients proximally for motor ($P = 0.25$) and sensory ($P = 0.33$) functions when compared to non-diabetic patients. There was a significant difference in the efficacy of the block distally between diabetic and non-diabetic patients in both motor ($P < 0.005$) and sensory function ($P < 0.001$). Furthermore, in diabetic patients the response to the block between type 1 and type 2 was statistically significant ($P < 0.001$).

Conclusion: Diabetic patients are at increased morbidity and mortality risks following general anaesthesia and therefore, regional block is a favourable option in these patients. In diabetes, the efficacy of brachial plexus block is different compared to normal individuals. This study showed that brachial plexus block can be used efficiently in shoulder surgery in patients with diabetes. In more distal surgical procedures, the block is more likely to fail in diabetic patients and orthopaedic surgeons as well as anaesthetists should be prepared to either reinforce the block by using a local anaesthetic or to convert to general anaesthesia.

A-0290 Cold-Induced Vasodilation (CIVD) following median or ulnar nerve injury

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Hypothesis - peripheral nerve injury of the upper extremity frequently causes changes in the thermoregulatory system of the hands and fingers and complaints of post-traumatic cold intolerance (CI). In this study, we aimed to measure the influence of median or ulnar nerve injury on cold induced vasodilatation (CIVD) during prolonged cooling at low temperatures.

Methods: Twelve patients with a median ($n=6$) or ulnar ($n=6$) injury were tested 4 to 76 months after nerve repair. The palmar sides of both hands were cooled continuously using a cold C. The skin temperature of the fingers was measured using a plate of 5 videothermography and graphs were plotted of the temperature changes

of the nail bed of the distal phalanx. The presence of a CIVD reaction was defined as a C starting at the distal minimum increase in temperature of more than 2.5 phalanx. Self-reported presence of CI was measured using the Cold Intolerance Severity Score questionnaire (CISS).

Results: A CIVD reaction was absent in the affected digits of 4 patients (follow-up 6-37 months) whereas the CIVD reaction in the non-injured hand was present. The CIVD was present in 6 patients after 50 months follow-up (24-76). Two patients did not have a CIVD reaction in both injured and uninjured hands. All patients with a CIVD response had at least diminished protective sensation. The absence or presence of the CIVD reaction was not correlated with CISS score.

Summary: After peripheral nerve injury: o Possibility to restore normal thermo-physiological responses of the fingers o This might be an indication of nerve recovery. o Subjective symptoms of CI can be present when thermo-physiological responses to cold are normal.

A-0344 Nerve transfers vs nerve grafting for shoulder reconstruction in supraclavicular brachial plexus injuries

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Purpose: Shoulder function restoration is an important priority for patients with supraclavicular brachial plexus injuries (BPI). Traditionally, proximal root exploration has been advocated to identify suitable donor stumps for nerve grafting (NG), although this has recently been challenged by the increasing popularity of nerve transfers (NT) with cited advantages such as easier dissections and healthier donors. This study compares the outcome between NT versus NG for restoration of shoulder function.

Methods: Between 2003 and 2006, fifty-six patients received surgery for supraclavicular BPI, as divided into three groups. Group 1 ($n=37$) underwent NT using the spinal accessory (SAN) or phrenic nerve (PhN); group 2 ($n=11$) underwent NG from the proximal C5 stump; and group 3 ($n=8$) received NT with accompanying partial C5 NG contributions. Outcomes were assessed in terms of shoulder abduction, with $>90^\circ$ considered a favourable result within a follow-up period of four years.

Results: Overall, results from NG (96.4°) were better than NT (87.6°), although the best results were from the combined NT/NG group (106°). There was no significant difference, however, between these groups ($p=0.729$). In addition, no significant difference was found when

comparing the proportion of patients in each group who achieved a good result ($>90^\circ$, $p=0.786$).

Conclusions: Our study revealed no significant difference between NG and NT for shoulder abduction. Proximal stump dissection is recommended, however, to spare the SAN as a future free functioning muscle neurotizer, if necessary. Furthermore, the C5 stump dissection provides a potential donor for elbow flexion, as well as concomitant identification of C6 as another intra-plexal source for neurotization.

A-0361 Traumatic Axonotmesis condition: a Procedure for the best peripheral nerve recovery by the autologous vascularized epineurial transposition

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Purpose: Due to stagnation in results of peripheral nerve injuries, this study aims to show our experience through a new technique in nerve repair. The procedure provides to perform the condition similar to the well known traumatic axonotmesis lesion in order to ensure the best functional recovery of nerve lesion.

Methods: We perform a partial direct fascicular repair of only 3 to 5 peripheral leading fascicles combined with an autologous vascularized epineurial transposition of an injured nerve. Inside the section line, a central environment is so constituted in which neurotrophic growth factors can concentrate. Spontaneous outgrowth of Schwann cells and the extension of axons of the central unmatched fascicles (80 % of the total), will occur in complete absence of central suture material (absence of interfascicular scarring). The distal epineurial transposition increases the mechanical stability, relieves tension upon the fascicular sutures and shields axonal growth and nerve fibres from external scar tissue.

Results: From 2002 to 2010, 121 lesions were evaluated. Excellent functional results were obtained in 43 repairs (35,53 % of cases); good in 53 (43,80 %); fair in 16 (13,22 %) and poor in 9 cases (7,43 %).

Conclusion: Existing natural neurotropism for spontaneous axonal matching may be even more effective if a protective environment and a condition similar to anatomopathological traumatic axonotmesis lesion by means of the vascularized autologous epineurial transposition is performed, favouring a best functional recovery of the injured peripheral nerve.

A-0366 Double distal median to ulnar neurotisation after high ulnar nerve lesions: a retrospective analysis and comparison with a control group

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High ulnar nerve lesions have usually a bad prognosis with irreversible intrinsic muscles atrophy and poor function. One of the major factors is the long regeneration distance of the severed nerve fibers. Few years ago the double senso-motor distal neurotisation (end-to-end or end-to-side) with the anterior interosseous nerve and the palmar branch of the median nerve was proposed as possible solution in order to shorten the regeneration distance. In 2007-2008 six patients with a high ulnar nerve lesion were operated on with a coaptation of the proximal lesion and distal double neurotisation. The mean follow-up was 8.6 months. As control group we selected six matching patients with similar lesions operated on in the previous years only with a proximal nerve repair. In this group the mean follow-up was 99.3 months. In both groups the results were analyzed with functional parameters, EMG and DASH-score. In the neurotisation group only one out of six had a good results and in three cases a CRPS type II was observed. In the control group only one patient developed light pain. Function (clinic and DASH) showed no significant differences. In conclusion at the moment we are very careful in the indication for distal median to ulnar neurotisation. The role of the endo-to-side coaptation is still to be clarified and could play a bigger role in our bad results and high complication rate.

A-0368 Neurogenic thoracic outlet syndrome - surgical experience, indication, surgical experience and results in a series of 59 patients

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Introduction: Reviewing the literature the indication for Thoracic Outlet Syndrome (TOS) - surgery is based on clinical findings only in the majority of the cases due to lack of objective findings. In a retrospective study we have analyzed our 68 cases in order to evaluate objective criteria for surgical intervention and the reduction of symptoms.

Methods: From 2001 to 2010 59 patients (5 men, 54 women aging from 10 to 71 years) were diagnosed clinically for TOS (Duration of symptoms mean 28 months, NRS mean 7). Additionally objective investigations were

performed: X-ray of the cervical spine to detect a cervical rib; a comprehensive electroneurographic investigation to detect signs of nerve compression; MR-angiography of the subclavian artery with elevated and adducted upper extremity to detect a stenosis of the artery as an indirect sign of compression of the brachial plexus. All patients underwent TOS-surgery via a single supraclavicular incision.

Results: Concerning the objective assessment a cervical rib was present in 33% of our cases. The electroneurographic investigation revealed signs of nerve compression in 47% of our cases. In nearly 90% of our cases a stenosis of the subclavian artery confirmed the clinical diagnosis. Surgery was performed without major complications. Patients recovered from their symptoms to NRS mean 2 within a mean time periode of 3 months.

Discussion: In our series we did base the indication for TOS surgery not only on clinical examination but also on objective findings, either the presence of a cervical rib and/or positive electroneurographic findings and/or a stenosis of the subclavian artery. The MR-angiography was the most significant investigation to objectify the clinical findings. The presented investigation setup seems to be appropriate to objectively diagnose TOS and indicate surgery. The supraclavicular incision gave adequate access to perform neurolysis of the brachial plexus, scalenotomy and resection of cervical or first rib without major complications in all cases.

A-0381 Nerve repair by means of tubulization: literature review and personal clinical experience

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In 1979 A. Narakas wrote "Why Is My Peripheral Nerve Surgery So Poor". In this paper, the author expressed some disappointing with microsurgery: "It would then be enough to reunite the stumps very precisely and have a fantastic result in a few weeks. But would it work? Unless we could, by a miracle, unite each fiber precisely to its own stump... All the fibers would meet at random, erroneously and start to function suddenly"...and concluded: "If I was not desperate to do better, would I know what hope is? In 1997 G Lundborg et al, published "Tubular versus conventional repair of median and ulnar nerves in the human forearm: early results from a prospective, randomized, clinical study". They stated: "Injury to a peripheral nerve is followed by local synthesis and release of neurotrophic factors of importance for the regeneration process. This concept was adopted for repair of transected human median and ulnar nerves in the forearm. As an alternative to conventional microsurgical repair of the nerve trunk, silicone tubes of appropriate size were used to enclose the injury zone, intentionally leaving a gap measuring 3-4 mm between the nerve ends inside the tube. We

started this method in 1999 and the purpose of this study was to review our clinical experience with silicon tubes. We started Lundborg's method in 2000th. Now we review 22 patients (14 women and 8 men): median nerve laceration in 10, ulnar nerve laceration in 8 and both nerves lacerations in 2 patients. Aged 14-56 (mean, 27.4) years. Mean the follow up 4.5 years. A battery of tests for sensory and motor functions of the hand, a Quick Disabilities of the Arm, Shoulder, and Hand (DASH), and EMG were carried out at final follow-up. In five patients the silicon tube was removed, at re-exploration the former gap was replaced by regenerated nerve tissue in direct continuity with the proximal and distal parts of the nerve trunk, the exact level of the former injury being impossible to identify. Our study data corroborate the intrinsic capacity of human major nerve trunks to reconstruct themselves in a preformed space when an optimal environment is offered the surgery is simplified and the surgical trauma is minimized.

A-0383 Neurotization of the posterior interosseous nerve with a branch of the anterior interosseous nerve in radial nerve palsy : Anatomical study and surgical technique

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Introduction: Tendon transfers are commonly used in late treatment of radial nerve palsy. Disadvantages of tendon transfers include the use of powerful muscle-tendon units such as Flexor Carpi Radialis or Flexor Superficialis Digitorum. Neurotization of the motor branches of the radial nerve with motor branches to the Flexor Digitorum Superficialis and Flexor Carpi Radialis has been previously reported (Mackinnon, 2007). However this option keeps the same disadvantage of sacrificing the innervation of healthy powerful muscles. For this reason, we studied the feasibility of neurotization of the deep branch of radial by Interosseous anterior nerve (AIN).

Materials and Methods: We have conducted 34 dissections of the forearm in cadavers specimen, measured for the median and radial nerve, the level of emergence of motor branches in relation to the bi-epicondylar line, simulated the neurotization to define the optimal surgical approach.

Results: The AIN origin from the median nerve was retrieved 45 mm below the elbow. The main branches for the Flexor Pollicis Longus and the Flexor Digitorum Profundus were retrieved, branching off the proximal portion of the AIN (until 80 mm). In 40% of the cases, the AIN gave off an accessory branch to the same muscles (FPL, FPD) 119 mm below the bi-epicondylar line. The AIN was crossing the proximal edge of the Pronator Quadratus 119 mm below the bi-epicondylar line. Thus, a 86 mm segment of the AIN could be dissected in a retrograde fashion with no adverse effect on the innervation of FPL and FDP.

The ideal pivot point would be situated 97 mm below the bipicondylar line. The origin of the deep branch of the radial nerve (IPN) was retrieved 79 mm. It gave off 3.52 motor branches for Extensor Digitorum, one motor branch for Extensor Digiti Minimi and Extensor Carpi Ulnaris and one for Abductor Policis Longus and Extensor Policis Brevis. Branches for the EPL and EIP were retrieved more distally, respectively 142 and 166 mm.

Discussion: The neurotization of the deep branch of radial nerve by AIN is technically possible. It's probably better to connect the AIN only to the branches of EDC and, after intra-neurodissection, the branches for EIP and EPL to exclude all the sensitive fibers of the PIN. However, in such a strategy, a tendon transfer has still to be performed for wrist extension. The ideal approach for the whole procedure should be a «Henry» anterior incision, that allows the dissection of the AIN to the pronator quadratus muscle. Another dorsal incision is then required at a midforearm level, opening the deep fascia of the EDC, and tracking the terminal branches of the PIN. The AIN, after passed through the interosseous membrane, suture to the branches of PIN.

Conclusion: This selective nerve transfer seems to be technically feasible and might be an alternative to tendon transfers in radial nerve palsies with a risk-to-benefit ratio acceptable.

A-0432 Less is more; a cadaveric demonstration of the difference in length of ulnar nerve required for contralateral C7 nerve transfers using the prevertebral route as compared to the subcutaneous route

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Purpose: Contralateral C7- transfer has become a new source of axon donor in complete brachial plexus lesions. The anterior part of the contralateral C7 root is used for neurotization via a reversed pedicular vascularised ulnar nerve graft and the proximal end of the graft is connected to the median nerve. The aim of this study was to demonstrate the decrease in length of vascularised ulnar nerve graft required for contralateral C7 nerve transfer when using the prevertebral route compared to the subcutaneous route.

Methods: Three cadavers were dissected along the course of the ulnar nerve, as well as into the prevertebral space using a standard anterior spinal approach. Further dissection was carried out to demonstrate a subcutaneous route for comparison, as well as identify the contralateral C7 nerve root. Strings were attached to the nerve root and

fed through the subcutaneous and prevertebral spaces created, to meet with the dissected ulnar nerve on the opposite side at the level of the vascular pedicle of the ulnar nerve (superior ulnar collateral vessel). The length of string required for both routes was measured and compared, with high resolution photographs taken for demonstration.

Results: Using the prevertebral route, an average of 10.2cm less string was used as compared to the subcutaneous route, which has clear repercussions for clinical practice.

Conclusions: By requiring a shorter length of vascularised ulnar nerve to be harvested, it preserves an adequate distal remnant of the ulnar nerve for neurotization with the median nerve, allowing for sensitisation of the vital ulnar border of the hand. In addition, the prevertebral route has been shown to be a simple and safe approach resulting in fewer postoperative complications.

A-0433 Cubital tunnel syndrome- an epidemiological study at a tertiary referral centre

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Purpose: To investigate the epidemiology and outcomes of patients presenting to a tertiary referral centre with cubital tunnel syndrome.

Methods: A total of 57 patients who underwent cubital tunnel release at this centre over a three year period were included. A retrospective analysis of case notes was combined with telephone interviews carried out at the time of this study, collecting data including patient demographics, comorbidities, investigations and management. Outcomes were assessed using a questionnaire incorporating a QuickDash score.

Results: Average presentation was 9 months after onset of symptoms, though this was as high as 36 months. 37% of patients had ipsilateral carpal tunnel syndrome, leading to earlier presentation. Dellon grade at presentation was I for 26 patients and II for 31 patients. Nerve conduction studies were carried out in less than half of the patients, with approximately half of these showing normal results. This correlated little with clinical findings and all underwent surgery, most commonly open decompression. Main complications were scar tenderness (n=11) and recurrence (n=4). Only one patient was unable to return to their same work post operatively. Average QuickDash score was 23.4, with all but 7 patients agreeing to further surgery if required. The results of a further 117 patients included will be combined and demonstrated at presentation.

Conclusions: Cubital tunnel syndrome is the second most common entrapment neuropathy in the body, and can

cause significant disability and disruption of daily life. It is a clinical diagnosis, and delays in presentation are largely due to lack of awareness amongst GPs. Cubital tunnel release is a simple operation with few complications and a high satisfaction rate. The main complication of scar tenderness can be reduced even further with new minimally invasive techniques.

A-0436 Surgical Restoration of Pediatric Forearm Supination Deformity in Obstetric Brachial Plexus Palsy

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Purpose: Obstetrical palsy of the upper extremity represents a severe traumatic complication, which involves the brachial plexus and occasionally the osteoarticular structures and muscles of the shoulder. Our aim is to describe and find an adequate modality of treatment for the relatively frequent obstetrical palsy sequela presented as forearm supination deformity. Forearm supination deformity tends to be progressive and therefore early recognition of this deformity is of paramount importance to prevent fixed deformities, which increase the hand function deficit. Forearm supination deformity is classified in two stages: flexible (posture in supination) and fixed (contracture) deformity, which directly determine the choice of the operative procedure(s). When passive reduction of the supination deformity is possible (flexible deformity) soft tissue procedures including tendon transfers are indicated. The bony procedures should be preferred in cases with severe contracture of the forearm in supination and distal radio-ulnar joint luxation (fixed deformity). In this study we used soft tissue techniques (including biceps re-routing pronotoplasty, brachioradialis re-routing pronotoplasty with or without interosseous membrane release) and techniques which include osteotomy of the forearm bones (excision of the radial head, radius pronation osteotomy, distal radio-ulnar fusion and wrist arthrodesis) to restore forearm posture and wrist stability in patients with supination deformity secondary to brachial plexus birth palsy.

Methods: Forty-three children (27 male, 16 female) whose age ranged between 3 and 15 years (mean age 8.2) operated between 1998 and 2004 were included in this study. Eighteen of them (11 male, 7 female) underwent soft tissue procedures, while twenty-five (16 male, 9 female) had osteotomy.

Results: As soft tissue procedures, the selected techniques were biceps re-routing pronotoplasty for 4 children

and brachioradialis re-routing pronotoplasty for 14 of them. Average gain in active pronation was 82.5 degrees, average loss of active supination was 22.5 degrees and average gain in total active motion was 55 degrees for the biceps re-routing group, whereas average gain in active pronation was 63.5 degrees, average loss of active supination was 11 degrees and average gain in total active motion was 53.2 degrees in brachioradialis re-routing group. Selected techniques were excision of the radial head for 4 patients, radius pronation osteotomy for 6 patients, distal radio-ulnar fusion for 4 patients and wrist arthrodesis for 4 patients as the osteotomy procedures. Average gain in active pronation was 96 degrees in radius head excision, 66 degrees in radius pronation osteotomy, 61 degrees in distal radio-ulnar fusion and 58 degrees in wrist arthrodesis groups. For the osteotomy group as a whole, the mean active forearm supination decreased from 50.4 degrees preoperatively to 40.8 degrees after surgery. More than one procedure (mostly 2-3) were often necessary to achieve the desired results.

Conclusions: These results clearly show that patients can benefit from surgical correction of forearm supination deformity which probably will cause significant improvement in functional status. After these surgical procedures, in a considerable proportion of patients, the "begging hand" posture can be corrected to a more functional and less noticeable position. Key words: Obstetric palsy, brachial plexus, supination deformity, osteotomy, brachioradialis re-routing pronotoplasty.

A-0458 Ultrasonographic identification of peripheral nerves of the hand and forearm

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The target of our research is to appreciate possibilities of ultrasound diagnosis of peripheral nerve pathologies. We studied 238 patients with pathological processes of ulnar, medial, and radial nerves and its ramus on the hand and forearm. Among them 57 had multiple injuries. So we studied pathological processes of 339 nerves. The research was carried out on the 3500 Philips ultrasound scanner fitted with the 12-15 MHz linear-array transducer. Longitudinal and transverse scanning was applied, palpation under sonoscopy, real-time dynamic study, examination of contralateral segment was used. Ultrasound gave the possibility to determine length of section of nerve that we must repair by surgical including appreciation of three parameters: length of diastase between the nerve fragments and neuroma of proximal fragment, linear extent of dystrophic tissues of distal fragment. Ultrasound can be used in diagnosis and selection of optimum method of treatment (nerve suture, neuroplastic, partial nerve distraction), and for the

operation planning. Ultrasound's advantage is the ability to conduct accurate topical diagnosis of the injury and the location of the nerve fragments, respectively, the natural skin landmarks or pathologic entities: the operational and post-traumatic skin scars. This is especially true when there are multiple skin wounds, stab and gunshot wounds, extensive wounds, having a longitudinal oblique direction. Ultrasound allows us to explore simultaneously the anatomical structures surrounding the nerve (tendons, muscles, blood vessels) and to identify possible concomitant injuries. Among patients 117 had combined injuries of nerves and tendons. During the diagnostic of inter-nally trunked nerve injuries ultrasound gave the possibility to determine the reasons that caused the compression of the nerve trunk (haematoma, tumor, foreign bodies, adhesion adjacent to soft tissues and others). In some cases this is a determining factor in selection of treatment and the extent of nerve damage getting less important. In the post-operative period ultrasound allows to observe, at any time, the dynamics of morphological changes of a nerve trunk. To add more, it allows to determine the complications and medication errors (neuroma at the region of the nerve suture, the interruption of nerve after operation and others). As a result of the ultrasound research 238 patients displayed the features of full lesion of 138 nerves, partial lesion of 15 nerves and intra-trunk lesions of 133 nerves. The data received from ultrasound was used for the operation planning. In all cases the ultrasound research data was confirmed during the operation. Results of surgical treatment and histological research showed ultrasound sensibility - 85,7 %, specificity - 88,2, diagnosis efficacy - 0,85. The findings of the research make it possible to state that ultrasound is a high-informative method for the study of the pathological process of the nerves of the hand and forearm.

A-0500 Thermoregulatory vascular responses are not altered in nerve injury induced Cold Intolerance in rats

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Purpose: Cold intolerance is defined as abnormal pain after exposure to non-painful cold. It has been suggested that cold intolerance may be related to dysfunctional thermoregulation in upper extremity nerve injury patients. Purpose of this study was to examine if thermoregulation of a rat hind paw is altered in different peripheral nerve injury models and if these patterns are related to severity of cold intolerance.

Methods: The Spared Nerve Injury and the Complete Sciatic Lesion model were used, without concomitant vascular damage, and compared to sham operated rats. In the Spared Nerve Injury (n=8) and Complete Sciatic Lesion (n=8) model the re-warming patterns and Cold Induced Vasodilation responses after cold stress exposure were investigated pre-operatively and at 3, 6 and 9 weeks post-operatively with a cooling device to induce cooling of the hind paws. Thermocouples were attached on the dorsal side of the hind paw to monitor re-warming patterns and measure CIVD responses.

Results: Based on the Von Frey Test and Cold Plate Test, both lesion types developed both mechanical- and cold hypersensitivity, whereas the sham operated rats did not develop any hypersensitivity. While we found no significantly different re-warming patterns in the SNI and CSL group compared to Sham group, we did find a tendency in temperature increase in the CSL group 3 weeks post operatively. We found no significant effects in Cold Induced Vasodilation of the operated hind limb for time and for group.

Conclusion: Overall, our findings indicate that thermoregulation responses are not altered after peripheral nerve injury in these rat models despite the fact that these animals did develop cold intolerance. This suggests that disturbed thermoregulation may not be the prime mechanism for CI and that other, most likely, neuropathological mechanisms may play a more important role.

A-0017 Outcomes of Distal Radioulnar Joint Arthroplasty

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Purpose: To evaluate the long-term outcomes of ulnar head endoprosthesis for the treatment of distal radioulnar joint (DRUJ) instability and arthrosis.

Methods: A retrospective review was conducting analyzing the outcome of all ulnar head prosthesis implanted within our institution over a 10 year period. All patients presented complaining of pain and functional disability due to instability or arthrosis of the DRUJ. Standardized preoperative and postoperative assessments included a patient rated pain score, forearm range of motion, grip strength and Mayo Wrist Score. Preoperative and postoperative radiographs were examined to determine whether implant survival was associated with patient pre and postoperative characteristics.

Results: Sixty nine patients were followed for a median of 49 months (range: 16 to 126 months). Eighty-nine percent of prosthesis were uncemented. Pain scores decreased by a mean of 2.2 (\pm 1.8) points, and Mayo Wrist scores improved a mean of 26 (\pm 13) points after surgery. Mean grip strength improved by 2 (\pm 11) Kg from preoperative measurements. There were no statistically significant differences with respect to pre and postoperative wrist and forearm range of motion. Kaplan-Meier analysis demonstrated 81% survival at 6 years.

Summary: Distal ulna arthroplasty restored stability and function to patients with DRUJ impingement or arthrosis. Thirty two percent of patients, however, required additional surgical procedures after primary ulnar endoprosthesis placement.

A-0032 Surface arthroplasty of proximal interphalangeal joint with avanta prosthesis

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Purpose: To retrospectively review the surgical technique, clinical indications, postoperative protocols and clinical

outcomes of patients with surface replacement arthroplasty of the proximal interphalangeal (PIP) joint.

Methods: From November 2003 to December 2009 a total of 42 joint replacements in 36 patients were performed with a minimum follow-up period of 10 months. Indications for surgery included post traumatic arthritis of PIP joint, rheumatoid arthritis, osteoarthritis. Counter-indications were lack of stability, infections and non reconstructable extensor tendons.

Results: No major complications were reported. In three cases surgical management was changed from unconstrained prosthesis to Swanson prosthesis due to poor positioning of the proximal component. For the remaining prostheses a significant decrease in pain was reported in all cases, the mean range of motion of the PIP joint improved from 43 to 60 degrees ($p=0.001$), and the mean grip strength from 169-199 N ($p=0.002$). On the visual analog scale, 85 % of patients were satisfied. Radiographic findings confirmed complete osteointegration of the implant without loosening.

Conclusions: The results of this study demonstrate that arthroplasty of PIP Joint is a useful technique that reduces pain and improves ROM.

A-0037 Total wrist type "Remotion - SBI" in orthopedic trauma-patients. Implantation via less invasive approach

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Basics: Posttraumatic wrist-arthrosis frequently causes significant loss of range of motion accompanied by severe pain resulting in a major decrease of occupational capability. Consequently, patients sustain restrictions to their socio-cultural operating abilities (activities of daily living or ADL's). Common operative procedures to treat these sequelae consist of partial or total wrist-fusion., According to multiple studies, and particularly with total wrist fusion, patients tend to remain dissatisfied. The

wish for preservation of motion is absolutely understandable and by means of a total wrist implant, patient's call for mobility can be headed. However, morbidity of the approach for implanting a total wrist can be rather high in terms of postoperative swelling, pain and a long-term phase of gradually regaining motion. A less invasive approach however has shown that it can provide for less frequency and severity of these typical post-operative issues.

Method: n=15; age [42, 73], m:w = 11:4. Total wrist type "Remotion", SBI. In all cases total wrist implant from SBI ("Remotion") was used. In 10 cases we were successfully implanting the prosthesis via a less invasive approach: 10 cm skin-incision and only notching the retinaculum for one centimeter between portal 1' proved to be fully suffice for implanting the prosthesis. Postoperatively patients were restricted to motion for 2 weeks in a strong dressing (3 times plaster-cast). From day 2 post-op patients were lead to lymphdrainage and ergotherapy (fingers). As we have constantly seen severe neuritis of the interosseus radial nerve, partial denervation (Wilhelm) was added in all cases. The radio-carpal capsule was totally resected in 10 cases for the tissue had sustained severe alteration by chronic synovitis and did not seem to provide enough stability when sutured.

Results: After 4-6 weeks ROM was at least in S 30/0/30 in all cases. After 3 months full ROM was obtained [average 45/0/40]. Pain was released from pre-op average 8/10 (VAS) to 2/10. 6 patients were totally free of pain within 3 months. Longterm follow-up is 5 years; short-term follow-up is 6 months. All implants are stable. No dislocations or instability has been observed. No infections. One patient experienced functional loss of extensor digitiv minimi. Looking back to the pre-op status, all patients confirmed that they would have the procedure done again. 2 Patients have total wrist-implants on both sides.

Conclusion: Total wrist-implant "Remotion" is a highly sophisticated implant, capable of meeting the expectations of both the physician, in terms of criterion for reliability, stability and effective pain relief, as well as meeting the needs of the patients for functional restoration. As a consequence we regard the total wrist-implant as a "first choice procedure" in severe cases of arthrosis. Less invasive approach looks very promising, as complete release of the retinaculum and large skin-incisions seem no longer necessary in many such cases. Patients seem to take great benefit from this technique.

A-0059 Long-term Results (more than 10 years) Follow up of Total Joint Arthroplasty in the Treatment of Thumb Carpometacarpal Joint Osteoarthritis

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Degenerative arthritis of the first carpometacarpal joint is a very common and restricting condition that frequently affects middle-aged females. Many different surgical techniques have been recommended for osteoarthritis of the thumb basal joint: Trapecectomy; trapezo-metacarpal arthrodesis; LTRI, and joint replacement. Total joint replacement has been an effective treatment of this condition because of the earlier postoperative recuperation and better replica of axes of rotation of the original joint that substitute. The purpose of this article is to present the outcome of a long-term follow up (more than 10 years) of a total non-cemented and non-constringed trapeziometacarpal implant in the treatment of this disease. Total joint arthroplasty of the trapeziometacarpal joint was performed on 30 thumbs in 29 patients (27 women and 2 men) to treat advanced osteoarthritis (Eaton and Littler stages III and IV) between 1999 and 2000. Indications for surgery after failure of conservative treatment, were severe pain, loss of pinch strength, and reduced thumb motion that restricted activities of daily living. A Arpe prosthesis was the implant used in this series. The average follow-up time was 10.9 years. At the final follow-up evaluation: 1 patient have die in the 3rd year follow up because of a neo, 1 left follow up at the sixth year because of an Alzheimer, remaining 28 implants in 27 patients. One of them is dislocated from the early postop, and the patient refused the revision; 2 other have been revised: one for an early dislocation, who was successfully corrected and in the final follow up is functional, and other because of loosening of the cup, resolved with bone graft and a new cup. All the 28 implants remain place: 26 (92.8%) are functional and 2 are not functional. One is the patient of the early dislocation that refused the revision, and the other is a patient who suffered an important hypocalcaemia after an parathyroid glands undue resection. In the functional ones, thumb palmar abduction averaged 20°, thumb radial abduction averaged 25§ and thumb opposition to the base of the small finger was present. The average pinch strength was 5.5 kg (85% of non-affected side). Radiographic studies at the final follow-up evaluations did not show signs of implant loosening, although some of them have suffered little sinking of the components, perhaps due to deficient initial adjustment. Two patient complained of minimal pain, and the remaining 24 patients were pain free. In conclusion, total joint arthroplasty of the thumb CMC joint non-cemented and non-constrained has proven to be efficacious with improved motion, strength, and pain relief. The implants also have passed

in a good manner the time test (similar to hip or Knee implants). We currently recommend this technique for the treatment of Eaton stage III and early stage IV osteoarthritis of the CMC joint in patients with low/medium activity demands.

A-0072 Results of the Total Modular Wrist Prosthesis in revision total wrist arthroplasty: a retrospective study of 18 cases

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Purpose: Total wrist arthroplasty remains a procedure with a relatively high incidence of complications. Although arthrodesis is an option after failed primary wrist arthroplasty, revision arthroplasty should also still be considered. This study presents the results of using the Total Modular Wrist prosthesis as a revision prosthesis in failed primary total wrist arthroplasty.

Methods: Over a period of 8 years the Total Modular Wrist (TMW) prosthesis was used as a revision implant in 18 rheumatoid patients (18 cases) which were included in this retrospective study. There were 3 failed Swanson, 2 failed Guepar and 13 failed TMW implants (all unconstrained) revised. In 12 patients an unconstrained prosthesis was used as revision implant and in 7 patients a constrained version. The mean follow-up period was 5 years (8 mnths - 8,5 yrs). Outcome parameters were pain (VAS), range of motion, DASH-score, SF-12 score and gripstrength. The follow-up radiographs were analyzed with regards to alignment, migration of the implant and radiolucency in different zones around the prosthesis.

Results: At follow up 9 patients had undergone a re-operation (1 infection, 8 imbalance) after the initial revision operation. 5 Implants were revised to a constrained prosthesis and 4 patients underwent an arthrodesis. At follow up the average VAS score in rest was 3, during night 2 and at maximal activity 4. The mean range of motion of the remaining arthroplasties was: palmar flexion 31°, dorsal flexion 33°, supination 48° and pronation 90°. The mean DASH score was 69 points and the mean SF-12 was 59.8 points. The average gripstrength of the remaining arthroplasties was 9,8 lbs. Radiologically all remaining implants had a good alignment and there was no migration of the implant. Radiolucency was seen around the radial implant in 6 cases and around the carpal screws in one case, all asymptomatic.

Conclusion: Revision arthroplasty of a total wrist prosthesis remains a challenging intervention. Especially imbalance of the implant, mainly due to the rheumatoid arthritis disease, is a complication often seen. To

encounter this imbalance of the wrist joint the use of a more constrained implant is advised.

A-0096 Revision arthroplasty of the PIP-joint after primary failure of a silicone implant

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Purpose: Silicone arthroplasty of the PIP-joint is still the golden standard since the introduction of Swanson 40 years ago. Revision after failed proximal interphalangeal joint arthroplasty is challenging. Besides the conversion into a joint fusion, revision implant arthroplasty is a possible option. It is the purpose of this study to analyse the results of Silicone revision arthroplasty after failed Silastic implants in the PIP joint.

Methods: In a retrospective case series out of 612 Silicone PIP joint arthroplasties in a 10 year period, 34 revision arthroplasties in 27 patients were analyzed. Nineteen (70.4%) of these patients with a total of 23 joints could be seen for follow up examination. All primary and all revision implants were Silicone arthroplasties, all but one with the original Swanson design. The indication for revision surgery included pain, joint deformity and limited range of motion. Patient evaluation measurement included the recording of mobility, strength and residual deformity as well as pain scoring and patients satisfaction.

Results: The revision rate in this series was 5.5%. Average time between revision and primary surgery was 3,8 years (0.4-19.4 years). The average follow up after revision was 3.2 years (0.6-8.3 years). Intraoperatively 12/37 implants were completely intact, no case showed significant Silicone synovitis. The active range of motion before the primary arthroplasty procedure was 56° ($\pm 17.6^\circ$), before revision 47° ($\pm 26.0^\circ$) and after the revision 46° ($\pm 20.0^\circ$). Those 9 joints with which had been revised due to unsatisfactory mobility after the primary joint replacement showed an average range of motion before the revision of 30° ($\pm 15.0^\circ$) and after the revision procedure at time of follow up of 50° ($\pm 18.3^\circ$). Fifteen of 23 revised joints were without pain, the average pain score (VAS 1 to 10) at follow up was 1.5. Patient's satisfaction on a scale from 0 (completely dissatisfied) to 10 (very satisfied) averaged 6.9. Seventeen joints had a residual ulnar deviation of 16°. Three implants showed radiographical signs of implant failure at follow up.

Conclusion: The revision rate after Silicone PIP arthroplasty in this series is low. In cases of failure of the primary procedure Silicone revision arthroplasty gives overall satisfactory results. In cases of severe limitation of ROM after the primary arthroplasty a revision and replacement of the Silicone implant could gain better mobility. However pre-existing ulnar deviation could not be sufficiently corrected

with the revision procedure. The best indication for implant revision surgery at the PIP level remains pain.

A-0229 A 5-year prospective outcome study of Pi2 pyrocarbon interposition arthroplasty for the treatment of thumb carpometacarpal joint (CMCJ) osteoarthritis

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Purpose: Trapeziectomy with pyrocarbon implant is a recent procedure for CMCJ osteoarthritis. This study aims to report the first review of Pi2 pyrocarbon implants with a 5-year follow-up.

Methods: The prospective study included 42 cases in 39 patients. Mean patient age at surgery was 63 years (range, 49-77 years). The implant was inserted by an anterior approach, after trapeziectomy and minimal trapezoidectomy. We performed a dorsal capsuloplasty and a ligamentoplasty using distally based strips of the APL and the FCR tendons to avoid the luxation of the implant. The assessment was made by an independent examiner and based on clinical outcome, functional scores and radiographic review.

Results: The mean follow up was 62.4 months (range, 55-83 months). A replacement of the implant was performed in one case. A CRP syndrome was identified for 2 patients. Overall satisfaction ranged from "very satisfied" to "satisfied" for 97% of the patients, and none were unsatisfied. Pain relief was excellent with a maximum of level 3 on a VAS. Mobility range and strength were increased and rather comparable to the opposite side. Return to full activities was complete after 76 days on average (range, 30-240 days). Improvement of the PRWE and the quickDash score was respectively of 66% and 60%. Radiographic review reported 2 luxations of the implant and minimal bony remodelings for 29% of patients, without any clinical significance.

Conclusion: The Pi2 implant is well tolerated at 5 years. It is a reliable procedure for the treatment of the CMCJ osteoarthritis. Major benefits are: preservation of the length of the thumb increasing its strength and mobility, and short recovery period.

A-0250 Non-viable proximal pole of the scaphoid: APSI vs isolated scaphoidectomy

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Introduction: The proximal scaphoid implant is now over 10 years, with the philosophy of restoring the geometry of the carpus and maintaining first carpal row coherence. However, there are few publications attesting its results as well as comparative studies with other techniques. The aim of this study was to compare the clinical and radiological results of the pyrocarbon adaptive partial scaphoid implant (APSI) with isolated proximal pole scaphoidectomy for the treatment of patients with pseudarthrosis with necrosis of the proximal pole of the scaphoid or scaphoid nonunion advanced collapse (SNAC wrist).

Material and methods: This is a retrospective study of 21 patients (12 with SNAC wrist, 9 pseudarthrosis with necrosis of the proximal pole) treated with proximal pole arthroplasty with APSI (13 patients - group I) or isolated proximal pole scaphoidectomy (8 patients - group II) with a follow-up time of 30 and 44 months, respectively. The mean age at the time of surgery was 43 years for group I and 39 years for group II. Dorsal open approach was used in 17 cases, volar in 4. Fifteen patients have had previous surgical treatments. All the patients were submitted to the same rehabilitation program. The clinical evaluation was performed using the Mayo wrist score and the range of motion and the pinch and grip were compared to the opposite healthy hand. Complications and patient satisfaction were also evaluated. Radiological evaluation included comparison of the carpal height and radio-lunate angle between pre and post-op x-rays.

Results: The average Mayo wrist score at the follow-up was 80 for the group I and 78 for the group II, and 75% of the patients of both groups resumed their sport and professional activities. In terms of range of motion and grip and pinch the results were similar in both groups (with a slight advantage for group I) with values of around 70-80% compared with the opposite healthy hand. All the patients, with exception of 1 patient from each group, were satisfied with the results. There has been one case with dorsal dislocation that required surgical revision for implant removal. From the radiological assessment, according to the criteria of Youm, we saw maintenance of carpal height in 93% of patients of group I and only 38% of Group II. With respect to the radio-lunar angle, we saw maintenance or improvement in 77% of patients in group I and worsening in 50% of patients of group II.

Discussion: Considering our results, and despite being a small sample that is failing to achieve statistically significant results, there seems to be a tendency for overlapping clinical outcomes between both techniques but with advantage to the arthroplasty with regard to radiological findings. Although being a more expensive and demanding surgery, the results of arthroplasty seem encouraging mainly to avoid further deterioration and carpal collapse. It is now necessary long-term studies to prove its long-term benefit. The use of an arthroscopic technique, already in some

centers, may also make it less invasive and with quicker recovery.

A-0256 Results of the Universal II Total Wrist Prosthesis in patients with Rheumatoid Arthritis and in patients with Post-Traumatic Arthrosis

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In literature few results of the Universal II wrist prosthesis are known. In total we found 33 cases, described in 2 studies. Both studies showed mainly a great reduction in pain and limitations in daily life. The use of the Universal II in patients with post-traumatic arthrosis has never been described. This presentation shows preliminary results in our prospective clinical trial. We evaluate the results and possibly differences between patients with rheumatoid arthritis and patients with post-traumatic arthrosis. Between 2005 and 2009 in total 50 prostheses were implanted by a single surgeon. All prostheses used were Universal II, non cemented. The study population consists of 33 wrist prostheses in 33 patients (22 women and 11 men). Range in age is 29 to 83 years old. Indication for surgery was Rheumatoid Arthritis (panarthrosis), Post-traumatic arthrosis (SLAC/SNAC wrist, grade 4), or avascular necrosis of the carpals (Kienbock). The follow-up is 12 months. Preoperatively, 3-, 6- and 12 months postoperatively we measure Range of Motion (ROM), Strength (by E-link), DASH and Painscore. At this moment we have data for 17 patients. In all cases ROM improved. Twelve months postoperatively the average ROM shows: 166° pro-/supination, 65° flexion/extension and 24° radial/ulnar deviation. Strength did not improve significantly. DASH scores improved by 34 % (P=0,001). Average painscores were reduced by more than 50 % (P=0,004). Complications were seen in 4 cases (1 infection, 2 carpal tunnel syndrome and 1 CRPS). At this stage we couldn't show a significant difference between the 2 groups.

A-0271 Avanta SR-MCP Arthroplasties, a prospective consecutive study for five years

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Introduction: A resurfacing of the MCP joint has been an option for years to the Golden Standard of flexible of the

MCP joint. There has only been presented few reports of Avanta SR-MCP with long time follow up.

Material: This prospective study includes 105 Avanta SR-MCP arthroplasties with a follow up from 1 month to 5 years (74 with a minimum of 1 year). Median age 59 years (29-86). Main indications are Rheumatoid Arthritis 88 joints and 14 Osteoarthritis. In the rheumatoid group, severe conditions with volar sub- or volar dislocation also are included. In 7 joints Tupper arthroplasty and 2 joints flexible Silicone arthroplasties has been performed.

Results: Preop. ROM (median) 42 degrees (0-88) and 1 year follow up ROM was 46 degrees (16-90). VAS preop. 35mm (0-99) and at 1 year 0 mm (0-100). Grip strength preop. 14 kgF (2-60) and at 1 year 14 kgF (2-60). Pinch grip preop. 15 KPa (0-38) and at 1 year 24 Kpa (0-70). Complications: No infections. Loosening around the stem 1 prostheses at 3 years follow up. Eight early postoperatively joint dislocations due to insufficient collaterale ligament and these collaterale ligaments were reconstructed and did not have any influence on the postop. ROM, VAS, and grip strength.

Conclusions: Avanta SR-MCP arthroplasty is a good alternative to the flexible silicone prostheses in rheumatoid and osteoarthritic patients with non displaced joints and there are few complications postoperatively. And SR-MCP is an option in patients with more severe rheumatoid changes if ligaments are to be reconstructed.

A-0272 Avanta SR-PIP Arthroplasty, a prospective study for six years

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Introduction: A resurfacing of the PIP joint has been an option for years to flexible Prostheses and arthrodeses of the joint. The aim of this study is to report results of uncemented Avanta SR-PIP arthroplasties.

Material: This prospective study includes 78 Avanta SR-PIP arthroplasties with a follow up from 1 month to 6 years (55 with a minimum of 1 year). Median age 62,3 years (25-83). Main indications are Rheumatoid Arthritis 18 joints, 45 Osteoarthritic joints and 15 other indications. In the rheumatoid group few cases with severe conditions of Boutonnière deformity or MCP arthroplasty in the same finger were included.

Results: Preoperative ROM (median) 36 degrees (0-75) and at 1 year follow up ROM was increased to 42 degrees (0-102). VAS preoperative 62mm (0-100) and at 1 year 2 mm (0-98). Grip strength preoperative 16 kgF (2-51) and at 1 year 18 kgF (1-34). Pinch grip preoperative 20 KPa (0-52) and at 1 year 29 Kpa (8-52). The increase of ROM, strength and decrease in VAS are unchanged 6

years postoperatively. Complications: No infections. Due to loosening around the stem of 8 prostheses were revised to new SR-PIP prostheses. 20 patients reoperated one or more than one time. Five arthrodesis and three of these due to dislocation in severe rheumatoid conditions. Tenolyses more than once in 7 joints caused by adhesions the extensor tendon. One stem was repositioned postoperatively due to incorrect position. Three FDS tenodeses performed due to hyperextension.

Conclusions: Avanta SR-PIP increases ROM and strength and a decreases pain, but are related to soft tissue problems postoperatively as reported in other papers. 11,8% loosening of the prostheses and revision. HA coating of the stem should be considered. Severe rheumatoid cases including Boutoniere deformity should be avoided.

A-0282 The Elektra prosthesis for total replacement of the first cmc-joint. Prospective study with follow-up of one to six years

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Background: Soft-tissue arthroplasties of the CMC1-joint is known to give at least 85 percent of good or excellent results. A draw-back of these methods is the rather long recovery time. In recent years a number of new implants have been presented but the results are yet not very well documented.

Aims: The aim of this study was to evaluate the long term results after joint replacement with the Elektra prosthesis, a non-cemented, HAP-coated 3-component CrCo-implant. The cup is the second generation Elektra cup.

Patients and Methods: 54 patients operated were followed prospectively. Diagnosis was idiopathic osteoarthritis in all cases. 40 were women and 14 men. The operated hand was dominant in 31 cases and non dominant in 23 cases. Median age 58,5 years (37,5-74,5).

Results: The follow-up time was one to six years. Pain on VAS was reduced from 6,0 preoperatively to 0 at six years follow-up. Grip-strength increased from 22,5 KgF preoperatively to 26 KgF 3 years postoperatively and then gradually decreased to the preoperatively value at six years. Pinch-strength increased from 2,5 KgF preoperatively to 3,5 KgF at five years. Abduction was 33 degrees preoperatively and 40 at follow-up, volar adduction 33 degrees preoperatively and 38 at six years follow-up. All parameters were better at 6 to 9 weeks postoperatively compared with the preoperative values. **COMPLICATIONS** Removal of the prostheses occurred in 11 cases. Revision of the cups to cemented polyethylene cups were done in 5 cases. Five prostheses dislocated for one or more times.

Conclusions: Arthroplasties with an Electra prostheses have a very fast recovery and a higher ROM, Grip and

pinch strength and reduced pain level. These values were almost unchanged during the years. Complication rate were quite high and especially related to the loosening of the cup. A new third generation HA coated titanium cup have been designed and is now tested in a prospective trail.

A-0295 The Maestro total wrist implant- a two-year follow-up

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Background: The Maestro total wrist implant is a non-constrained non-cemented arthroplasty. The aim of the study is to evaluate the outcome in this newly designed prosthesis in patients with rheumatoid arthritis, osteoarthritis and post-traumatic arthritis.

Material and Methods: A prospective consecutive series of 45 prosthesis was conducted. Preoperatively and at follow up AROM, grip strength, 2 pinch and key pinch force, pain at rest and in activity (VAS scales), COPM, DASH and X-ray was performed. 8 men and 37 women were included (Mean age 54.3 years). Patients were classified as Wrightington grade 2-4. No patients were lost to follow up.

Results: No prosthesis was revised. Pain and grip strength improved significantly, and the patient satisfaction and increased ability and performance increased significantly (COPM, DASH). No clinical or radiological loosening was detected. Range of motion was even better than our earlier experiences with other wrist prosthesis (Re-motion, Universal II, BIAx).

Discussion: The Maestro total wrist arthroplasty is a reasonable treatment in the arthritic patient that have higher demands that the usual rheumatoid patient and offers a functional range of motion, increased strength and a pain free wrist. However, long-term follow-up studies are advocated. **Key words;** Total wrist implant. Wrist arthroplasty.

A-0296 Proximal interphalangeal hemi-joint replacement

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Background: The major drawbacks of pip joint prosthesis are loosening and reduced motion. In this prospective study the clinical value of a hemiprosthesis was investigated.

Material and Methods: A prospective series of 29 joint replacements were performed. Mean follow-up time were 33 months (12-52) and evaluated by an independent physiotherapist and occupational therapist regarding grip strength, active range of motion, pain in activity and at rest,

and functional scoring (COPM- Canadian Occupational Performance Measure, DASH).

Results: The mean active range of motion, grip strenght, pinch and key pinch force increased after surgery. Pain at rest and in activity as well as hand function assessed with COPM and DASH improved significantly. No prosthetic loosening or revisions were performed.

Discussion: This study shows that a hemiprosthesis for the pip joint provides significant pain relief and patient satisfaction as well as increased mobility in the short term. We believe that hemiprosthetic might reduce the risk of prosthetic loosening. However, further long-term studies are advocated.

A-0303 Universal 2 prosthetic replacement of the wrist

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Purpose: As rheumatoid patients population modified in recent years together with its expectations and requests, upper limb prosthetic replacements are more frequently taken into consideration as an indication for functional joint reconstructions. The aim of this study is to evaluate the results of the Universal 2 total wrist prosthesis in a series of rheumatoid patients as an alternative to wrist arthrodesis.

Methods: Since 2003, 19 total wrist arthroplasties were performed in 18 patients affected by rheumatoid arthritis; in all of the cases we used a Universal 2 semiconstrained uncemented prosthetic device. Mean follow-up of our most recent revision was 49 months (range 17- 93 months). The patients were 17 females and 1 male with a mean age of 60 years (range 32-74 ys). In 10 cases other upper limb joint procedures had already been performed: elbow replacement (2 cases) and MP replacement (2 cases) homolaterally; 1 elbow replacement, 1 MP prosthetic replacement, 4 RSL arthrodeses, 1 RL arthrodesis, 3 total wrist arthrodeses and 2 IP-MP thumb arthrodeses on the contralateral side. Subjective and objective data were recorded at follow-up including: overall patient's satisfaction and residual pain, postoperative ROM and its variation in comparison to preoperative values, hand grip strength, DASH and PWRE score, sequential X-rays controls. Long-term complications and reasons for revision or failure were also considered.

Results: All patients had satisfactory or complete relief of pain; the mean visual analogue pain score was 0.75. Average patient satisfaction was rated as 9.2 (range 0-10). The mean grip strength improved post-operatively when compared to pre-operative evaluation scores. There was improvement in the range of motion and improvement of DASH and PWRE scores. Evidence of radiological

loosening of the carpal component was observed in two symptomatic cases. Two cases underwent an implant revision: in one case a carpal component was revised because of polyethylene insert wear secondary to intra-operative malalignment; in one case the implant was removed because of muscular unbalance and a Swanson's silicone spacer was applied.

Conclusions: Total wrist prosthetic replacement provides pain relief and improves function in rheumatoid arthritis. According to our mid-term results the Universal 2 implant can be considered as a predictable functional option when managing wrist joint arthritis.

A-0329 The Elektra prosthesis for the CMC joint of the thumb after follow-up of 10 years; 48 cases

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The purpose of this communication is to study the results of Elektra prosthesis for the treatment of osteoarthritis of the CMC joint of the thumb after long follow-up (minimal is 10 years). Since 1997 we are using the Elektra prothesis, and we have publicated our results for the 100 first cases. Elektra is métal-metal, non retentive prosthesis using the principle of ball and socket. In this series the metals used were titanium only for the 10 first cases, and for the others Chrom- Cobalt for the gliding surfaces, and titanium for the stem. The surgical approach was dorsal, between the Abductor pollicis longus and the Extensor pollicis brevis. The bone resection was only done from the metacarpal and was 4 to 5mm. No fixation of the Abductor Pollicis longus was done at the end of implantation of the prosthesis. Cast splinting was used postoperatively for 3 weeks and no rehabilitation was used for the majority of patients.

Material et method: We've choosen all the cases we've done since more as ten years, since the beginning of use of Elektra prosthesis. We've found 56 cases of arthroplasties with Elektra (54 patients). The minimal passing time was 10 years and maximal 12 years. At the time of study in our series, 4 patients were dead and for 4 others it was impossible to find adress or to see at our consultation. The results. At the beginning, 48 cases were rewieved, the cases who needed revision were excluded from the results at 10 years. At the end the results concern 29 patients (51%) The mobilty was appreciated with maximal abduction between the first and the second metacarpal.(45° for 18 patients, 40° for 7), with the opposition (Kapandji scale)(10 for 28 patients and with the table test for the rétroposition. The force was appreciated with the Jamar for the global strength(mean 25Kgf) and with Key pinch (mean 6). The recovery time was 5 weeks in all cases but 1. The pain disappeared in all cases but 2. At the X rays,

excessive flexion of the cup was found in 15% of the cases. The appreciation by the patients was good in all cases except in 1. Complications is the most interesting chapter of this series with long follow-up (about 48 cases): - 1 fracture of the trapezium. - 1 case of allergy - 3 deepening of the stem - 5 dislocations but 3 post trauma - 14 loosening of the cup and in 10 cases after trauma.

Discussion: the results of this short series is interesting because very few publications were done with long follow-up. More as 56% of the prostheses were still in place, with good results. The main complications were dislocation and loosening, and occurred in 75% of cases after trauma and in 2 cases totally unknown by the patients. After this study we've modify the external surface of the new Elektra's cup to obtain better osteointegration.

A-0338 High failure rate treating CMC 1 osteoarthritis with PI2[®] pyrocarbon prosthesis

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Purpose: One technique treating CMC 1 osteoarthritis is trapezium resection and interposition with a pyrocarbon prosthesis. This procedure maintains the length of the first ray and is designed to generate a powerful pinch. The objective of this study was to evaluate the subjective and objective results of patients operated upon in our hand clinic.

Patients and methods: There were 41 patients (45 thumbs) with at least one year of follow-up who underwent this procedure between March 2004 and June 2009. Nineteen patients did not participate for a variety of reasons in particular seven of these refused to participate because the prosthesis had been removed. Thus, there were 22 patients (26 thumbs) with a median age of 60 years (range, 45-80 years), available for clinical and radiological review at a median follow up of 30 months (range, 12- 78 months). CMC osteoarthritis was classified as Dell stage 1 in 5 thumbs, stage 2 in 7 thumbs, stage 3 in 13 thumbs and stage 4 in 1 thumb.

Results: Of the 22 patients (26 prostheses) participating in the review five patients (5 prostheses) had been re-operated upon with removal of the prosthesis at a median of 11 months postoperative (range, 1 week -25 months). In the review six patients were not satisfied and had expected better results, three of them had their prosthesis removed. Of the remaining 16 patients, all were very satisfied. Of the patients who were very satisfied the median QuickDASH was 11 (range, 0-52), and the PRWE (patient rated wrist

evaluation questionnaire) was 12 (range, 0-50). In comparison, the median QuickDASH for patients who were not satisfied was 45 (range, 27-55), and the PRWE was 55 (range, 5-109). Patients who were not satisfied all had weather-related pain recorded as mean 5 (range, 0-8) on a visual pain scale (range, 0-10), as compared to a mean 0 (range, 0-5) for patients with a satisfying result. The clinical examination took into account all 17 patients who still had their prosthesis (21 prostheses). The global force measured on the second position with a Jamar dynamometer was 22kg (range, 5-56kg), as compared to 22kg (range, 4-44kg) before the operation. The lateral pinch for all patients was 5.5kg (range, 2-12 kg), as compared to 4.5kg (range, 0-10 kg) preoperatively. Opposition according to Kapandji was 10 (range, 9-10), compared to 9 (7-10) before the operation. In 13 of the remaining 21 prostheses a dorsal subluxation (n=10) or dislocation (n=3) of the first ray together with the prosthesis occurred, which was not correlated to the surgical approach.

Conclusion: 73% of the patients were very satisfied and we obtained excellent pinch force (122%) as well as an improvement of opposition of the thumb compared to the preoperative values. However, five out of 26 prostheses (19%) seen at the review had been removed. Of the 19 patients who did not participate at the review seven prostheses had removed. In the end we got failure of 12 implants out of 45 thumbs, thus 27%.

A-0400 EBRA - a Software Tool for Early Prediction of Prosthesis Failure of the Carpometacarpal Joint of the Thumb

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Prosthetic replacement of an arthrotic carpometacarpal joint of the thumb remains challenging due to the difficulty of its fixation to the trapezium. Different models have been

designed. Their durability has been discouraging so far. Early recognition of prosthesis failure is difficult. A tool helping to identify prosthesis misdesign as cause for early implant loosening is needed. The aim of this study was to evaluate the applicability of the software program EBRA (Ein-Bild-Röntgen-Analyse) to the trapezometacarpal joint of the thumb. EBRA has been well established and used for monitoring cup migration in total hip implants. A cadaver hand containing the midcarpal and carpal bones was used to adjust EBRA to the carpus. Grid lines and points were defined to the carpal bones a dummy cup in place. To mimic the clinical setting X-rays were taken from the cadaver hand after varying the position of the cup in known angles and shifts. The grid lines and points were applied. EBRA calculated the position of the cup. Statistical analysis of the obtained data showed a high accuracy of the calculated values to the assumed position of the cup. Thus in the cadaver the varying positions of the cup were reflected correctly by EBRA. In a second step the newly established measuring chain was tested in the clinical setting. 119 patients with a total of 142 implanted De la Caffinière prostheses were recruited and 545 X-rays were examined. From final analysis were excluded those cases that had less than three follow-ups until showing first signs of implant instability. EBRA was applied to the remaining 76 patients and 102 prostheses (follow-up period of 19.2 months). The obtained data were used to draw linear graphs of migration and inclination. Corresponding regression lines were made up to the point of the first instability. For detection of cup loosening the 'Wachtl' criteria were used. 68.9% of the de la Caffinière prostheses were still stable after 12 months and 48.5% after 24 months. The difference between the group "loose" and the group "stable" was significant in the case of cup shift in the y-axis. EBRA proved to be a reliable tool to visualize cup migration. With EBRA cup migration of an implanted trapezometacarpal prosthesis can be detected before final loosening. The clinical series proved that EBRA does predict implant failure ahead of time. The patient series described will be of use for evaluation of other models. A comparison with new cement-free prostheses shall follow.

A-0416 Total wrist arthroplasty for rheumatoid arthritis. Results of the first 21 patients operated

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The rheumatoid arthritis is the main indication for total wrist arthroplasty. The goal of this study is to analyze the experience with the implants used at our department. We

have retrospectively reviewed 24 prosthesis operated on 21 patients. There were 8 Universal 2 wrist system and 16 ReMotion wrist system. The average follow-up was 35 months (range 15-73). Pain has been successfully relieved in all patients; range of motion has respectively increased 5,8° e 15,7° for flexion and dorsiflexion, de 3,3° e 6° for radial and ulnar deviation, 22° and 26° for pronation and supination. Grip and pinch has respectively increased 5,4 and 1 kg. DASH has been evaluated in most patients with an average improvement of 19 points. As complications, we have an hematoma and a superficial skin necrosis. Radiological examination has revealed loosening of one radial component. At the time, none of the patients needed to be reoperated. In our experience, total wrist arthroplasty, has been a successful procedure in treatment of rheumatoid arthritis, with a low rate of complications. Even though we have not a long term follow-up, the implants have revealed a durable bone fixation in almost cases.

A-0429 Short term outcomes of Trapeziectomy versus pyrocarbon interposition implant (PI2) arthroplasty for Thumb Carpometacarpal Osteoarthritis- preliminary results

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Multiple methods have been used to treat thumb carpometacarpal joint (CMCJ) osteoarthritis. This study compares the short term outcomes of trapeziectomy alone and PI2 implantation. We undertook a cross-sectional observational study involving 33 patients (36 thumbs). 18 thumbs had trapeziectomy alone and 18 had PI2. Preoperative radiological assessment using the Eaton and Glickel grading for CMCJ osteoarthritis and clinical review including DASH and SF-36 score was performed at a mean follow-up of 18 months. Preoperative and postoperative pain level was assessed using Visual Analogue Scale (VAS) and satisfaction of the surgery using the Likert 5-point scale. There were 30 women and 3 men. Mean DASH score at follow up was 26.8 for trapeziectomy and 35.4 for the PI2 group. Preoperative to postoperative VAS for pain showed an improvement from fair to excellent in 60% of patients in trapeziectomy and 30% of the patients in PI2 group. 6 out of 16(38 %) patients in PI2 group had multiple surgeries mainly due to dislocation or subluxation of the implant. The overall Likert 5-point scale scores were highest for trapeziectomy group with 70% very satisfied compared to 40% in PI2 group. Preliminary results of PI2 show a relatively high complication rate compared to simple trapeziectomy. Complications such as subluxation and dislocation observed in the early cohort resulting in multiple surgeries

may be attributed to steep learning curve of the surgical technique and creation of a shallow groove for the implant. This may have contributed to the low satisfaction levels observed in P12 group.

A-0450 An online registry for total wrist replacement

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The purpose of this paper is to present a newly created, webbased registry, collecting data on the results of total wrist arthroplasty using the Re-motion total wrist implant. To this date, 127 cases from 5 centers have been registered, but as the number of cases and registered centers increases continuously and the data are analyzed instantly and automatically when new data are added, updated data and analyses will be presented. Analyses comprises life tables for implant survival and follow-up results at regular intervals. At this moment a 2-year follow is available on 53 cases, a 3 year follow-up on 41 cases, a 4-year follow-up on 21 cases and a 5-year follow-up on 13 cases. E.g.: Two-year follow-up data show, that pain - measured on a visual analogue scale - was reduced efficiently from 59 to 11. Function - evaluated by the QuickDASH - was improved, in almost all cases from. Grip strength increased in average by 70 percent, dorsal flexion by 20 percent, ulnar flexion by 25 percent and forearm rotation by 13 percent, while volar and radial flexion remained essentially unchanged. The 7-year survival rate of the implants was 95 percent.

A-0459 Novel pyrocarbon interposition arthroplasty for the wrist when radiocarpal and midcarpal joint destruction

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Purpose: Post traumatic, arthritic or degenerative destruction of the midcarpal and radiocarpal joints are difficult to treat. Surgical options are denervation, total arthrodesis or total wrist prosthesis. We propose a new arthroplasty of the radiocarpal and midcarpal joints with an interposition of a free pyrocarbon implant. We are reporting the preliminary results of this technique in a prospective series of 22 cases.

Methods: The implant has a quadri-elliptic almond like shape. There are 8 sizes depending on the length and the thickness of the implant. The arthroplasty can be performed with a posterior approach or a radial approach. Bone resections involve the distal styloid of the radius, the 2 proximal thirds of the scaphoid, the lunate and the proximal head of the capitate. The implant is inserted in place of the bone resections without any bone fixation or ligamentoplasty. From November 2008 to June 2010, 22 arthroplasties were performed in 13 males and 9 females with a mean age of 59 years (37 to 80). The aetiology of the destruction of the wrist were a SNAC or a SLAC wrist in 5 cases, a radius malunion in 4 cases, a failure of a partial arthrodesis in 4 cases, a failure of a silicon intra-carpal implant in 3 cases, a Kienböck disease in 2 cases, a rheumatoid arthritis in 2 cases, a failure of a proximal row carpectomy in one case, a sequelae of septic arthritis. Results were evaluated radiographically and clinically on pain (VAS), wrist mobility, strength (grasp), function with 2 autoquestionnaires (PRWE and quick-Dash) and patient satisfaction.

Results: The mean follow-up was 14.3 months (6 to 24 months). Complications included 3 CRPS and 3 axial rotation of the implant. Two of them were reoperated on with a bigger implant in one case and a proper repositioning of the implant in the second one. No dislocation were noticed. Pain and function improved a lot in all cases. Improvement of mobility and strength depended on the aetiology and the preoperative conditions. On the X-rays the implants remained in place and mobile for the 22 patients. No adverse effects were noticed either on soft tissues or bone. 21 patients were satisfied or very satisfied with there operation.

Discussion: This interposition implant has two surfaces of mobility. Its shape and its free motion allow to adapt its position during wrist movements. The main extrinsic ligaments of the wrist are spared and bone resections are minimal therefore the wrist remains stable and keeps its bone stock. This minimally invasive procedure does not cut the bridges for a reoperation with a total arthrodesis or total wrist arthroplasty in case of a major complication.

Conclusion: This interposition arthroplasty can be a solution for difficult problems of the wrist. It can be an alternative to more invasive and palliative solutions. Nevertheless, subluxation of the radio or the midcarpal joint, gross instability, or weak bone stock of the wrist seem to be contra-indications for this arthroplasty.

A-0497 Trapeziectomy and tendon interposition for the osteoarthritis of the trapeziometacarpal joint: benefits of the anchovy anchor fixation and tendon suspension

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Purpose: Trapeziometacarpal osteoarthritis is a common pathology, affecting predominantly postmenopausal women, causing swelling, pain and finally, loss of function. Numerous surgical procedures are used after the failure of the conservative treatment. The objective in this clinical study was to determine the long term results of our technique (trapeziectomy with tendon interposition) and the benefits of the resorbable anchoring of the anchovy-like structure at the base of the first metacarpal and the flexor carpi radialis suspension.

Materials and Methods: This is a continuous, retrospective, single surgeon series. 30 cases of advanced thumb trapeziometacarpal osteoarthritis (grades 3-4 Eaton-Littler) were treated with trapeziectomy, tendon interposition and anchovy anchor fixation and suspension. The average follow-up was 3 years. We assessed the outcomes subjectively and by clinical, functional and radiographic examination. The DASH score and the visual analogue pain scale were used to evaluate the patients pre- and postoperatively. The objective assessment included the range of motion, key pinch, and grip strength.

Results: Of the 30 thumbs, 86,67% achieved good pain relief and 90% regained sufficient strength and painless mobility to allow normal activities of the daily living. Key pinch improved significantly at 50% of patients, but continued to be 35% lower than the contralateral, healthy side. The grip strength was improved in 70% at 12 months. Hyperextension of the MCP joint occurred in 10 cases. Collapse of the trapezoid height was found in 80% patients at radiographic control, but did not affect their mobility. The overall rate of satisfaction was 90%. None of the patients needed reintervention. The reflex sympathetic dystrophy diagnosed in 4 patients (13,3%) had a negative impact on the short term result.

Conclusion: The outcomes of our modification of the classical trapeziectomy with tendon interposition by resorbable anchor fixation of the anchovy-like structure at the base of the first metacarpal and flexor carpi radialis suspension showed that this is a reliable procedure, technically simple, without the necessity of bony drilling, with good results, low complication rate and high level of patient satisfaction at long term follow-up.

A-0498 Pyrolytic metacarpophalangeal implants in osteoarthritis

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Introduction: Indications for MCP prosthesis are limited excepting rheumatoid arthritis; in these patients the Swanson implant is most often used. In osteoarthritis of the MCP joints we implant the pyrolytic prosthesis.

Material – Methods: Between May 2002 and December 2008 we implanted 11 MCP prosthesis in 11 patients (7 men and 4 women) presenting idiopathic osteoarthritis in 7 cases and post-traumatic osteoarthritis in 4 cases. The mean age of the patients was 46 years (19 to 70 years). The dominant hand was operated in 5 cases. The surgical procedure concerned the index finger in 2 cases, the middle finger in 7 cases, the annular and the auricular in 1 case respectively. The preoperative mean arc of motion was 39° (-13° / 52°). Grip strength was evaluated to 65% of the opposite side. All the 11 patients were reviewed with a minimum follow-up of 1 year and a maximum of 7 years. Results With a mean follow-up of 51 months (12 to 92 months) 9 patients are satisfied or very satisfied and 2 patients are not satisfied. 7 patients are painfree and 4 patients present some barometric pain with a maximum of 2 points on the EVA scale. The mean arc of MCP motion is 56° (-14° to 70°) corresponding to a gain of 17°. The grip strength is evaluated to 80% of the opposite side. The radiographic analysis note a subsidence of the implants superior to 2 mm in one case, of 1 to 2 mm in 5 cases and inferior to 1 mm in 5 cases. There is no desaxation of the implants. A periprosthetic radiolucent line appears around all implants during the six post-operative months.

Discussion: Results of MCP pyrolytic implants are excellent in idiopathic osteoarthritis. 6 of the 7 patients considered the hand to be normal and have "forgotten" the implant. Results are less encouraging in post-traumatic osteoarthritis probably because of the associated lesions of the soft tissues. The pyrocarbone shows no sign of wear on the X-rays; a longer radiographic follow-up is necessary to control if there is increasing of the subsidence of the implants. In rheumatoid arthritis we always implant silicone spacers because these implants are easier to use when dealing with MCP dislocations, in cases of osteoporotic bone and in cases of involving the 4 MCP joints. Finally the functional demand of these patients is lower.

Conclusion: Idiopathic osteoarthritis of the MCP joint represents an excellent indication for implantation of pyrolytic prosthesis.

A-0503 The distal radius replacement and resurfacing prosthesis for complex intra-articular fractures

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Purpose: Complex intra-articular distal radius fractures represent a challenging therapeutic problem, specially in elderly and osteoporotic patients. Fixation with stable plates is a solution for metaphyseal instability, specific fixation of each intra-articular fragment remains sometimes a very difficult problem. In these cases with a major intra-articular comminution we propose to replace and to resurface the distal radius by a prosthesis, in fractures related to aging and osteoporosis.

Material-Methods: The prosthesis is composed of a radial stem and an epiphyseal-metaphyseal block articulating both with the carpal condyle and the ulnar head. Since March 2005, 11 patients were operated. 10 women and 1 man, the mean age was 75 years old (38 to 88). 10 cases concerned elderly and osteoporotic patients: 7 times for complex intra-articular fractures and 3 times for malunion. In one case the procedure concerned a young man with a pathologic fracture (geant cell tumor). The patients were reviewed with a mean follow-up of 31 months (from 2 to 55 months).

Results: 10 patients are satisfied or very satisfied, one patient is dissatisfied with a painful and stiff wrist after an algodystrophic syndrome. The mean mobilities are : extension 65°, flexion 30°, ulnar deviation 20°, radial deviation 20°, pronation 65°, supination 60°. The mean strength was 80% of the controlateral strength. The implants are perfectly stable on the x-rays with a mean follow-up of 31 months.

Discussion: The replacement and resurfacing of the distal radius by a prosthesis articulating both with the carpal condyle and the ulnar head are possible. This concept allows the treatment of the most complex distal radius fractures with metaphyseal instability and intra-articular comminution. The clinical results are very encouraging. These results are better compare to the results of complex reconstruction; the mobility is superior to mobility obtained after palliative surgery : radio-lunate or radio-scapho-lunate arthrodesis.

Conclusion: The treatment of complex intra-articular distal radius fractures by replacement and resurfacing prosthesis is a solution we can now discuss in elderly patients with osteoporosis. This solution must be known for distal radius tumors.

A-0536 Ulnar Head Implant Arthroplasty for Treatment of Arthritis of the DRUJ

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Introduction: Ulnar head implant arthroplasty is becoming an increasingly used option for the treatment of arthritis of the distal radioulnar joint (DRUJ) because it has the potential to avoid problems of radioulnar impingement associated with complete or partial resections. It is our hypothesis that ulnar head arthroplasty results in a functional range of forearm motion, good patient satisfaction, and good radiographic findings.

Methods: Following institutional review board (IRB) approval, the initial consecutive 28 patients (28 wrists) who had undergone distal ulnar arthroplasty (three different manufacturers' implants we used) by a single surgeon were reviewed. Following surgery, patients were evaluated clinically for range of forearm motion, grip strength, and complications. Radiographs were obtained preoperatively and at follow-up. Postoperatively, the Patient Rated Wrist Evaluation (PRWE) survey was applied.

Results: Mean age at surgery was 54 years (range: 23-82 years). Most common preoperative diagnoses were primary DRUJ arthritis (14), arthritis secondary to fracture or malunion (10), and rheumatoid arthritis (3). Ten patients had undergone previous operations on the distal ulna. Postoperatively, four patients were lost to follow-up, two patients died prior to final follow-up, and one patient had their prosthesis removed for loosening and pain. Mean follow-up for the twenty patients completing our series was 2.6 years (range: 9 months-9.7 years). Of these twenty, one patient required additional surgery for instability that responded to conversion to a smaller head and soft tissue reconstruction. Postoperative range of motion averaged 71 degrees and 55 degrees for pronation and supination respectively. Flexion averaged 55 degrees, while extension averaged 52 degrees. Average ulnar deviation and radial deviation were 23.1 and 14.7 degrees respectively. Grip strength at final follow-up averaged 77 lbs on the patients' operative side compared to 91 lbs for the unaffected side. At final follow-up, average PRWE scores were 18.5 for pain and 15.7 for function, with a total score of 34.2.

Summary Points: Ulnar head implant arthroplasty is becoming an increasingly used option for the treatment of arthritis of the DRUJ because it has the potential to avoid problems of radioulnar impingement associated with complete or partial resections. At mean followup of 2.6 years, ulnar head implant arthroplasty results in a functional range of forearm motion, good patient satisfaction, and good radiographic findings.



A-0002 Genome-wide association study finds 9 susceptibility loci for Dupuytren's disease and suggests a major role for WNT-signaling

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Purpose: Dupuytren's disease (DD) is a benign fibromatosis of the hands and fingers, often leading to the patients being unable to straighten affected fingers fully. We hypothesized that the susceptibility to DD is influenced by multiple genetic and environmental factors. We performed a genome-wide association study to identify DD susceptibility genes and further understanding of its pathogenesis.

Methods: The genome-wide association study included 960 Dutch DD cases and 3,117 controls. The top-35 associated single nucleotide polymorphisms (SNPs) were replicated in three independent cohorts, comprising 1,365 DD cases and 8,445 controls from Germany, the UK and the Netherlands.

Results: Initially we observed genome-wide significance for eight SNPs at three loci. After replication and joint analysis of 2,325 DD cases and 11,562 controls, we had 11 SNPs from nine different loci that showed genome-wide significance. Six DD loci contain genes known to be involved in the WNT signaling pathway.

Conclusions: This study implicates nine different loci involved in the genetic susceptibility to DD. The presence of WNT signaling pathway genes in six of the nine loci suggests that it is likely to be a key player in the fibromatosis process observed in DD.

A-0276 Ultrastructural study of radial Dupuytren's disease

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Purpose: To study the ultrastructure by electron microscopy of cords in Dupuytren's disease located in the thenar and first web location, radial Dupuytren's disease, and a similar study of palmar cords and normal aponeurosis, to compare them in order to discover resemblances or differences.

Methods: Cords from 5 patients surgically treated of radial and palmar Dupuytren's disease were studied, with 59 tissue samples from radial location and 36 from palmar area and 13 tissue samples of normal palmar aponeurosis from patients operated for carpal tunnel syndrome. Samples 1mm³ sized were directly fixed in 3% glutaraldehyde in 0.1 M sodium cacodylate buffer. Later on they were specially treated for transmission and scanning electron microscopy studies. Samples were examined with a Zeiss EM 10C or Zeiss EM 109 electron microscope and with a JEOL SM-6100 scanning microscope. Cells and extracellular components were studied Results Scanning microscopy. There were some differences between thenar and first web cords, being the first less structured, with less set fiber bundles, with longitudinal orientation and a smooth, compact surface. Cords in the first web space had a highly organized tissue, with parallel longitudinal fibers. They also presented fibers in an arrangement in regular waves, which is not seen in palmar cords. Transmission electron microscopy. The extracellular ultrastructure of radial cords space was similar to the one of palmar cords, with large number of fibers, densely distributed and with a similar diameter. Cells in radial cords were of two types and different from cell in palmar cords. The first type corresponded to a flat cell with oval nuclei and abundant euchromatin and nuclear heterochromatin. The surface of nuclei was smooth with folds, abundant mitochondria and microvilli (sheet like process), endoplasmic reticulum and some lysosomes. On the cell surface were founded desmosomes and adhaerens junctions. In cytoplasm filamentous fibrillar structures were identified corresponding to myofilaments. The second cell type had elongated nuclei with dense chromatin, with cytoplasmic extension and myofilaments and they could be in the involutive phase of Luck and within Wassilev type III.

Conclusions: The cellular characteristics and the presence of myofilaments that define myofibroblasts have been described only in nodules but not in cords of palmar Dupuytren's disease. However cells from cords from radial cords have characteristics of myofibroblasts; so they would be also present in cords when cords are located in the radial location. Also the arrangement in regular waves seen in radial cords has been described in nodules only. This gives a special peculiarity to radial cords.

A-0286 Change in Range of Motion and Degree of Contracture After Treatment With Collagenase Clostridium Histolyticum for Dupuytren's Contracture: Pooled Analyses From 2 Multinational Double-Blind Trials

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Purpose: Dupuytren's disease (DD) is a fibroproliferative disorder of the hand affecting ~3%-6% of the population. DD typically affects older men of northern European descent and causes progressive digital flexion contracture. Current treatment options for Dupuytren's contracture (DC) usually involve invasive surgery. Two measures of treatment success in DC are change in range of motion (ROM), an important surrogate for hand functionality in clinical trials, and change in degree of contracture. Results from the 2 multicenter, multinational double-blind clinical trials of collagenase clostridium histolyticum (CCH) for treatment of DC were pooled (N=372 patients) to provide an overall analysis of efficacy and safety of CCH versus placebo for ROM and contracture.

Methods: In the 2 double-blind, placebo-controlled trials, DC patients with contracture of a metacarpophalangeal (MP) joint (20-100 degrees) or proximal interphalangeal (PIP) joint (20-80 degrees) were randomized to receive up to 3 injections of CCH (0.58 mg) or placebo at 30-day intervals in the contracted collagen cord of the primary joint identified for treatment in each patient. The primary endpoint, correction of the affected joint to 0-5 degrees of full extension 30 days after the last injection, was previously reported for each trial. ROM, the difference between the full flexion angle and full extension angle (in degrees), and degree of contracture (flexion deformity) were assessed at baseline and 30 days after last injection. An analysis of variance with treatment, study, and baseline severity as main effects was used to test for differences in 2 secondary endpoints, change in ROM and contracture.

Results: The mean±SD age of patients was 62.8±9.4 years (range 33-89), and 81% were men. CCH was administered in 248 primary joints (153 MP; 95 PIP), and 124 primary joints (80 MP; 44 PIP) received placebo. For MP joints, following CCH treatment there was a mean±SD increase in ROM of 40.6±19.2 degrees (baseline ROM 42.2±19.1 degrees), which was significantly different (P<0.0001) from the change in placebo-treated MP joints, where ROM increased 4.4±13.0 degrees from baseline (45.1±19.4). For contracture, CCH treatment in MP joints resulted in a mean percentage decrease of 86.7±28.3% (baseline 48.2±19.3 degrees of contracture), which was

significantly different ($P < 0.0001$) than in the placebo group, where contracture decreased $8.1 \pm 31.1\%$ from baseline (45.6 ± 20.1 degrees). For PIP joints treated with CCH, ROM increased 29.8 ± 20.6 degrees from baseline (44.9 ± 19.8); ROM in placebo-treated PIP joints increased 5.1 ± 17.8 degrees from baseline (45.0 ± 16.4 ; $P < 0.0001$). There was a mean percentage decrease in contracture from baseline of $63.1 \pm 32.7\%$ in CCH-treated PIP joints and $11.9 \pm 28.1\%$ in placebo-treated PIP joints ($P < 0.0001$). The majority of CCH-treated patients experienced at least 1 treatment-related adverse event (AE), most of which were mild or moderate in intensity and resolved without intervention within 2 weeks. One serious treatment-related AE occurred in each of 4 patients.

Conclusions: For patients with DC, injectable CCH significantly improved both ROM and degree of contracture compared with placebo, with few serious adverse events. These findings from the 2 multicenter, multinational double-blind trials strongly support the use of CCH as an alternative to surgery for treatment of DC.

A-0287 Efficacy and tolerability of collagenase clostridium histolyticum in European patients with Dupuytren's contracture: results from a multicenter, open-label study

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Purpose: Dupuytren's disease is a fibroproliferative hand condition causing progressive digital flexion contracture, typically affecting older men of northern European descent. Treatment, when necessary, has usually involved surgery. Injectable collagenase clostridium histolyticum (CCH) is a minimally invasive, non-surgical therapy to correct Dupuytren's contracture (DC). We evaluated the efficacy and tolerability of ≤ 5 CCH injections using a protocol designed to follow clinical practice. In this abstract, we report results from European patients enrolled in this trial.

Methods: This was a 9-month, open-label study in which DC patients with primary flexion deformities of 20 - 100° for metacarpophalangeal [MP] joints or 20 - 80° for proximal interphalangeal [PIP] joints received ≤ 3 CCH (0.58 mg) injections/cord (≤ 5 injections/patient) at 30-day intervals. The current analysis reports data from the patients

enrolled at 12 sites in Denmark, Finland, Sweden, Switzerland, and the United Kingdom. The primary endpoint was clinical success, defined as a reduction in contracture to $\leq 5^\circ$ 30 days after the last injection ("Day 30"). After first injection into a prioritized cord, patients opted to receive up to 2 more injections into the same cord, or into cords from other affected joints, whether or not they achieved clinical success with the first joint. Adverse events (AEs) were monitored.

Results: In Europe, 137 patients (91.2% male) with a mean \pm standard deviation (STD) age of 63.5 ± 9.4 years were enrolled; these patients received a total of 282 CCH injections (1.3 ± 0.62 injections per cord). For the primary endpoint, 61.3% of MP ($n=119$) and 37.9% of PIP ($n=95$) joints showed a reduction in contracture to $\leq 5^\circ$ at Day 30 after CCH injections. The mean \pm STD percentage change in degree of contracture from baseline to Day 30 was $84.1 \pm 22.1\%$ in MP joints and $61.8 \pm 43.1\%$ in PIP joints. Range of motion in MP joints increased from $46.6 \pm 18.9^\circ$ at baseline to $82.4 \pm 16.3^\circ$ at Day 30 (mean \pm STD change, $35.9 \pm 16.6^\circ$), and from $53.8 \pm 18.3^\circ$ to $80.9 \pm 17.9^\circ$ (mean \pm STD change, $27.1 \pm 17.5^\circ$) in PIP joints. Physicians rated 45.2% of patients "very much improved," 39.7% "much improved," and 12.7% "minimally improved." In patients' global assessment, 72.2% were "very satisfied" and 22.2% were "quite satisfied" with their treatment. Overall, 97.8% of patients reported at least 1 treatment-emergent AE. Most commonly reported AEs were localized bruising, edema, hemorrhage, pain, swelling, and tenderness; most resolved without intervention within a week. There were no serious AEs deemed to be related to CCH treatment.

Conclusions: Results from European patients enrolled in this open-label study provide support for the efficacy of CCH in correcting the flexion deformity of MP/PIP joints in patients with DC. The safety profile in this subgroup of patients was similar to that observed in previous studies. Long-term follow-up data is as yet unavailable.

A-0292 Collagenase clostridium histolyticum for the treatment of Dupuytren's contracture: mechanism of action and tissue effects

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The collagen of the extracellular matrix is not static but is constantly being remodeled in response to the local environment. Collagen remodeling is tightly regulated in vivo,

resulting in a balance between synthesis and degradation which allows the quantity and quality of the extracellular matrix to be adapted precisely to physiologic need. Disregulation of the balance between these two processes in favor of collagen deposition has been shown to have a role in the pathogenesis of a number of fibrotic conditions, notably in Dupuytren's contracture. A purified bacterial enzyme, collagenase clostridium histolyticum, (known as Xiaflex [US]/Xiapex [EU]) has recently been approved in the United States for treatment of Dupuytren's contracture by direct injection into the pathologic collagen deposit of the Dupuytren's cord. This product is composed of a fixed ratio mixture of the two collagenases secreted by the bacterium *Clostridium histolyticum*; each enzyme attacks a different site on the collagen molecule resulting in synergistic activity when they are used in combination. The result is rapid and complete degradation of collagen into a number of small fragments which are readily removed from the site of formation by a combination of additional enzymatic proteolysis and phagocytosis. In tissue explant cultures treated with collagenase clostridium histolyticum, enzymatic digestion is most rapid in the first four hours following injection, with nearly complete lysis of collagen occurring within 12 hours. Collagen lysis in these experiments was confined to the area and volume of the injection, with sharp demarcation between the affected and adjacent unaffected areas. Collagenase clostridium histolyticum has activity primarily against the fibrillar collagen subtypes; in particular, it has good activity against type I and type III collagen which are the primary structural components of the Dupuytren's cord. In contrast, the enzyme has limited to no activity against the primary component of vascular and epithelial basement membranes and the perineurium, type IV collagen, which protects these structures from degradation by the enzyme. The result is selective lysis of the structural collagen components of the Dupuytren's cord with sparing of arteries, nerves and capillaries following local injection.

A-0299 Efficacy and safety of collagenase clostridium histolyticum (CCH) in patients who had previous hand surgery

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Purpose: Treatment for Dupuytren's contracture (DC) involves excision or division of the collagen cord in affected finger(s). Although surgery can improve outcomes, recurrence is common, and patients typically require retreatment. Surgical retreatment may be complex and results

in higher complication rates compared to primary procedures. Collagenase clostridium histolyticum (CCH) is a non-surgical therapy with efficacy in correcting DC. The efficacy and safety of CCH in patients with DC who had previous surgery for the condition were evaluated.

Methods: Data from 12 CCH clinical trials were pooled. Three of the 12 were open-label studies, and six were randomized, double-blind, placebo-controlled trials; three of these trials had open-label extensions. Although study designs differed slightly, in general, patients with joint flexion deformities $\geq 20^\circ$ could receive ≤ 3 collagenase (0.58 mg) injections/joint at 30-day intervals. Efficacy was based on fixed flexion contracture (FFC), and adverse events (AEs) were monitored. At screening, patients were asked if they had previous surgery for DC and, if so, to provide details about the type/date of surgery. Independent reviewers coded all verbatim descriptions to the hand, finger, and joint receiving surgery. Data from 1082 patients were analyzed; 422 (39%) patients had previous surgery for DC. For these subjects, patient- and joint-level data were coded/categorized as CCH treatment on the Operated hand (n=206 patients) and CCH treatment on the Non-operated hand (n=196 patients) groups. Patients without an identifiable surgical hand (n=20) were excluded. Endpoints included changes from baseline in FFC and range of motion (ROM). Efficacy and safety were compared between the CCH treatment on the Operated hand and CCH treatment on the Non-Operated hand groups. Results. Mean \pm SD time from surgery to first CCH injection was 6.9 \pm 6.2 years. After CCH treatment for MP joints, mean \pm SE percentage reductions in FFC were 75 \pm 2.8% (n=126 joints, Operated hand) and 80 \pm 2.0% (n=209 joints, Non-operated hand; P=0.6); mean \pm SE improvements in ROM were 32 \pm 1.9 $^\circ$ and 32 \pm 1.2 $^\circ$ (P=0.9), respectively. For PIP joints, mean \pm SE percentage reductions in FFC were 52 \pm 2.6% (n=185 joints, Operated hand) and 50 \pm 3.7% (n=148 joints, Non-operated hand; P=0.6); mean \pm SE improvements in ROM were 24 \pm 1.5 $^\circ$ and 26 \pm 1.7 $^\circ$ (P=0.3). AEs occurring in >30% of patients in the Operated hand (n=206) and Non-operated hand (n=196) groups were: edema peripheral (84% and 76%; P=0.05), contusion (64% and 49%; P=0.003), injection-site pain (36% and 44%; P=0.09), extremity pain (49% and 30%; P<0.001), and injection-site hemorrhage (35% and 41%; P=0.3). Statistically significant differences were not deemed to be clinically significant. Most AEs were mild or moderate in intensity and resolved without intervention. There were no significant differences in AE duration between patients with CCH in the Operated hand and CCH in the Non-operated hand groups (P>0.08).

Conclusions: These findings suggest that previous surgery for DC does not affect the efficacy or safety of CCH. This is important, as CCH can be a viable option in patients recurring after previous surgery. AE rates were slightly higher, but not clinically significant.

A-0316 The Southampton Dupuytren's Scoring Scheme

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Purpose: The aim of this study was to construct and validate a simple patient related outcome measure scheme to quantify the disability caused by Dupuytren's Disease (DD) thus enabling prioritisation of treatment, allow reliable audit of surgical outcome and support future research.

Methods: The Southampton Dupuytren's Scoring System (SDSS) was developed in a staged fashion according to the recommendations of Derby Outcomes Conference. 1. item generation from questionnaire filled in by 20 patients; 2. item reduction to create a 20-question proforma; 3. Internal consistency (Cronbach's alpha) 4. Test-retest (3 week interval testing on 61 patients) 5. Field management was used to assess the user friendliness of the scoring system. 6. Sensitivity to change Standardised response mean 7. Construct validity : ability of the SDSS to measure what it is supposed to measure. comparing SDSS with QuickDASH (Disability of Arm, Shoulder and Hand) Results Internal consistency: Cronbach's alpha was 0.87. (Cronbach's alpha of 0.8-0.9 indicates acceptable reliability). Test-retest reliability: The test re-test correlation coefficient was 0.79 between SDSS scores at a three-week interval (high reliability). Field-testing: The SDSS ratings were found to be higher than the QDASH ratings evaluated by the patients who answered both questionnaires. Sensitivity to change: Standardised response mean was more sensitive for SDSS compared to QuickDASH (-1.76 vs -1.19 $p > 0.05$) Construct Validity: To assess if the SDSS is measuring what is supposed to measure, we compared the SDSS with QuickDASH. A high significant correlation (Pearson correlation-0.598) was found between the two scoring systems.

Conclusions: SDSS is a suitable disease-specific patient related outcome measure for DD. It has good internal consistency and is performs better than QuickDASH in terms of test-retest reliability and sensitivity to change. SDSS shows better field-testing attributes suggesting that it is a relatively more patient and practitioner friendly scoring system. We propose the SDSS is a useful patient related outcome measure for DD.

A-0410 5-year results of randomized clinical trial on treatment in Dupuytren's disease: percutaneous needle fasciotomy versus limited fasciectomy

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Background: Now that the armentarium to treat Dupuytren's Disease is increasing, there is a need for comparative studies. Here we present the 5-year follow-up results of our randomised controlled study that compared percutaneous needle fasciotomy (PNF) and limited fasciectomy (LF).

Methods: 111 patients with 115 affected hands with a minimal passive extension deficit of 30° were randomly assigned to the treatment arms. Follow up was at one and six weeks, six months, 1,2,3,4, and 5 years postoperatively. Outcome parameters were Total Passive Extension Deficit (TPED), patient-satisfaction, finger flexion and sensibility. Besides, we recorded if disease extension occurred during follow-up. Primary end point was recurrence in any treated ray, defined as an increase of TPED of >30°.

Results: After 5 years, the recurrence rate in the PNF group was with 84.9% significantly higher than that of the LF group (20.9%), $p < 0.001$, and occurred significantly sooner in the PNF group ($p = 0.001$). Higher age at time of treatment diminishes the risk of recurrent disease, $p = 0.005$. We were unable to prove that diathesis characteristics influenced recurrence. Satisfaction was high in both groups, but in the LF group significantly higher than in the PNF group. Nevertheless, many patients (53%) chose to have their recurrence treated by PNF.

Conclusions: PNF is best suitable for elder patients and for those willing to accept the drawback of a possible early recurrence and want to benefit of advantages such as fast recovery, low complication rate and minimal invasiveness.

A-0418 Treatment of severe Dupuytren's contracture by homo- or heterodigital flaps

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In comparison to the MCP joint the contracted PIP joint in Dupuytren's disease is more difficult to release by Bruner Zig- zag incisions or Z-plasties.

Method: From 1.1.2005 to 31.12.2010 flap plasties (35 homodigital, 5 heterodigital) were used in a total amount of 40 patients (5 women, 35 men) in a contraction of the PIP

joint of more than 30°. Mostly the flap was taken from the dorso-ulnar side of the midphalanx. The defect was closed by a skin graft or by a bilobed flap. This method can easily be combined with the open palm technique in Tubiana stage 3 and 4.

Results: In all cases with preoperative PIP joint contraction up to 60° full joint extension could be reached, but flexion contracture reappeared after 2 years until 20°. In joint contracture over 60° an extension deficit of 20° remained intraoperatively despite open arthrolysis. The flexion contracture reappeared up to 40° after 2 years.

Conclusion: The primary planning of flap plasties for contraction of the PIP joint over 30° increases the postoperative result because the rate of recurrence of flexion contracture is 30% less than by using conventional skin-incisions.

A-0516 Surgical management of Dupuytren's disease across 12 European countries: an analysis of patient charts

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Purpose: The fibroproliferative hand condition that causes progressive digital flexion contracture, Dupuytren's contracture (DC), is common in Europe and is usually treated surgically. However, the indications and strategies for treatment, as well as hospitalization practices and insurance coverage, may differ by country.

Methods: This study, conducted in 12 European countries (Czech Republic, Denmark, Finland, France, Germany, Hungary, Italy, Netherlands, Poland, Spain, Sweden, and United Kingdom), randomly selected 687 hand, plastic, and orthopedic surgeons to review medical charts of 5 consecutive patients treated for DC in 2008. Referral patterns, method of treatment, hospitalization data and insurance coverage, were gathered from a physician survey and

patient charts using standardized questionnaires. Descriptive statistics are reported by country and for country comparisons.

Results: In total, 687 hand, orthopedic, and plastic surgeons reviewed 3357 patient charts (ranging from 90 in Sweden to 456 in France). Mean (\pm SD) age of patients was 62.0 \pm 10.3 years, with the oldest patients in Sweden (67.0 \pm 11.4). Overall, 81% were men (71% in France; 87% in both Denmark and Finland). Most patients (77%) were referred to surgeons by another physician (53% by a general practitioner) and 23% presented directly; referrals accounted for 43% patients in Italy, 36% in Spain, and 34% in Hungary. Fasciectomy was the most common procedure performed overall (71% of patients), followed by open or subcutaneous fasciotomy (16%) and needle fasciectomy (11%). The typical wait time for fasciectomy was \geq 15 weeks in Poland, Sweden, and Finland, and \leq 6 weeks in Germany, France, Hungary, and Czech Republic. Overall, 84% of patients were treated in public hospitals. Of all patients, 47% were treated as inpatients (mean \pm SD 2.3 \pm 1.6 nights), 48% as outpatients/day cases, and 5% as office procedures. The proportion treated as inpatients was 96% in Hungary, 83% in Poland, 58% in the Czech Republic, and 56% in Germany; in contrast, it was 4% in Denmark, 8% in Finland, 9% in the Netherlands, and 14% in Sweden. For all inpatients, the mean (\pm SD) number of nights in hospital was 2.3 \pm 1.6; this was 3.3 \pm 1.9 nights in Poland, 3.2 \pm 1.8 in Germany, and 3.0 \pm 2.0 in the Czech Republic. It was $<$ 1.5 nights in Finland, Denmark, Spain, the UK, the Netherlands, and Sweden. National/public health insurance covered \geq 94% of patients' DC treatment in all countries except Finland (85%), Germany (81%), Spain (75%), and the Netherlands (69%). Private insurance covered \leq 2% of patients in all countries except in France (53%), Spain (23%), Netherlands (20%), Germany (19%), and Finland (5%).

Conclusions: Based on novel data from thousands of patients with Dupuytren's contracture in Europe, we conclude that differences in referral pattern and treatment strategies of the disease occur across Europe, but fasciectomy is still the most common surgical procedure performed by all surgeons, whether hand, plastic, or orthopedic.

A-0013 Complex wrist injuries: fractures of the lunate

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Purpose: Fracture of the normal lunate, isolate or associated with fracture of scaphoid or radius, are very rare. We present the surgical technique and results of the surgical treatment in 6 patients with lunate fracture associated with complex injury of the wrist treated between 2005 to 2010 in our institution.

Methods: Six male patients underwent to surgical treatment of complex injury of the wrist. The lunate fractures were classified according Teisen classification. Dorsal and volar approach were used in all patients except one when, proximal carpectomy was done due to gross fragmentation of the scaphoid and lunate. In the 5 remaining patients repair / ORIF was performed with bone anchors or screws.

Results: After a mean follow up of 3.7 years, the average active flexion was 75 degrees, extension 70 degrees, radial and ulnar deviation was 20 degrees. No proation-supination impairment was observed.

Conclusion: Based on Teisen classification and in their findings the authors propose a treatment algorithm.

A-0106 Minimally invasive surgical treatment of scaphoid fractures

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Purpose: Surgical treatment of undisplaced scaphoid fractures may be considered after taking into account the economic burden and the specific professional requirements of high-demand patients. Compression-screws offer stable fixation and cannulated screws limit the approach and the dissection. The surgical technique of minimally-invasive (MI) fixation of acute, undisplaced scaphoid fractures is presented and results are compared

with a group that underwent conservative treatment with cast (CCT).

Methods: Sixteen patients with acute undisplaced scaphoid fractures of the waist (12) or proximal third (4) were treated with MI fixation, under regional anesthesia. They were compared retrospectively with a CCT group of similar gender and age distribution. CCT group included sixteen patients with acute undisplaced scaphoid fractures of the waist (14) or proximal third (2) treated with a long-arm thumb spica cast. All patients were male with mean age of 28 years (15-50). For MI fixation, the cannulated compression screws were applied percutaneously through dorsal (5) or palmar (11) approach, under fluoroscopic control.

Results: Follow-up ranged from 23 to 50 months. A short-arm cast was applied for 1-2 weeks in patients with MI fixation and a long-arm thumb spica cast was applied for 9-12 weeks in the CCT group. Two complications (screw-driver tip failure) were recorded at the MI fixation group. Radiographic union was accomplished in all cases of MI fixation in 5-7 weeks and in the CCT patients in 9-12 weeks. Grip strength was restored at 8-10 weeks in MI patients whereas at 12-15 weeks in CCT patients. Full range of motion was achieved 6-10 weeks in MI patients and 10-17 weeks in CCT patients. MI patients returned to their previous occupation within 4-5 weeks whereas CCT patients resumed their previous activities after 10-14 weeks.

Conclusions: MI fixation for undisplaced scaphoid fractures provides stable fixation, expedites union and diminishes the period of professional absence, thus limiting the economic burden for the patient and the insurance system.

A-0132 Operative Treatment of Avulsion Fracture of Flexor Digitorum Profundus

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Purpose: Avulsion fracture of FDP tendon (Jersey finger) is an uncommon injury and usually related with sports

activity. We reviewed 10 cases of Jersey finger which underwent open surgical treatment and analyzed the clinical outcome.

Method: In a 9 year period (2001-2009), 10 cases of avulsion of the FDP tendon were diagnosed and treated. Fracture patterns were classified according to the extended classification system of Leddy and Packer proposed by Al-Qattan. We evaluated radiological and functional outcome.

Result: The average age of patients was 41 years old, and common injury mechanism was hyperextension by jersey (4 cases) and slip down (3 cases). The fifth finger was the most commonly affected lesion (5 cases). There were 1 case of type II injury, 4 cases of type III injury, and 5 cases of type Vb injury. The fracture fragment was fixated with mini screws and multiple Kirschner's wires. The DIP joint was fixated with Kirschner's wires temporarily in 6 cases. There was 1 case of revision surgery and 3 cases of moderate stiffness of the DIP joint. Bony union was achieved average in 6.2 weeks. Average proportion of active range of motion was 92.3%, and the final functional outcome was satisfactory in 8 cases.

Conclusion: In management of avulsion injury of FDP tendon, especially type III and V, surgeons should consider the tendency of re-displacement of bony fragment by retraction force of FDP. Rigid fixation of the fracture fragment with temporary fixation of DIP joint with Kirschner's wire may restore the normal finger function. **Key Words:** Flexor digitorum profundus, Avulsion, Jersey finger, Surgery

A-0147 Treatment of metacarpal fractures experience with internal fixation

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Purpose: Fractures of metacarpal bones one of the more frequent type of skeleton trauma. Fractures of metacarpal bones are often treated with plate stabilization or pinning fixation. High complication rates after this type of treatment have been reported in the literature. The purpose of this study is to describe the technic of intramedullary stabilization and to present outcome.

Methods: Patients who underwent a fracture of metecarpal bones between 2007 and 2009 were included in this study. 368 fractures were surgically treated with intramedullary fixation and examined. In most cases our patients were young men (307 people). The patient's average age was 23,4 years. All patients had fractures of diaphysis and metadiaphysis. In 167 cases were fractures of 4 metacarpal bone, in 149 cases - 5 metacarpal bone and other in 78 cases. It were fractures simultaneous several (two and more) metacarpal bones in 87 cases.

Results: Evaluation of the results were entrusted to objective and subjective criteria (global function by DASH, pain by VAS). Objective criteria included measurement of strength, range of motion, the duration of sick leave. The average follow-up period was 22,3 month. VAS score was 0 in 282 cases, 1 in 18, 2 in 7. The average DASH score was 3,2. We had no complication in our practice. All patient returned to previous work.

Conclusions: In cases of metacarpal bone fractures, open reduction with stable intramedullary fixation has a good result. Internal nail fixation can be recommended how very simple and effective method of metacarpal fractures treatment.

A-0152 Double trapezial sign in scaphoid nonunion

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Objective: Diagnosis of scaphoid fracture is often delayed, because of its anatomical complexity, and leads to nonunion. However, after some period, the ends of the proximal and distal segments of the fractured scaphoid become sclerotic, showing so-called "double trapezial sign". The sign means as "two trapezia in one wrist", because of the distal scaphoid segment looks like as trapezium with its sclerosis at fracture end. We reviewed the radiograms of the scaphoid non-union 36 cases retrospectively, and evaluated the "double trapezial sign" for the clinical implication of the diagnosis of scaphoid nonunion.

Methods: The reliability and reproducibility of double trapezial sign were established using 36 cases of scaphoid nonunion. Plain X-rays of the wrist of 36 cases with the clinical diagnosis of scaphoid nonunion were reviewed. The gender ratio was one female and 35 male patients with an age range of 16 to 58 years (average, 38.5 years). The period from trauma to initial radiologic evaluation range of 2 to 241 months (average, 29.1 months). Each x-ray reviewed twice for intra-observer reliability, and two hand surgeon and one musculoskeletal radiologist participated in this study for inter-observer reliability. The results of interpretation of wrist x-rays are classified into positive, suspicious and negative of double trapezial sign. Result Group A means unanimous for positive double trapezial sign, group B means unanimous for negative double trapezial sign and group C means that raters are not unanimous for the sign. The interobserver reliance, as same interpretation by one rater in different time, had statistical significance. The interobserver reliance, as same interpretation by different rater, also had statistical significance. The location of fracture was more waist or slightly distal in positive double trapezial sign.

Conclusion: Although several established radiologic findings of nonunion of scaphoid, clear diagnosis is still difficult in some cases. On this account, surgeons usually check CT and MRI to evaluate and confirm the nonunion. But once plain X-ray shows double trapezium sign, nonunion of scaphoid can be confirmed without other radiologic modalities. The "double trapezium sign" is quite distinctive radiologic feature, and easy to read in plain X-ray of wrist joint.

A-0154 A percutaneous transtrapezium approach to scaphoid fractures does not lead to ST degeneration

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Purpose: Biomechanical studies have shown that a long, centrally placed screw is favourable in scaphoid fracture fixation. A volar percutaneous transtrapezium approach was used to facilitate central screw placement. The purpose of this study was to evaluate radiographic changes at the ST-joint at long term follow up in patients where this approach was used.

Methods: Results were graded with use of the visual analogue scale (VAS) and modified Mayo wrist score. Radiographs of both hands, comprising an anteroposterior, lateral and 45 degrees pronated oblique view were obtained. Degenerative changes at the ST-joint were staged according to the modified Eaton & Glickel classification.

Results: 34 patients with an average age of 34 years were followed at a mean of 6.1 years (4-9). Union was obtained in all at an average time of 6.4 weeks (6-10). There were no significant differences in VAS score and ROM, between the operated and nonoperated side ($p > 0.05$). The mean Mayo wrist score was 93 (80-100). Three patients showed stage 2 osteoarthritis of the ST-joint. In 2 patients, stage 2 osteoarthritis was found in the injured and uninjured side. One patient had asymptomatic stage 2 degenerative changes limited to the injured side.

Conclusions: The advantages of the volar percutaneous transtrapezium approach include central screw placement, without the need for manipulation of the wrist. From the present study it can be concluded that the volar percutaneous transtrapezium approach to fix scaphoid fractures does not lead to significant radiographic degenerative changes in the ST joint at a follow-up of more than 6 years.

A-0162 Percutaneous Transtrapezium Screw Fixation of the Scaphoid Fractures

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Purpose: Percutaneous screw fixation of the minimally displaced scaphoid fractures has gained popularity because of the high union rates and early return to job. However, central screw placement is very difficult because of the unique scaphoid shape and obstruction by the trapezium when using a standard volar approach. The purpose of this study is to evaluate the clinical results of the percutaneous transtrapezium approach, in which screws are advanced through the trapezium.

Materials & Methods: There were ten men and five women. The mean age was 45 years (range 20-59 years). The mean follow-up time was 13 months. For all cases, the standard Acutrak headless screw (Acumed[®], Beaverton, Oregon) was used.

Results: At the period of follow up, the arc of motion ranged on average from 40 degrees of flexion to 45 degrees of extension and the grip power of the affected hand reached on average 90% compared with the unaffected side. Clinical results assessed by modified Mayo score showed twelve excellent and three good results. On plain radiographs, all cases showed good central placement of the screw. The mean time to union was 7.8 weeks and no changes at the scaphotrapezium joint were observed.

Conclusion: We believe that a percutaneous transtrapezium approach is a reliable method. However, longer follow up period would be required because of the possibility of arthritic change at the scaphotrapezium joint.

A-0168 Optimal fixation of acute scaphoid fractures - a cadaveric study

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Purpose: Several reports described the biomechanical advantage of central placement of a headless cannulated screw in transverse scaphoid waist fractures. Using a finite element computerized model it has been shown that for different fracture configurations, more stable fixation is achieved by a screw placed perpendicular to the fracture plane. In addition, central placement is technically difficult in specific clinical scenarios such as the case of a distal percutaneous approach. There were 2 aims to the current study:

1. To confirm the results of the computerized model with a cadaveric model of an unstable oblique fracture;

2. To evaluate the placement of a screw perpendicular to the fracture through the scaphoid tuberosity.

Methods: Eight pairs of cadaveric scaphoid bones were removed from fresh cadaveric wrists. Oblique osteotomies were designed for each specimen using a standard template and fixated with a Synthes 3.0 HCS cannulated screw. In each matched pair, one of the scaphoids had the screw positioned, at the center of the base and the other was placed perpendicular to the fracture, as confirmed using fluoroscopy. The screw which was placed perpendicular to the oblique fracture resulted in the screw being directed toward the scaphoid tuberosity. The specimen was then potted in a holder using polyurethane and placed into a fixture with a pneumatically driven plunger that was resting on the surface of the distal pole of the specimen. The load acting through the plunger had been increased gradually and was measured using a load-cell; its excursion was measured as well. Stiffness, load at failure and mechanism of failure were measured, and the two groups (central vs. perpendicular screw placement) were compared with regard to stiffness and strength. Results We found no difference between central placement of the screw in the base of the scaphoid compared with positioning of the screw perpendicular to the fracture plane. Stiffness was found to be similar (131 N per mm in the central screw vs. 131 N per mm in the perpendicular screw; ns) as well as a similar load to failure (137N in the central screw vs. 148N in the perpendicular screw; ns).

Conclusions: In this biomechanical model of an unstable scaphoid fracture we found that a similar stability of the fixation had been achieved when comparing placement of the screw perpendicular to the fracture plane or placement of the screw in a central position in the base of the scaphoid. Specifically, placing the screw through the tuberosity, without violating the trapezium or the scapho-trapezoid joint, will not impair fixation stability according to this model of an unstable fracture.

A-0179 Functional Conservative Treatment of Proximal Phalangeal Fractures using the Lucerne Cast (LuCa) - Do We Have to Immobilize the Wrist?

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Purpose: Over the past three decades, dynamic splint systems for nonoperative treatment of proximal phalangeal fractures have been described by several authors. The main principle of these casts is an intrinsic-plus-position of the metacarpophalangeal joints causing the extensor hood

to tighten and to move distally, which results in two thirds of the proximal phalanx being embraced. Until recently, all treatment protocols using dynamic splints included an immobilization of the wrist joint. The purpose of our study was to compare the clinical and radiological results of conservative-functional treatment using two different types of casts, with or without immobilization of the wrist joint.

Methods: From September 2008 to September 2010, a prospective randomized multicenter study was conducted on four hospitals in Switzerland. Clinical and radiological results of 77 consecutive patients having 86 fractured proximal phalanges were recorded through a minimum follow-up of 3 months. Intra-articular fractures, pathological fractures, and open fractures were excluded. Patients were randomly assigned into two groups, to be treated either with a short cast (n=44), or with a long cast (n=33), respectively.

Results: In four patients initially treated with a short cast, surgery was required 7-14 days after first presentation because of irreducible fracture (n=3) and a closed extensor tendon lesion (n=1), respectively. In the remaining 73 patients, fracture consolidation was achieved with a mean period of splinting of 4 weeks (minimum 3 weeks, maximum 7 weeks). Two patients treated with a long cast developed chronic regional pain syndrome. Radiologically, there were no statistically significant differences between the two groups in terms of dorsal angulation (mean: 4° with short cast, mean: 3° with long cast) or lateral deviation (mean: 1° in both groups). There was no difference in total active finger motion between the two groups, neither after cast removal nor after 12 weeks. However, range of wrist joint motion after cast removal was statistically higher in patients with a short cast (p < 0.0001). Patients satisfaction (visual analogue scale: 0-10) was high for both groups (mean: 9.5 with short cast, mean: 8.7 with long cast; p < 0.05).

Conclusions: Proximal phalangeal fractures can be effectively treated using conservative-functional casts. Clinical and radiological results achieved with a short cast (Lucerne Cast, LuCa) are comparable with those of already established treatment protocols (long casts with immobilization of the wrist joint). Since the LuCa allows free mobilization of the wrist joint, the cast is comfortable to wear and may have relevance in the treatment of disabled patients, who only can be mobilized with crutches or walkers.

A-0223 Clinical and radiological results after operative treatment of mallet fracture

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Purpose: Mallet fractures are common. Many therapeutic options for these fractures are described in literature. Operative stabilisation is generally recommended in

cases with more than one-third of the articular surface involved. We present the subjective and objective results of a single institution study with operative treatment using Kirschner wire technique.

Methods: Forty-three patients with mallet fractures, that involved at least one third of the articular surface of the distal interphalangeal (DIP) joint were treated between 02/05 and 08/09 using Kirschner wire technique. The aim was a closed reduction, otherwise an open reduction was performed using 2 Kirschner wires to fix the fragment and a third wire for a temporal arthrodesis. Postoperative splinting for 4-6 weeks before removal of the Kirschner wire was used. At a median follow-up of 24.5 months (8-60 months) 32 patients (median age 42 years; range 19-69 years) were evaluated clinically, with conventional radiography as well as ultrasound and standardized questionnaire.

Results: Five patients developed superficial wound infections as an early complication and were treated with antibiotics: two of these patients needed a removal of the Kirschner wire 3 and 5 weeks earlier than planned. As late complications, two patients showed persistent nail deformity and two had an ulnar deviation of the DIP joint. The median extension lag was 10° [0-30°], the median flexion lag was 15° [0-60°]. Eleven patients had a flexion lag of more than 20°. Four patients had an extension lag of more than 20°. All of these patients showed tendon tears or large lesions by ultrasound. Degenerative changes were noted in radiographs of 15 patients.

Conclusions: Because of unsatisfactory results in 63% (n=20), conservative treatment involving a splint for 6 weeks will be our treatment of choice in future. Operative treatment will be done in patients with mallet fractures of the thumb or those with fracture-dislocations.

A-0247 Validity of clinical scaphoid examinations in wrist injury with normal X-ray. Clinical scaphoid score (CSS) compared with scaphoid pathology confirmed by MRI

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Purpose: Clinical tests are our most important tools in assessing possible scaphoid pathology after a wrist trauma. Our aim was to evaluate the three most commonly used tests and compare them with confirmed MRI pathology in the scaphoid in spite of normal initial X-rays.

Methods: Patients aged 18 to 49 with traumatic wrist pain attending the Accident and Emergency Department (AED) Bergen, Norway from November 5th 2009 to November

4th 2010 were included if initial X-rays were normal. The X-rays included carpal bones and distal radius series. All patients were examined with the three most commonly used clinical scaphoid tests; pain in the anatomical snuffbox with the wrist in ulnar deviation (3 points), pain on the scaphoid tubercle with the wrist extended (2 points) and finally indirect scaphoid or radial sided pain when axially compressing the thumb (1 point). Both wrists were examined. The clinical scaphoid score (CSS) is a summary of the points for each examination and was used and compared with confirmed MRI pathology, where scaphoid fractures and bone bruise were considered pathological findings. MRI was done within a median of two days (range 0-28 days) after injury and was analyzed by the same radiologist (MB).

Results: We included 153 consecutive patients with acute wrist sprain; 70 women and 83 men with a mean age of 30 (range 18-49) years. A fall on the outstretched hand was the most common mechanism of injury, and many were injured during sports. Thirteen patients had scaphoid fracture and eight had scaphoid bone bruise confirmed with MRI in spite of negative X-rays. A CSS of 3 points or more (pain in the anatomical snuffbox alone, combined pain on the tubercle and axial compression of the thumb, or various combinations) had a sensitivity of 85%, specificity of 44%, positive predictive value of 13% and negative predictive value of 97% for scaphoid fractures. When adding bone bruise to fracture of the scaphoid, the sensitivity and specificity stayed unchanged, but the positive predictive value increased to 24%. When comparing examinations done by experienced AED-doctors (n=77) and new doctors with less than one year of practice at the AED department (n=76), the sensitivity increased from 71% to 100% in favour of experienced doctors.

Conclusion: In an AED setting, the three most commonly used clinical tests to identify possible scaphoid fracture fail to do so in patients with negative X-ray. The diagnostic sensitivity increase when more experienced AED doctors are involved, but the level of diagnostic precision is still low, most likely due to the general pain in an injured wrist at the time of trauma. However, in patients with less than 3 points of CSS, a negative predictive value of 97% strongly indicates that the risk of scaphoid pathology is unlikely. Our findings also imply that in patients with normal X-rays and a CSS of 3 points or more, the threshold for further MRI should be lower than in present practice.

A-0251 MRI findings in adults with acute wrist sprain and negative x-ray

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Purpose: Wrist injuries with negative x-rays are usually diagnosed as acute wrist sprain. This leads to a risk of serious injuries not being appropriately diagnosed and treated. The aim of this study was to explore the pathoanatomical diagnosis using acute MRI.

Methods: The inclusion criterion for this prospective MRI study was patients between 18 to 49 years, who attended the Accident and Emergency Department (AED) Bergen, Norway after having sustained an acute wrist trauma within the previous week. Acute x-ray excluded fractures or dislocations. MRI was done within a median of two days (range 0-28 days) after the trauma. The registration was conducted from November 5th 2009 to November 4th 2010.

Results: A total of 153 acute MRI were done out of which 38 were normal. Thus 115 of all patients had 249 pathological MRI findings even though the initial x-rays were considered normal. An average of 2 (range 1 - 8) pathological findings per patient with positive MRI was found. The most important findings were 52 fractures, 50 bone bruises, 11 TFCC injuries and four scapholunate ligament lesions. The identified fractures were located in the distal radius (n=14), scaphoid (n=13), base of the metacarpal bones (n=13), triquetrum (n=6), capitate (n=3), ulna (n=2) and trapezoid (n=1). Bone bruises (n=50) were found in all of the eight carpal bones in addition to the radius, ulna and metacarpal bones. Ten patients had traumatic tendon lesions. The remaining soft tissue pathology included synovitis (n=53), different ganglions (n=25) and thenar contusions (n=5).

Conclusions: Acute wrist sprain is an inaccurate diagnosis as our study shows that MRI of patients with acute wrist trauma and negative x-ray had pathological findings in 115 of all patients. MRI is a sensitive investigation and is a good diagnostic tool to identify injuries associated with this diffuse medical term. We found that with a more precise diagnosis, the conservative treatment for these patients was improved. The identified fractures were appropriately immobilisation in a cast for three to six weeks. The bone bruises were mostly immobilised in a supportive bandage, but cast immobilisation for two weeks was also used when pain was more prominent. The ligament lesions were conservatively treated with a high plaster above the elbow in neutral rotation. They were later referred to specialist for control, but none of them needed further operative treatment. The tendon lesions were treated with conservative immobilisation and follow up of physiotherapists. The various soft tissue injuries received symptomatic treatment with a supportive bandage and early mobilisation. In order to give more accurate treatment to the large number of different pathological findings in acute wrist sprains, we recommend that MRI should be considered as an early investigation, especially if the wrist pain does not settle within the first two weeks.

A-0293 Infection rate of open v closed fixation for metacarpal fractures

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Introduction and purpose: Complications rate of open v closed fixation for metacarpal fractures has rarely been studied, despite being such commonly performed procedures. Botte et al (1992) showed an 18% complication rate for k-wire fixation compared with Stahl et al (2001) who reported 15.2%. Fusetti (2002) reported a 33% complication rate for ORIF metacarpal fractures. Our unit treats operatively an average of 470 patients with hand fractures yearly. We present our unit's infection complication rate for these two techniques, taking a cohort of metacarpal fracture patients.

Methods: Data was obtained retrospectively from our hand therapy unit patients' notes. We reviewed all metacarpal fractures, which were treated operatively over a 6 month period (January-June 2009), with regard to fracture site, patient age, past medical history, and infection complications.

Results: Out of 167 operatively fixed hand fracture cases during this period, 112 (67%) were metacarpal fractures (open and closed) while the rest 55 (33%) were phalangeal fractures. Of the metacarpal fractures 64 (57%) were managed with ORIF. The rest of 48 (43%) were managed with k-wires. Seven (6.25%) patients had infection. All infections were seen following k-wire fixation of closed metacarpal fractures 14.6% (n=7, of 48). Infection complication rate following ORIF was 0%.

Conclusions: In our study we found that rate of infection following k-wire fixation was far higher than ORIF fixation of metacarpal fractures (14.6% v 0%).

A-0332 The long term outcome of scaphoid non-union using herbert screw and iliac crest graft

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Purpose: The purpose of this study was to evaluate the results of internal fixation of scaphoid non-union, using the Herbert screw and iliac crest graft in terms of union and functional results.

Material and methods: The study included 400 patients, 72 female and 328 male from 1990 to 2008 who were treated with Herbert screw and iliac crest bone graft. The mean duration between the traumatic event and surgery was 36 months (range 6 months to 10 years) and the dominant

hand was affected in 86% of those presented. All pts had preoperative measurement of SL angles and scaphoid length on plain radiographs, taken with both hands in neutral position. A volar or dorsal approach was used and after anatomic reduction with iliac bone graft and Herbert screw was applied. A volar thumb spica was applied for two weeks followed a splint for another four weeks and hard manual work was avoided for 6 months. Total of 392 patients were followed-up at least for 6 years. The modified Mayo wrist score, which refers to pain, functional status, range of motion and grip strength was used. Fracture union was confirmed by both clinical and radiological examination.

Results: The union rate was 99%. The mean union time was 6 months (range 4 to 12). Non union occurred in 4 patients, 2 of whom fall on there operated hand and appeared with loosening of the hardware. According to the Mayo wrist score, excellent results were achieved in 319, good in 70 and fair in 3. The time needed to achieve bone union was increased in cases with delay in treatment. The patients of this category appeared to have the less functional results, even if an excellent radiographic result was apparent. Discussion The authors believe that the main factors which affect the functional results and success of this surgical technique are 1. The prevention of the dorsal scaphoid cortex 2. The use of iliac crest bone graft that can easily fashioned to fit the defect 3. The completed excavation of the non union site and sclerotic bone 4. The rounding and trimming of the graft with a high speed drill so that the surface of the graft to match to the whole of scaphoid 5. The clinical evidence of vascularity that was a key step toward proceeding with internal fixation. On the basis of our data, we concluded that Herbert screw fixation with bone grafting is the treatment of choice for Herbert D scaphoid pseudarthrosis.

A-0385 Significance of Reduction of the Humpback Deformity in Scaphoid Reconstruction

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Significance of Reduction of the Humpback Deformity in Scaphoid Reconstruction: A Reflection of the Clinical and Radiological Outcome of united Scaphoid Pseudarthrosis Introduction The first line of treatment of scaphoid pseudarthrosis is the interposition of iliac crest graft and stabilization with a headless bone screw. Whenever possible we use a volar approach in order to facilitate the reduction of the frequently seen humpback deformity. But what is the significance of the reduction of the humpback deformity? Is it essential to get the humpback deformity reduced

regarding the postoperative outcome? The present study will correlate the reduction of the humpback deformity in scaphoid reconstructions to the postoperative outcome.

Material and Methods: From 2008 - 2010 we operated on 56 patients with scaphoid pseudarthrosis. We excluded patients with non united scaphoid and obvious factors that cause limitations of range of motion like protruding screws. 34 patients were included and got a follow-up examination. The humpback deformity was measured by a CT-Scan which has been performed in the axis of the scaphoid. Dash score, grip strength, mayo wrist score, ROM and other parameters were used to determine the clinical outcome. The cases have been divided into two groups. The first group had no or slight humpback deformity up to 25°. The second group had a humpback deformity of more than 45°.

Results and Conclusion: The follow-up period was 7.3 months on average. More than 50% had a humpback deformity of more than 45°. There was a slight better range of motion and Dash value for the first group. The second group has a significantly increased incidence of osteophyte formation. We conclude that the main disadvantage of unreduced humpback deformity is the increased occurring formation of osteophytes in the dorsal aspect of the scaphoid which might cause an impingement with extension. Therefore we recommend the proper reduction of the humpback deformity with scaphoid reconstruction.

A-0445 Open reduction and pull out fixation of the rotated avulsion fracture by the volar plate in PIP joint

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Introduction: Most of the avulsion fracture by the volar plate in proximal interphalangeal joints are small and undisplaced, so it can be treated by conservative methods. But, if the fragment size is significantly large and rotated, then the rotated fragment interfere range of motion of the proximal interphalangeal joint, and requires open reduction and fixation. In previous reports, many kinds of methods have been used, such as open reduction and internal fixation with K-wire, miniscrew, interosseous wiring and fragment excision with advancement of volar plate. If the fragment are comminuted or friable, rigid fixation is very difficult. So we tried a new method: The fragment and VP is pulled out by nylon through the base of middle phalangeal bone and tied over the dorsum of the bone.

Materials and Methods: From 2007 to 2009, authors performed this method in 5 pts (all male) The mean age was 28.4 years (13 to 54 years) The involved fingers were 4 small fingers and one ring finger Open reduction was

done thru volar zigzag incision. Two parallel holes were made with wire driver on the avulsed fragment. Thru the hole Nylon #3 was passed and volar plate was sutured as half of modified Kessler technique used in tendon suture, and then it was pulled out thru the middle phalanx and tied subperiosteally at dorsum of the bone. Active assistive ROM exercise was begun at 3rd day after operation.

Results: In all fracture, we have achieved bony union, congruous joint and good range of motion.

Conclusion: Open reduction and internal fixation by pull out technique is very effective and easy method in treatment of the rotated avulsion fracture by volar plate in proximal interphalangeal joints.

A-0488 Unreduced perilunate injuries: Treatment options and mid-term results

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Delayed diagnosis of perilunate dislocations or fracture dislocations, is a frequent complication (16% to 25% of cases, according to different series). It is known that the delayed treatment is ambiguous and lead to an unfavorable result. The aim of this study is to examine the surgical options and the mid- term results of these injuries, in a series of 16 patients who were treated with a delay more than one month. Sixteen patients of mean age 43 years (range 19 - 63 years old) where examined complaining for wrist pain caused by misdiagnosed or non-diagnosed ligamentous or osseo-ligamentous perilunate injuries.

Seven patients had a lesser arc, eight had a greater arc injury and one had a neglected dorsal midcarpal subluxation. The mean delay in diagnosis and treatment application was 10.3 weeks (range, 4 - 19 weeks) except in one patient whose delay in diagnosis was 20 years. The delay was due mainly to missed diagnosis (11 patients) and secondary to the severity of the initial injury (5 patients). Twelve patients were operated with a combined approach (dorsal and volar), three patients with dorsal and one with a volar approach. Treatment consisted of open reduction and internal fixation in 10 patients, partial fusion in four patients (as primary treatment in two and as secondary treatment in two patients) and excision of the lunate in one patient. Clinical evaluation was based on DASH and Mayo wrist score while radiographic evaluation was based on instability findings and the presence of arthritis. The range of motion and grip strength were measured using a computer assisted method.

Results: were evaluated after a mean follow up of 24 months (range 12 - 88 months). Overall results were evaluated as excellent (2 cases), good (9 cases) and fair (in 5 cases). None of the patients regain the initial range of movement or the normal grip strength, but the majority of the patients had a satisfying functional outcome for the upper limb (DASH score). We concluded that open reduction and internal fixation in cases of delayed diagnosed perilunate injuries is advisable independently from the time elapsed from injury, but the possibility of a salvage procedure is increased. Factors affecting our surgical options were: The extent of scar retraction of soft tissues, the friability of the lunate (osteopenia), and the condition of the articular cartilage particularly of the distal lunate and the head of the capitate.

A-0003 Half-year outcomes of wrist arthroscopy with intra-articular hyaluronic acid treatment

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Purpose: A chondro-protective and pain decreasing effect is attributed to hyaluronic acid. Intra-articular hyaluronic acid injection applicated intra-operatively might influence favorably both, the pain situation and the wrist joint function. We wanted to evaluate the effects of intra-articular hyaluronic acid treatment following therapeutic wrist arthroscopy, in a prospective randomized trial.

Methods: We prospectively studied 140 patients with persistent wrist pain that underwent therapeutic wrist arthroscopy in a single center by a single surgeon, followed up over a 6-months period. The 140 adults were randomly assigned to either therapeutic wrist arthroscopy without (A-group) or with (HYA-group) additional administration of intra-operative hyaluronic acid. Hyaluronic acid (Ostenil[®], 1%, 20mg/2ml) was instilled into wrist joints of 70 patients directly at the end of the arthroscopic procedure and a second time 3 weeks after operation. Clinical investigations were performed before operation, at 1, 3 and 6 weeks as well as 3 and 6 months post-arthroscopy. Mayo wrist score, DASH questionnaire, grip strength, visual analogue pain scale (VAS pain) and clinical global impression (CGI) were statistically and descriptively evaluated. All patients were categorised in 4 groups intra-operatively, related to the severity of the diagnosis (case group 1=mild pathological findings; case group 2=moderate pathological findings; case group 3=severe pathological findings; case group 4=terminal wrist damage). These groups were analysed for potential correlation between level of post-operative benefit and severity of diagnosis. For safety considerations adverse events were reported. The outcomes were analyzed by the Wilcoxon-Mann-Whitney-test.

Results: The Mann-Whitney statistics for primary endpoint Mayo total score at 3 months post-arthroscopy showed

statistically significant proven superiority for the HYA-group ($p < 0.00001$). Evaluation of Mayo sub-scores showed superiority of the HYA-group in sub-scores 'range of motion', 'pain' and 'daily activities', but not in sub-score 'grip strength'. General improvement of Mayo total score was shown in 82.6% of the A-group and 94.3% of the HYA-group. 11.8% of the A-group and 1.4% of the HYA-group presented worsening of the Mayo Wrist Score after 6 months. Superiority of hyaluronic acid treatment was also reflected by the CGI of patients and investigator at 6 months after surgery. No differences between treatment groups were observed for the DASH questionnaire and evaluation of the grip strength by dynamometer. Evaluation of Mayo total wrist score with regard to classification into different diagnostic severity groups showed observed superiority of post-arthroscopic hyaluronic acid treatment for patients with mild pathological findings and terminal wrist damage.

Conclusions: The benefit of therapeutic wrist arthroscopy can be improved significantly by intra-operative administration of intra-articular hyaluronic acid (Ostenil[®]), especially in patients with either mild pathological findings or terminal wrist damage.

A-0021 Arthroscopic Osteoid Osteoma ablation, Is it necessary to arthrolysis?

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Introduction: Osteoid osteoma is a benign bone tumor. Standard treatment is minimal invasive ablation under image controlled. Osteoid osteoma is rarely periarticular. In These cases percutaneous ablation is forbidden and contracture of the joint is evident. Arthroscopic ablation is now well developed for periarticular osteoid osteoma. We reviewed our cases to evaluate if the contracture of the joint would resolve with simple arthroscopic ablation?

Material and Method: All of our osteoid osteoma cases from our first arthroscopic ablation in Jan 2009 were reviewed from our archive. All of them were called and were examined for joint Range of motion.

Results: Four cases of periarticular osteoid osteoma two in wrist and two in elbow were found in our archives from Jan 2009 till Oct 2010. The mean time of the beginning of the symptom and the operation was 8.9 (6-23) months. Range of motion deficit between affected side and normal side was 27 (10-60) degrees. This reduced to 9 (0-18) after mean follow up of 6.7 (5-9) months.

Discussion: In spite of our few cases but it seems arthrolysis of the affected joints is not necessary to regain better range of motion.

A-0026 The Value of Wrist Arthroscopy in Kienböck's Disease

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Purpose/Background: Intact articular surfaces are of major importance for the prognosis and treatment of lunate necrosis (Kienböck's disease). Though arthroscopy is the most reliable method in the diagnosis of intraarticular pathology it is rarely applied in this condition. Purpose of this study was to evaluate, whether arthroscopy supplies additional informations of therapeutical relevance, the gained informations influence the rating of the stage of the disease and the resection of the posterior and anterior interosseus nerves reduces the complaints.

Patients/Material and Methods: Twenty prospectively evaluated patients underwent arthroscopy for Kienböck's disease. Follow up was performed after 5 ± 7 month. Initial diagnosis was performed by enhanced magnet resonance images in nineteen cases, completed by standard radiographies of the wrist in all and computed tomography in thirteen cases. Preoperative staging was performed according to the MRI-adapted classification of Lichtman and Ross [2]. (Seven wrists stage IIIA, seven wrists stage IIIB and six wrists stage IV). Pre- and postoperatively the range of motion and gripstrength were recorded. Pain was assessed by a visual analogue scale and the activities of daily live by the DASH-score. Arthroscopy and intraarticular assessment and therapy followed standard procedures. A modified denervation procedure was performed by resection of the posterior and anterior interosseus nerves The results were staged according to the system for arthroscopic staging of Kienböck's disease described by Bain and Begg [1].

Results: In general the number of damaged articular surfaces increased from Lichtman-stage III to IV. No clear correlation between the Lichtman-stage and the severity of the articular damage was found. Severe cartilage lesions were already found in Lichtman-stage IIIA and IIIB. In the opposite in stage IV patients only four of six cases showed

articular damages in the fossa lunata and only three cases damages of the midcarpal surface of the lunate. Healing performed uneventfully. At the recent follow up range of motion and grip strength were both slightly reduced. Despite wrist denervation pain reduction was low. The DASH score showed a slight improvement. The individual responses were unequivocal: Seven patients required further operations (3 proximal row carpectomies, 4 triscaph fusions). In three of these seven patients the preceding arthroscopic evaluation guided the subsequent surgical therapy to less invasive procedures. Four patients reported minimal, five patients reported remarkable improvement but all did not wish further procedures. Four patients reported complete relieve.

Conclusions: In Kienböck's disease arthroscopy detected important alterations of the articular surfaces and supplies the radiological diagnosis. Radiological staging can over- but also underestimate the cartilage damage. In selected cases this resulted in major influences on surgical treatment. Therefore in Kienböck's disease arthroscopy is of high value and is recommended as a part of the diagnosis in this condition.

Literature

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A-0076 Value and reliability of videodocumentation compared to fotodocumentation in wrist-arthroscopies

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Purpose: Reliability of digitally saved fotos in wrist-arthroscopies is limited especially in evaluation of the SL- and LT-ligaments. It is expected that documentation of ligament structures is facilitated better by videos. The purpose of this study was to determine and compare intra- and interobserverreliability of foto- and video-documents in wrist-arthroscopies.

Methods: 60 consecutive arthroscopies were done in a standardized manner. To document intra-operative findings fotos of at least the following 8 standard-views were digitally saved: Radioscaphoidal joint and radiovolar ligaments; scapholunate joint from radiocarpal; radiolunate joint; TFCC; ulnar recessus with lunotriquetral joint; scapholunate and lunotriquetral joint and the capitate facet from midcarpal. Furthermore videos were saved of

the radio- and ulnocarpal as well as of the midcarpal joint. After 3 months the documents again were shown to the arthroscoping surgeons and to two hand surgeons with more than 10 years experience in wrist-arthroscopy asking for diagnosis. This was done in a sequential manner: first the taken fotos and then the fotos and the videos were presented. Intraobserver reliability was assessed by comparing the intraoperative diagnosis with the diagnosis based on the fotos and videos. Interobserver reliability was assessed by comparing the intraoperative diagnosis of the scoping surgeons with the diagnosis of the two experienced hand surgeons. Statistical analysis was performed using kappa values ranging from -1 (complete disagreement) to +1 (complete agreement). Kappa values of 0.80 to 1.00 indicate excellent reproducibility; 0.60 to 0.80, substantial; 0.40 to 0.60, moderate; 0.20 to 0.40, slight and <0.20, poor reproducibility. Furthermore those fotos and videos were compared to each other that did not show any or did show maximum accordance in diagnosis.

Results: Intraobserver reliability was expectably higher than interobserver reliability. Overall consulting the videos additionally to the fotos did not improve reproducibility (Kappa-value 0,42/0,27/0,26 vs. 0,39/0,28/0,26). The TFCC was assessed notably better by the video. However assessment of SL- and LT-ligaments was not improved by the videos. The display of the examined structure with a good overview and with the use of a probe were features of fotos as well as of videos with good reproducibility.

Conclusions: Videos are able to improve assessment of the TFCC but not necessarily of the SL- and LT-ligament. Like fotos videos have to meet quality criteria to display wrist findings more clearly.

A-0191 Treatment of combined scaphoid fracture and scapholunate ligament lesion

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Introduction and aim: According to the patho-mechanics of carpal-instability it is generally accepted that scaphoid fracture and scapholunate ligament lesion should not occur together. Nevertheless the simultaneous occurrence of a scaphoid fracture and scapholunate ligament (SL) lesion has been described since many years but usually in high energy trauma with a trans-scaphoid palmar lunate fracture dislocation. The use of arthroscopic assistance in scaphoid internal fixation has allowed the finding of the association between scaphoid fractures and SL lesions in a high percentage of cases ranging from 10 to 75%. The aim of this study is to evaluate the results of simultaneous internal fixation of scaphoid and SL ligament stabilisation.

Materials and methods: Seven patients affected by simultaneous scaphoid fracture (5 waist, 1 proximal, 1 distal pole) and SL ligament lesions were treated since 2008. All were males and the mean age was 29 years old (21-39). There were 4 chronic injuries and 3 acute. MRI performed in all cases confirmed the scapho-lunate associated lesion. All patients were examined under arthroscopy. The treatment of acute injuries was screwing of scaphoid fracture associated to pinning of SL joint. In the chronic cases arthroscopy was used to confirm and stage the SL lesion and classify it according to Geissler and EWAS. The chronic cases underwent open surgery, screwing of scaphoid (through a small volar approach or dorsal approach) and reconstruction of SL ligament by capsulodesis according to Berger in the same intervention or secondarily in a second operation. The patients were evaluated at a mean follow-up of 11 months (5-30 months). The Mayo and DASH scores were used to evaluate the patients at follow-up Results A Geissler stage III in 6 patients and a Geissler stage II in one patient were found. At follow-up X-rays documented healing of the fracture in all cases. The results were excellent and good according to the Mayo Wrist Score. Grip strength was comparable to contralateral side and patients returned to previous work. One patient reported occasional pain under load at follow-up at 5 months. Two patients treated with dorsal capsulodesis had a slight reduction of flexion of the wrist (limited to 40°).

Discussion and conclusions: The diagnosis of a ligamentous lesions in the wrist associated to scaphoid fracture has been evolving in the last years with the diffusion of wrist arthroscopy that allows the identification of associated lesions. Nowadays, we know that a spectrum of different ligament lesions can occur and they can be associated in different ways which are still under definition. Our preliminary results are excellent and good; a longer follow-up is needed to correctly evaluate the results in the long term. According to our experience the lesion to be treated are not so frequent but we cannot exclude that they are still underdiagnosed in the clinical practice. The increased use of arthroscopic examination of the wrist is advisable in wrist trauma in order to establish a correct diagnosis, prognosis and treatment of all the patient's lesions, possibly preventing degenerative arthritis.

A-0213 Arthroscopic Assessment of the Wrist in the Kienböck's Disease

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The osteonecrosis of the semilunate or Kienbock disease, is still a challenge presently in relation to understanding

the etiology and treatment. Lichtman et al divided into 4 stages ranging from incipient signs of osteonecrosis of semilunate until its complete collapse. But, the doctor may be induced to error, as for the staging of the disease, if he/she considers other factors such as duration of the illness, intensity of pain and range of motion. The proposal of our work was to conduct the arthroscopic study of the wrist of patients with the Kienböck's disease in the 3A and 3B stages, in order to evaluate the articular conditions of the carpus, establishing a parallel with the preoperative clinical condition. We evaluated, arthroscopically, 15 patients who had the Kienböck's disease in stage 3, whom 5 were type 3A and 10 were type 3B, according to the classification of Lichtman. The inclusion criterion was the patients who showed symptoms in the wrist, and whose radiographic examination showed the image of idiopathic osteonecrosis of the semilunar, classified as stage 3 from LICHTMAN's, and without past surgery in the wrist. We believe that stage 3 is which generates more doubts about choice of better treatment, since the collapse of semilunate addition, we have to consider the amendment of the scaphoid angle and its consequences in the compromised joint. The arthroscopic study of the wrist with Kienböck disease could provide subsidies to make the best decision surgery

A-0300 Arthroscopic Resection Arthroplasty for Treatment of Combined CMC and STT (Pantrapezial) Arthrosis

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Purpose: Arthroscopic resection arthroplasty of the thumb carpometacarpal (CMC) joint has been reported by multiple authors with reasonably good results. Indications have generally included a substantial cartilage loss at the CMC joint precluding joint sparing procedures and a preserved scaphotrapeziotrapezoid (STT) joint. Patients with advanced STT arthrosis have typically undergone open procedures. Arthroscopy of the STT joint has been described for the purpose of diagnosing, staging and treating isolated STT arthritis. While the results of arthroscopic resection arthroplasty for the CMC and STT joints independently have been good, results for the combined procedure for pantrapezial arthrosis is lacking. The purpose of the study was to evaluate the early results of arthroscopic resection arthroplasty of both CMC and STT joints for patients with pantrapezial arthrosis.

Methods: After IRB approved and informed consent was obtained, we evaluated 39 cases performed on 38 consecutive patients. Patients who did not have one-year follow-up were excluded. This left 35 cases of arthroscopic resection arthroplasty of the CMC and STT joints performed in 34

patients with 1 year minimum follow-up. There were 27 females and 7 males. Average age was 63, (range 46 to 79). All patients underwent simultaneous arthroscopic resection arthroplasty of both the CMC and STT joints. Two to three mm of bone was resected from the proximal and distal aspect of both the CMC and STT joints. Preoperative data collected included 10 point self reported Pain Scale, Disabilities of the arm, shoulder and hand outcome measure (DASH), range of motion, grip strength, key and chuck pinch, length of symptoms and treatment. Post operative data included the above plus patient satisfaction graded on a 0 to 5 scale. Data were collected at postoperative months 1, 3, 6 and 12.

Results: Average time of post operative immobilization was less than 3 weeks (range 2-6). DASH score averaged 46 preoperatively, and 51, 30, 20, and 19 ($p < .0005$) for the aforementioned postoperative intervals. The mean improvement in key pinch was 2.9 lbs (95%CI: 0.84-5.00) ($p = .0008$). The mean improvement in grip was 9.52 lbs (95% CI: 1.467-17.58) ($p = 0.023$). Pain improved from 7 preoperatively to 1 ($p < .0005$) at 1 year follow-up. 32 of 34 patients stated that they would have the surgery again. The average satisfaction in follow-up was 4 (range 2-5). Two patients underwent revision to an open procedure for persistent pain. There was 1 patient with a deep infection that required additional surgery. One superficial infection resolved with outpatient antibiotics. Five patients reported paresthesias in the distribution of the superficial branch of the radial nerve, all of which resolved by the 3rd postoperative month. Three patients developed FCR tendonitis in the postoperative period.

Conclusions: Short-term analysis suggests that arthroscopic resection arthroplasty for pantrapezial arthrosis provides satisfactory pain relief and return of strength and function.

A-0354 Arthroscopic reconstruction of the S-L ligament in the III-IV lesions of Gessler classification: a new technical possibility?

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The treatment of scapho-lunate dissociation is a challenging problem. The surgical strategy depending on chronological and anatomical factors. The trophic condition of the S-L ligament is strictly correlated to the time between the trauma and diagnosis. The wrist's condition (presence of arthrosis and anatomical congruence) and the characteristic of the instability (possible reduction of the DISI and the rotatory subluxation of the scaphoid) must be evaluated before performing any surgical procedures. In literature there are different and various techniques of

reconstruction of the S-L ligament to perform but all techniques have some complications where the stiffness is often present despite of a perfect reconstruction of the ligament. From the experiences of open surgery of the wrist the new idea to convert the bone-ligament-bone reconstruction of the S-L ligament in arthroscopic method. The concept of a "biologic surgery" and "mini-invasive surgery" thrust us to find a new method of reconstruction of S-L ligament with the conviction that the preservation of the vascularization and the proprioceptive innervation of the wrist would improved the outcomes. The A. present their new, personal and reproducible technique using bone-ligament-bone graft by arthroscopic method On the basis of our preliminary experience, with five cases treated and with a minimum follow-up of one year, the advantages are undeniable. A short follow-up doesn't permit us a definitive opinion, but the preliminary results thrust us to a cautious optimistic judgement of this new technical possibility.

A-0397 Arthroscopic Excision of Dorsal Wrist Ganglion: Factors related to Recurrence and Residual Pain

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Purpose: The purpose of this study was to discover the recurrence rate of ganglion after arthroscopic excision and to assess risk factors for recurrence and residual pain, with special interest in presence of a cyst stalk seen under arthroscopy and preoperative pain.

Methods: A total of 115 wrists (111 patients) that underwent arthroscopic excision for wrist dorsal ganglion between April 2005 and February 2009 were evaluated prospectively. There were 57 men and 54 women with an average age of 34 years (range, 9-72 years). The follow-up averaged 37 months (range, 18-61 month). Sixteen wrists had recurred ganglion cysts previously treated with open excision. Parameters tested against recurrence and pain after surgery included gender, age, dominant hand, preoperative pain, duration of symptoms, preoperative recurred cyst, details of operation, and follow-up period.

Results: The recurrence rate of ganglion after arthroscopic excision was 10% (11 of 115 wrists). Of the patients with recurrence, four were successfully treated again with arthroscopic surgery. Ten of 11 (91%) wrists with recurrence were dominant sides (OR=8.41, $p=0.036$). Female gender, small sized cyst, and young age were related with recurrence ($p < 0.05$). The selected cut-off values in ROC analysis were corresponding to the age of 24 years and the size of 11 mm. Twenty-one wrists (18%) had residual pain at final follow-up. Among those, sixteen wrists (76%) of the

women reported residual pain that was significantly different compared to the wrist without pain ($p=0.017$). Preoperative recurred cyst, duration of symptoms, and intra-operative details including presence of a cyst stalk, intercarpal ligament instability, TFCC degeneration which observed under arthroscopy were not considered risk factors of recurrence or postoperative residual pain.

Conclusions: Our study showed that the rate of recurrence of ganglion after arthroscopic excision was similar with those previously reported. There was a substantial rate of residual pain after arthroscopic ganglionectomy. Factors related with recurrence and residual pain were considered as more multi-faceted than straightforward concept of insufficient treatment of operative details observed under arthroscope or preoperative conditions. **Key Words:** Wrist, dorsal ganglion, arthroscopic excision, recurrence.

A-0414 Arthroscopic Treatment of Chronic Metacarpophalangeal Joint Pain of the Thumb - anatomical basis and results

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Introduction: The metacarpophalangeal joint (MCPJ) of the thumb is a frequently injured joint. Even minor sprain without complete collateral ligament tear may occasionally end up in residual stiffness and pain. Cause of such chronic posttraumatic MCPJ pain is however elusive and treatment is often challenging.

Method: From 2002 to 2010, 14 patients were seen with chronic disabling pain more than 3 months after injury. Preoperative fluoroscopy screening, operative MCJP arthrogram and arthroscopy was done to document the degree of residual collateral laxity, volar subluxation and volar recess contracture. Arthroscopic release in particular over the volar recess was then performed. Patient was followed for at least 3 months.

Results: On fluoroscopy, 80% demonstrated incongruent flexion. In seven cases with bilateral MCPJ arthrogram performed, the injured side showed significant contracture of the volar recess. MP arthroscopy demonstrated diffuse synovitis, fibrosis and narrowing of joint space. This was opened up only after the volar plate was released from the MP head with the help of shaver and freer dissector. Osteochondral defects were noticed in 3 cases at the dorsal lip of the base of proximal phalanx suggesting abnormal impaction. On follow-up, half of them were nearly pain free at 1 week. All patients demonstrated improvement in pain, ranges of movement and pinch grip at final follow-up.

Conclusion: Arthroscopic release is a feasible treatment for chronic thumb MCJP pain after injury. The arthroscopic

and radiological finding supports volar plate adhesion and volar recess contracture as a common pathology for such residual pain and stiffness.

A-0495 Arthroscopic reconstruction of proximal lesions of the TFCC in acute and chronic lesions

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In the literature the importance of the foveal reconstruction of lesions of the TFCC becomes more and more important the last 10 years. The most common reconstruction is still the suturing of the TFCC on the floor of the 6th extensor tendon sheet. Nakamura describes the necessity and also a technique to fix the foveal insertion of the TFCC back to the ulna. But at the beginning he only use and recommend this technique for acute and subacute lesions. G. Tuennerhoff reported good results even so in chronic lesions with a little difference in the technique. In our study we report about 23 patients treated from 2007 to 2010 with the technique described from Nakamura also in acute than in chronic lesions. The minimum of follow-up is 12 months. We compare also the groups of acute/subacute and chronic lesions treated with the same technique and the same

postoperative treatment. Concerning our results Ww can recommend this technique as well as for acute than for chronic proximal lesions of the TFCC.

A-0496 Occult scapholunate instability in adolescents. treatment options

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Pain at the wrist and/or a ganglion cyst are often the only symptoms of occult or predynamic SLI. Pain in the wrist at grip may worsen the condition or be the only complain of predynamic SLI. Dysfunction comes from an increased motion between the two bones, generating shear stress, local synovitis, pain and discomfort. PdSLD degree comes from a minimal distension/stretchening (grade I, according to Geissler et al's classification*) to a partial rupture of the proximal membrane without gross instability (grades II or III). This may also be a result of fast growing/hormone depended general ligamentous laxity in adolescents (girls). Her we present our approach to occult scapholunate instability in adolescens, diagnostics, treatment options and results.



A-0217 Selected soft tissue repair of the TFCC to restore stability of the DRUJ

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Purpose: The purpose of this study is to evaluate the postoperative results of reinstating distal radio-ulnar joint (DRUJ) stability through reefing of the dorsal capsular extension of the dorsal marginal ligament (DML) with or without foveal reinsertion of the triangular fibrocartilage complex (TFCC).

Methods: 48 patients were included in this retrospective study. All patients were subjected to wrist arthroscopy for diagnosis. The mean follow up period was 22 months. The postoperative results were evaluated with the DASH questionnaire, VAS scores, grip strength and range of motion. These findings were extrapolated in the Mayo wrist score.

Results: Nineteen patients were treated with reefing of the DML and dorsal capsule only. In 28 cases the reefing capsuloplasty was performed in combination with reinsertion to the fovea. In six patients a Wafer procedure was included as well. One patient was treated with an ulna shortening osteotomy and reefing of the DML. The mean DASH score was 18.4 after treatment (range: 0-69.2). Mean VAS scores had improved 3.7 points. The mean impairment in range of movement (ROM) of the wrist was 9 degrees flexion, 6 degrees extension, 8 degrees pronation and 9 degrees supination. Ulnar-Radiar deviation were impaired 7 and 5 degrees respectively. The mean grip strength was 92% of the control side (range: 2.2-62.6kg/cm² and 8.0-66.7kg/cm²). These findings were extrapolated into Mayo wrist scores with a mean of 70 (range: 25-90) and can be interpreted as satisfactory.

Conclusions: This relatively simple procedure is a reliable method to restore volar-dorsal DRUJ stability with a significant decrease in pain sensation, good DASH scores and functional grip strength and ROM. The results show durable stability, also in sport professionals, who were well represented in this study.

A-0234 Spontaneous reduction of DRUJ after ulnar shortening in ulnar impaction syndrome

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Objective: The ulnar shortening osteotomy on ulnar impaction syndrome has been used to reduce ulnar side wrist pain, and stop articular or subchondral damage of lunate and injury of TFCC. Ulnar shortening may help in stabilizing the distal radioulnar joint by increasing the tension in TFCC. If there were instability of DRUJ, ulnar head usually subluxated dorsally than dorsal cortex of radius in plain lateral radiography. We are to report the results of radiological spontaneous reduction of DRUJ after shortening in ulnar impaction syndrome.

Methods: Fifty cases of ulnar impaction syndrome with ulnar shortening osteotomy were reviewed retrospectively (22 males and 29 females). The mean age was 42.6 years old, range from 22 to 77 years. The mean follow-up period was 14.1 months (range from 2 to 59). Preoperative and postoperative ulnar variance, reduction of dorsal ulnar head subluxation in true neutral lateral radiograms were calculated. The degree of dorsal subluxation of ulnar head was defined as the distance between most dorsal cortex of ulnar head and Lister's tubercle of radius in true lateral plain radiogram.

Results: The preoperative ulnar variance was positive 3.08 mm in average and postoperative ulnar variance was negative 0.05 mm, and the mean shortening length was 3.04 mm. Mean preoperative dorsal subluxation of ulnar head was 2.13 mm and postoperative subluxation was 0.14 mm. By these results, spontaneous reduction of ulnar head after ulnar shortening was 1.99 mm. Postoperative residual ulnar side wrist pain is related to the degree of reduction.

Conclusion: Ulnar impaction syndrome is usually combined with dorsal subluxation of ulnar head. After shortening osteotomy, ulnar heads were reduced spontaneously without other soft tissue procedures. If complete reduction is identified after surgery patient usually do not complain about residual pain. On the other hand, if dorsal subluxation of ulnar head was not reduced after surgery, the

patient often complained residual ulnar side pain. The above phenomenon of spontaneous ulnar head reduction after ulnar shortening procedure might be the result of the regression of the impact from the ulnar side carpal bone on the ulnar head. In case of undesirable spontaneous reduction of ulnar head, the fixed soft tissue stiffness or sustained instability of DRUJ might be the main cause.

A-0280 Early results of a prospective case series with the APTIS total DRUJ implant

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Purpose: When the DRUJ fails, the option of ulnar head replacements has shown to be working well however, especially in regards to instability, they have sometimes shown to be insufficient. New methods of treatment e.g. ulnar head surface replacements and total joint replacements have therefore surfaced. Another type of arthroplasty with a linked constrained total joint prosthesis has been marketed by APTIS[®]. This concept of constrained or “partially” constrained prosthesis has been met with sound skepticism since early loosening has shown to be a problem in several other joints. Although in complex situations where there is a lack of both DRU joint surfaces and stabilizing soft tissue, or when other methods have failed, there is a need for more unconventional methods. In an attempt to evaluate this type of implant the author decided to do a pilot study on a series of patients with absent or badly damaged DRUJ and coexisting gross instability.

Methods: 7 patients, 5 women and 2 men, mean age 44, underwent arthroplasty with a minimum follow up time of one year (range 1-5). 3 patients worked full- or part-time. 6 patients had an initial traumatic event and the average number of preceding surgeries was three (range 1-6). Major symptoms were aching and pain during motion or loading. The indication for arthroplasty was DRUJ synostosis, arthritic DRUJ with instability, Essex-Lopresti injury where both the ulnar and radial head had been resected, failed Bowers-, Sauvé-kampanjij- and Darrach (2 patients) procedures. The surgeries were performed by the same surgeon and a prior established protocol was used during follow up. The outcome was evaluated through X-rays, questionnaires (DASH, SF36) and clinical measurements.

Results: There have not been any signs of loosening on the X-rays at follow up although several X-rays showed some radiolucency at the distal part of ulna. This has been interpreted as a sign of stress shielding. Pain levels measured through visual analog scale decreased from 51 to 15 mm. Mean values of DASH for the group improved from 58 to 48. In average, the total range of forearm rotation prior to the

arthroplasty was 110 degrees. Postoperatively this increased to 130 degrees compared with 160 in the non-affected arm. Grip strength went from 15 to 20 Kgs compared to 36 Kgs on average in the non-affected hand. Torque in supination increased 190% and in pronation by 210%. In comparison both these values reached about 65% of the normal force in the unaffected arm. Lifting capacity was difficult to evaluate due to methodological problems.

Conclusion: Early findings and other results in this small series of patients are encouraging and the prosthesis seems especially useful as salvage to other salvage procedures. In the short-time perspective, the risk level with this procedure, is perceived to be within reasonable limits since there have not been any adverse events or radiological signs of loosening.

A-0407 Retinaculum sling with capsule plication for reducible DRUJ instability - technique and results

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Purpose: Distal radioulnar joint (DRUJ) instability causes swelling of the wrist, ulnar-sided wrist pain and decreased grip strength. When the problem is not recognized, chronic instability may develop. Chronic instability rarely improves spontaneously and can only be treated surgically. The palmar and dorsal radioulnar ligaments (RUL's) of the triangular fibrocartilage complex are the primary stabilizers of the DRUJ, and therefore, many operation techniques developed have focused on restoring the function of RUL's. Since in chronic situations the RUL's can be attenuated, retracted and partly necrotic, it is unlikely that arthroscopy can successfully treat DRUJ instability. In open techniques the condition of the RUL's are of lesser importance. The principal method used is anatomical reconstructions of the RUL's. This technique is a complex and extensive procedure that may increase the risk of complications. Less invasive methods include capsule plication. However, it is expected that the capsule may be attenuated in chronic situations and only provide sufficient solidity for minimal instability. Therefore, in this technique the capsule together with a part of the extensor retinaculum are used and closed vest over pants which presumably will provide more strength. In this study we evaluated the outcome of this simple and novel technique.

Methods and patients: We performed a retrospective study to analyse the outcome of the novel surgical treatment for DRUJ instability. Selected were patients operated by two

surgeons (JBJ and JHC) in the period July 2004 till April 2009. Patients were excluded if they were operated on the same hand for another reason than DRUJ instability during the same operation or after surgery for DRUJ instability, but before the start of this study. All included patients were sent questionnaires at least 8 months after surgery, including validated questionnaires about pain and loss of upper extremity function, and a hand-function test was performed during an outpatient clinic visit. The test included range of motion of the wrist and grip strength. Results 39 patients were included of which 36 patients participated. Mean age was 39 years (range 18-67). Twelve patients were male and 24 patients were female. Mean follow up was 2.3 years (range 0.8 - 4.7). According to the Mayo Modified Wrist Score 16 patients had an excellent result, 15 patients had a good result, 3 patients had fair result and 2 patients had a poor result. The mean VAS of pain was 2.3 (\pm 2.4) and the mean score of the Patient Rated Wrist/Hand Score was 29 (\pm 24). The outcome of the range of the wrist was 157 degrees (\pm 26) of pronosupination, 120 degrees (\pm 18) of wrist flexion/extension and 48 degrees (\pm 11) of ulnar/radial deviation. The outcome of range of motion was on average 92% of the not-operated side. Grip strength was 35 kilo's (\pm 14) what was 90% of the not-operated side.

Conclusion: This simple operative technique could successfully resolve pain and restore function. Therefore, we would like to recommend this technique first before applying more invasive and technically demanding techniques.

A-0447 Modified Sauve-Kapandji Procedure for DRUJ Instability or Degeneration

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Purpose: Sauve-Kapandji (below S-K) procedure is preferably used as the salvage operation of the destructed or unstable distal radioulnar joint. It prevents carpal translocation, cosmetically superior to Darrach procedure, and can maintain the ulnocarpal load bearing mechanism. However, the complication of distal ulno-radial impingement has been reported between distal radius and the distal end of proximal ulna segment, and many methods also have been reported to prevent the unwanted result. The authors modified the original S-K technique of 1 cm leaving and 1 cm resection of distal ulna to 2 cm leaving and 2 cm resection, and experienced good results without the distal ulna-radius impingement or distal ulna instability. We describe the technique and the clinical result.

Method: The clinical results of 28 patients, who underwent the modified S-K procedure for the treatment of DRUJ arthritis or instability, were reviewed. The patients were operated between March 2003 and January 2010, and

were 9 male and 19 female patients. Modified S-K technique is defined as the 2 cm ulna head arthrodesed to the distal radial sigmoid notch, and the 2 cm gap is created with the resection of ulna proximal to the remained ulnar head. So, the distal tip of proximal ulna is leveled approximately 4 cm proximal to the level of distal radius articular surface. There are no other additional procedures, except often interposition of the resected ulnar cortical half segment to widen the narrow wrist width from the already destructed and deepened sigmoid notch. The arthrodesis of distal radio-ulnar joint was done using a cancellous screw with additional Kirschner wire, occasionally. The position of wrist fusion was in neutral. At last follow-up, radiological evaluations and the range of motion were checked.

Results: Among the 28 patients 18 patients were of rheumatoid arthritis, and the other 10 patients were non-rheumatoid from various disorders, which include posttraumatic arthritis, ulnar impaction syndrome, etc. The mean age at the time of operation was 51 years (22-83 years) old, and the mean follow-up period was 12 months (2-69 months). The average remained ulna head was 21 mm and the gap was also 21 mm in length. The postoperative average distance between the distal tip of ulna and radius was 9 mm and the final distance was 7.8 mm. The preoperative pronosupination ranges of motion of wrist were pronation 28° and supination 33°, and at last follow-up, pronation 70° and supination 65°. There were no ulno-radial impingement symptoms in these patients at last follow-up, clinically and radiologically.

Conclusion: We think the above good result of the modified S-K procedure as because of the widened initial distance between the tip of distal ulna and radius, which is interposed with the radioulnar membrane and other soft tissues, such as muscles. The interposed soft tissues prevent the impingement between ulna and radius, even though allowing the instability of the distal tip of ulna.

A-0463 Comparison between open and arthroscopic TFCC bony repair for post-traumatic DRUJ instability

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Introduction: The aim of the study was to compare the result of open versus arthroscopic surgery for the TFCC type 1B lesion.

Material and Method: From 2002 to 2009 almost hundred cases affected by post-traumatic DRUJ instability were operated. All patients had preop and postop clinical (Mayo Wrist Score) and imaging (x-ray and MRI)

evaluations. DASH questionnaire and PRWE were also administrated in order to evaluate the subjective result. Wrist arthroscopy was always performed to confirm the quality of TFCC tear and associated lesions. Surgery of both technique were performed in the vertical position. Forty-four cases had open surgery (dorsal approach according with Garcia Elias technique) [group 1] and 41 arthroscopic assisted repair (according with Atzei technique) [group 2] of the TFCC. In both groups the TFCC was re-fixed at the fovea using screw anchors. Standardized immobilization for a month and rehab protocol (2 months) were used in all patients.

Results: At a mean f-up of 5 and 6 months, respectively, the two groups were evaluated accordingly. Pain decreased significantly in both groups: 7 to 4 and 8 to 3, respectively. Wrist flexion-extension had a slight improvement, but prono-supination had opposite behavior in the two groups: increasing in the group 2 and decreasing in the group 1. Grip strength increased in both group. Three cases of the group 1 had failure and were re-operated: in two of them treatment failed again. In the group 2 a case had a reoperation for tendinitis of the ECU.

Discussion and Conclusion: Both technique demonstrated to be extremely valid in the treatment of the TFCC type B1 lesion in term of pain relief and recovery of DRUJ stability. However, open technique showed to left residual limitation of the pronation probably due to wider surgical exposition in comparison with the arthroscopy. On the contrary, arthroscopy showed to be extremely valid in localizing the level of TFCC lesion (fovea) and its repair. Arthroscopy allows to be more precise in the suture of both branches of the TFCC ligament (volar and dorsal) contemporary. Moreover, arthroscopy proved to be less painful

in the postop period, allowing an easily rehabilitation and a better final results in term of wrist motion.

A-0521 New MR image for the diagnosis of peripheral TFCC injury

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The TFCC injuries are usually diagnosed by a coronal MRI. We have described the Float image for the diagnosis of peripheral injuries of the TFCC. In a sagittal image parallel to the ulnar diaphysis and placed lateral to the ulnar fovea, we can observe the radiocubital dorsal and volar ligaments of the TFCC. A distance of more than 4mm between the dorsal edge of the meniscus and the joint capsule suggests the presence of TFCC peripheral rupture. 51 patients were selected from all the patients who underwent wrist arthroscopy between 2006-2009. Inclusion criteria: MRI at our hospital, arthroscopy at our hospital, no presence of radial fracture. We assessed the correlation between the presence of the Float image and a TFCC injury confirmed by arthroscopy. The Float image for the diagnosis of peripheral TFCC injuries has a sensibility of 0.929 [0.774 to 0.98] and a specificity of 0,857 [0.654 to 0.95]. PPV: 0.897 [0.736 to 0.964] and NPV: 0.9 [0.699 to 0.972] The Float MRI is a high sensibility and specificity method for the diagnosis of peripheral TFCC. The coronal MRI is useful for diagnosing central ruptures but has less sensibility for the peripheral injuries.

A-0220 Thumb Deformity In Spastic Hand

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Introduction: The typical deformity of the thumb in patients with cerebral palsy is caused by an imbalance of paretic and spastic muscles. The intrinsic deformity results from tightness of the adductor pollicis, the first dorsal interosseus and FPB and weakened APL, EPB and EPL. The extrinsic deformity depends on the spastic and contracted FPL with weak EPL. The combined type is called thumb-in-palm. Often we can see joint instability, mostly MCP hyperextension. These deformities of the thumb cause difficulties in grip.

Materials: From 2004/III to 2010/XI, 180 individuals with spastic were referred to our institution. Most of them had cerebral palsy-125, 28 had endured stroke, 19 suffered of brain injury, 5 were after brain surgery, and 3 after encephalitis. In most of these patients the grip and the thumb deformity were reconstructed in the first phase of the reconstruction.

Methods: All patients had skin web space contracture. We use VYZZ skin plasty of the first web space, occasionally Z plasty. The most important are the 1st dorsal interosseus release and release the insertion of the adductor pollicis and its more proximal reattachment. FPB is released distally when indicated. FPL may be lengthened by Z plasty or intramuscular tendon slide. After the release of the first web space we have to augment weak APL, EPL, EPB. The EPL rerouting supplements the extension and abduction of the thumb. We combine this method with APL to BR or PL to APL tenodesis transfer. We have never indicated MCP or CMC joint fusion, we have used MCP capsulodesis. After surgery we use static splinting for 4 weeks and removable splint is applied for the second month when exercises are begun. ROM was measured pre- and postoperatively, video-documentation was also shoot pre- and postoperatively.

Results: The first web space was released in all patients and the ROM was improved. Abduction/extension of the thumb was improved on average by 30 degrees. Better abduction and extension of the thumb makes a pinch and a grasp possible, as well as it allows better gripe of larger objects.

Conclusion: In 90 percent of cases we first reconstruct a distal grip with release of the first web space. No single method is universally successful. We have always combined releases of skin and muscles with transfers to augmentation of extension and abduction of the thumb and MCP joint stabilization.

A-0232 Effects of scar tissue on mechanical characteristics of transferred flexor carpi ulnaris muscle in the rat

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Purpose: To improve active wrist extension in patients with obstetrical brachial plexus lesion (OBPL) and to alleviate a problematic imbalance at the wrist joint in cerebral palsy patients, transposition of flexor carpi ulnaris (FCU) tendon onto extensor carpi radialis longus and/or brevis muscle (ECRL/B) is performed. However, results after recovery can be surprisingly variable (e.g., an increase in wrist extension between 0 and 100 degrees; Ritt, unpublished observations in OBPL patients). This may be explained by interindividual differences in neural response and/or in tissue adaptation. The goal of this study was to quantify to what extent scar tissue formation following a FCU-to-ECRL/B tendon transfer affects the biomechanical characteristics of the transferred FCU. As there are severe limitations of studying tendon transfers in humans (e.g., it is not possible to perform a second surgery for experimental measurements), we used an animal model.

Methods: Under aseptic conditions and with the rats deeply anesthetized, FCU was transferred to the cut distal tendons of ECRL/B. Five weeks postoperatively, FCU muscle function was evaluated in situ. First, wrist movements upon excitation of FCU using indwelling electrodes were

observed prior to and after severing the new FCU insertion. Second, the distal FCU tendon was connected to a force transducer for measurement of isometric length-force characteristics. Simultaneous supramaximal stimulation of ulnar and median nerves excited maximally all palmar muscles in the antebrahium. Data were collected (1) with minimally disrupted connective tissues, (2) after full dissection of the FCU distal tendon exclusively, and (3) after partial (~50% along its length) dissection of FCU muscle belly. Dissection involved disrupting scar tissue.

Results: In all except one rat, excitation of FCU yielded wrist extension movements. Even after tenotomy of the new FCU tendon, some wrist extension remained in six rats. This indicates myofascial force transmission from FCU muscle onto structures that, in contrast to its cut distal tendon, still span the wrist joint. Despite using the same surgical procedures for each rat, substantial variability in length-force characteristics of FCU was found: e.g., passive force at optimum length ranged from 0.14 N to 1.87 N. Length-force characteristics were substantially changed after dissection of both the FCU tendon and muscle belly: optimal force increased (by 22%), passive force at optimum length decreased (by 90%), and the length range increased (from 3.5 mm to 5.0 mm). In addition, variability decreased after tendon and muscle belly dissection.

Conclusions: The results of this study indicate that tendon transfer successfully altered the mechanical effect of FCU from wrist flexion to wrist extension. However, the tendon and muscle belly of transferred FCU had stiff connections to surrounding structures through new layers of connective tissue ('scar tissue'). The interindividual variability is explained by differences in the mechanical characteristics of the scar tissue surrounding muscle belly and tendon. This suggests that scar tissue hampers the wrist extensor function of transferred FCU muscle. Supported in part by EU Marie Curie International Reintegration Grant IRG-203846.

A-0327 Biomechanic and kinematic arguments for glenohumeral dysplasia in obstetric brachia plexus palsy

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Medial rotation contracture (MRC) is a frequent complication of severe upper lesions in obstetric brachial plexus palsy (obpp) and is associated to various degrees of glenohumeral dysplasia (GHD). Muscle imbalance is the most frequently advanced pathophysiologic hypothesis. We present arguments from biomechanic and kinematic studies on obpp children performed in the last 15 years.

Material: volunteers and affected children at school age (total 20).

Methods: complex multifactorial movement analysis, including force transducers and inverse dynamics algorithms.

Results: Actually, first results of pathologic dynamic force components onto the GH joint are shown. Biomechanic models are presented.

Discussion: GHD is a multifactorial and rather unknown entity. Experimental data allow some explanations and show directions of further research. Actual data could influence early decision making to prevent GHD and other structural deformities.

A-0377 Quality of life with tetraplegia after reconstructive hand surgery

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Purpose: The aim of the study was to analyse the results after reconstructive hand surgery of 16 tetraplegic patients. The evaluation of tetraplegic patients is difficult and depends on a number of individual factors such as personality, home environment and others. A survey can reflect these elements and the changes that occur in the life of patients with tetraplegia.

Method: Based on the experience with the reconstruction of hand function in tetraplegia (IC Group 1-3) in 16 patients we analysed the social, personal and economic effects following rehabilitation as compared with the situation before surgery. The spinal cord injury functional questionnaire (SCIF according to House) was used, in addition with a questionnaire on personal and social aspects. The answers were categorized from one to six in the style of school grades.

Results: Between October 2003 and May 2010, 16 patients were operated on 18 hands (23 operations). Five patient were lost to follow up, three of them live abroad and could not be included in the survey and two patients did not respond. Those patients who responded belonged in the IC Group as follows: two patients group 1; five patients group 2 and five patients group 3. The median time from injury until operation was 21 months and ranged from 7 months to 20 years. The median age at the time of surgery was 32 years and ranged from 18 to 46 years. The shortest follow-up was 7 months, the longest 7 years. The graded answers showed an improvement on numerous personal and social aspects, in particular reported an advancement of profession and family life, housekeeping, car driving and hygiene. The answers to the SCIF questionnaire showed an improvement in the ability to use the hand more efficiently in a number of activities at home and a significant

improvement in handling small objects. We did not observe any correlation between the time until operation or the patients age and the outcome in the questionnaire.

Conclusion: The patients showed a clear increase of independence and quality of life regardless of age and the time between injury and hand surgery. There was a measurable health economic benefit after hand surgery in some cases. None of the activities asked for have worsened after surgery.

A-0455 ECU tenodesis to improve grip strength and prevent shoulder pain in patients with tetraplegia

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Purpose: Patients with cervical spinal cord injury (SCI) and tetraplegia often present a radial deformity of the wrist. The muscles acting as wrist ulnar deviators are often paralysed while radial deviators mostly extensor carpi radialis longus and brevis (ECRL and ECRB) are innervated, which results in a radial deformity. The grip strength is strongest in extension and a few degrees of ulnar deviation of the wrist. When reconstructing the grip this fact ought to be considered and a tenodesis of the extensor carpi ulnaris (ECU) should be performed to give the patient the best possibility for a strong grip. The purpose of the study was to compare reconstruction of the grip with and without ECU-tenodesis as well as evaluating the outcome of the procedure.

Methods: 16 individuals (16 hands) with complete or incomplete spastic tetraplegia had reconstructive surgery to restore the grip. In all cases a tenodesis of the ECU to the ulnar head was performed to correct the radial deformity. Grip strength and radial deformity was measured pre- and postoperatively. A group of 33 patients (43 hands) with previous grip reconstructions without tenodesis of the ECU was compared with the group with ECU tenodesis.

Results: The grip strength of the group with tenodesis of the ECU was 6.4 kg compared with 2.8 kg in the group without the tenodesis. On average radial deformity was 22 degrees preoperatively compared to 5 degrees at follow-up in the ECU-tenodesis group.

Conclusions: This study suggests that radial deformity should be corrected with a tenodesis of the ECU to maximize the grip strength for tetraplegic patients. The procedure is technically easy to perform and can be combined with grip reconstruction or spasticity-reducing surgery. Correction of the wrist deformity enhances a more ergonomic use of the hand, which may also be preventive for shoulder problems, which are common among patients with tetraplegia. We acknowledge that the study group is small and the pronounced difference in strength can probably not all be explained by the tenodesis of the ECU.

A-0456 Outcomes of the alphabet-procedure for reconstruction of the grip in tetraplegia

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Purpose: Poor grip function is often a handicap among patients with spinal cord injuries (SCI) and tetraplegia. Traditionally reconstruction of the grip has been divided in two stages, a flexor stage, and sometimes an extensor stage. This means two operations and two rehabilitation periods per limb for the patients to achieve a grip and an opening of the hand. New suture techniques, strong side-to-side sutures give possibilities for early active mobilization and less surgical adhesions. Consequently this also allows for more simultaneous surgical procedures. Along with new biomechanical data to allow the early active mobilization, a new technique was introduced to combine the extensor and flexor phase. This new set of surgical procedures is called the alphabet reconstruction - ABCDEFG - Advanced Balanced Combined Digital Extensor Flexor Grip reconstruction. The purpose of this study was to measure the outcomes of the alphabet-procedure and to compare it with traditional reconstruction of the grip.

Methods: 18 patients (20 hands) with SCI and tetraplegia classified OCU 3-5 according to ICHF (International Classification of Hand Function) were included in the study. The patients underwent a set of surgical procedures according to the alphabet reconstruction, tendon transfers to reconstruct flexion of the fingers and the thumb and tenodeses to enhance thumb extension and correction of radial deformity and interossei function (passively) and arthrodesis of the 1st CMC joint. Opening of the hand and grip strength was measured and also compared with 27 patients (36 hands) with reconstructions made the traditional way.

Results: The patients with the alphabet-procedure achieved a better opening grip of the hand, 6.4 cm compared with 5.3 cm in the traditionally reconstructed patients. Grip strength differed much and was 6.7 kg in the alphabet group and 1.6 kg in the traditional group. One patient was dissatisfied and was given active extensors.

Conclusions: The patients with the alphabet reconstruction had better opening grip and better grip strength than the patients with the traditional way of reconstruction of the grip. Early active mobilization is a key factor in improving the functional outcome after grip reconstruction.

A-0538 Half FPL 'Lasso' To A1 Pulley For Dynamic Metacarpophalangeal Joint Stabilization For 'Z' Deformity Of Thumb & Froment's Sign Correction In Irreversible Ulnar / Median-Ulnar Nerve Paralysis

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Purpose: To develop a tendon transfer technique using 1/2 Flexor Pollicis Longus (FPL) to A1 pulley 'lasso' for dynamic thumb Metacarpophalangeal Joint (MCPJ) stabilization.

Background: Half FPL to Extensor Pollicis Longus (EPL) transfer for thumb 'Z' deformity correction functions as a dynamic tenodesis to restricts Interphalangeal joint (IPJ) motion. This corrects Froment's sign but leads to difficulty in rolling movements of thumb. A technique using " FPL 'lasso' to A1 pulley has been developed for dynamic stabilization of MCPJ of thumb without interfering with IPJ.

Method: In a prospective trial 20 mobile thumbs with irreversible ulnar or median & ulnar paralysis had " FPL 'Lasso' to A1 Pulley. The radial half of FPL was detached from IPJ & split proximally to the CMC joint. The tendon was looped to A1 pulley and attached to itself with a Pulvertaft weave with MCPJ flexed and IPJ extended. Active mobilization was begun at 48 hours. Position of MCPJ & IPJ during pinch at 6 months or prior to opposition transfer (supporting the CMC in abduction) were assessed using Outcomes measures (a) MCPJ: Hyperextension <100 Good and >100 Poor (b) IPJ flexion : Good 0-300, Fair 31-600 and poor >600.

Results: During pinch MCPJ position was good in all thumbs. IPJ flexion was good in 13, fair in 6 and poor in 1. IPJ range of motion ranged from 10-400 (average 250) at 6 months.

Conclusion: Half FPL 'Lasso' to A1 pulley can provide during pinch a dynamic MCPJ stabilization in 'Z' deformity of thumb and correct Froment's sign. The transfer can undergo immediate active mobilization protocol & retains active IPJ motion. In Median-Ulnar paralysis " FPL 'lasso' can be combined with claw deformity correction and then the Opposition transfer to the thumb requires a single transfer amenable to immediate mobilization.

A-0539 A Randomized Clinical Trial Comparing Immediate Active Motion With Immobilization After Tendon Transfer for Claw Deformity

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Purpose: Immobilization after tendon transfers has been the conventional postoperative management. In this study, we tested the hypothesis in a randomized clinical trial comparing the effectiveness of the early active mobilization with that of conventional immobilization.

Methods: Fifty supple claw hand deformities were randomized postoperatively into 2 equal groups for early active mobilization and immobilization. Therapy began on the second postoperative day for the early active mobilization group and on the twenty-second postoperative day for the immobilization group. The primary outcome measures were deformity correction, active range of motion of digits, tendon transfer insertion pullout, and time until discharge from rehabilitation. Secondary outcome measures were swelling, pain, hand strength, and dexterity. Both groups were compared at discharge from rehabilitation and at the last clinical follow-up (at least 1 year postoperatively).

Results: Assessments were available for all 50 patients at discharge and for 23 patients in each group at follow-up. The average follow-up was 18 months for the early active mobilization group and 17 months for the immobilization group. Deformity correction, range of motion, swelling, dexterity, and hand strength were similar for both groups at discharge and a follow-up. There was no evidence of tendon insertion pullout in any patient of either group. Relief of pain was achieved significantly earlier with early active mobilization. Morbidity was reduced by, on average, 22 days with early active mobilization.

Conclusions: We found that the immediate active motion protocol is safe and has similar outcomes compared with those of immobilization, with the added advantage of earlier pain relief and quicker restoration of hand function. Immediate motion after tendon transfer can significantly reduce morbidity and speed up the rehabilitation of paralytic limbs, and it may save expense for the patients.

A-0007 Thumb reconstruction by partial great toe transfer with short pedicle procedure

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Since 1997, 41 thumbs defects at or distal to the P1 were reconstructed using partial great toe transfer with a short vascular pedicle. An iliac bone graft was sometime used for basal P1 amputation (Morrison et al., 1980). The particularity of short vascular pedicle procedure is that anastomosis was done with a palmar digital artery of the thumb contrary to the classical anastomosis with the radial artery on the snuff box which need a long pedicle. The time of arising was shorter and easier than with a long vascular pedicle (less than 1 hour even in plantar dominant first Intermetatarsal artery because harvest stop on the intermetacarpal ligament). The rate of vascular complication (spasm= 20%, second look=15%, fails=5%) was the same than with a long pedicle . This procedure of short pedicle gives the best cosmetic appearance with no scar on the dorsal and social side of the hand and a very short scar on the foot less than 5 cm. Now, we use short pedicle for all our digit reconstruction by toe transfer.

A-0044 Posterior interosseous artery island flap – Clinical results with special focus on donor site morbidity

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Purpose: The use of the posterior interosseous artery island flap for reconstruction of soft tissue defects of the hand is well established. The positive outcome of soft tissue reconstruction with this flap has already been shown in the literature but there are no studies that specially consider the donor site. In this study we thus focussed on donor site morbidity in addition to the usual clinical findings.

Methods: Between 1995 and 2009, 40 patients (22 male, 18 female) underwent soft tissue reconstruction with a posterior interosseous artery island flap at our institution. The patients ranged in age from 19 to 92 years (mean 57). Defect etiology included trauma (n=17), infection (n=10), tumor resection (n=7), paravasation (n=3) and burn injury (n=3). Flap sizes ranged from 4 x 4 to 14 x 7 cm. Data analysis included risk factors, the recipient site, donor site closure, duration of surgery, the postoperative course and complications. Twenty-one patients were available for a clinical follow-up examination with special emphasis on the donor site.

Results: In 67.5% the postoperative course was uneventful; in 32.5% there were postoperative complications, whereby these necessitated surgical procedures in 12.5%. There were two complete flap losses. Donor sites were closed directly in 50%. In the 21 patients available for follow-up, the donor site scar measured 18.6 x 0.5 cm (mean) after direct closure and 19.5 x 5.9 cm after closure with grafts. Impairment of forearm contour was more severe in the skin graft group. The mean total score on the Vancouver Scar Scale regarding the donor site was 2.4 (1.2 for directly closed donor sites, 4.6 for grafted donor sites). One-fifth of the patients reported minor pain with a mean value of 1.7 on a visual analogue scale (1-10). The aesthetic appearance of the donor site was subjectively graded with 2.3 points on the VAS (1 best result, 10 worst result).

Conclusions: Our data reveal that the posterior interosseous flap is a valuable option for the management of soft tissue defects on the dorsum of the hand not only due to its reliable anatomy and soft and pliable tissue but also to its low donor site morbidity and high patient acceptance.

A-0045 Thumb reconstruction by grafting skeletonized amputated phalanges & soft tissue cover

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This study reports cases of crush-avulsion injury to the thumb at different levels presented at our plastic and hand surgery unit between 2005 and 2007. All of the

patients were male labors with machine injuries to the thumb with non-replantable amputations. Distal phalanx, proximal phalanx, or both, were used as a free cortical bone graft. The amputated part was skeletonized keeping the periosteum attached to the cortical bone of the phalanx fixing it to the stump and covering it by either local flap like dorsal metacarpal flap or regional flaps like the distally based pedicled radial forearm flap and neurovascular island sensate flap or groin flap. The results were functionally and cosmetically good and follow up X rays showed no osteoporotic resorption after 3 years.

A-0127 Formative hand surgery by combined use of hand and microsurgical techniques and an external fixator

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Purpose: Reliable initial treatment with a view toward 2-stage reconstruction and a treatment plan centered on postoperative rehabilitation are important to improving the function of replanted fingers and reconstructed hand after severe trauma. In order to acquire better joint function, it is logical to start using an adjustable external fixator that allows ROM exercise while exerting traction on the finger joint before bone union. We use a compass PIP joint hinge external fixator (CPJH) or an Ilizarov Mini external fixator (IM) and have obtained consistent results in regard to release of the above-described contractures around the first interdigital space and PIP joints. Moreover, since we have performed bone lengthening and bone transfer with the IM to treat lost fingers, we will report our experience thus far.

Subjects and Methods: There are three groups of subjects: 1) a group (13 fingers) with replanted fingers who wore a CPJH or IM for the purpose of traction of a proximal interphalangeal (PIP) or metacarpophalangeal (MP) joint and ROM exercise (CPJH 7, IM 6), 2) a group (12 hands) in which contracture with the first interdigital space was released with an IM. 3) a group composed of 9 fingers in whom lengthening and reconstruction of the proximal phalanx was performed. In Group 1, depending on the type of the fracture, we attempted to maintain reduction during the initial treatment by using the IM, to which we had added new parts. Later, we inserted wire and rearranged the fixator into the form of a hinge, and we performed post-treatment by applying traction to the joint. In Group 2, it was possible to attach the external fixator by a method that for the first time enabled opening between the first interdigital space in 2 directions. In Group 3, as a rule we started bone lengthening on postoperative day 7. As a rule we lengthened the bone at a rate of 0.5 mm/day. Results 1) TAM was

55%, and the mean score according to the new criteria for evaluation of the function of amputated and reattached fingers of the Japanese Society for Surgery of the Hand was 66 points. 2) The mean follow-up period was 11 months. The preoperative passive distance between the thumb and index finger was 41% in radial abduction, and 33% in palmar abduction. Postoperatively, in radial abduction, the passive distance between the thumb and index finger was 91%, while in palmar abduction the passive distance between the thumb and index finger was 92%. 3) The total amount of lengthening was 15 mm to 35 mm. There were also cases in which sensory reconstruction was performed by adding a sensory flaps.

Discussion: We think that they are also useful for reconstructing missing fingers, and that "Formative hand surgery" centered on soft tissue and bone lengthening with an external fixator is an effective solution to the treatment of various deformities and losses after hand trauma.

A-0173 The posterior interosseous flap - our experience of 28 clinical cases

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We are presenting our experience of 28 cases in emergency repair of soft tissue lost of the hand using the posterior interosseous flap. The paper describes some of the clinical applications in hand soft-tissue reconstruction with large areas of skin that can be used safely based on the posterior interosseous artery which is a vessel of secondary importance for hand vascularisation. The fact that we proceed to emergency repair, give a functional advantage to the patient.

A-0196 Composite Free Venous Flaps In The Reconstruction of Composite Digital Defects: A Clinical Experience In 31 patients

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Introduction: Three Dimensional digital defects occurring due to trauma or other etiologies may create difficulties in the modalities of reconstruction. In certain conditions, such defects may be composite in nature. Nerve, artery, vein and skin may be injured simultaneously with a gap of tissue defect that requires flaps and grafts harvested from other parts of the body. Furnishing the injury site with composite

tissue may enable a flow through restoration from proximal to the distal end of the digit. In such situations, composite free venous flaps that contain a vessel, nerve and cutaneous and subcutaneous fatty tissue might be a good solution. In this study we presented the use of different types of free composite venous flaps in tissue defects in the digital region and investigated its clinical outcomes.

Patients and Methods: Thirty-one patients (between the ages 19-51) whom were admitted to our emergency department were evaluated for acute hand injuries. Group1 (N: 10) included composite digital defects (artery, nerve, skin) at the volar mid-phalangeal level, Group 2(N: 13) with total digital amputations and avulsion injuries, Group3 (N: 4) with digital amputations and dorsal digital defect (vein, skin), Group4 (N: 4) with digital tip amputation classified as TAMAI I. The mean size of the flaps was 3.4 cm and all flaps were harvested from the ipsilateral forearm. Twenty-seven flaps were prepared including a nerve branch of the lateral cutaneous nerve of the forearm for simultaneous nerve reconstruction, 9 flaps were designed as Artery-Vein-Artery, and 4 as Vein-Vein-Vein, 3 flaps as Artery-Vein-Artery +Vein) and 15 flaps were in the form of Artery-Vein-Vein.

Results: All patients were followed up for six months, 3 patients suffered of partial flap loss while only one patient suffered of total loss that was a smoker. The rest of flaps healed perfectly and the sensory restoration was optimum.

Conclusion: The composite free venous flaps may be considered as an effective, all-in-one versatile method in reconstructing composite digital defects resulted from hand injuries. Key words: composite, digital, venous flaps

A-0216 Direct and reverse metacarpal flaps: a review of 32 cases

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Distally based dorsal metacarpal artery (DMCA) flaps are well established in reconstructive hand surgery; blood supply relays on reverse as described by Maruyama and Dautel or directly by means of a cutaneous branches of the distal DMCA as described by Quaba or on the arterial branches anastomosing the volar and dorsal arterial networks of the fingers as described by Bakhach. We report a retrospective series of 32 cases during a 8 y period for dorsal, palmar and commissural loss of substance of fingers. Trick and pitfalls are described. These flaps are transposed as reverse or direct flow island flaps are sometimes indicated as composite flap to restore extensor apparatus of fingers. No flap necrosis was observed, and donor site morbidity was minimal. We describe many modification

of these flaps and the outcomes for different indications. Patients were discharged the day after surgery and allowed to mobilize the finger early.

A-0254 Does posttraumatic thumb reconstruction effectively improve hand function?

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Background: The importance of even an impaired thumb for effective prehensile function cannot be underestimated. Pollicisation, toe to thumb transfer, and osteoplastic thumb reconstruction, along with free tissue transfer, are the most reported reconstructive procedures after traumatic amputation at the proximal and middle third of the thumb. To our knowledge, no microsurgical center has ever compared the functional results of the above-mentioned procedures with non-reconstructed amputated thumbs. We will present our clinical studies on functional outcomes with special attention to the M2 DASH questionnaire and effect size of Cohen's d.

Methods: From 1998 to 2007, 22 posttraumatic thumb reconstructions were successfully performed. After ethical approval, 11 patients (2 women and 9 men) with posttraumatic thumb reconstruction (three pollicizations of the index or index stump, four free lateral arm osteocutaneous neurosensory flaps and four microvascular second toe to thumb transfers), performed during the period 2000-2007, were re-examined after 4.2 (SD \pm 2.1) years (range 2-7 years post injury). All patients underwent standardized testing by a trained hand therapist and the patients' self assessment questionnaires were independently analyzed by researchers who were not involved in their treatment. To ensure homogeneity among the patients' data, we selected only patients with isolated thumb amputations at the level of the proximal phalanx.

Results: The total M2 - DASH score after thumb reconstruction was 18.55 (SD \pm 16.79). The M2-DASH score of patients with nonreconstructed thumbs was 32.77 (SD \pm 18.87). Pairwise comparisons between reconstructed and amputated thumbs showed statistically significant differences (Wilcoxon rank sum test, p-value = 0.03) and a highly effective improvement of hand function (Cohen's d = 1.10) after thumb reconstruction relative to amputated thumbs. Semmes Weinstein results, power measurements and active range of motion between patients with reconstructed and amputated thumbs did not vary significantly (Wilcoxon rank sum test, p-value = 0.10, p-value = 0.90, p-value = 0.54). A moderate effective improvement of hand function was seen in sensory recovery and active range of motion (Cohen's d = 0.6) after thumb

reconstruction. No difference in effectiveness was seen in power measurement.

Conclusion: It is no surprise that on the basis of these mid-term follow-up results, it can be concluded that patients with thumb reconstruction have better hand function than patients with thumb amputation, as demonstrated by the M2-DASH score and objective parameters. The majority of patients after thumb reconstruction were able to return to their former occupations and had an amazingly low level of disability. Before selecting a candidate for thumb reconstruction, it is critical to decide on an individualized treatment plan. Factors such as the patient's occupation and the importance of the aesthetic appearance of the thumb must be carefully considered. The surgeon must investigate the patient's current use pattern and functional requirements before considering a reconstructive treatment.

A-0263 Severe upper limb injuries with or without neurovascular compromise in children and adolescents. analysis of 31 cases

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Aim: The purpose of this paper is to present our experience in the treatment of severe upper limb injuries in children. Early recognition and treatment of upper limb injuries in children may prevent unfavorable outcomes after surgery.

Materials-Methods: Between 2002 and 2004 we have treated 32 cases of severe upper limb injuries in children or preadolescents aged between 2 and 14 years. All cases were classified according to the S.A.T.Ty (Severity, Anatomy, Topography, Type) evaluation scale, closely related with the prognosis of the injury. In all cases post-operative follow up was longer than one year. A detailed presentation of all patients is shown in Table 2. Demographic data, the severity, initial treatment and result are presented. As regards the anatomical distribution of the injuries all were of the A2 type because they were compound injuries involving more than one tissue type. Ten cases were admitted with non viable (S2) limbs or fingers (partial or complete amputations). Among them six were S2Ty1 guillotine type and four were S2Ty2 crush type. Among the non amputating injuries there were 4 crush-avulsion S1Ty2 type injuries secondary to motor vehicle accidents (2 cases) or blast injuries (2 cases) who were treated with flaps. 18 injuries were combined

injuries located at the fingers, wrist or forearm. In 15 cases direct tendon and nerve repair was performed while in 3 cases nerve grafting was performed. As regards the topography of injuries the palmar surface injuries (T1) prevail followed by dorsal surface injuries (T2) and complete amputations (T3).

Results: Among the 10 cases with partial or complete amputation revascularization was feasible in 6 cases. In 4 cases revascularization was not feasible because of severe crushing or in 1 case because of the small size of the avulsed index finger. Among the 3 crush-avulsion type injuries (S1Ty2) 4 emergency flaps were carried out (3 fasciocutaneous ulnar artery based flaps and 1 groin flap). One of the abovementioned flaps underwent partial necrosis and the defect was treated with a complementary reverse flap based on the distal perforators of the radial artery. The 15 combined injuries of the forearm, wrist, palm and finger were treated with end to end suturing of the tendons and nerves with significant improvement of the function according to Dellon-McKinnon. The sensation and active movement reached at average almost 80% of the normal limb. In the 3 cases where nerve grafts were used the sensation lagged significantly behind the normal side.

Conclusion: The outcome of childhood severe upper limb injuries seems to be good and surgical repair should be attempted according to the guidelines set for adults. A correlation seems to exist between the outcome of treatment and the classification of the injury according to the SATTY system. In cases with crush-avulsion injuries S2-Ty2 reconstruction was not possible, while in cases classified as S2Ty1 or S1Ty2 the outcome was more or less improved. Fasciocutaneous flaps based on perforator arteries are a very important tool in the surgeon's armamentarium because sacrifice of a major artery is avoided.

A-0356 Microvascular monitoring with a novel laser doppler imaging system

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Laser Doppler Imaging (LDI) is a non-invasive and contactless optical method to visualize microcirculatory perfusion in the skin. So far, LDI systems have been slow and bulky, making them a useful tool in microcirculation research, but limiting clinical adoption. In collaboration with the Swiss start-up company Admago, we have developed a novel, easy-to-use LDI camera that works in real-time. Measures are repeatable and operator independent, and the camera can be used by surgeons and nurses alike. We report on first experiences using the camera during

and after surgery to objectify the assessment and the monitoring of flaps and replanted tissue. We compare perfusion levels of neighboring tissue sites, and track their evolution over time, which provides us with an instantaneous and reliable measure of tissue viability. Our initial experiences have shown that the Admago LDI system is extremely sensitive to changes in the arterial and venous blood flow which is extremely important in the monitoring of microsurgical interventions. It allows with high reliability an early differentiation between superficial and deep burns. It is an important tool in monitoring of extremity frostbite. Further work must still be conducted to evaluate the importance of this tool in some vascular diseases of the hand such as Reynaud's syndrome, and other microvascular angiopathy. In conclusion, Admago LDI system is a reliable non invasive tool based on a new technology. It is extremely sensitive to tissues arterial and venous blood flow variation and very easy to use in clinical and research applications in hand surgery.

A-0375 Experimental and Clinical Application of Fibrin Glue in Microvascular Anastomoses: 10 Years of Experience

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Purpose: Since the first experiments with fibrin glue application in microvascular anastomoses in 1977, several studies have reported its benefits on suture reduction and anastomosis decreased time. In spite of that, clinical experience has been limited to two neurosurgical and two replantation case series. We performed two experimental studies followed by a clinical study with fibrin glue application in microvascular anastomoses, between 2003 and 2008, with favorable outcomes in all of them. Consequently, we incorporated the routine use of the fibrin glue in our free flap cases and replantations. The objective of this presentation is to share our cumulated experience with the fibrin glue application in microvascular anastomoses for almost 10 years.

Methods: two experimental studies were conducted comparing the conventional suture technique with the fibrin glue assisted technique in terms of number of sutures, anastomosis time, patency rate, bleeding and histopathological findings. In the first study (2003), we performed end-to-end anastomoses in the femoral and carotid arteries of rats. In the second study (2008), the experimental model consisted of a free groin flap transfer to the anterior cervical region in rabbits. The flap's circulation was restored by means of an end-to-side anastomosis between the femoral and carotid arteries, and an

end-to-end anastomosis between the femoral and external jugular veins. In the clinical study, 24 consecutive cases of free flaps were performed, from March 2005 to June 2006. Twenty were included in the study. They were divided in two groups, according to the anastomosis technique: conventional group (n=7 patients) and fibrin glue group (n=13 patients).

Results: the application of fibrin glue significantly reduced the number of sutures and the time required to complete the anastomoses. The anastomotic bleeding was also reduced. The patency rates and the flaps' survival rate were not adversely affected by the fibrin glue application in both experimental and clinical studies.

Conclusions: Fibrin glue application in microvascular anastomoses proved to be safe and reliable in experimental and clinical studies. It allowed us to complete the anastomoses more easily, with fewer sutures and less time.

A-0396 The proximally designed sural flap based on the accompanying artery of the lesser saphenous vein: comparing indications and outcomes with the traditional sural flap

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Purpose: most of the literature about the sural flap, deals with soft tissue defects at the lower leg and foot based on the classical description of Masquelet et al., in which the flap is nourished through neurocutaneous branches of the superficial sural artery. Nevertheless, some authors have shown that the lesser saphenous vein and its accompanying artery play an important role in the vascularization of the posterior skin of the leg through venocutaneous branches. This finding allowed a more proximal design of the sural flap at the upper third of the leg, increasing its arc of rotation. The objective of this study was to compare the classical concept of the sural flap with the more proximally designed sural flap, in terms of indications and outcomes.

Methods: from March 2006 to December 2010, 22 consecutive cases of distally based sural flaps were performed. Twenty two were included in this study and were divided into two groups according to the level where the flaps were harvested. In group A (n=8), the entire flap was outlined distal to the midpoint of the leg, while in group B (n=13), more than 50% of the flap was outlined proximal to the midpoint of the leg. In group A, all the soft tissue defects were located at the lower leg and the hind-foot, while in group B they involved the anterior aspect of the middle third of the tibia in nine of thirteen cases.

Results: in group A, the complication rate was 25% (2/8) including 1 subtotal flap necrosis and 1 marginal flap necrosis. In group B, the complication rate was 30,76% (4/13) including 1 subtotal flap necrosis, 2 marginal flap necrosis and 1 proximal third flap necrosis. The flap survival rate was 88,89% (7/8) in group A and 92,30% (1/13).

Conclusion: the traditional concept of the sural flap, based solely on the superficial sural artery, it's suitable to cover soft tissue defects located at the distal fourth of the leg and hind-foot. The more proximally designed sural flap, based on the accompanying artery of the lesser saphenous vein, can reach more proximal and anterior locations, such as the anterior aspect of the tibia in its middle and distal thirds. Both of them showed to be reliable, easy to perform and with a low donor site morbidity when the flap width was less than 5 cm. The complication and survival rates were acceptable and quite similar in both groups.

A-0398 The Use of Venous Flaps in Reconstruction of Digital Defects: Experience with the Shunt-Restricted Technique for Improved Survival and Reliability

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Introduction: The arterialised-venous flap has been described as an alternative option for reconstruction of smaller digital defects where either local, regional or other arterialised free flap options are unsuitable. Despite providing thin, pliable cover with an almost negligible donor site, it remains unpopular due to the high congestion and unpredictable survival rates, caused largely by unrestricted arterio-venous shunting across the flap. This study explores the effects of shunt restriction in improving the success rate of venous flap reconstruction.

Methods: Eighteen flaps (17 patients) were performed for digital defects secondary to trauma (n=12), contracture release (n=4) and malignancy (n=1). Inflow was established via an antegrade fashion from the digital arteries and outflow to dorsal veins. Shunt restriction was achieved by strategic use of hemoclips according to various venous patterns: (1) across the communicating branch of parallel veins in 'H'-flaps; (2) near to the bifurcation point of a 'Y'-flap; or (3) midpoint of a single vein ('I'-flap). Average flap size was 8.55 cm².

Results: All of the flaps survived entirely. Six flaps demonstrated an initial congestion at the afferent end which resolved eventually. One flap developed epidermolysis but suffered no eventual full-thickness loss.

Conclusions: Shunt-restriction improves the survival of venous flaps with resultant increased perfusion and reduced congestion, making them a reliable option for reconstruction of difficult digital defects.

A-0434 Analysis of Consistency of the Perforated Radial Forearm Flap

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Background: Supplied by the septocutaneous perforating branches of the radial artery, the radial artery flap plays an important role as a fasciocutaneous flap. It is classified by Mathes and Nihai as a Type B fasciocutaneous flap. It is designed on the volar forearm and, despite its conspicuous donor site, has proved useful both when harvested for local and free flap use. The traditional radial forearm flap resulted in the loss of the radial artery and the development of the perforator radial forearm flap helped preserve the radial artery of the forearm.

Objective: The purpose of this study is to determine safest distance of the most distal perforator of the radial artery from the radial styloid artery in planning and raising a perforator radial forearm flap.

Material and Methods: Five human cadaveric forearms were dissected. The first originating radial artery perforator was identified on both left and right forearms. Location relative to the distal tip radial styloid was measured on all occasions. This was performed using callipers. An average of 3 measurements were done.

Results: A total of 10 radial arteries were dissected from 5 cadaveric forearms (aged between 62 and 87 years at death). All distal most perforators consistently emerged from the radial artery within 5 cm from the tip of the radial styloid and entered into the flap. Average distance from the radial styloid was 2.92 cm among perforators. There was however a large variation between arms. Left arms perforators were further away from the styloid process by an average of 1.6cm.

Conclusions: Our study has demonstrated that the distal most perforator will be safely included in the flap if in the design of the pedicle perforator radial forearm flap the point of anchorage should not be less than 5 cm from the tip of the radial styloid.

A-0479 Vascularized second toe joint transfer for finger PIP reconstruction : 34 cases with 4,6 years follow-up

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In a retrospective clinical study, 34 vascularized second toe PIP joint transfers to the hand were evaluated with an average follow-up of 4,6 (1 - 12) years.

Materials and methods: The mean age range was 17,75 (2 - 42) years. The finger joint defect was caused by trauma in 27 patients, by infection in 5 patients, and by tumour and congenital deformity in 1 patient each. Now, the whole procedure is achieved with a short pedicle technique through a single dorsal approach.

Results: There has been no microsurgical failure but 4 fingers needed secondary procedures (arthrodesis or amputation), 3 times due to sepsis and 1 due to painful ankylosis in flexion. The average active range of motion was 44.3° (0-80). The lack of extension is almost inevitable (34.3° average). All recipient hands were painless. DIP range of motion was 40.7°(0-70). In all cases, there was no clinical and radiological evidence of arthritis at the last follow-up. In the pediatric population, no iatrogenic epiphysiodesis has been deplored and growth potential has been preserved. There is no discomfort in walking as the toe was amputated or reconstructed.

Conclusion: The microsurgical reconstruction of the PIP by vascularized joint transfer from second toe is the best therapeutic option for restitute perennial and usefull joint mobility. It remains the only reasonable option to reconstruction in young population.

A-0485 To tunnelise or not the pedicle of a flap?

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Purpose: The number of pedicled flaps in upper limb soft tissue substitution is constantly growing. A critical part of a pedicled flap is the pedicle itself. Rotation or double rotation of the pedicle can influence the blood in- and outflow and the survival and integration of the pedicle. Tunnelisation of the pedicle increases the aesthetic value of the flap, but it may affect it's circulation. Dealing with an important number of pedicled flaps in our unit, our feeling was that, a tunnelised pedicle flap has more frequent complications, than the flaps, without tunnelised pedicle. To confirm this, we decided to analyse the pedicled flaps performed in the last 6 years in our unit.

Methods: We have retrospectively analysed all the pedicled flaps, performed in a big trauma and hand surgery department of a regional university hospital in the last 6 years. We considered the survival and integration of the flaps, the partial survival of the flaps, and the other postoperative complications.

Results: In the last 6 years we have performed 98 pedicled flaps for upper limb tissue substitution. 56 of them had tunnelised pedicles, 42 had pedicle covered with split skin graft . The number of serious complications in the tunnelised group showed: 2 total losses of flaps, 2 partial losses greater than 25% of the flap, 3 partial losses smaller than 25 % of the flap, and 4 epidermolysis. The number of complications, in case of the 42 flaps with not tunnelised but grafted pedicles, presented 1 total loss of the flap, 2 partial losses smaller than 25 % of the flap, and 1 epidermolysis.

Conclusions: Our data analysis demonstrated a significantly higher rate of complications in case of flaps with tunellised pedicles. We found complications always in retrograde flow flaps. We think, that avoiding tunnelisation of retrograde flow pedicled flaps can considerably improve the results in flap survival and decrease the number of complications.

A-0056 Corrective osteotomy for malunited fractures of the distal radius

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Objectives: despite great achievements in the treatment of distal radius fractures, one of the most common complications is still malunion. It causes deformity of the wrist, pain, loss of wrist motion, forearm rotation and reduced grip strength. Corrective osteotomy enables to restore the anatomy of the distal radius and function of the wrist. Depending on the type of the malunion, an extraarticular or intraarticular osteotomy may be performed. The purpose of this study was to evaluate the results and complications of corrective osteotomy and locked plating for malunited fractures of the distal radius.

Methods: We present a review of 110 patients with 111 malunions of distal radius treated surgically between 07.2001 and 10.2010. There were 41 male and 69 female with average age of 41 (15 - 75). The time interval between injury and surgery was from one to 30 months (approximately 2,03 months). According to the AO-classification, there were 70 A, 12 B and 29 C type fractures. In 104 patients we performed a corrective wedge osteotomy of the distal radius with iliac bone graft transfer (30), distal radius graft (9) and bone substitute - «ChronOs»/«Orthos» (32/1). In 7 Patients with B and C type malunited fracture we performed the intra-articular corrective osteotomy through an extra-articular approach using a preoperative computer tomography and intraoperative fluoroscopy. In all patients was performed an osteosynthesis of the distal radius using locking volar or dorsal plates. The immediate mobilization of the wrist was begun on the second postoperative day. Mean follow-up was 22 months, from a minimum of 3 months to a maximum of 7 years. We examined 102 of 110 patients after corrective osteotomy with the respect of an active range of motion (ROM) of the wrist and forearm, grip strength, DASH- and MAYO-scores and measurement of radiological parameters.

Results: Preoperative active ROM was 54% of the other hand, postoperative was 83,5%. Preoperative grasping

power was 28,3%, postoperative was 81,6% of the other side. Radiographic examination demonstrated an overall union rate of 98% (100 patients) in 3 months after surgery. Radioulnar inclination increased from 13° preoperative to 23° postoperative. Palmar inclination increased from -7° [-46° to 37,5°] preoperative to 0,8° postoperative. Preoperative ulnar variance of +5.3 mm was corrected to 0.8 mm postoperatively. Intraarticular steps were corrected from 2,3 mm to 0,6 mm. Postoperative Mayo wrist score was good or excellent in 81 Patients (79,4%), the mean DASH score was 17,5. Complications included: 2 nonunions after bone substitute, 3 postoperative CTS, 1 De Quervain syndrome, 1 superficial radial nerve injury, 5 posttraumatic arthrosis.

Conclusions: The corrective extra- and intraarticular osteotomy is an effective method for restoring of bone configuration of the distal radius. The osteosynthesis of the distal radius with locking plates following postoperative immediate mobilisation allows improving of grip strength, range of wrist and forearm motion, radiological parameters, with improvement of the factors of MAYO- and DASH scores.

A-0297 12-month follow-up of 230 intraarticular (AO-C fractures) distal radius fractures operated with a dorsal pi-plate and a volar T-plate

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Background: Recent studies have shown postoperative sequel with malalignment of the fractures and ruptures of both the flexor and extensor tendons with volar approach. Earlier studies with dorsal and volar technique are few and very small series. Our study reports the results of 230 cases.

Material and Methods: A prospective consecutive series of 238 patients, 8 patients were initially staged as C fractures but intraoperatively classified as B-fractures and thus excluded. Mean age 51.6 years. Physiotherapy was initiated after 2 weeks in plaster. An independent physiotherapist at 1,6, and 12 months performed follow-up. X-ray was performed 1, and 12 months after surgery.

Results: Initial x-ray showed according to AO staging 15 C1, 52 C2 and 163 C3 fractures. At 12 follow-up extension were 49°, flexion 54, supination 82, pronation 81, ulnar abduction 21 and radial abduction 22. Grip strength measured with Jamar dynamometer 33kg (97% of the unaffected hand), Key pinch 6.9 (103%). Pain measured with VAS in activity was 0.6. 90% were classified as excellent or good. 2 patients had intermittent numbness in thumb and index finger, 1 infection and pseudarthrosis and 2 patients with flexor pollicis longus ruptures. The plates were removed in 35% of the cases.

Discussion: We recommend the double-plating system in comminute intraarticular distal radius fractures, despite several secondary plate removals.

A-0330 Distal radius malunion - two bone osteotomy and factors affecting decision making

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Introduction: Distal radius malunion covers "easy" angular or rotational malunions as well as malunions appearing after high energy injury, infection of the fracture or malunions with previous multiple surgical procedures. In certain situations soft tissues are very tight or over all situation is so complicated that simple radial corrective osteotomy is not enough for a good functional result. That is why authors are trying to find factors that do influence decision making whether to do just radial or combined radial and concomitant ulnar osteotomy.

Methods: Authors are presenting group of 10 patients treated with two bone osteotomy at the same time. Pre and postoperative X rays, range of motion, grip strength where studied and all additional clinical problems where described in this group.

Results: Group analysis revealed that 4 fractures where open, 5 where high energy injuries, 2 where infected, 8 patients had 2-4 previous surgical procedures and 4 had concomitant neurological, vascular or tendon problem preoperatively. Deformities varied from 2-20 mm of radial shortening, 70 degrees of volar to 55 of dorsal angulation and minus 20 to plus 18 degrees of ulnar inclination. Extension of the wrist averaged 31 degrees, flexion 34 degrees, supination 34 degrees and forearm pronation 34 degrees. The average grip strength was of 17 kilograms compared to 33 on contralateral side. At an average of 10,8 months [range, 6 to 17 months] radial shortening

improved from 9,9mm to 0,8mm, volar inclination improved to 14,3 degrees and ulnar inclination to 14,9 degrees. Range of motion changed from 34 to 59 degrees of extension, 31 to 46 degrees of flexion, 34 to 62 degrees of supination and 34 to 65 degrees of pronation. Grip strength improved from 17,25 to 31,25 kg.

Discussion: Concomitant radius and ulnar osteotomy is a big surgery but valuable way of treatment of distal radius malunion in cases of severe soft tissue impairment as it happens in cases of high energy and open injuries, in previously infected cases and in cases after multiple surgeries. All these factors are aggravating soft tissue tension and increasing risk of postoperative stiffness. 9 patients have had different types of bony procedures, soft tissue complications or algodystrophy. All needed individual approach and type of osteotomy but all have had reasonable functional and cosmetic improvement.

A-0393 Management of distal metaphyseal and diaphyseal radius/ulna fractures in Children: A Retrospective analysis

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Purpose: To evaluate the outcome (primarily in terms of redisplacement and residual deformity) of displaced distal metaphyseal and diaphyseal radius/ulna fracture treatment: Manipulation under anaesthesia (MUA) with plaster cast versus surgical stabilisation (pinning) in paediatric age group and for different fracture types (for instance, radial fractures with or without ulna fracture).

Methods: Retrospective analysis from case notes (Blue Spier electronic patient data record system) and radiographs of 170 children aged 0 to 16 yrs.

Results: 33 % of distal metaphyseal radius fractures redisplaced with majority (72%) in MUA with cast group. Almost all redisplaced fractures had associated ulna fracture. 43 % of these displaced fractures underwent another procedure for correction of deformity. 15 % of diaphyseal radius fractures re-displaced with majority (90 %) in MUA with cast group. Almost all redisplaced diaphyseal radius had associated ulna fracture. 10% of these displaced fractures underwent further procedure. Complication rate with pinning was very low (< 1%). No long term complication was encountered with pinning.

Conclusion: For displaced distal metaphyseal and diaphyseal radius fractures requiring intervention, it is advisable to do pinning rather than MUA with cast only.

A-0011 Radiocarpal fracture-dislocations: a study of 22 patients

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Purpose: Radiocarpal fracture dislocation is rare complex injury, characterized by dislocation of the radiocarpal joint with or without palmar or dorsal fracture avulsion of the cortical margin of the distal radius. The purpose of this study was to evaluate our experience with the surgical treatment of radiocarpal fracture dislocations in 22 consecutive patients, with respect to surgical approach and existing classification schemes.

Methods: twenty two patients who underwent surgical treatment of radiocarpal fracture dislocation were followed-up for a mean period of 78 months. They were examined for pain, grip strength, wrist range of motion (ROM) and final radiographic assessment. The results were submitted to a score system proposed, for functional evaluation, by Gartland and Werley (1978) and radiographic evaluation, by Knirk and Jupiter (1986). Based on surgical and radiographic findings a new classification was proposed.

Results: With an average follow-up period of 78 months the following rates were obtained: Flexion, 65 degrees; Extension, 52 degrees; Ulnar deviation, 18 degrees and 12 degrees of Radial deviation. The mean grip strength was 83%. At latest follow up, in the radiographs evaluation, we observed narrowing of radiocarpal articulation, grade I of Knirk and Jupiter classification, in four patients. According Gartland and Werley system of functional evaluation, nineteen patients (86%) had an excellent and good results; two (9%) had a fair result and one (4,5%) poor result.

Conclusions: A good understanding, based on a rationale classification could lead to a better treatment with an anatomical repair with stable fixation assuring satisfactory functional results.

A-0020 Volar radioscapholunate arthrodesis as salvage procedure related to intraarticular hardware irritation after volar fixed angle plating in distal radius fractures

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Purpose: Volar fixed angle plating of displaced distal radius fractures has become a very popular technique in the past years. Secondary loss of reduction, especially under osteoporotic conditions, or volar translation of the carpus may cause an intraarticular positioning of the locking screws which sometimes leads to massive destruction and damage of the cartilage in the radiocarpal joint. In these cases, if reconstruction is not possible, we perform a volar radioscapholunate fusion as a salvage procedure.

Methods: 5 patients were treated from March 2006 to March 2009. 4 male, 1 female. The average age of the patients was 50.6 years (range 41-66). The surgical technique contains a volar approach, previously placed hardware removal, distal scaphoidectomy, cancellous bone graft and radioscapholunate arthrodesis with a locking frame plate placing each 2 screws in the lunate and the scaphoid.

Results: Average follow-up period was 34 months (14-50). The CT scans at follow-up showed no pseudarthrosis, one case of midcarpal arthrosis was related to surgical procedures. The clinical results showed pain relieve in all the cases. Residual function cover 51° flexion-extension arc, 21° radial-ulnar deviation arc and 60% of grip strength compared to the contralateral side.

Conclusion: Dorsal radioscapholunate arthrodesis is a common salvage procedure in painful posttraumatic osteoarthritis of the wrist. In cases of hardware irritation after volar plating we perform a volar radioscapholunate fusion to minimize the pain with a good residual wrist motion and grip strength.

A-0025 Complications following palmar plate fixation of distal radius fractures: A review of 665 cases

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Introduction: Palmar plate fixation of unstable distal radial fractures is becoming the standard treatment for this common injury. The literature regarding the complications of this procedure is limited to case reports or small case series. We present a large series of this popular technique and the associated complications.

Methods: The complications following open reduction and palmar plate fixation of unstable extra- and intraarticular distal radius fractures were evaluated in a retrospective study. The data was collected by chart and x-ray review. A multidirectional fixed angle implant was used in all cases. Patients were treated in our hospital or were referred to us.

Results: Between February 2004 and December 2009 a total of 665 palmar plates were implanted in 652 patients. The overall complication rate, excluding hardware removal, was 13% (85 complications in 67 cases). Revision surgery was necessary in 11% (74 procedures). Altogether 11 types of complications were observed. The most common reasons for revision surgery were secondary loss of reduction (15 patients), intraarticular screw placement (8 patients), and postoperative median nerve compression (20 patients). An ulna shortening osteotomy for ulnar impaction syndrome was necessary in eight cases. There were two flexor pollicis longus, one finger flexor, and four extensor pollicis longus tendon ruptures. Nine patients developed a complex regional pain syndrome. A fasciotomy for post-traumatic compartment syndrome of the forearm had to be performed in four cases. Hardware failure occurred in three cases and there were two surgical site infections. Hardware removal was performed in 232 (34%) cases. For many patients this procedure was beneficial.

Conclusion: Palmar plate fixation of distal radius fractures is a safe and successful procedure. Nevertheless, complications necessitating a second operative intervention are relatively common. Many complications can be anticipated by improving the surgical technique and avoiding technical pitfalls. Hardware removal is often beneficial for the patients.

A-0043 Effect of patient age on malunion of distal radius fractures subject to operative treatment

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Purpose: It has been shown that advancing age is the most important parameter to predict reduction loss of distal radius fractures treated with closed reduction and plaster cast immobilization. Purpose of the present study was to investigate if age influenced the radiological outcome following surgical fixation.

Methods: Radiographic outcomes of 200 distal radius fractures following surgical treatment were retrospectively assessed. Outcome was considered poor when fractures had healed with a dorsal tilt greater than 10°, a palmar tilt exceeding 16° or palmar displacement of the fracture, intra-articular steps greater than 2 mm or more than 2 mm radial shortening. Most fractures were treated with percutaneous K-wire fixation (n=139) and palmar plates (n=50). There were 128 women and 64 men. Mean age of the patients was 54 years (range: 16-96 yrs). The fracture was caused by a simple fall in 107 wrists and in a high energy trauma in 41 wrists. The majority of fractures were initially dorsally displaced (n=162) and 127 fractures were intra-articular.

Results: Thirty-five percent of fractures were malunited. In patients over 65 years of age, malunion was present in 54 % of the cases. Mean age of patients with malunion was 60 and without 51 years. Nineteen patients had dorsal malunion (mean age 68), 17 palmar malunion (mean age 53 years), 16 radiocarpal incongruity with an acceptable palmar tilt (mean age: 51 years) and 17 had radial shortening with an acceptable palmar tilt without intra-articular incongruity (mean age 65). The differences were statistically significant. When wrists treated with K-wires were evaluated separately, mean age of patients with malunion was 62 and without 50 years ($P < 0.0001$). In fractures stabilized with a palmar plate, mean age of patients without malunion was 52 and with 56 years, this difference was not significant ($P = 0.39$).

Conclusions: In the present study it was found that patients with malunion after surgical treatment were older than those without malunion. The influence of age on malunion was greater for K-wires than for palmar plates with locking screws. However, a reliable comparison between the two treatment methods cannot be made, as more fractures sustained in a high velocity trauma were treated with a palmar plate than with K-wires.

A-0069 Intraarticular AO Type C fractures of the distal radius in young patients Can we expect an early return to work with good functional and radiological results after surgical treatment?

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Purpose: On one hand young patients pretend outstanding functional and radiological results after treatment of distal radius fractures. On the other hand exactly these patients expose themselves to high energy traumas that may lead to complex intraarticular fractures of the distal radius. These patients even expect to turn back to work and to their daily activities as soon as possible with excellent functional and radiological results. The purpose of this study is to present the results we obtained operating on this specific group of patients with particular regards on the time they get back to work and on the functional and radiological results.

Methods: From January 2005 to July 2007 we operated on 151 patients with distal radius fractures. 39 patients were younger than fifty years (16-49) affected by complex fractures (AO type C). One observer could follow up 20 patients medially 32,3 (10-44) months post OP. One patient with a bilateral fracture has been excluded from this study. Plate fixation was used in 18 patients, external fixation and pins in one patient and pins and cast fixation in another patient.

Results: Using the Krimmer score 19 patients obtained good and excellent functional results, one patient had a fair result. The average Krimmer score was 89,5 (55-100), the average ROM was 92,7 % (69,4-100) of the controlateral side, the grip strength was measured 85,6 % (32,7-100) of the controlateral side. The average DASH score was 7.7 (0-37). We observed three complications: one case with scapho-lunate dissociation, one patient with an instability of the distal radio-ulna joint and another patient with a combined lesion: a scapho-lunate dissociation and an instability of the DRUJ. This patient was treated by reinsertion of the TFC and Berger's capsulodesis obtaining only a fair result. Patients turned back to work medially after 2.6 months (1.5-6). On radiologic examination we found an average radial inclination of 26°, palmar inclination of 6° and a residual intraarticular stepp off of 0.1mm. In two patients a slight and moderate narrowing of the radio carpal joint space was observed.

Conclusions: A high percentage of good functional and radiological results was obtained in this group of patients. Inadequate treatment of associated lesions may be responsible for a less favourable outcome. An early return to work and daily life activities cannot be predicted in this kind of patients.

A-0079 Epidemiology of fractures of the distal radius

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Purpose: It is important that the orthopaedic surgeon is aware of the epidemiology of the fractures so that sensible decisions can be made about treatment, the direction of clinical research and health care planning. Knowledge of the epidemiology is particularly important in fractures of the distal radius as they are one of the most common fracture types encountered by orthopaedic surgeons.

Methods: Between July 2007 and June 2008, 1128 consecutive fractures of the distal radius treated by the Orthopaedic Trauma Unit were analysed. This is the only orthopaedic trauma unit for a population of 517,555. All acute inpatient and outpatient fractures occurring in Edinburgh residents aged 15 years and older were included.

Results: Distal radius fractures accounted for 16% of all acute fractures, 71% of all forearm fractures and 27% of all upper limb fractures. They were the commonest single fracture type. The average age was 57 years, and the gender ration was 70:30 (F:M). The average age of female patients was 64 years (range 15 to 98 years) and for male patients it was 40 years (range 15 to 97 years). The overall incidence was 22 fractures /10,000/year and was higher in females. A bimodal fracture distribution was seen in both genders. Incidence in females rose sharply from 10/10,000/yr in those aged 55 years or less to 117/10,000/yr in those over 85 years. Fractures from sport and high energy trauma were more common in younger age groups. Simple falls from standing caused the majority of fractures in older patients. Extra-articular AO / OTA Type A fractures accounted for 60% of injuries. Partial articular Type B fractures were less common (16%). Complete articular Type C fractures affected 23% of patients, with a female preponderance and average age of 59 years. This is contrary to the generally accepted view that intra-articular fractures occur predominantly in young men. The commonest AO / OTA subtypes encountered were A3.2, A2.2, A2.1, C2.1 and B1.1. Open fractures were rare.

Conclusions: This study contains a robust analysis of these fractures in a defined population with a high capture rate and accurate reporting. The incidence of fractures is higher in females, with increasing age and is increasing. The commonest fracture types are those with metaphyseal comminution especially in older females. Severe articular fractures are uncommon. This has implications for the future direction of research, development, teaching and treatment of these injuries.

A-0090 Accurate radiographic measurement of the distal radial tilt

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Background: It is often hard to see the distal articular surface of the radius clearly on standard lateral x-rays of the wrist and therefore difficult to measure the distal radial tilt or dorsal angulation after fracture. We wished to determine if there are advantages to tilting the x-ray beam 15° from distal to proximal.

Methods: Both wrists in 189 patients who had been treated for at least one dorsally displaced distal radius fracture were x-rayed with two lateral views; one at a right angle to the wrist and one tilted by approximately 15° from distal to proximal. Two investigators independently measured the radial tilt first on all the right angle views and then, without reference to earlier measurements, on all the tilted views. The differences between the observer's measurements on the two projections were then compared. We then compared the angles measured on the two views in order to determine if there is any significant difference between them.

Results: The mean difference in the angles recorded by the two investigators was 2.5° for the tilted projections and 3.7° for the right angle projections ($p = 4.7 \times 10^{-8}$). The inter-observer repeatability coefficient was 7.2° for the tilted films and 9.2° for the right angle films. The precision (standard error) of the method was 2.6° for the tilted projection and 3.5° for right angle projection. The mean angle measured on the 15° tilted views was 5° more dorsal than on the right angle views for wrists with more than 15° volar tilt. The mean difference was 3° for wrists with a volar tilt between 10° and 15°, and 0° to 2° for wrists with less volar tilt or dorsal displacement.

Conclusions: We concluded lateral projections tilted 15° from distal to proximal allow more precise measurements than right-angle views and that no correction of the measurement is necessary when comparing to measurements made on right-angle view images, as long as there is some displacement in a dorsal direction of the distal fragment.

A-0091 On the relationship between displacement and clinical outcome after Colle's fractures

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Background: Restoration of the alignment of the skeleton after distal radius fracture has been awarded increased importance in recent years, leading to a greatly increased number of patients being operated. However, the significance of accurate reduction of the fracture is still unclear.

Methods: We reviewed 400 patients who had been treated for dorsally displaced distal radius fracture 5.5 (2.5 to 12.7) years earlier, in an attempt to find the limits of displacement compatible with a good clinical outcome. At review a history was taken, the function of the wrist determined and both wrists x-rayed. Data were analysed with the aid of scatter-plots, ANOVA and multiple linear regression.

Results: Among the 262 conservatively treated patients without earlier or later injuries to the wrist or hand there was a trend for increased residual displacement at review being associated with poorer function, but it was not statistically significant except for radial inclination of less than 10°. Regression analysis using all factors commonly thought to be of importance in determining the clinical outcome as independent variables explained 21% of the variability of the clinical outcome. Dorsal angulation, ulnar variance and radial inclination together accounted for 13% of the variability. There was no significant association between any outcome parameter and the radiological measurements at review among 89 operated patients.

Conclusion: We conclude that the radiological outcome after dorsally displaced radius fractures has only a minor influence on the clinical outcome.

A-0095 Percutaneous pinning of distal radius fractures

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Background: Reduction of distal radius fractures is often supplemented with percutaneous pinning. There is little evidence that this affects the clinical outcome.

Methods: A total of 43 pinned and 296 conservatively treated patients were reviewed 6 (3-13) years after injury. We tried to find conservatively treated patients with similar x-rays at injury for each of the pinned patients, and were able to find 30 cases with conservative controls. We also found conservative controls for 29 of the pinned patients on the basis of the x-ray at review. Clinical and radiological results in each of the two sets of cases and controls were contrasted and compared.

Results: When comparing patients with similar x-rays at the time of injury, we found a non-significant trend for better radiological results at review, but no difference in

clinical parameters. The comparison of pairs of patients with a similar x-ray at review revealed that pinned patients had had more displacement of the fracture at the time of injury and had a somewhat poorer clinical result at review.

Discussion: We have identified seven radiomized studies in the literature where pinning is compared to reduction and plaster of Paris alone. Most report better radiological results at review. Three studies with 6-12 months follow-up report better clinical outcome in pinned patients, while the remaining four studies with 12-24 months follow-up found no significant clinical benefit from the pinning.

Conclusions: Although the radiological results are improved by percutaneous pinning in addition to reduction and plaster of Paris, the clinical outcome in extra-articular and simple intra-articular fractures seems unaffected.

A-0111 A prospective comparison of self-reported outcome measures and satisfaction scores in patients treated with external fixation versus volar fixed angle plating of unstable closed distal radius fractures

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Purpose: The purpose of this prospective study was to compare self-reported satisfaction and functional scores of patients treated for unstable distal radius fractures with either external fixation or volar locked plating.

Methods: Patients aged 18-85 presenting with unilateral closed distal radius fracture unaccompanied by other upper extremity injury, determined to be unstable by either the malunion formula of McQueen et al or by the Modified LaFontaine criteria, and sufficient to be treated with surgery, were eligible for the study. All patients enrolled in this study were evaluated prior to treatment with follow-ups after treatment at 6-, 13-, 26- and 52-weeks. At baseline patients were asked to indicate their pre-injury health status when responding to DASH and PRWE. Follow-up DASH and PRWE measures were scaled so that scores reflected current relative to baseline function, with scores approached zero reflecting return to pre-injury functional status. Treatment efficacy was evaluated by comparing DASH and PRWE changes from baseline across follow-up within a 2bTrt x 4wTime factorial design using analysis of covariance with baseline scores as the covariate.

Results: Patients were treated with either external fixation (n=27) or ORIF with a volar locking plate (n=43). Mean age was 51.9 years (19.5 to 85.3) and 81% of patients were female. The mean DASH scores for the external fixation group at 6-, 13-, 26- and 52-weeks were 39.09, 21.18, 9.82, and 5.73, respectively, and this improvement over time was statistically significant ($p < .0001$). The mean

DASH scores for the group treated with plating were 27.46, 15.84, 6.19 and 7.00 ($p < .0001$). DASH scores were better in the group treated with volar plating vs. external fixation at all follow-up intervals, but were only statistically significant at 6-weeks ($p < .041$). The lesser improvement in DASH scores at this early follow-up point for the external fixation group may reflect the fact that these patients were limited in their motion due to the external fixation hardware, which had not yet been removed at this follow-up interval. The PRWE results demonstrated a similar pattern: the mean PRWE score for the external fixation group were 4.49, 2.40, 0.98, and 0.63 ($p < .0001$) and for volar plating group were 3.52, 1.72, 0.98, and 0.97 ($p < .0001$). Patient reported satisfaction with symptoms (5 pt scale), treatment (0/1), and appearance of fracture site (0/1) was also considered when evaluating treatment efficacy. None of the treatment or treatment x time interaction effects were statistically significant. However, improvement in satisfaction with appearance and relief from symptoms across time were both significant ($p < .001$).

Conclusion: Patients with unstable closed distal radius fractures demonstrated steady improvement in self reported function and satisfaction with their symptoms regardless of treatment modality. Thus, treatment efficacy and patient satisfaction with treatment concerns do not appear to provide a useful basis for determining treatment choice.

A-0114 A prospective comparison of injury and surgical complications in patients treated with external fixation versus volar locking plating of unstable closed distal radius fractures

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Purpose: The purpose of this multicenter study was to prospectively evaluate patient risks and safety as measured by complication rates observed with external fixation (EF) versus volar fixed angle plating (VP) in patients with unstable distal radius fractures.

Methods: Patients aged 18-85 presenting with unilateral closed distal radius fracture unaccompanied by other upper extremity injuries, determined to be unstable by either the malunion formula of McQueen et al or by the Modified LaFontaine criteria and sufficient to be treated with surgery, were eligible for the study. All patients enrolled in this study were evaluated prior to treatment and at 6-, 13-, 26- and 52-weeks after surgery. All treatment complications were recorded. In addition, any complication that was not resolved prior to a subsequent visit was classified as persistent. The complication form included 19 specific complications or consequences of fracture and an "other" option was included to handle unanticipated complications.

Results: Patients were treated with either EF (n=27) or ORIF with a VP (n=43). The mean age was 51.9 years (19.5 to 85.3) and 81% of patients were female. Complications were observed in 11 of the 70 patients (15.17%). Overall, 22% of the patients treated with EF had some complications vs. 11.6% of the patients treated with VP ($p < .14$). Specifically: a) 7 of the patients had 1 complication with 2 of these patients, both treated with VP, had persistent decreased sensation in the radial sensory nerve (RSN) distribution; b) 2 patients had 2 complications: One patient, treated with VP, had non-persistent median nerve dysfunction (MND) needing observation and tenderness at the radial styloid over the distal part of the plate, and the other patient, treated with EF, had non-persistent pin infection and wound cellulitis; c) 1 patient, treated with EF, had 3 complications: non-persistent MND and pin infection and persistent RSN hypesthesias. d) 1 patient, treated with VP, had four complications: non-persistent right TFCC tear and ulnar-sided wrist pain, which was caused by the injury rather than the treatment, and late onset carpal tunnel syndrome, and two persistent complications (MND and tendon irritation. This patient underwent a second surgery for removal of the plate and an endoscopic carpal tunnel decompression. Overall, 4 of 43 VP patients vs. 1 of 27 EF patients (9.3% vs. 3.7%) demonstrated persistent complications. Thus, the relative risk (RR) of persistent complications in the VP vs. the EF treated patients was 2.51 (95% CI 0.29-21.31).

Conclusions: The majority of anticipated potential complications associated with EF or VP treatment for closed unstable distal radius fractures were never observed. Although the RR of persistent complications of 2.5 was not statistically significant, should these differential rates be confirmed with larger samples sizes the potential for higher persistent complications rates associated with VP relative to EF treatment will need to be considered and discussed with patients when selecting surgical treatment options for closed unstable distal radius fractures.

A-0130 Extensor tendon problems due to screw prominences related to palmar locking plating of distal radius

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Purpose: To analyze the complications related to dorsal screw penetration due to volar locking plating of unstable distal radius fractures.

Methods: Forty-six patients (20 males, 26 females; mean age 50.8 years; range 24 to 87 years), who were treated with volar locking plates for unstable distal radius

fractures, were evaluated in a mean follow-up period of 18.4 months (6-43 months). The mechanism of injury was a fall in 42 patients and motor vehicle accident in four patients. The dominant side was affected in 21 patients. According to AO/ASIF classification system, fractures were classified as type A (n=7), B (n=3) and C (n=36). Ulnar styloid fractures accompanied to 22 of them and 8 were fixed. All operations were performed in an average of 3.4 days (0-24 days) after initial trauma, under fluoroscopic and radiographic controls. Dorsal screw penetrations and related findings such as affected compartment, screw prominence, tenosynovitis and tendon tear were assessed with ultrasound (US). Uninjured wrists were examined as controls. Patients who had additional injuries or previous injuries of the same limb, open fractures and fractures treated with other techniques were excluded.

Results: Totally, 230 locking screws were placed in the distal rows of the locking plates. Ultrasound showed that 59 screws were protruding 0.5mm or more (range 0.5 to 6.1mm) from the dorsal cortex of distal radius. The first extensor compartment was violated by one screw, the second compartment by 22 screws, the third compartment by 15 screws, and the fourth compartment by 21 screws. The most common ultrasonographic finding was tenosynovitis (18 of 59 screws) but most of the screw prominences were asymptomatic (45 of 59 screws). There was one asymptomatic tenosynovitis for each compartment. Symptomatic tenosynovitis resulted from 7/21 prominent screws in the fourth compartment (in three patients: three screws each of two cases and one screw in the third case), 5/15 in the third compartment (in five patients: one EPL rupture, one EPL partial rupture and three clinically symptomatic patients), and 2/22 in the second compartment (two screws in the same patient). Ultrasound detected one extensor pollicis longus (EPL) rupture, subsequently treated by tendon transfer, and one partial EPL tear. When asymptomatic tenosynovitis was included, the overall number of patients affected was 13 of 46 patients.

Conclusion: Ultrasound imaging may be useful in cases where intra-articular and/or comminuted fractures require distal plate placement and engagement of screws in the dorsal cortex. Standard radiographs and fluoroscopy can not adequately visualize screw lengths secondary to the complex anatomy of distal radius and geometry of dorsal cortex. US is as important as radiographic and clinical controls in preventing complications. If necessary, early hardware removal can be performed.

A-0141 Arthroscopic assisted fixation of intra-articular distal radius fractures: A review of the literature and the results of our experience at Tygerberg hospital

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Purpose: The benefit of arthroscopic assisted fixation of intra-articular distal radius fractures remains debated in the literature. The goal of this study was therefore to review the literature and establish if the addition of wrist arthroscopy plays a significant role in improving reduction and identifying additional pathology in intra-articular distal radius fractures treated with volar locking plates. We asked the simple question, "Did the addition of a wrist arthroscopy alter the initial management in a patient with an intra-articular distal radius fracture?"

Methods: Patients with intra-articular distal radius fractures requiring volar plate fixation were included in this study. Once the fracture had been exposed, a volar plate was applied with screws proximally and k-wires were used to maintain the articular surface reduction. The reduction was confirmed with an image intensifier. A wrist arthroscopy was then performed to directly assess the reduction of the distal radius articular surface and to exam for additional soft tissue pathology with special reference to the TFCC, S-L Ligament and L-T Ligament. Joint surface congruency and soft tissue pathology was treated in accordance with our protocol.

Results: A total of thirty-nine patients with forty fractures were included in this study. On arthroscopic assessment, distal radius articular surface incongruency and/or pathology of the TFCC, S-L Ligament or L-T Ligament was noted in twenty-seven (67.5%) of the cases. Of these seventeen (42.5%) required improvement in reduction and/or treatment of soft tissue pathology.

Conclusion: The addition of a wrist arthroscopy during fixation of intra-articular distal radius fracture allows for a detailed inspection of the articular surface, allowing for anatomical reduction. It also allows an assessment and/or treatment of the soft tissue structures, TFCC, S-L Ligament and L-T Ligament, within the wrist joint. In our series we found that the addition of an arthroscopy altered out initial management in seventeen (42.5%) of our patients. Whether this translates to sustained clinical improvement in the long term will be determined in the follow-up of these patients.

A-0156 Long Locking Compression Plate Fixation for Distal Radius Fractures with Metaphyseal and Diaphyseal Extension

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Purpose: Distal radial fractures are the most common fractures of the upper limb, comprising more than 16% of all fractures. However distal radial fracture with metaphyseal and diaphyseal extension is uncommon. Although fracture of distal radius is very common, the comminuted distal radial fracture with metaphyseal and diaphyseal extension

remains challenging to treat. While previous reports have proposed the various methods to treat this type of injury, the optimal treatment method remains debatable. Some authors suggested temporary plate fixation across the wrist joint. However, it also has possible disadvantages, such as stiffness of the wrist, irritation of extensor tendon. Recently, a new type of implant that is long enough to fix the metaphysis and diaphysis was introduced. The purpose of this study was to report the radiographic and functional outcomes of treatment with long locking plate system for distal radius fractures with metaphyseal and diaphyseal extension.

Methods: This retrospective study was performed from September 2005 to April 2008. 25 fractures were treated with open reduction and internal fixation with application of a 2.4mm extra-long locking compression plate (LCP) volar distal radius plate. Final review was undertaken at a final follow-up of mean 41 months (range, 24 to 55 months) and included clinical, functional and radiological assessment. The results were assessed on the basis of the complication, range of motion, grip strength and physical capacity. Radiological assessment included measurement of volar tilt, radial length, radial inclination, capitulate angle and radiocarpal joint congruity. For measurement of the gradual collapse, we compared the distance from the proximal tip of the plate to the distal tip of the radial styloid process at the time of operative fixation and final follow-up visit. For precise measurement, all assessments were performed on the true AP and lateral radiograph.

Results: Satisfactory reduction (defined as within 20° of normal volar tilt, <2mm of radial shortening, and <1mm of articular incongruity) and fracture healing was achieved in all cases. Six plates (27.3%) were removed after postoperative 15.4 months (range, 11-20 months) on average. The mean range of motion of the wrist at time of final follow-up was 74° extension (range: 60-80°), 70° flexion (range: 50-80°), 78° pronation (range: 65-85°), 76° supination (range: 65-85°), 35° ulnar deviation (range: 15-50°) and 24° radial deviation (range:10-40°). Finger motion was free in all patients. The DASH Questionnaire was completed in all patients and scored out of a maximum of 100 points. The average DASH score was 10.1 points (range: 0 to 54), and the score was 0 to 19 points (a very good result) for twenty-one patients. One patient with higher DASH scores had an ipsilateral 3rd, 4th, and 5th fingers amputations. On the basis of the demerit-point system of Gartland and Werley, at the final follow up sixteen results were rated as excellent, five were rated as good, and one as fair.

Conclusion: Long locking compression plate is useful in the management of severely comminuted fractures of the distal part of the radius in which there is proximal extension into the diaphysis.

A-0161 Risk Factors for Avulsion Injuries of Triangular Fibrocartilage Complex From the Fovea of Ulnar Head in Distal Radius Fractures

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Background: An avulsion of triangular fibrocartilage complex (TFCC) from the fovea of ulnar head is a rare but important soft tissue injury accompanying distal radius fractures. Its diagnosis has been frequently missed, leaving the involved wrist unstable and symptomatic. The purpose of this study was to identify risk factors for sustaining avulsion injuries of TFCC from the fovea of ulnar head in patients with distal radius fractures.

Methods: 234 wrists in 240 patients who sustained unstable distal radius fractures were included. During the operation, distal radioulnar joint instability was tested manually after stable fixation of distal radius fractures, and those with positive results received further surgical exploration of distal radioulnar joint to confirm TFCC avulsion from the fovea of ulnar head. Clinical and radiographic data were compared between those with the TFCC avulsion injury and those without the injury.

Results: Of the thirteen wrists with DRUJ instability, eight had avulsions of TFCC from the fovea of ulnar head. The number of patients with open wound and the ulnar variance in the pre-reduction radiograph were significantly higher in the injury group ($P < 0.05$). Using multivariate logistic regression analysis, the presence of the open wound at the volar ulnar side of the wrist and ulnar positive variance 6 mm were significant risk factors for sustaining avulsion injuries of TFCC.

Conclusion: Patients with open wound and/or ulnar positive variance 6 mm in pre-reduction radiographs in the setting of distal radius fractures should be suspected for concomitant avulsion injuries of TFCC from the fovea of ulnar head.

A-0170 Do Anti-Oxidants Modulate the Outcome of Fractures? A Prospective Randomized Controlled Trial

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Purpose: This study was designed to examine the effect of Vitamin C on hand and wrist function, the incidence of complex regional pain syndrome (CRPS) and the rate of fracture healing following fracture of the distal radius.

Methods: A prospective, randomized double blind controlled trial was performed on 336 patients with fracture of the

distal radius. After informed consent patients were randomized to receive either 500 mg vitamin C or a placebo for 50 days, starting on the day after fracture. The groups were stratified into displaced and undisplaced fractures. The study did not alter the treatment method of the fracture. Clinical and functional evaluations were carried out at 2, 6, 12, 26 and 52 weeks. Radiological evaluations were performed at 2, 6, 12 and 26 weeks. The primary outcome was the Disability Arm Shoulder Hand (DASH) score. CRPS was diagnosed and scored using the criteria described by Roger Atkins. Functional evaluations included measurement of pain on activity and at rest, active range of movement, grip and pinch strength. Bone-healing was assessed by cortical bridging and trabeculae crossing the fracture site.

Results: There were no differences in the DASH score at any of the time intervals for either displaced or undisplaced fractures. There were a few statistically significant differences in the testing of movement and strength but none of these were clinically significant and all showed worse outcomes in the Vitamin C group. In patients with undisplaced fractures there was a statistically significantly higher rate of CRPS treated with vitamin C at 6 weeks ($p = 0.022$), but no other differences in the rate of CRPS at any time point. There were no differences in the time to bone healing between the groups. In the displaced fracture group treated with vitamin C, there was a significantly higher rate of complications ($p = 0.043$) and worse pain on activity ($p = 0.045$) at 26 weeks, but no other significant differences between the groups.

Conclusion: This study showed that vitamin C does not improve the patient rated outcome, range of movement, strength, rate of CRPS or bone healing after distal radius fractures and questions the previous evidence of an advantageous effect of vitamin C administration after wrist fracture. **Keywords:** distal radius fracture, functional outcome, fracture healing, complex regional pain syndrome

A-0177 Fixed angle volar plate reducing complications against non-fixed devices in the distal radius fractures. Clinical outcomes in 105 patients

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Purpose: To see if fixed angle volar plate system represents a reduction in the rate of tendon and intraarticular complications comparing with non-fixed plate.

Methods: Between January 2007 and March 2010 120 patients were surgically treated because of a distal radius fracture on our trauma department. We've treated

the first 40 patients with a non-fixed volar T-Plate (ITS[®], MBA) and the next 65 with a fixed angle plate (DVR[®] Anatomic Volar Plating System, Johnson & Johnson). We missed 15 cases: 3 change of address, 10 uncooperative patients and 2 deaths. It's a prospective but not randomized study because when we started the study the second device wasn't available in our country. With a minimum follow up of 12 months (from 8 to 18) clinical outcome was measured by the Mayo Wrist Score at 6 months by an independent member of the department. All the patients were explored with CT-Scan by 2 independent members of our radiology department looking for dorsal and intraarticular screw protrusion.

Results: 22,5% of the patients treated with a non-fixed angle plate had a complication (1 radio carpal arthropathy, 2 nonunion fractures, 1 plate infection, 3 tenosynovitis of the extensor pollicis longus and removal plate was necessary in 2 patients because of pain without CT findings). Articular screw protrusion was reported in 7,5% of the patients with non-fixed plate whereas with a fixed angle plate was 6,15%. Dorsal screw protrusion was 35% in non-fixed and 13,8% in the fixed angle system. Fixed angle plate had some problem in the 10,7% of the patients (3 ruptures of the extensor pollicis longus, 2 radio carpal arthropathy and 2 removal plate because of pain).

Conclusions: In our series fixed angle plate reduces the risk of complications and had better functional scores than non-fixed plates. However the type of complications were similar in both devices. Prospective not randomized study make us think that further studies will be necessary.

A-0180 Effect on the disability of the upper extremity of conservative management of distal radius fractures. A prospective study

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Introduction: Distal radius fractures (DRF) are a common injury in the A&E departments, being a major cause of disability of the upper extremity. The aim of this prospective study is to assess the possible association between objective physical variables such as wrist range of movement (ROM), radiological parameters, and upper extremity disability (measured by the DASH questionnaire), after conservative treatment of DRF.

Patients and methods: 44 patients with non-operatively managed DRF were enrolled in a prospective cohort study from July 2007 till September 2009. Inclusion criteria: unilateral DRF in skeletally mature patients, treated non-operatively with closed reduction and cast. Patients who sustained a previous fracture of the wrist, or bilateral wrist fracture, or with dementia, were excluded. After the closed reduction and immobilization of the fracture in the A&E department we asked the patients to complete the DASH questionnaire, referring to their baseline pre-fracture state. All fractures were classified according to the AO classification. After one year, 36 patients were still available for follow-up purposes. We assessed the following objective physical variables: ROM of both wrists: flexion/extension arch and pronation/supination arch. We recorded the following radiologic parameters: radial angulation, volar angulation and radial shortening. The patient-perceived results were measured by the DASH questionnaire, while pain was measured using the VAS scale. Statistical analysis was performed using the SPSS 15.0.

Results: Average follow up: 13,39 months (range 12.3-16.43). Mean age: 62.5 years (18-91). 75% of the fractures were 23A and 24,1% 23B. Average pre-fracture DASH score was 19.6 and 42.1 at the end of follow-up. Radial tilt: 18.18°. Volar tilt: 3,35°. Radial shortening: 5,76mm. ROM for flexion/extension of the involved wrist: 103.6° and non-involved wrist: 131.2°. ROM for pronation/supination involved wrist: 145.7° and non-involved wrist: 173.8°. Post-fracture VAS score: 3.5. We didn't find any significant statistical correlation between the lost of ROM, neither with radiological malalignment nor with patient-perceived outcomes. But we found a significant association between items 24-28 of the DASH (except item 26) questionnaire and the VAS score.

Conclusions: The results of the present study show that, conservative treatment of DRF seems to deteriorate the patient self-reported outcomes measured by the DASH questionnaire.

A-0257 Scaphoid lesion associated to severe comminuted fractures distal radius

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We would like to present a lesion we found in the proximal pole of the scaphoid, this defect was produced by the impaction of the shaft of the radius against the proximal pole of the scaphoid in cases of high velocity injuries. This lesion has not been described before, could only be found in dorsal approach to the wrist, and seems to occur associated with motor vehicles accidents when the collision occurred at high velocity. We have a series of three cases in which the pattern of the fracture of the radius gave us the indication of doing a dorsal approach. The fractures were fixed with dorsal plates and bone graft and the

lesion of the scaphoid was suture back in place with the help of micro anchors with a satisfactory result. The discovery of those lesion and the repair allowed the patient recovered a good range of wrist motion and prevent the development of post-traumatic arthritis. We would like surgeons to be aware of the appearance of those lesion when a typical fracture pattern occurs and the indication of a dorsal approach to repair it.

A-0343 Finger flexion contracture following chronic tethering of the flexor digitorum profundus muscle after treatment of pediatric forearm fractures

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Introduction: Forearm fractures are common injuries in childhood but tethering of the flexor digitorum profundus muscle with finger flexion contracture has been rarely reported. The two pathomechanisms are acute entrapment of the muscle at the fracture site or chronic muscle fibrosis secondary to hemorrhage from the fracture site.

Patients and Methods: Two children with chronic tethering of the deep finger flexors after forearm fracture have been treated in our clinic in 2009. The first patient is a 3 years old boy who presented 4 months after a healed conservatively managed proximal ulna fracture with an inability to extend his ring - and middle finger of the affected side. Passive full extension was only achieved with the wrist in full flexion. Hand therapy and extension splinting failed to improve the condition. 8 months after the initial injury surgical exploration was performed. The intraoperative findings showed normal and vital muscles but a strong fibrotic string superficial on the flexor digitorum profundus muscle. Treatment consisted of resection of the fibrotic scar tissue. The fascial defect was bridged with healthy forearm fascia to prevent recurrence of tethering. The second case is a 6 years old boy who developed a ring - and small finger extension lag following consolidation and removal of metal of a midshaft forearm fracture that was stabilized with intramedullary pins. Finger extension could not be restored by hand therapy and splinting. 8 months later the patient underwent surgical exploration. The flexor digitorum profundus muscle belly of the ring and small finger was strongly adherent to the ulna at the former fracture site. Electric stimulation demonstrated vital muscle. Resection of the fibrotic adhesions was carried out. A silicon goretex sheet was placed between bone and muscle. Postoperative treatment consisted of static extension splinting at night for 6 weeks in both cases.

Results: Freeing the muscle from the fibrotic scar tissue immediately restored full passive range of motion in both

cases. Full active range of motion was present in the first case at 7 months and in the second case at 3 months after surgery. No further therapeutic intervention was necessary.

Conclusions: Diagnosis was delayed in our reported cases for several months because of failure to recognize this rare condition. Surgical release of the fibrotic tissue yields excellent results while conservative management fails to improve the condition.

A-0358 Conservative treatment of intra-articular distal radius fractures in patients under 65 years old

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Purpose: To assess the outcome of the conservative treatment of intra-articular distal radius fractures in patients under 65 years old.

Methods: 38 patients under 65 years old (age range 20-65, mean 49) of which 26 were female and 12 male, with non-operatively managed distal radius fractures were enrolled in a prospective study. Operative treatment was proposed to all of the patients due to the characteristics of the fracture and their age, but they either did not consent or were not covered by medical insurance. After the reduction of the fracture a long arm cast was applied for 10 days, which was replaced by a short arm cast for another 35 days. After the removal of the cast all patients followed a physiotherapy program. They all had radiographs before and after reduction, at 3 months, 6 months and one year post-traumatic and the radiographic indices were calculated (radial inclination, radial shortening, palmar tilt, articular step). They patients completed the QUICK DASH SCORE (Disabilities of the Arm, Shoulder and Hand), MAYO WRIST SCORE and VAS (Visual Analogue Scale) at 3 months, 6 months and one year. Moreover bilateral grip and pinch strength and wrist flexion and extension were measured at 3 months, 6 months and one year.

Results: Of the patients studied (n=38, mean age 49 years, primarily white women), the difference of grip strength compared to the contralateral hand varied from 11 kg at 3 months to 7.63 kg at 6 months and 4.75 kg at one year. The difference in pinch strength was 1.95 kg, 1.36 kg and 0.25 kg respectively. Wrist extension was improved more than wrist flexion in time. The mean value of QUICKDASH was 28.49 at 3 months, 18.17 at 6 months and 5.68 at 1 year. The MAYO WRIST SCORE had a mean value of 63.84, 69.09 and 72.5 at 3, 6 months and 1 year post respectively. The radiographic deformity remained unchanged.

Conclusion: The overall patient satisfaction that was determined by the QUICK DASH SCORE was good, although the radiographic indices were not improved and the range of motion and grip and pinch strength still had a difference compared to the contralateral hand at the last follow up. Therefore the conservative treatment of intra-articular fractures in patients under 65 years old who refuse operative treatment could be considered acceptable.

A-0371 Patient-reported disability during the two years following closed reduction and cast or external fixation of displaced distal radius fractures: A prospective cohort study

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Purpose: The purpose of this prospective cohort study was to investigate patient-reported disability over two years after a displaced distal radius fracture treated with closed reduction and cast or surgical fixation and assess its relationship with fracture malunion.

Methods: Of 165 consecutive patients with displaced distal radius fracture treated at one emergency hospital with closed reduction and cast or closed reduction and external or percutaneous pin fixation 123 patients (94 women), aged 19-88 (mean 63) years, participated in this study. The patients completed the disabilities of the arm, shoulder and hand (DASH) questionnaire at baseline (inquired about arm function before fracture) and at 3, 6, 12 and 24 months after the fracture. Radiographic examination was done at 12 months. Fracture malunion was defined as ulnar variance ≥ 1 mm or dorsal tilt >10 degrees. The patients were classified into three malunion categories; no malunion (n=35), malunion involving either dorsal tilt or ulnar variance (n=65), and combined malunion involving both dorsal tilt and ulnar variance (n=23). A mixed model analysis was performed to study the change in DASH score (score 0-100, lower is better) over time in relation to malunion category, adjusting for age, sex, treatment method and AO fracture type. Regression analyses were also done on the individual radiographic variables of ulnar variance, radial tilt, and radial inclination (each as a continuous variable in separates models and together in one model)

adjusting for the same covariates and for the corresponding radiographic variable in the contralateral wrist.

Results: The patients with no malunion or with malunion involving only ulnar variance or dorsal tilt had a rapid decrease in disability after three months whereas the patients with combined malunion had a slower and incomplete recovery. The patients with combined malunion had significantly worse change in DASH score from baseline to 2 years than the patients with no malunion (mean difference 13.7, 95% CI 3.6-23.8, $p<0.001$) and the patients with malunion involving only ulnar variance or only dorsal tilt (mean difference 8.3, 95% CI 1.4-15.2, $p=0.021$). In patients with malunion involving ulnar variance or dorsal tilt the change in DASH score over time was worse than that for the patients with no malunion but the difference was not statistically significant (mean difference 4.1, 95% CI -4.2-12.5, $p=0.33$). Analysis of the separate effect of each radiographic variable showed that with every millimeter of positive ulnar variance the mean change in DASH score from baseline increased significantly by 1.78 (95% CI 0.42-3.14, $p=0.011$), but the separate effects of dorsal tilt and radial inclination were not statistically significant. When analyzing the radiographic variables together ulnar variance had the highest relative importance; with every millimeter of positive ulnar variance the mean change in DASH score from baseline increased by 1.55 (95% CI 0.01-3.08, $p=0.048$).

Conclusions: Following distal radius fracture the association between fracture malunion and arm-related disability persists up to 2 years after fracture. The findings support the use of treatment methods that achieve fracture healing with lowest risk of malunion.

A-0394 Surgical treatment of distal radius fractures in patients over 65 years. Our experience

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Purpose: The distal radius fractures are very common in elderly population. In the last decades, the development of surgical and perioperative techniques and the higher demand of elderly people contributed to increase the trend to treat distal radius fractures with internal fixation. The purpose is to compare our results to the data shown by Literature.

Methods: On between January 2004 and December 2009, at our department 730 patients underwent surgery; among them 230 were over 65 years old. 182 submit ORIF, 36 percutaneous pinning with K-wires, 12 external or augmented external fixation. We reviewed 106 patients. They submit internal fixation through volar or less frequently dorsal

approach and plates of 1st and 2nd generation were used. The clinical outcome was assessed by clinical examination, interview to obtain subjective result and DASH score system. We classified the fractures using AO classification. After surgery the wrist were immobilized for 4-5 weeks in a short cast. X-rays control was taken after 5 weeks, and after 3 months.

Results: We report our results: Dash score average was 9,7 in a range including 0 to 17,6. We obtain an average of 43,6 degrees of flexion, 56 degrees of extension, 81° of supination, 86,7° of pronation; the recovery of a good function were regained after an average of three months, while the strength took from 3 to 6 months, with a predominantly decrease. 33 patients themselves defined excellent the outcome, 50 good, 16 poor and 7 were not satisfied. We had 8% of CTS; 6 failures, 3 infections, 2 extensor pollicis longus ruptures.

Conclusion: The crescent high demand of the older patients require us to improve quality of management. Several ways of treatment are possible, from conservative to surgical, with a wide range of solutions. Literature is shared between surgical and conservative treatment. It has been proved that there is no correlation between radiological result and clinical outcome, on the other side a worse quality of life, an increased mortality has been observed in patients treated conservatively. Nonetheless some recent studies have reported quicker and better functional results in patients treated with ORIF. We believe that correct indication for surgery, on the basis of a right comprehension of the pattern of fracture, general clinical conditions and identification of high or low demand patients, are essential keys to provide adequate treatment.

A-0403 Homogeneous groups of patients in acute distal radius fractures? A prospective epidemiologic study about 406 patients

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Purpose: Despite an impressive number of articles each year about acute distal radius fractures (DRF), both AAOS and Cochrane reports state that there is no evidence to what type of surgery is best for these injuries. We made the hypotheses that one of the main reasons for this is a too wide range of age of most series, making difficult comparisons of treatments. The purpose of this paper was to prospectively identify homogeneous groups of patients not only by their age but also by criteria related to the patient, to the circumstances of accident, and to the AO type of fracture. We hypothesized that identifying such groups could help comparisons of treatment in future studies.

Methods: Between September 2008 and December 2010, 406 acute DRF were prospectively analyzed in one University Hand Surgery unit using criteria related to the patient (health status, functional needs), to the accident (polytrauma, energy), and to the fracture (AO classification and radiological criteria related to the distal radius, the DRUJ and ulna as well as the carpus).

Results: The mean age of this series was 55 years (16 to 97). There were 59% of female. Four groups of patients could be individualized: group 1 (dependent patients with minimal functional needs), group 3 (normal health with maximum functional needs), group 2 (intermediate in terms of health and needs). We identified a polytrauma group requiring a specific management. In addition we found that the age of the patients with AO "B" type (33) was very different than the age of the patients with AO "A" (58) or "C" (56) fractures ($p < 0,005$).

Conclusion: Our results suggest that the use of a new classification from a large single-center series based not only on the anatomical type of the fracture but also on criteria related to the patient itself and to the circumstances of the accident can lead to the identification of more homogeneous groups of patients with obvious therapeutic implications.

A-0406 Management of complex distal radius and ulnar fractures: is the prosthesis of ulnar head a therapeutic option?

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Purpose: Fracture of the ulnar head can be associated to distal radius fractures in severe trauma of the wrist. This is an additional instability factor according to Frickman. If internal fixation of the distal radius only is performed immobilisation has to be prolonged and stiffness of the wrist can occur. Different modern therapeutic options exist for stabilisation of distal ulna as internal fixation with plate and screws, pinning, external fixation, prosthetic replacement. The aim of this study is to evaluate the results of the different treatment options in distal radius and ulnar fractures.

Methods: From 2006 to 2009, 23 patients were treated; mean age 65 yo (range 26-78), 20 females and 3 males. Internal fixation with plate and screws of distal radius and ulna was performed in 15 patients (AO-LCP 2.4 plates or De Puy for radius and 2.00 or 2.7 mm AO plates for distal ulna). In 6 cases internal fixation of distal radius was performed with pinning or external fixation of distal ulna (Joshi). In 2 cases internal fixation of distal radius was performed associated to distal ulna prosthesis as ulnar head fracture was multifragmentary. All patients

were reviewed at 30, 60, 90 days post-operatively and then at a mean follow-up of 21 months (range 4-34 months). Plaster slab was removed at 30 days in the first group, at 50-60 days in the second group and at 40 days in the third group. Mayo wrist score, DASH score and PRWE were evaluated at follow-up.

Results: all patients of the first group (internal fixation of distal radius and ulna) obtained excellent results, with quick recovery of full ROM and absence of pain. In 2 cases a slight reduction of grip (of 10%) was recorded, Mean DASH was 5.3 (0-10.8) and mean PRWE was 10 (0-38). Excellent and good results were obtained in the second group (internal fixation of distal radius and pinning or external fixation of distal ulna) but rehabilitation was not possible until 50-60 days postoperatively so full function was recovered several months later (mean 5 months). In the few cases of the third group (prosthetic replacement) there were 2 good results. All patients returned to previous work or occupations in all the three groups.

Conclusions: Modern treatment options allow stabilisation of the fractures of distal radius and ulna. Early mobilisation is possible with double plating, while the use of pinning or external fixation delays the rehabilitation up to 50-60 days. The distal ulnar fragment is not always easy to fix as it is often small or multifragmented. In those cases plating is not possible and pinning with external fixation is advised. In selected cases a distal ulnar head prosthesis can be used with good results but of course reconstruction is always to be preferred if possible. Our results show that internal fixation of distal radius and ulna is the best treatment option when possible as it allows an optimal stabilisation of the fragments and early mobilisation with excellent results.

A-0443 Low profile plates versus K-wire for treatment of unstable fractures of neck of fifth metacarpal

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Unstable fractures of the neck of the fifth metacarpal occur more often among young males and require surgical intervention. The choice of surgical method depends on many factors (nature of the fracture, age, activity level, surgeon's personal preferences and experience). The purpose of this study is to compare the results of the surgical treatment of such injuries with open reduction and internal fixation with low profile plates (condylar blade plate 2,4mm) and Kirschner wires (K-wires).

Material and Methods: Between 2007-2010, we treated 39 patients (33 male, 6 female), average age 34.5 years, who sustained closed isolated, unstable fractures of neck of 5th metacarpal. In three cases the fractures were

bilateral. In 27 patients the fractures affected the right hand. The fractures resulted from crush injury in 18, sports injury in 7, vehicle accident in 9 and from other causes in 5. Surgery was performed within 24 - 48 h from the injury. 22 patients were managed with open reduction and internal fixation with a 2.4mm condylar blade plate (group A). The plate was placed on the lateral side of 5th metacarpal and bone grafting was used in 4 patients. 20 patients were managed with intramedullary K-wire (group B). Postoperative mobilisation exercises (active -passive) were initiated within 48 -72 hours after surgery in all patients.

Results: The average follow - up was 17 months. The DASH Score, clinical criteria (wrist strength, range of motion of MCP join, return to work) and radiographic (fifth metacarpal head flexion displacement pre- postoperative and at the last follow-up) were used to evaluate the results. In group A we had 17 excellent results (77,27%), 3 good (13,63%), and 2 poor (9,1%). In this group we had 3 complications: 1 superficial infection, 1 non-union and 1 loosening of 2 screws. In group B we had 12 (60%) excellent results, 5 good (25%), and 3 poor (15%). We had 7 complications: 2 pin tract infections, 2 wire migrations with loss of reduction, 1 neuroma of the dorsal cutaneous branch of ulnar nerve, 1 malunion and 1 complex regional pain syndrome.

Conclusions: The fractures of the neck of 5th metacarpal account for the 20% of all hand fractures. Unstable fractures (angulation>30°, rotatory malalignment, shortening of metacarpal head >3mm) are an indication for surgical treatment. Open reduction and internal fixation with low profile plates is a stable fixation that permits early mobilisation and good results and has a low percentage of complication compared to closed reduction and fixation with K-wires.

A-0444 Open reduction and internal fixation versus indirect reduction and percutaneous fixation for unstable osteoporotic extrarticular distal radius fractures, in patients older than 65 years

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The purpose of this study is to compare the results from the management of unstable osteoporotic extrarticular distal radius fractures, in patients older than 65 years, treated with open reduction and internal fixation (O.R.I.F.) versus indirect reduction and percutaneous fixation.

Material & Methods: Between 2006-2009 we treated 38 patients (12 male, 26 female), average age 74.5 (65-91), with unstable extrarticular distal radius fractures. The fractures resulted from fall (n=29), motor vehicle accident (n=3) and work-related accident (n=6). One patient had

bilateral fractures, and two of the fractures had a grade I open wound. 28 fractures affected the right wrist (24 dominant, 4 nondominant) and 10 the left wrist (6 dominant, 4 nondominant). The fractures as classified by AO were: 19 type A2 and 20 type A3. The preoperative radiographic evaluation showed an average of dorsal angulation 23° (range 35° - 55°), average radial inclination 11° (range -11° - 40°), average radial shortening of 4mm (range 0-6mm). None of the affected wrists had carpal instability or lesions at the distal radioulnar joint. The time between injury and surgical fixation averaged 6 days (0-11 days). 21 (Group A) fractures were treated by O.R.I.F. using an extended flexor carpi radialis approach and a palmar locking plate. 18 (Group B) fractures were treated with closed reduction, external fixation and percutaneous K-wire fixation (one or two k-wires positioning through radial styloid, and one through the dorsal aspect of the radius). The fixators and the K-wires in group B were removed between 6-8 weeks. Postoperatively active finger motion and physiotherapy at 6 to 8 weeks was implemented.

Results: The average follow-up was 23 months. During follow-up we evaluated the range of motion, strength,

pain and radiologic union of the fractures. For the evaluation we used the Gartland and Werley Scale and the DASH Score. In the Group A 17 patients (81%) had excellent results, 2 (9,5%) good and 2 (9,5%) had poor results. In this group we had 5 complications: 1 superficial infection, 1 hematoma, 1 reflex sympathetic dystrophy, 1 rupture of extensor tendon and 1 loosening of 2 screws. In group B 11 patients (61,1%) had excellent results, 3 (16,7%) good and 4 (22,2%) had poor results. In this group we had 7 complications: 2 pin tract infections, 1 nonunion, 1 reflex sympathetic dystrophy, 2 malunions, 1 nerve lesion (superficial branch of radial nerve).

Conclusion: Distal radius fractures are the most common fractures in adults older than 65 years old due to the increased incidence of falls and osteoporosis. The goal of the treatment of these fractures is to restore the wrist anatomy and to allow quick return of hand function. 15% of those patients are treated with surgical reduction. Open reduction and internal fixation with palmar locking plates is a method of surgical treatment that offers low percentage of complication and facilitates quickly restoration of hand function.

A-0023 3D Assessment of Hand Function

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Purpose: Patient reported outcome measures (PROM) are increasingly central to National Health Service quality of care assessments. This study investigates the benefit of elective hand surgery, using a 3-dimensional (3D) graphical model for evaluating and presenting outcome. In hand surgery, there are three basic types of problem; dysfunction, deformity and pain. Patients with different conditions present with varying severities of these three variables. This study aimed to investigate synchronously the impact of different elective hand operations on these three variables.

Methods: Two hundred and fifty two patients scheduled for elective hand surgery were invited to complete a pre-operative questionnaire on the severity of their pain, dysfunction and deformity of their hand(s) prior to surgery. Patients graded each variable on a four point scale (0 (normal) - 3 (severe)) based on which descriptions best met their symptoms. Patients were contacted at a mean of eight months post-operatively by post and asked to complete the same questionnaire again. Pre and post-operative scores for each parameter were simultaneously plotted on a 3D graph to demonstrate degree of 'normalisation' of their hands following surgery.

Results: One hundred and ninety patients completed pre and post-operative questionnaires, giving a response rate of 75%. Diagnostic groups undergoing surgery were: nerve compression (n=53), Dupuytren's disease (n= 51), ganglion (n=17), other lumps (n=21), trigger finger (n=20), TMCJ osteoarthritis (n=10), rheumatoid disease (n=5) and miscellaneous (n=13). The assessment method reveals differences in perceived disability between the diagnostic groups. A significant improvement toward normality was seen after surgery in each surgical group.

Conclusions: This prospective study investigates the three core elements of patient hand assessment: pain, dysfunction and deformity. The questionnaire developed is short, simple and easy for patients to complete. By plotting each variable simultaneously on a 3D graph pre and post-operatively, a simple, visual representation of surgical

outcome can be produced for patients, both individually and grouped by operation, at specific times during their treatment process. The method is both sensitive to the effects of surgery and able to differentiate between different conditions. This model of presentation and analysis may be applicable to other fields of surgery.

A-0030 Development of operative trauma hand surgery skills via simulator based surgical training - an affordable and successful course model

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Hand trauma makes up a significant portion of the acute workload presenting to both Plastic and Orthopaedic surgeons with significant repercussions to both the patient and the wider economy in terms of both function and lost working days. Increasingly, reduced working hours are being imposed on surgical trainees with the result that the traditional apprenticeship based model of operative skills training, as the sole training delivery system, can no longer be considered adequate. To worsen matters, restricted educational budgets make cadaver based courses in operative surgery prohibitively expensive for many surgical trainees with basic hand surgery courses often costing twice a junior trainee's annual study budget. To ensure that tradition of excellence in operative surgical training in trauma hand surgery is maintained, innovative ideas have to be explored. We present our experience of having developed a very successful, "within budget" operative trauma hand surgery skills course which is entirely simulator based. The course, using a variety of inexpensive, custom built, realistic simulators, affords delegates extensive hands-on practical training in fundamental trauma hand surgical skills such as:

- Initial management of hand trauma
- Soft tissue cover e.g. fingertip injuries, homo/heterodigital flaps management of hand infections

- Tendon repair
- Hand fracture fixation
- Basic microsurgery techniques including nerve repair (using loupe magnification)

Simulator based trauma hand surgical skills training has an expanding role as an adjunct to traditional training methods. We assert that there is a need for more simulator based trauma hand surgical skills courses to be developed. In addition there is a need for skills training centres, with suitable simulators to be readily accessible to all plastic and orthopaedic surgery trainees.

A-0078 Evaluation of post-operative comfort and early functional results in the treatment of basal thumb arthritis. Comparative prospective study of trapeziectomy with tendon interposition vs MAIA[®] prosthesis in 74 female patients

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Purpose: Trapeziectomy is a common well-studied treatment procedure for basal thumb arthritis. The intervention is effective in reducing pain with a very low complication rate, but has a long and varying functional recovery time. Some authors report also a loss of strength. The disadvantages of trapeziectomy led to emergence of total prosthetic designs. This series compares a total trapezio-metacarpal prosthesis (TMP) MAIA[®] and trapeziectomy-interposition (TI) in the short-term (6 months) and presents our initial usage of a TMP.

Methods: We prospectively followed two comparable cohorts of 44 and 27 female patients above 45 years of age, treated for basal joint arthritis with either a constrained TMP or TI respectively. Surgery was done between April 2009 and February 2010 with no randomization. All the patients were followed post-operatively for six months. Physical examination, functional tests and questionnaires (prehension, pain, satisfaction), and X-rays (first ray length, metacarpal subluxation) were compared.

Results: Mobility, pain reduction, satisfaction, strength and functional scores were better in the prosthesis group. The pinch strength was 30% greater than it was before surgery, the length of the thumb column was maintained, and better correction of the subluxation was obtained in this TMP group. There were six cases of De Quervain's tenosynovitis and one case of loosening due to trauma. Patients, who underwent TMP implantation, were more satisfied in the short term.

Conclusion: this series presents our initial usage of a TMP for basal thumb arthritis surgery. Based on our experience,

the MAIA[®] trapezio-metacarpal prosthesis provides short-term results that are very good and better than the current "Gold Standard" of trapeziectomy. These good initial results will have to be confirmed over the long term. Good results with trapezio-metacarpal arthroplasty can be achieved through rigorous surgical technique and careful patient selection. However, this enthusiasm must be tempered by the short follow-up in this series.

A-0086 DASH and QuickDASH questionnaires; Average scores in the general population in Norway

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Background: The 30 question DASH and the 11 question Quick DASH forms are often used to evaluate subjective results after treatment but are difficult to evaluate without normal values from the general population for comparison. There has been a lack of such values. Both forms have 4 optional questions on work and 4 on sports or playing an instrument.

Methods: A total of 2000 DASH forms and 800 Quick DASH forms were mailed to 200 men and 200 women in each age decade from 20-29 to over 80. Recipients were randomly selected.

Results: After 11 weeks and one reminder 50% of the DASH forms and 56% of the Quick DASH forms had been returned sufficiently completed to calculate a score ($p < 0.005$). Mean DASH scores for women rose with age from 5 among those aged 20-29 to 22 among those aged 70-79 and 36 for those over 80. The corresponding mean values for men were 5, 13 and 22. Mean Quick DASH scores were very similar and Pearson's correlation coefficient for the two forms was 0.999 for all 992 forms where both scores could be calculated, 0.981 for the 764 forms with a score over 0, and 0.938 for the 174 forms with scores of 30 or more. Median scores were consistently considerably lower than mean scores for both forms. Over 3% had not answered questions 2 and 25 on the DASH form and over 7% question 21 on sexual activity. These questions are not included in the Quick DASH form. 67% of respondents also completed the optional section on work. Mean values varied between 6 and 9 for women in the three younger age-bands, was 12 for women aged 60-79, and 24 for those over 80. Among men the mean scores were 5 for those aged 20-39, between 8 and 10 for those aged 40-79 and 18 for men over 80. Only 34% of respondents completed the optional section on sports/musical instruments. Mean scores were between 7 and 12 for women aged 20-59, and 20 for women aged 60-79.

Mean scores for men aged 20-49 were between 4 and 6, and between 10 and 18 for those over 50. Quick DASH scores were statistically significantly lower for respondents with a high income than for those with a lower income, and also for those with a long education compared to respondents with shorter schooling.

Conclusions: The high average scores in the general population, particularly among the elderly, should be borne in mind when evaluating scores among patients. The Quick DASH should be preferred to the full DASH as it is shorter, more often responded to, and the scores are very highly correlated to DASH scores. Few respondents complete the optional work and sports/musical instrument sections and they are probably of limited value. Ideally, income and length of education should be taken into account when interpreting scores.

A-0087 Cold intolerance after hand injuries. Disposing factors and long term prognosis

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Background: Cold intolerance after hand injuries is often debilitating. We wished to determine what factors make it more likely to occur and whether it improves or worsens with time.

Methods: We retrospectively studied 103 patients who had sustained a simple cut leading to a flexor tendon injury in the finger between 3 months and 20 years earlier. A total of 48 had also injured a digital nerve. At review patients indicated on a VAS scale their discomfort during the first winter after injury and the last winter before review and also gave a VAS evaluation of pain in the hand after keeping it in a bath of water at 1-4 degrees centigrade for 60 seconds.

Results: Cold sensitivity during the first winter after injury was reported by 66% patients. Its development was unrelated to the age at injury. The proportions of smokers, injury of more than one finger, and re-operation or with postoperative complications were significantly higher among patients with cold sensitivity. At review 49% indicated that they had improved, 41% that cold sensitivity was unchanged and 10% that they were worse. Standardized immersion in cold water showed that on average cold sensitivity was slightly worse with time.

Conclusions: We conclude that cold intolerance after hand injuries is more likely in smokers, with increasing extent of the injury and when there have been complications or repeated surgery. It is uninfluenced by age at injury. Subjectively it improves a bit with time, but the response

to a standardized cold stimulus indicates that objectively it is on average slightly worse.

A-0107 Measurement of grip force with a new sensor mat

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Purpose: This study compares grip force measurement with the digital dynamometer as gold standard to a special setting with pliance[®] sensor mats. Aim of the study is to validate this new method to measure grip force by pressure sensors.

Method: 76 healthy probands (38 male, 38 female) with a mean age of 32 years (range 18-65 years) were included in this study. Each proband performed grip force tests with a digital Jamar dynamometer and a new pliance[®] system. For the latter, three cylinders with 10, 15, and 20 cm circumference (corresponding to the Jamar handle size 2, 3, and 4) were coated with special mats measuring the load distribution with a resolution of 2 sensors per cm². The probands performed three times a maximum force grip consecutively with both hands, with the three sizes of the Jamar dynamometer and the pliance[®] system each in succession. The test was repeated at another two days to get information about temporal variation and test-retest variability. The mean force and maximum force for both methods were evaluated. To compare the values of both systems the correlation coefficient was calculated.

Result: The mean force with the Jamar dynamometer averaged 249.1 N on the left hand and 273.7 N on the right hand for handle size 2, 231.5/249.2 N for size 3, and 200.1/221.7 N for size 4. The maximum force was left 278.6 N and right 307.1 N (size 2), 263.9/284.5 N (size 3), and 230.5/251.1 N (size 4) on average. For the pliance[®] system, a mean force of 391.0 N left and 416.8 N right was achieved for the small cylinder, 452.8/482.6 N for the middle cylinder, and 318.5/ 342.1 N for the large cylinder. The maximum force averaged 450.9/478.9 N for the small cylinder, 505.1/538.0 N for the middle cylinder, and 360.0/385.8 N for the large cylinder. The correlation coefficient between the Jamar dynamometer and the pliance[®] system was 0.9 for all values of the middle and large cylinder in comparison to the Jamar handle size 3 and 4 (p=0.001). For the small cylinder/Jamar handle size 2 the correlation coefficient was 0.8 (p=0.001).

Conclusion: The pliance[®] system is a valid method to measure grip force. Besides, the pliance[®] system can provide a dynamic, high resolution map of the pressure distribution

of the fingers, thumb and palm during cylinder grip. Further analysis is necessary to identify typical local load- ing parameters of the hand during gripping.

A-0150 Effectiveness of interventions for secondary Raynaud's Phenomenon - a systematic review

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Purpose: In secondary Raynaud's Phenomenon (RP) vaso- spastic attacks are superimposed on either structural or biochemical changes in the vessel wall due to the concom- itant disease. Due to the unclear nature of the disease, therapy is directed more to alleviation of symptoms than to curing the disease. In this systematic review we assessed the effectiveness of (non)surgical symptomatic interventions to treat secondary RP.

Methods: The Cochrane Library, Pubmed, Embase, Pedro and Cinahl were searched for relevant systematic reviews and randomized clinical trials (RCTs). Two reviewers inde- pendently extracted data and assessed the methodological quality. If pooling of data was not possible, a best-evidence synthesis was used to summarize the results.

Results: Of the 5 reviews and 18 RCTs included, one RCT studied acupuncture. All others concentrated on the effec- tiveness of drugs (oral or i.v.). It appeared that calcium channel blockers significantly reduce the frequency and severity of Raynaud attacks and are therefore effective in the treatment of secondary RP. Iloprost (oral and i.v.) was also found to be effective. Limited evidence was found for Atorvastatin. For other traditional and more recently dis- covered interventions, no clear favourable effects were found.

Conclusions: This review shows that there is clear evi- dence in favour of calcium channel blockers and Iloprost (oral and i.v.) to treat secondary RP. For all other interven- tions only limited or no evidence was found. More high-quality, well-designed RCTs are needed in this field, especially for new interventions based on recent knowl- edge about the pathophysiology of secondary RP.

A-0195 The Hand Injuries In The Very young Population: A retrospective investigation of Etiology, Injury type and Treatment Modalities

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Introduction: Hand injuries encountered in neonates, pre- school (0-6) and school (6-14) age may show epidemiolog- ical and etiological differences. The motor development of the upper extremity and hand is actually a result of earning the intentional and fine motions in correlation to the phys- ical growth, central nervous system differentiation and acquired cognitive abilities which are gained in the men- tioned ages. Therefore, such injuries in early ages may impair the process as whole. This study aimed to investi- gate the epidemiology, etiology and the treatment outco- mes in the very young suffering of hand injuries.

Patients and Methods: The study included a total of 507 young patients aged between 0-6 years between the years 2006-2010, a retrospective investigation of records were performed and the data was analyzed according to the type of injury, etiology, location of the patient during injury insult, anatomical localization and treatment modalities.

Results: The distribution of patients according to sex ratio was 1/1.5(female/male). The highest amount of injuries was observed in five years of age. Type of injuries percentage were: tendon injuries in 13.4, nerve injuries in 8.3%, digital fracture in 12.6 %, vascular injury in 7.1%, burn injuries in 6.4 %, digital amputation in 19.9% and complex hand injuries in 31.9 %. The distribution of etiology was as: due to com- pression and crush injury in 55 %, sharp instruments in 31.5 %, burn in 6.4%, falling down in 3.1%, gun shot in 13.7%, foreign body infection in 0.8% and other blunt instruments in 1.8%. The highest rate of injury 75% was observed due to door trap. The location of the patients during injury insult were 72.6% at home while 27.4 % were out of home, the seasonal dominance was in spring and summer (76%) and peak of injury time during the day was between (14:00- 20:00h, 80%). The localization and injury pattern were as the following: Injury to the digital tip in 75.3%, to the digits in 9.6%, to the palmer region in 8.4% and 5% in the forearm. 54% of patients were hospitalized, 88.5% were operated at injury time while 11.5% of the patients were operated elec- tively. Treatment modalities were: 32.3 % simple primary suture, 43 % nail bed repair, 1.3% foreign body extraction, 4.6 % composite graft, 18.6% local flap and k-wire fixation in 2.3%.

Conclusion: The hand injuries in the very young population seems to be common and the investigation of the etiology and process of injury might give us new and better modalities in preventing such injuries. Key words: Very, Young, Hand, Injury

A-0201 Vascularization of the trapeziometacarpal joint and its clinical importance

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Few studies (Bahri et al., 1982) investigate the vascular anatomy of the trapeziometacarpal (TM) saddle joint of the thumb. The aim of our study was to describe the supplying arteries of the trapezium and the TM joint. It is of capital importance in relation to trapezium osteotomies (Goubau et al., 2007; Messina, 2000; Kapandji and Heim, 2002; Ropars et al., 2009; Roux, 2004). We have done 10 anatomical dissections in 10 different cadavers using two different techniques (4 macerations, 6 classic dissections). The arteries of the saddle joint originate from the radial artery and the princeps pollicis artery. We have found four important branches. The arteries form a vascular network around the joint. The dorsoradial surface of the joint has the richest arterial network. This should be emphasized when considering the surgical approach for a trapezial osteotomy.

A-0262 Changing incidence of sports-related wrist fractures between 1997 and 2007 in a population-based study

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Objective: Wrist fractures account for 20-30% of all fractures. Incidence rates of these fractures change over time due to osteoporosis or to changes in sport- and leisure time activities. The purpose of this study is to examine recent long-term population-based trends in incidence and causes of wrist fractures, and variation by age and sex. Study design: Descriptive epidemiological study of a national database.

Methods: Trend analyses of data collected by the nationally representative injury surveillance system of emergency department visits (LIS). Age-standardized incidence rates of wrist fractures per 100,000 person-years were calculated for each year between 1997 and 2007.

Results: In the overall male group, after a decrease between 1997 and 2001 the age-standardized incidence rate increased with 3.4% annually, from 217 [95% confidence interval: 207-226] per 100,000 person-years in 2002 to 246 [237-257] in 2007 ($p < 0.001$). In females, the

incidence rate increased with 1.7% annually, from 280 (269-290) in 2002 to 307 (296-318) in 2007 ($p < 0.025$). In boys and girls, aged 0-9 years, the incidence rate rose 3.9% ($p < 0.001$) and 4.9% ($p < 0.001$) annually between 2002 and 2007. In this same period the incidence rate among 10-19 years old increased annually with 3.6% ($p < 0.001$) in boys and 4.9% ($p < 0.001$) in girls. Among the population over 50 years old, incidence rates were stable in males but significantly decreased in females during the whole study period. We found that the increases of wrist fractures between 2002 and 2007 in childhood were mainly due to changes in the incidence of wrist fractures during soccer and gymnastics at school.

Conclusions: The incidence rate of wrist fractures in childhood increased significantly since 2002. The female population of 50 years and older showed a significant decrease. The increase in wrist fractures at young ages was sports-related. The attribution to this unfavourable trend of modifiable risk factors during soccer and school gymnastics should be investigated.

A-0266 Health care costs and productivity costs of hand and wrist injuries in a population-based study

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Background: Injuries to the hand and wrist account for approximately twenty percent of the attendances at the emergency department (ED) and might impose a large economic burden. We aimed to estimate the total health care costs and productivity costs of injuries to the hand and wrist, and compared them to the other main injury groups in a nationwide study.

Methods: Data were retrieved from the Dutch Injury Surveillance System, which records injuries treated at the emergency department, and from a patient follow-up survey conducted between 2003 and 2007. Injury incidence, healthcare costs, and productivity costs (due to absenteeism) were calculated by age categories and by different subgroups of injuries. An incidence-based cost model was used to estimate health care costs of injuries, according to the cost-of-illness methodology. Follow-up data on return to work rates and absence duration were incorporated in the absenteeism model that was used to estimate the productivity costs.

Results: Total costs due to injuries in The Netherlands in 2007 were €3.2 billion. Hand and wrist injuries annually account for €540 million and rank first in the order of most expensive injury types, before knee- and lower leg fractures (€410 million) and hip fractures (€388 million). Productivity costs contributed more (56%) than direct health care costs to the total costs of hand and wrist

injuries. This was also reflected in the age distribution, which showed that people from working age (20-64 years) are responsible for about 75% of all costs due to hand and wrist injuries. Within the overall group of hand and wrist injuries, fractures of hand and fingers are the most expensive group (€203 million), again largely due to large production costs in the age group of 20-64 years (€140 million).

Conclusion: Hand and wrist injuries constitute not only a significant part of all treated injuries at the ED, but also represent a significant economic burden to society. In this population-based study, we found both high health care and productivity costs, with the latter making the largest contribution. This study suggests that further clinical research should focus on surgical and rehabilitation interventions of hand and wrist injuries, to lower the time off work.

A-0283 The development of an outcome based community orientated curriculum for hand surgery education in the UK based on the current practice of a dedicated tertiary referral centre, incorporating the current views of stake holders on changes in the curriculum

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Hand surgery is practiced in the UK by orthopaedic and plastic trained specialist. The curriculum of these root specialities does not have a comprehensive curriculum for hand surgery as it forms only part of the practice. This has posed problems in the fragmented nature of care given by these surgeon trained via the root specialities as hand surgery is not an independent speciality. Based on the author's (who is a practicing hand surgeon) own observation, due to the lack of comprehensive skill set among these surgeons, patients often have to undergo multiple procedures under different surgeons to obtain optimal treatment especially in hand trauma which is not acceptable. Outcome based curriculum have been shown to be a strategy to produce targeted and focused education to produce fit for purpose surgeons in a cost effective manner. The rationale thus is first to understand what is the current portfolio of cases commonly seen by dedicated hand surgeons in the UK. From this we can determine what the competencies are needed for hand surgeons to be able to practice safely, competently and with mastery in those common conditions independently. A survey of the stake holders will provide data to understand the climate on opinions and views on education of hand surgeons in UK. This will provide the background for the development of an outcome based curriculum in Hand Surgery for the UK that

can be utilised to produce an academic program (MSc) with a University. This will provide an accessible and equitable education opportunity for doctors to gain knowledge and skills in their current working environment and thereby improving the quality of care given to hand patients. The Birmingham Hand Centre (combining the New Queen Elizabeth Hospital, the Royal Orthopaedic hospital and the Birmingham Children's Hospital) comprises one of the largest tertiary referral centres with 12 dedicated hand surgeons in the UK. They perform in excess of 5000 operations per year inclusive of elective, trauma and paediatric hand surgery. The data for the current practice was obtained by analysing the hospital information system (HIS) of the 3 hospital for the number and types of hand surgery procedures performed over a 5 year period using the National Health Service UK Operating Procedure Coding Systems codes for hand surgery. The incidence of hand surgery procedures was then ascertained by dividing the number of hand surgery cases by the total number of operations performed. The comparative importance of hand surgery will be determined by dividing the ratio of hand surgeons to the total number of surgeons with the previous incidence ratio. Analysis of the current practice and the curriculum was performed using the Pareto rules:- 80% of the case mix in current practice will be the curriculum needed to be mastered by dedicated hand surgeon independently and therefore will be the proposed new curriculum based on the needs of the community currently. All other content in the curriculum will be optional and can be an elective component.

A-0298 A prospective randomized study between Burton and APL interposition-arthroplasty; - a 10 years follow up

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Background: To investigate the long-term functional and clinical outcome between interposition-arthroplasty according to Burton with a ligament reconstruction and tendon interposition arthroplasty (LRTI) with the abductor pollicis longus tendon, a prospective randomised study was conducted.

Material and Methods: 67 patients with 81 CMC I arthrosis were included and randomised in to two groups. Follow up was conducted after 6 months, 2 years and 10 years. 81 operations were followed up after 6 months, 77 after 2 years and 52 after 10 years. Grip, key and two-pinch strength, pain (VAS) and functional score (Sollerman-test) were measured, as well as active range of motion in radial and palmar abduction and the opposition of the thumb.

Results: There were no significant differences recorded between the two groups at any follow-up. At 10 years follow-up grip strength was 24 kg, two-pinch 5.4 and key-pinch 5.3 kg, pain 0.5 and Sollerman test 16.75 in the two groups brought together. There was no significant difference between the groups at 2 and 10 years follow up, expect in radial and palmar abduction, which decreased significantly from 69,7 degree for the radial abduction to 63.8 degree and for palmar abduction, which decreased significantly from 69.8 to 63.5 degree at 10 years follow-up.

Discussion: At 10 years follow up both groups showed excellent strength, ROM, functional scoring and highly satisfied patients. Both procedures showed a low complication risk. Our results in the long perspective have to be considered when discussing the indication for other alternatives with small series and short term follow up e.g. CMC I prosthesis.

A-0307 A prospective audit of patient satisfaction with the component parts of carpal tunnel decompression

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Introduction: The outcome of carpal tunnel decompression is well documented in the medical literature. It is not however well documented as to the patient satisfaction of the individual parts of the procedure. The aim of this study was to determine the level of patient satisfaction with these individual steps in order to identify individual aspects where improvements to the service could be made.

Methods: 50 patients were recruited into the study upon presentation for surgery. A questionnaire was completed immediately post-operatively. Areas of patient satisfaction measured included, tolerance of tourniquet and local anaesthetic, subjective pain scores and overall satisfaction. A subset of these patients was followed-up to discharge in order to determine satisfaction with suture removal.

Results: Satisfaction levels were very high with most aspects of the patient journey. In terms of the procedure; the tourniquet and local anaesthetic were the least well tolerated, although not in all patients. Interestingly lack of tolerance of these steps showed no significant relationship to the overall patient experience. Suture removal is tolerated well by patients. Almost every patient would recommend the procedure to a friend or relative.

Conclusions: In this study we have been able to demonstrate that even when patients poorly tolerate individual component parts of carpal tunnel decompression surgery, this does not result in a poor overall patient experience of the procedure. This then questions the benefit of striving to develop strategies to reduce patient intolerance to the

component parts, for example, performing surgery without a tourniquet or warming the anaesthetic.

A-0365 Relocation and/or wrapping of of painful neuromas associated with CRPS type II

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The differential diagnosis of chronic neuropathic pain is still a challenge and in many cases the treatment is delayed because the nerve involvement is underestimated. Nerve adhesion and/or in continuity neuromas should be carefully searched for with clinical ("neurodesis" effect, local nerve blocks) and instrumental diagnostic (emg, sonography). In the literature there are some reports of successful surgical treatment: neurolysis, neuroma resection and muscle relocation, soft-tissue coverage. We report our experience with surgical treatment of CRPS 2 patients. From 2008 to 2009 we treated 14 patients (6 women, 8 men) with an in average 29 months long history of chronic neuropathic pain. All patients had already received pharmacological and physical treatment. A nerve of the upper extremity was involved in 8 cases. All patients were operated on with exploration (14/14), neurolysis (14/14), neuroma resection (3/14) and soft-tissue coverage with fascia flap (6/14), fat flap (4/14) and muscle flap (1/14). Nine patients had a substantial improvement and could be reintegrated to work, five patients showed minimal or no improvement. All patients reported about no resst pain any more, some motion pain and tap pain (pain when tapping on the nerve). All patients were satisfied with the procedure, also those with residual pain. This preliminary results are in accord with some reports of the litterature demonstrating that an accurate pain evaluation and search for neuroms and their surgical treatment can be beneficial to patient with chronic neuropathic pain.

A-0439 The HANDGUIDE study: European treatment guidelines for five non-traumatic hand disorders

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Purpose: Evidence based treatment guidelines for hand disorders can further optimize the quality of care by maximally integrating scientific evidence in the selection of intervention. However, since scientific evidence is often insufficient to make treatment choices, we have initiated a consensus project named the HANDGUIDE study, to develop European treatment guidelines for five common non-traumatic hand disorders: trigger finger, De Quervain's disease, Dupuytren's disease, carpal tunnel syndrome and Guyon canal syndrome.

Methods: The development of these guidelines is performed in two phases: Phase I: Establishing current evidence for effectiveness of interventions: We have finalized systematic reviews on the effectiveness of conservative and surgical treatments for these five hand disorders. Phase II: Delphi consensus strategy: Based on the presence or absence of such evidence, we use the Delphi consensus strategy to develop guidelines. A Delphi consensus strategy is basically a series of sequential questionnaires or "rounds", interspersed by controlled feedback that seeks to achieve consensus of opinion among a panel of (international) experts. We have asked P&RM physicians, hand surgeons (FESSH), and hand therapists (EFSHT) to participate in this consensus project by delegating experts in the field of hand surgery and rehabilitation to participate in the Delphi consensus strategies. We are conducting three web-based Delphi consensus projects: Delphi-I: Tendinopathies of the hand, i.e. trigger finger, and De Quervain's disease Delphi-II: Dupuytren's disease Delphi-III: Nerve entrapments of the hand, i.e. carpal tunnel syndrome and Guyon canal syndrome.

Results: 17 countries have selected experts for the HANDGUIDE study and a total of 112 experts (52 hand surgeons, 47 hand therapists and 13 PR&M physicians) have been selected to participate in the Delphi consensus strategies. In Delphi I, II and III, 38, 42 and 35 experts respectively will cooperate (some PR&M physicians will participate in more than one Delphi consensus strategy). The first round of Delphi-I was started in October 2010 and is finished now. The second round will start in January 2011. The first rounds of Delphi-II and Delphi-III will start at the beginning of 2011.

Conclusion: The ultimate goal is to achieve multidisciplinary consensus on European treatment guidelines for the five hand disorders. The guidelines will not be ready in May 2011, but we expect that we can present some first results during EUROHAND 2011.

A-0454 Usefulness of B-mode and colour coded ultrasound sonography in hand surgery

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Purpose: Presentation of employment and benefit of ultrasound sonography in the assessment of pathological findings of patients investigated in a department of hand surgery.

Methods: We use B-mode and colour coded ultrasound sonography (18 MHz) in the diagnostic setup of patients for the assessment of 1. localization, size and type of tumours, 2. haemorrhages, 3. joint effusion, 4. synovitis, 5. for the identification of Ganglia, 6. ruptured and adhesed tendons, 7. to investigate symptoms following osteosynthesis of hand and distal forearm, 8. to monitor resorption processes in implanted foreign material, 9. to assess perfusion before flap plasty, 10. nerve compression syndromes, 11. for the diagnosis of Stener-lesions. In 2009/2010 350 ultrasound investigation were performed. The most frequent indications/ findings were unclarified swellings (n 30), affection of tendons (n 22), tumours (n 25), unclear symptoms following trauma and operation (n 18), ganglia (n 16), control of screw length after plate fixation of distal radius fractures (n 13) lesions of the ulnar collateral ligament (n 16). In addition monitoring of resorption and nerve regeneration after implantation of resorbable nerve tubes (n 160) were investigated.

Results: Ultrasound sonography was helpful to analyse the pathological finding in more than 90 % of the cases. In general it allowed a better planning of operation. Ultrasound results were mostly confirmed intraoperatively and histologically. In 7 cases of ulnar collateral ligament lesions Stener-lesions were found and confirmed operatively. In addition ultrasound techniques allowed to assess adequate screw length in plate fixation, which was often unclear in conventional X-ray and would require CT-scans. Ultrasound sonography may even be helpful to assess tumour type, except for haemangiomas, which often demand MRI.

Conclusions: B-mode and colour coded ultrasound sonography is a promising and valuable diagnostic tool in hand surgery and may provide additional and complementary information to CT and MRI, especially in pathological findings of the fingers. It is likely that application of ultrasound sonography will increase in the future, because it can be easily and rapidly performed, it is cheap and even more important comfortable and not harmful to the patient.

A-0504 Our experience in the treatment of trapezium metacarpal arthritis

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Purpose: To report our experience in the treatment of trapezium metacarpal arthrosis using different methods.

Material and methods: our experience with over 5 years of follow up study consists of over 100 patients treated with trapeziectomy/hemitrapeziectomy and ligament interposition arthroplasty (Weilby modified by Ceruso and Burton Pellegrini), 18 cases treated with arthrodesis; 200 cases of total arthroplasty (Tripodal, Avanta, Mayo Clinic) and partial arthroplasty (Moje hemi implant) in 15 year of activity. The patients were studied retrospectively. We classified the basal thumb arthrosis by Eaton classification. The patient's evaluation consisted by measurement of ROM of the first ray in abduction and opposition, evaluation of pain reduction by VAS score, improvement of pinch grip and strength grip (by Jamar test); the radiographic aspect of the first ray (TSHR index: trapezium height space ratio); DASH score.

Results: trapeziectomy/hemitrapeziectomy and ligament interposition arthroplasty: good results in 50% cases after 3 months; hand grasping reduction (25%); Flexor Carpi Radialis tendinitis (10% with Weilby modified by Ceruso); residual pain (20%); second surgery in 5 cases for painful thumb, functional limitation and adherent scar. Total and partial arthroplasty: 122 good results, 73 sufficient and 11 poor, we removed 18 implants (for loosening/pain).

Conclusions: the trapeziectomy with ligament interposition arthroplasty is the better choice for intermediate stages (Eaton 2-3) even if there is residual pain for over 6 months after the surgery, FRC tendinitis (in the cases treated with Weilby Ceruso technique), additional time surgery to correct zeta deformity of the thumb. The total or hemi prosthetic replacement improve pain resolution, early restore good clinical aspect, but could be radiographical evolution with

appearance of osteophytes in the base of first metacarpal and reduction of the movement in time with no pain, our indication is for patients low demand. Arthrodesis needs long healing time, guarantees grip strength in patients with high functional requests, but has a low compliance for the limitation of thumb movements.

A-0533 Abductor pollicis longus tendon interposition for arthrosis of the first carpo-metacarpal joint. Long term results

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Background: We have performed an interposition arthroplasty using the abductor pollicis longus tendon for arthrosis in the basal joint of the thumb in our department since 1995. In 2001 we reviewed 47 patients (55 thumbs) an average of 3 (1-5) years after surgery. The pain relief was excellent in 32 thumbs, and 25 patients improved their ability to perform daily tasks. Mobility was well preserved. Key pinch and grip strengths averaged 78% and 89%, respectively, of those in unaffected hands.

Methods: We have now reviewed all available 28 of these patients (31 thumbs) 11-14 years after surgery.

Results: The mean DASH value had decreased from 28 to 20. The PRWE score was 23 and VAS scores for pain and cosmesis were practically unchanged. Also mobility was unchanged, except for abduction of the thumb which had decreased from 51 to 36 degrees. Average strength in key pinch had increased from 3.6kg to 5.3kg and grip strength from 20kg to 25kg. The radiographic distance between the metacarpal base and the scaphoid was unchanged at 4.5mm.

Conclusions: The good results after this procedure persist 11-14 years after surgery.



A-0046 The patient's point of view about informed consent (IC): a prospective study in carpal tunnel surgery

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Aim: the patient's perception of IC is not well known and our experience suggested that many patients tend to view consent as an administrative act, neglecting the rule of decision making instrument as a way of making their wishes known. For further improvement of IC procedure it is crucial to understand the patient's attitude and the emotional impact about IC.

Material: Prospective study. Within one month after carpal tunnel release a questionnaire was sent to 188 consecutive patients. Questions focused on patient's recall information about risks, benefits, alternative options, preferences about decisions process and global satisfaction with IC. Patient's understanding of the legal consequences of the IC was analysed.

Results: A total of 137 patients [73%] responded. Information was rated excellent or good in more than 90% of cases. 87% of patients didn't need more information about surgery. Risk's recall rate was 59%. IC reduced pre-operative anxiety in 65% and the influence of IC in patient's decision was relevant in 55% of cases. Patients have limited understanding of the legal consequences of the consensus and 29% of patients believed that primary function was to protect hospital. 10% believed that IC remove patients right to compensation in case of claims.

Conclusion: Patient involvement in medical decision care is a key aspect of patient centred care. The actual form of combined written and oral preoperative information presented is adapted to patient's wishes and needs, provide an adequate legal proof and allows a structured conversation. There is a substantial uncertainty about legal implication of IC, leading to potential discord. We strongly recommend to explain to patient that consensus serve primarily their interest.

A-0047 Should aspirin be stopped before tunnel carpal surgery

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Aim: There are no studies on intra- and postoperative complications of hand surgery in patients who take aspirin pre-operatively. To investigate the effects of aspirin in patients undergoing hand surgery, we performed a prospective study to determine whether patients who continued to take aspirin during carpal tunnel release (CTR) had an increased incidence of clinically significant complications.

Materials and method: Between January 2008 and January 2010, 100 patients, taking regularly and since at least 1 year aspirin 100 mg/day, undergoing standard open CTR under intra-venous-regional-anaesthesia and tourniquet control were the study groups: 50 patients stopped aspirin, for at least 5 days before surgery, and resumed it 3 days postoperatively (GROUP 1), while 50 patients continued to take aspirin (GROUP 2). The control group (GROUP 3) comprised 50 patients never anti-aggregated who had undergone a similar procedure. Incidence of clinically significant per- or post-operative complication was recorded and divided in local and cardio-cerebro-vascular complications. Local complications were successively divided into minor and major according to Page and Stern. Local haematoma was evaluated at 2 (before resume aspirin) and 14 days (after resumed aspirin) after the operation. The patient portion (PP) of the Patient and Observer Scar Assessment Scale (POSAS) was used at the final control at 90 days for a subjective and numerical evaluation of the scar.

Results: A total of 3 complications (1 minor, 2 major complications) and 27 haematomas (19 minor/8 major) were recorded. There was no significant difference in the incidence of complications and/or haematomas in the groups. The PP-POSAS score is uninfluenced by continuation or suspension of aspirin.

Conclusion: Our study demonstrates that continuation of aspirin did not increase the risk of local or general complications. Continuation of aspirin did not influence the subjective scar assessment. It is concluded that it is

unnecessary to stop aspirin before CTR when good meticulous surgical techniques are used.

A-0054 Interest of Canaletto® implant for recurrent carpal tunnel decompression: about 20 cases

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Purpose: Second time carpal tunnel decompression is not exceptionally performed. During reoperation, different procedures proposed to conserve median nerve sliding space. The aim of our clinical retrospective review was conducted to evaluate the results of a new implant: Canaletto® device.

Description and method: Twenty consecutive cases (19 patients) undergoing second carpal tunnel release were identified. Their average age was 54 years old. The average interval between the original carpal tunnel release and re-exploration was 28 months. The average of median nerve sensory latency across carpal tunnel was 33.6 m/s. At surgery, according to the 3rd intermetacarpal space, neurolysis of median nerve was performed by 30 mm palmer incision, Canaletto® (polyethylene and silicone) was implanted by suturing with released flexor retinaculum. Evaluation including pain (using a visual analogic pain scale and DN4 score), function (DASH score), grip strength, sensibility of fingertips, thenar trophicity and time to return back to work.

Results: The last follow-up was 20 months post-operative. All preoperative and last follow-up values were significantly improved ($p > 0.005$), DN4 (4.2/2.7), pain (6.475/3.2), DASH (55.11/27.73), grip strength (56.91/85.91), hypoesthesia and amyotrophy. No patient had any complication and they return back to work in 13.6 weeks.

Conclusions: These findings suggest that silicone material is able to induce a biological membrane with anti-adhesive properties. Our results are the same of literature, but with a short surgery time and a small incision. But our findings should be demonstrated with a prospective, comparative, randomised trial.

A-0065 A comparison of the effectiveness of carpal tunnel release in patients with CTS diagnosis based on only clinical vs clinical and electrophysiological grounds

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The utility of electrodiagnostic testing in diagnosing of carpal tunnel syndrome (CTS) has been questioned. A

prospective, randomized study was designed to compare effectiveness carpal tunnel release in patients with CTS diagnosis based on clinical grounds versus clinical and electrophysiological grounds. Ninety-three patients (93 hands) with a mean age of 58 years were operated on, 45 patients with clinical CTS diagnosis confirmed by nerve conduction studies and 48 without this test. Grip and pinch strengths, digital sensibility (filament test) and Levine scores were evaluated throughout 6 months follow-up. We found no statistically significant differences in respect of any considered parameter between the groups with or without nerve conduction studies. Our results show that nerve conduction studies do not improve results of surgical treatment of clinically relevant CTS.

A-0073 The surgical zones of the carpal tunnel

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Carpal tunnel release is often utilized as a training procedure for surgeons because of its high incidence and perceived surgical simplicity. This study describes three distinct anatomical zones through which the median nerve passes as it traverses the carpal tunnel, with practical recommendations to surgeons of all grades as to how to avoid injury to the nerve during surgical release. 50 healthy asymptomatic volunteer subjects (100 hands) were examined by non-invasive ultrasound assessment of the depth of the surface of the median nerve from the surface of the overlying skin. Three easily identifiable bony landmarks were identified (radiocarpal joint, capitulate joint and carpometacarpal joint) and depth measurements taken at each of these points. Information was also collected relating to age, gender, hand size and hand dominance. Measurements were recorded with fingers in full extension and in full flexion. The median nerve was found to pass through three distinct zones; proximal (median depth = 2.3 mm), transitional (median depth = 3.6 mm) and distal (median depth = 6.2 mm) ($p = < 0.0001$). Larger hands (glove size > 7) and male hands were found to have deeper nerves throughout their course. This study accurately describes new zonal anatomy for the depth of the median nerve under the skin, as it traverses the carpal tunnel. This is highly relevant in clinical practice, especially as many of these procedures are performed by trainee surgeons who may be unaware of the depth of the nerve as they incise the skin.

A-0097 Carpal Tunnel release under local anaesthesia with or without epinephrine

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Background: Carpal tunnel release is very commonly performed in hand surgery departments. However different types of anaesthesia are used. In many cases this procedure is done with local anaesthesia and sometimes epinephrine is added. The advantages and inconvenience are not well known and have not been studied.

Aim: The aim of this prospective study was to compare outcomes of 2 series of patients having endoscopic Carpal Tunnel release under local anaesthesia with or without epinephrine.

Methods: One hundred and twenty consecutive eligible patients having typical carpal tunnel syndrome were selected. The only exclusion were patients treated for arteritis. The study was double blinded (caregiver and outcomes assessor) and patients were prospectively randomised by computer in 2 groups: The first group had local anaesthesia with 5 cc of lidocaine. The second had 5 cc lidocaine with epinephrine (1 percent). Injection at the palmar crease using a 25G 15 mm needle was carried out by the surgeon ten minutes before the usual endoscopic procedure using a tourniquet. The primary outcome measure was patient satisfaction (subjective assessment scoring 1 to 5). Secondary outcomes comprised return to daily activities and work (in days), peroperative and postoperative pain (subjective assessment using 1 to 10 scale and pain treatment), postoperative complication (oedema, haematoma, stiffness measured by assessor), duration of surgery and score of the short DASH. Patient data (sex, age, workers compensation or not) were introduced in a software analysis system together with the outcomes measured.

Results: Quantitative variables (age, satisfaction, pain, complications, duration) are described with medians and ranges. Qualitative variables (sex, workers compensation) are described in percentage. Demographics and late clinical outcomes are similar in the 2 series with a high consistency (Cronbach's coefficient). There was no difference in patient satisfaction, although significant differences were noted in post operative pain score and complications (paired t-test).

Conclusion: This level 1 study shows that using epinephrine together with local anaesthesia improves significantly results, particularly early complication rates and pain. We encourage the use of this type of anaesthesia. Our next step is to abandon the use of tourniquet in this type of surgery.

A-0100 Triggering of the digits following carpal tunnel surgery; a coincidence or a consequence?

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Carpal tunnel syndrome and trigger finger may be seen in the same hand simultaneously. Development of trigger finger is not rare in patients who underwent carpal tunnel syndrome surgery, but the relationship between them has not been exactly put forward yet. In this study the effect of transverse carpal ligament release on its own or together with volar carpal ligament release on trigger finger formation was investigated and the incidence was compared to the incidence in conservatively treated patients. This prospective study was performed on patients divided into surgery group (126 patients, 175 hands) and conservative group (81 patients, 147 hands). Gender, age, dominant hand, severity of Carpal tunnel syndrome, Visual analogue scale score, physical examination findings, existence or history of trigger finger, Electromyografie results and treatments if applied were recorded in the first presentation. 1, 3, 6, 12, and 24 month Visual analogue scale scores of all patients were noted, their physical examination was performed and the development of triggering if any was recorded. Electromyografie was applied to all patients in 1st and 12th months after the operation. In the surgery group trigger finger was seen in 9.1% of hands before the operation, compared to 21.7% after the surgery. In the conservative group it was seen 5.4% of hands at the beginning of the study, compared to 1.4% during the follow-up. The development of trigger finger was significantly higher in the surgery group than the conservative group. While trigger finger development was 32.9% in the group that volar carpal ligament and transverse carpal ligament were released together it was 13.5% in the only transverse carpal ligament released group. Consequently, we think that volar carpal ligament release increases the trigger finger development. We consider that this study will shed a valuable insight to further anatomical and biomechanical studies.

A-0236 The auditory and visual reaction time in early stage of Carpal tunnel syndrome

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Purpose: Carpal tunnel syndrome (CTS) is a clinical condition for which electrodiagnostic testing is commonly requested. Routine electrodiagnostic testing for CTS usually includes needle electromyography (EMG) of the involved extremity and recording the median nerve

distal motor latency (DML), distal sensory latency (DSL) to the index finger and forearm conduction velocity. Unfortunately, these routine procedures aren't pleasant for patients with CTS. Besides this test, usually are used at the late phase of compression. An animal's ability to cope with the environmental changes for the maintenance of homeostasis depends on the integrity of cell communication and responses given by the various systems in terms of sensory perception and motor response. Time response is supposed to be the best factor for the management of homeostasis. The aim of this study is to test if reaction time tasks can be taken as a indicator, early nerve compression without noticeable clinical signs of symptoms.

Methods: The study was carried out with 20 patient that show primary signs of CTS. The auditory and visual reaction time was measured by reaction time instrument. The instrument is specially designed to measure response time in milliseconds. It has two modes of providing stimulus - audio and visual . The reaction time was recorded for auditory low and high frequency sound stimuli and visual reaction time for red and green light stimuli. As soon as the stimuli was perceived by the subject, they responded by pressing the response switch. The display indicated the response time in milliseconds. After familiarising the subject with the instrument and after repeated practice, three readings for each parameter were noted. The average of the three readings was taken as the value for reaction time task and was noted in the subject record profile.

Results: All the observed values for auditory reaction time for low and high frequency sound and visual reaction time for red and green light after comparison between uninjured hand and injured hand were statistically significant.

Conclusions: The reaction time for auditory and visual stimuli was more in patients of injured hand than in uninjured hand. Delayed reaction time in patient without noticeable clinical neuropathy can be taken as a non-invasive, low cost, sensitive indicator of early nerve damage without clinical signs or symptoms.

A-0249 Open versus mini-open procedure for carpal tunnel release: a prospective randomized study

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Background: Endoscopic treatment of the carpal tunnel syndrome has been demonstrated to reduce recovery time. Nevertheless, the additional cost of using endoscopic devices has reduced the use of this technique as an usual procedure. This study attempted to evaluate the outcomes of a variant of

this technique, in which a transversal skin incision is made in the volar carpal fold, and the carpal tunnel is released without using endoscopic devices. The objective was to compare this technique with the usual open procedure regarding to the postoperative outcomes and the rate of complications.

Methods: Prospective and randomized study of 60 patients treated operatively of the carpal tunnel syndrome from January 2008 to October 2009. All of the patients had a positive history and physical examination, positive electrical studies and failure of nonoperative measures. 30 patients were operated with the usual technique and 30 with the mini-open technique. Follow-up was made by the Boston Carpal Tunnel Questionnaire (BCTQ); patients were evaluated preoperatively and at 2 weeks, 3 months and 1 year postoperatively. Furthermore, disability period and patient satisfaction where evaluated.

Results: Both groups were homogeneous regarding to preoperative data. At one year follow-up, a significant improvement was observed in both groups, not only in the symptoms severity but also in the function score ($p < 0.001$). There was not any significant difference between both groups regarding to these two scores ($p = 0.10$ and $p = 0.25$ respectively). There was a bigger index of tenderness in the wound in the patients treated with the usual technique ($p = 0.046$). There was no differences in possible complications as numbness and tingling ($p = 0.62$) or weakness ($p = 0.42$) in the hand. Disability period was 2.5 weeks in both groups.

Conclusions: The mini-open technique produces less tenderness in the surgical wound. The results of the usual technique are reproduced with the mini-open and the complication index does not increase.

A-0315 Flexor retinaculum reconstruction after CTS release. Long term review of 248 cases

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Purpose: To develop a surgical technique of reconstructing the flexor retinaculum (FR), easy to perform under local anesthesia, to prevent the main drawbacks from surgery, which are prolonged palmar scar pain and decrease of grip strength.

Methods: The distal FR is divided close to its insertion at the hook of the hamate bone. The division is continued proximally in an ulnar direction of 45° towards the pisiform bone, and again longitudinally until the antebrachial fascia is reached. The proximal part of the radially based flap of the FR is then anchored to the hook of the hamate with a single suture, preventing anterior dislocation of the finger flexor tendons. Postoperatively, the wrist is immobilized in moderate extension for 3 weeks. 198 patients (248 treated hands) were reviewed at an average of 8 years and 7 months after surgery (from 5 to 16.5 years). Grip strength

with a Jamar dynamometer was measured in both hands with the wrist in both extension and 20° of flexion.

Results: All patients experienced complete disappearance of the symptoms without recurrences. The average grip strength in extension was 29 kg, and in flexion 17 kg. These values were 28% higher than those obtained in a series of 220 hands that were reviewed at an average of 3 years and 10 months after surgery and who did not have the FR reconstructed. Only 6 of the patients had pain in the palmar scar on an average of three weeks after the plaster was removed.

Conclusions: FR reconstruction with the present technique provides immediate relief of CTS symptoms without the risk of future recurrence, as the FR is kept undisturbed for the gliding of the median nerve and flexor tendons. FR reconstruction has the advantage of not decreasing grip strength and, what it is most important, absence of postoperative palmar scar pain.

A-0325 Changes in shape and displacement of the median nerve and tendons in the carpal tunnel; parameters for assessment of carpal tunnel syndrome

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Purpose: Although the precise aetiology of carpal tunnel syndrome (CTS) remains unknown, there is a growing body of literature suggesting that non-inflammatory fibrosis of the subsynovial connective tissue (SSCT) plays an important role. This tissue is found in the carpal tunnel between the median nerve and flexor tendons and it has been hypothesized that fibrosis and thickening of the SSCT might be the first step in developing CTS since it may restrict the ability of nerve and tendons within the carpal tunnel to move, and therefore cause compression of the median nerve. Measuring changes in shape and displacement of the nerve and tendons during hand movements might therefore provide information about possible changes in the properties of the SSCT in CTS patients. In this study we investigated the changes in shape and displacement of the median nerve and tendons during finger movement in asymptomatic subjects.

Methods: We made ultrasound scans (Philips iU22 with a L12-5 probe) of the carpal tunnel of 20 asymptomatic subjects moving from extension to flexion of all fingers and ending with flexion using a forceful grip. To identify the different structures and to calculate shape and displacement parameters, we manually placed polygons on the outside border of the median nerve and six flexor tendons

using an in-house developed image processing software package based on Matlab2010a. We analyzed the outcome values of the shape and displacement parameters if intra- and interrater intraclass correlation coefficients were above 0.5. Results Reliability of shape and displacement parameters of the median nerve and flexor tendons ranged from moderate to excellent, with the exception of shape parameters of the middle finger flexor digitorum profundus (FDP) and the ring finger flexor digitorum superficialis (FDS) and FDP. The most pronounced changes in shape and displacements were seen from extension to forceful grip. Shape Going from extension to forceful grip, circularity of the median nerve increased 14%, indicating a less-circular nerve, while the perimeter increased 6%. The tendons showed an opposite trend; the tendons became 25% more circular from extension to flexion using forceful grip while the perimeter decreased 11%. This pattern was supported by significant differences in all tendons, except by the change in perimeter in the index finger FDP and middle finger FDS, which did not reach significance ($0.05 < p < 0.1$). Displacement The largest displacement was seen in the median nerve; displacement during extension to forceful grip was 90% larger than the displacement from extension to flexion. Tendons showed a 17% increase in displacement during extension to forceful grip. However, this was not significantly different for the middle finger FDS and the ring finger FDS and FDP.

Conclusion: We found that changes were most pronounced when moving the fingers from extension to flexion using forceful grip. In asymptomatic subjects the median nerve flattens and moves ulnar, the tendons become more circular, and each FDS moves toward its corresponding FDP. The comprehensive reference values that we reported, can be used for evaluating possible changes in the displacement and or shape of the median nerve and tendons in CTS patients.

A-0326 Carpal tunnel syndrome in children

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Carpal tunnel syndrome is a frequent peripheral nerve compression pathology in adults. Its reality in children is debated. We present 3 clinical cases of severe CTS in children and their clinical outcome. We discuss the physiopathology and especially the problem of anatomic variations and aspecific flexor tendon synovialitis. Hand surgeons must be aware of this diagnosis in children presenting with paresthesia, to prevent late stage thenar atrophy.

A-0389 Median nerve deformation and displacement in the carpal tunnel during index finger and thumb motion

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Purpose: The purpose of this study was to investigate the deformation and displacement of the normal median nerve in the carpal tunnel during index finger and thumb motion, using ultrasound.

Methods: Thirty wrists from 15 asymptomatic volunteers were evaluated by ultrasound. Cross-sectional images of full flexion to extension motion were recorded. On the initial and final frames, the median nerve, flexor pollicis longus (FPL) and index finger flexor digitorum superficialis (FDS) tendons were outlined. Coordinate data was recorded and median nerve area, perimeter, aspect ratio of the minimal enclosing rectangle, and circularity in extension and flexion positions were calculated. Results During index finger flexion, the tendon moves volarly while the nerve moves radially. With thumb flexion the tendon moves volarly, but the median nerve moves towards the ulnar side. In both motions the area and perimeter of the median nerve in flexion were smaller than in extension.

Conclusions: We showed that the median nerve in healthy human subjects shifts away from the index finger FDS and FPL tendon while being compressed between the tendons and the flexor retinaculum in the carpal tunnel. We are planning to compare these data with measurements in patients with carpal tunnel syndrome. Key words: carpal tunnel, median nerve, ultrasound

A-0417 Carpal tunnel release: Comparison of the classic open technique with the a mini open technique

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Purpose: Carpal tunnel release is one of the most common procedures in hand surgery. The purpose of this prospective randomized study was to examine if the extent of the incision has an impact on the early of late recovery of the patients and return to their previous activities.

Methods: One hundred patients with clinical and neurophysiologic findings of carpal tunnel syndrome underwent carpal tunnel release. Patients were randomized in two groups. Fifty patients in the first group (with a mean age of 56 years) were operated with the classic open method and fifty patients in the second group (with a mean age of 54 years) underwent a minimally invasive release with the Knifelight device. For the method using the Knifelight, a skin incision of less than 1 cm was done at the distal edge of the flexor retinaculum and the release of the flexor retinaculum was performed by placing and advancing the device from distally to proximally. Illumination during transection of the ligament confirmed the release. Patients in both groups were instructed to use their hand immediately for light tasks but they did not perform weight bearing activities for two weeks.

Results: In all patients, pain and paresthesias improved significantly after surgery. Two-point discrimination improved gradually in both group and reached the final value (mean 4 mm in both groups) at 2 months postoperatively. Three weeks after the procedure grip strength was 75% of the preoperative value in the first group and 85% in the second group. At two months after the procedure grip strength was the same in both groups. It was measured 33 Kg compared to 29 Kg preoperatively. Patients of the second group with the Knifelight used their hand more freely four weeks postoperatively probably thanks to the smaller incision. Complications included one algodystrophy and one superficial infection both in the first group.

Conclusion: Patients of the second group recovered function and grip strength earlier than the first group. The smaller incision seems to have influenced the preliminary results. At two months, patients in both groups presented equal function and grip strength.

A-0022 treatment of terrible triad without radial head replacement review of 16 cases

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Introduction: Terrible triad is a complex fracture dislocation of the elbow with rare incidence and is difficult to manage. Standard treatment of this injury is repair of the coronoid and replacement of the radial head. Radial head prosthesis has its complications like loosening and capitulum suffering, let alone to its expense and availability. We review our patients with terrible triad who were treated with coronoid and collateral repair without radial head replacement to find their final results.

Material and method: From January 2007 till December 2009 we found 16 terrible triad in our archive. 11 of them had our inclusion criteria means, treated by coronoid and one or two collateral ligaments repair and radial head resection without replacement and at least 6 months follow up.

Results: We had 11 patient, 8 were male and 3 were female, right side was affected in 6 patients, mean age was 26.7 (21-36) years. Mean follow up was 11 (6-34) months. One of our patients suffered from severe heterotopic ossification with complete stiff elbow. With excluding this patient mean flexion was 112 (100-135) mean extension was 13 (0-30) and mean ROM was 98 (90-120) degrees. Mean Mayo Elbow Score was 82 (70-100). Two of our patient had moderate instability the others had stable elbow.

Conclusion: With exact repair of the coronoid and ligament(s) of the elbow, radial head excision is not unforgiving procedure in the treatment of terrible triad.

A-0094 Use of Coleman technique of fat grafting in the treatment of lateral epicondylitis

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Introduction: Surgical treatment Tennis elbow or lateral epicondylitis is challenging especially in work related accident.

Many techniques have been described and there is no consensus in surgical treatment. Coleman initially described his technique of fat grafting for body contouring and facial rejuvenation. It is now well established that fat grafting not only improve volume but also the quality of the skin due to the stem cells transfer.

Objectives: The purpose of the study was to report our preliminary results of the autologous fat grafting at the epicondyle level as a treatment for lateral epicondylitis.

Patients and methods: Between 2008 and 2009 we operated on eight patients who did not respond to conservative treatment for lateral epicondylitis. All the patients were operated under general anaesthesia using the original technique described by Coleman. Graft was harvested at the abdomen. Fat graft was injected subcutaneously at the lateral epicondyle. Physical activity was restricted for two weeks with progressive resumption. Results were evaluated on patients satisfaction and pain improvement in daily living activities.

Results: All patients were reviewed at a mean follow up of nine months. No complication was observed. Six of eight patients noticed pain improvement. Two patients did not respond to treatment. One of them underwent surgical muscular desinsertion without any result.

Conclusions: Autologous fat grafting appeared to be effective in treatment of epicondylitis. Our first results are encouraging but it has to be evaluated with an higher number of patients. It may be indicated in first option before a real surgical procedure especially in work related accident.

A-0145 Javelin thrower's elbow

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Javelin thrower's elbow problems usually result from valgus type stress in cocking-phase or whiplash-effect in acceleration phase of throwing event. The mildest form of stress, medial epicondylitis, can usually be treated by rest, NSAID-medication and physiotherapy. In many cases, however, the wrong throwing tecnics can cause severe injuries affecting ulnar collateral ligaments (UCL), osteochondral

laesions in radiohumeral joint and fossa olecrani. In 1986-2010 altogether 19 world-class javelin throwers elbows (16 men and 3 women including 3 dechathlonists) were treated operatively in Kuopio University Hospital, Kuopio and Medical center ITE, Joensuu, Finland. The diagnosis was made by clinical and MRI examination. 10 patients underwent suturation and re-insertion of UCL, in four cases reconstruction using the palmaris longus tendon-graft was performed. Arthroscopy and extraction of osteochondral loose bodies and osteophyte-shawing was made in 5 elbows. In 10 patients the ulnar-nerve neurolysis was performed. After six months 17 throwers could return to the former state as world class athletes. Two patients had to quit there activities due to the pain and laxity in throwing. However they had no pain or discomfort in every day living. The elbow joint movement was usually restricted with average 10 degrees of extension- and 10 degrees of flexion-deficit causing no harm in throwing movement. Later on, however, secondary osteoarthritis of the elbow joint can be expected.

A-0243 Mosaicplasty to treat osteochondritis dissecans of the elbow: ten year follow-up in 4 athletes

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Introduction: Articular cartilage lesions and osteochondral defects remain a difficult problem for the patient and physician. The knee joint has been the focus of these cartilage restoration procedures. Osteochondral defects in the elbow joint are significantly less common, and their management remains poorly defined. Mosaicplasty and similar forms of osteochondral transfer harvest cylindrical transplants from the less weight-bearing areas of the femoral condyles to the osteochondral defects of the same knee joint, or other joints, such as elbow. This study reports four cases of young sportsmen with deep osteochondral defect of the capitulum humeri using the mosaicplasty.

Materials and methods: At the National Institute for Sports Medicine we followed the clinical outcome of 4 young athletes for ten years after a mosaicplasty autogenous osteochondral transplantation from a non or less weight bearing portion of the knee to the elbow. Four patient -a 13-year-old female gymnast with 4-year history of persistent pain in the right elbow joint, a 15-year-old female gymnast with 2-year history of pain in the left elbow joint, a 15-year-old male handball-player having an acute locking of the left elbow joint caused by a loose body and a 25-year-old female patient with several-years history of pain in the left elbow joint- were treated with this method. The radiographic and MRI evaluation showed in all four

cases the osteochondral defect of the capitulum humeri. 6.5 mm and 8.5 mm cylindrical osteochondral grafts were performed on these four patients.

Results: All of the four patients had successful recovery. The clinical scores and the Figgie score which was based on evaluations that were done over a 4 year interval, and over a 10 year interval again, demonstrated good to excellent results in all four cases. None of the patients had septic or other complications, no long term donor site morbidity occurred. One patient, who was followed arthroscopically demonstrated good gliding surfaces of the transplanted hyaline cartilage. All four patients were followed up by radiography and MRI, which showed good incorporation of the transplanted cylinders.

Summary: Autogenous osteochondral mosaicplasty is a promising treatment for focal chondral and osteochondral articular defects that are between 1 and 4 cm² in size. The success of the procedure depends largely on the adherence to proper indications and attention to technical details. These cases suggest that osteochondral grafting is a useful procedure for difficult cases of osteochondral lesions in the elbow joint.

A-0462 Long-term results of the Outerbridge-Kashiwagi procedure in the treatment of the painful stiff elbow

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Purpose: Stiffness of the elbow can compromise the function of the entire upper extremity. Release of the contracted elbow is required to restore adequate range of motion and relief of pain. Many approaches and procedures have been used to release elbow contractures. The purpose of this retrospective study is to present the long-term results of the Outerbridge-Kashiwagi procedure in patients with an early arthritic or post-traumatic stiff elbow.

Methods: Twenty six patients with contraction of the elbow underwent the Outerbridge-Kashiwagi procedure for release of elbow stiffness. Age ranged from 18 to 72 years with an average of 42 years All patients had an extension deficit greater than 30 degrees and/or flexion less than 120 degrees. Etiology for the contracture included early degenerative arthritis, fractures of the distal humerus, fractures of the radial head or the olecranon, dislocation of the elbow and synovial chondromatosis. All patients had moderate to severe pain at the terminal flexion or extension (from 4 to 8 in a scale of 10). The procedure was performed in the lateral or supine position and the elbow was approach through a posterior incision.

Osteophytes of the olecranon or the olecranic fossa were resected. A foraminectomy in the olecranic fossa was performed and through this opening an anterior capsule release and resection of anterior osteophytes was performed. The elbow was mobilized the day after the operation and the patient followed physiotherapy for one month.

Results: Follow up ranged from 8 to 18 years with an average of 12 years. Preoperatively the mean arc of motion was from 40 to 95 degrees. At the final follow up it was increased 45 degrees and ranged from 20 to 120 degrees. Pain improved significantly and ranged from 2 to 4 in a visual analogue scale of 10. In the patients with early degenerative arthritis smaller osteophytes formed again but did not affect motion significantly. Twenty two patients stated that they were satisfied with the outcome. Four patients stated that they had anticipated a better outcome. Complications included algodystrophy in two patients, superficial infection in one patient and transient ulnar nerve palsy in one patient. No fracture of the lateral or distal humeral column occurred.

Conclusion: We concluded that with careful patient selection, meticulous surgical technique and an appropriate physical therapy regimen this procedure can prove very efficient in the treatment of the stiff and painful elbow. Reliable and long-lasting results with pain relief and functional arc of motion can be obtained.

A-0467 Distal humeral fractures treated with locked plates How good are the outcomes?

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Purpose: The use of locked plates is a relative new technique for the treatment of articular fractures of the distal humerus. The purpose of our study was to assess the clinical and radiological outcomes of this technique in our centre.

Methods: A retrospective analysis of distal humeral C fractures of the AO Classification between February 2009 and June 2010 was done. The inclusion criteria were a posterior approach, osteotomy of the olecranon and the use of an LCP distal humeral plate (Synthes®). Exclusion criteria were previous fractures, or the presence of a concomitant fracture in the same extremity. A total of 13 patients were included in the analysis. The average age of the patients was 48 years; 61.5% were male, with 38.5% of the fractures on the dominant side. 38.5% of the cases were open fractures. The average follow-up was 12 months. The following items were measured: range of motion in flexo-extension (FE) and pronosupination (PS); grip strength, Mayo Elbow Performance Score (MEPS) and radiological scale of Broberg and Morrey. Complications were recorded.

Results: Two cases presented a loss in reduction. Regarding the range of motion, the average FE obtained was 100° with no loss of PS. The average grip strength was 90% compared to the contralateral side. The MEPS obtained was $83,1 \pm 22,9$ points, and the radiological result according to the Broberg and Morrey score were six cases with G₅ 0, six cases G₅ 1, and one case G₅ 2. Eight complications were recorded, five patients had a cubital neuropathy, and three of the cases presented a delayed union.

Conclusions: The introduction of locked plates has allowed for a more stable construct of articular fractures of the distal humerus. The analysis of our cases has shown that in complex fractures treated with locked plates, there is a good consolidation rate, with an acceptable percentage of complications. A longer follow up is needed to validate these results.

A-0472 Late ulnar nerve palsy after a lateral column procedure for stiff elbow

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Purpose: The lateral column procedure is safe and effective for the treatment of a limitation in flexion or extension of the elbow and has currently become a standard mean to gain access for contracture release. The purpose of this study was to present the unusual complication of late ulnar nerve palsy following elbow release through a lateral approach.

Methods: Forty-seven elbows (forty-seven patients) with an elbow contracture were treated operatively with a lateral approach to the anterior and posterior aspects of the elbow. Postoperatively, nine patients (19.1%) developed tardy ulnar nerve palsy and were included in the study. The initial operation was undertaken for release of post-traumatic elbow contracture in 6 patients, for degenerative arthritis in 1 patient, and for elbow stiffness in 2 patients with neuromuscular disease. Prior to the index operation, there was no evident cause of ulnar nerve palsy. The mean interval between the original operation and the onset of ulnar nerve symptoms was 11 months (range, 6-19 months). Seven patients were classified as McGowan's grade I, and 2 as grade II. All these patients underwent a decompression of the nerve at the elbow region, with subcutaneous transposition in 6, and submuscular transposition in 3.

Results: The main cause of the palsy was compression by a fibrous band running between the two heads of flexor carpi

ulnar in 3 patients, a fibrous mass within the cubital tunnel in the inner surface of the posterior band of the medial collateral ligament of the elbow in 4 patients, and also adhesions between the floor of the cubital tunnel and the Osborne ligament in 2 patients. In all patients surgical treatment was followed by prompt recovery from the ulnar neuropathy and clinical symptoms. At an average of 14 months follow up there is no evidence of recurrence.

Conclusion: It is concluded that lateral column approach might be recognized as a cause of late presenting cubital tunnel syndrome. Consequently, the index of suspicion for late ulnar nerve palsy should be raised in patients who have previously undergone a lateral column procedure. Also, we believe that the patients should be informed about the likelihood of this complication.

A-0534 Ideal Graft Position of the Lateral Ulnar Collateral Ligament Reconstruction

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Purpose: Reconstruction of the LUCL using with the tendon graft has been accepted as the gold standard treatment for the posterolateral instability of the elbow. However, there is no consensus about tunnels position of LUCL reconstruction that is one of the most important factors for the ligament reconstruction. Recently, although there are some reports dealing with isometry of the LUCL, these reports have some limitations owing to indirect methods. The purpose of the this study was to evaluate the isometry according to the different tunnel position using real isometric measurement compare with 3- dimensional computed tomography (CT) and determine the most ideal position of graft in reconstruction of lateral ulnar collateral ligament.

Materials and Methods: Using the nine normal cadaveric elbows, the humeral tunnels were marked at 2 different locations: (1) most prominent point of lateral epicondyle by palpation, (2) anterior inferior side with 45 degree

direction (4:30 o'clock) and 10mm distance from lateral epicondyle. Ulnar tunnel position was marked at 3 different locations with linearly along the supinator crest of the ulna: (1) proximal margin of radial head (proximal point) (2) radial head and neck junction (middle point) (3) 10mm distal from the radial head and neck junction (distal point). After the ethibond suture with a tension isometer was placed each potential pair of insertion sites(six possible paths), the amount of excursion during elbow flexion (at 0°, 30°, 60°, 90° and 120°) were measured. To compare with data from 3 dimensional computed tomography(3D-CT), all specimens were scanned by computed tomography at 0°, 30°, 60°, 90°, and 120° flexion with fixation to the frame, and the distance change between the humeral and ulnar tunnels were calculated using the medical imaging software (OsifiX version 3.2).

Results: The isometry measured by two methods showed relatively similar patterns, although there are some differences. It was the same findings that there were significant differences between humeral tunnels - anterior inferior tunnel of the humerus was more isometric than lateral epicondyle tunnel and not differences among the ulnar tunnels. By the tension isometer measurements, the most isometric graft position for the LUCL reconstruction was between anterior inferior site of the humerus and distal site of the ulna over the annular ligament and joint capsule. By the 3D CT measurement, the most isometric path was between anterior inferior site of the humerus and proximal site of the ulna. The reason for difference between two methods is that the native LUCL is has 3 dimensional pathway.

Conclusion: Lateral ulnar collateral ligament is three dimensional structures that travel in curved line from humeral origin to ulnar insertion. We could localize the most isometric graft position practically. In reconstruction of LUCL, it is to be desirable that humeral tunnel orifice is placed closer to center of capitulum, ulnar tunnel orifice is placed to distal point of radial neck junction along the supinator crest of the ulna and graft tendon should be placed over the annular ligament and joint capsule.



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