A-0004 10-year follow-up of pyrocarbon implants for proximal interphalangeal joint replacement

L Reissner, S Schindele, S Hensler, M Marks, D Herren
Hand Surgery, Schulthess Clinic, Zurich, Switzerland

Purpose: Short and mid-term results of anatomical resurfacing using a pyrocarbon prosthesis (Ascension Orthopedics) showed reasonable clinical results with a high migration rate radiographically due to problematic implant fixation. The aim of the study was to investigate the subjective, clinical and radiographic long-term results after 10 years, and to compare them with the two year follow-up.

Methods: In a prospective, consecutive case series, 17 PIP-Pyrocarbon implants in 14 patients were assessed subjectively by a VAS pain scale, clinically and radiographically preoperative, at a mean follow up of 20.1 months (± 5.4) and 9.7 years (± 0.5). The indication for the joint replacement arthroplasty was degenerative osteoarthritis in 15 cases, chondrocalcinosis in one patient and post-traumatic in another patient.

Results: One patient died before the 10 year follow-up. One patient needed a revision surgery, due to implant failure. All other implants remain in situ. After a mean follow-up of 9.7 years no further migration of the implants were observed in comparison with the average 20.1 month follow-up. Radiolucent lines remained identical with an average of 2.1 mm (± 0.9). The average total range of motion of all replaced joints was 35° preoperatively, 38° at the two year follow-up and decreased significantly to 27° at the final follow-up (p ≤ 0.01). The average grip strength was 21 kg preoperatively, which increased to 26 kg at the two year follow-up and decreased again significantly at the final follow-up to 17 kg (p = 0.001). Significant pain relief was noted in all patients from 7.6 preoperatively to 1.4 at two years of follow-up and 0.8 at final follow-up (p ≤ 0.001).

Conclusions: To our knowledge this case series is the longest consecutive follow-up of PIP-Pyrocarbon implants. Compared to the results at the two year follow-up, the observed implant migration remained stable over time although no signs of secondary osteo-integration were observed. The range of motion decreased with longer follow-up and was, with less than 30°, disappointing for most patients. However, overall patients’ satisfaction remained high due to permanent pain-relief. Nevertheless, we no longer perform this kind of arthroplasty due to only moderate clinical results and potential complications with implant migration.

A-0006 Results of the metacarpal extension osteotomy and trapezial wedge osteotomy for early stage trapeziometacarpal arthropathy with and without trapeziometacarpal instability

CK Goorens, JF Goubau, P Van Hoonacker, D Kerckhove, B Berghs, T Scheerlinck
AZ St-Jan Brugge, Belgium University Hospital, Vrije Universiteit Brussels, Brussels, Belgium

Introduction: Trapeziometacarpal arthropathy can evolve to a disabling condition, long before radiological changes of advanced stage osteoarthritis appear. Possible accompanying trapeziometacarpal instability is due to a dysplasia of the trapezium with its increased articular slope or Devers’ angle, which is the angle measured between the axis of the second metacarpal and the slope of the trapezium (normal 129° with range 6°). Patients are usually young, mostly female and have high demands. When conservative treatment fails, surgical options are to be considered. Several techniques have been described, but to avoid or postpone more radical interventions such as arthroplasty or trapeziectomy, an alternative is the Wilson extension/abduction wedge osteotomy at the base of the first metacarpal to correct the thumb adduction and hyperextension of CMC I and to recenter contact pressure forces away from the diseased contact zone. More extensive osteotomy is mandatory to enhance joint stability in trapeziometacarpal instability. The addition-substraction osteotomy, combines an abduction osteotomy of the first metacarpal with an opening wedge osteotomy of the
trapezium to reorientate the trapezial saddle to stabilize the joint. Morbidity of an extra donor site is avoided by placing the substracted wedge of the metacarpal into the osteotomy of the trapezium.

**Purpose:** We present the results of a prospectively evaluated single-center consecutive cohort of 13 cases.

**Methods:** Clinical outcome assessment was performed for strength and ROM, functional with QuickDASH, and radiological for evaluating bony union and anatomical correction.

**Results:** Patients were female with mean age 41.7 (27–59) years. Diagnostic arthroscopy confirmed generally little cartilage disease on the articular joint surface, but also well-defined zones of deep cartilage damage anteroradially located on the trapezium and posteroulnary on the first metacarpal, clearly in direct contact with each other. Five patients were operated with the extension osteotomy for trapezio-metacarpal arthropathy without instability, and eight with the combined addition/subtraction osteotomy for trapezio-metacarpal arthropathy with instability. The mean follow-up period was 37 (10–42) months post-operatively. 87.5% of all patients were highly satisfied. Joint mobility and strength of the operated thumb was restored to a degree comparable to the contralateral thumb. The QuickDASH score and pain Visual Analogue Scale improved statistically significantly (p < 0.05). Trapezial osteotomy resulted in a decrease of the Devers’ angle from mean preoperative 142,4° to mean post-operative 128,5°. Theoretical complications include swelling, pain, CRPS, nonunion and malunion. 

Contraindications are advanced stages of osteoarthritis and a fixed subluxation in contrast to dynamic instability, which leads to a poor outcome.

**Conclusions:** This study showed promising results that osteotomies are a valid treatment option for disabling early stage trapeziometacarpal arthropathy with or without metacarpal instability.

**A-0007 Does osteoporosis increase the risk of mechanical failure after locking plate fixation of distal radius fractures?**

D Rikli, N Steinfelder, B Hanson, D De Faoite

1) Department of Traumatology, University Hospital Basel, Basel Switzerland

2) AO Clinical Investigation and Documentation, AO Foundation, Duebendorf, Switzerland

**Background/Aim:** There is evidence that osteoporotic bone is a predictor for the risk of treatment complications in elderly patients; this has yet to be substantially evaluated in clinical studies. Our prospective, multi-centre observational study set out to evaluate the influence of local bone mineral density (BMD) on the rate of mechanical failure after locking plate fixation of distal radius fractures in the elderly.

**Methods:** Two-hundred and forty-nine patients (age range: 54–88 years) with a closed distal radius fracture were treated with a volar locking plate in six different hospitals. Clinical and radiological examinations were scheduled at six weeks, 12 weeks, and one year. All complications were reported and functional outcome of the upper limb and wrist was evaluated using the Disabilities of the Arm, Shoulder, and Hand (DASH) and Patient Rated Wrist Evaluation (PRWE) questionnaires, respectively. Dual-energy x-ray absorptiometry (DXA) measurements from the contralateral distal radius were taken at six weeks to assess local cancellous BMD status. For the comparative analysis of BMD and patient outcomes, all patients were categorized as either a “mechanical failure” or “control” based on whether they experienced a defined complication (e.g. loss of reduction, delayed healing, secondary screw loosening) or not during the 1-year period, respectively.

**Results:** The study collective comprised 230 women and 19 men with low BMD (mean = 0.624 g/cm²). Of 249, nine patients suffered from a mechanical failure with an estimated risk of 3.6%. The mean BMD for mechanical failure patients (0.561 g/cm²) was similar to that for the control group (0.626 g/cm²). Functional outcome improved throughout the one-year period, but DASH and PRWE scores did not return to pre-injury levels indicating some remaining disability for the study population. At one year, mechanical failure patients had significantly worse DASH and PRWE scores compared to the control group (p < 0.001).

**Conclusions:** The estimated risk for elderly patients with a volar locking plate-treated distal radius fracture to experience a mechanical failure complication is low, and in line with already published data. No association could be shown between BMD and mechanical failure risk. This outcome is somewhat expected in older patients with lower BMD compared to the general population, and supports the theory that factors other than BMD play a greater role in the occurrence of mechanical failure complications associated with distal radius fractures in the elderly.

**A-0009 Randomized clinical trial of row proximal carpectomy and four corner fusion**

MA Aita, GM Ruggiero, WY Fukushima, EN Fujiki

Faculdade de Medicina do ABC
Purpose: To compare the clinical and functional results of patients with SNAC (Scaphoid Non Union Advanced Collapse), stage II, who underwent the row proximal carpectomy (RPC) or four corner fusion (FCF).

Methods: 27 patients were enrolled, 13 underwent the proximal row carpectomy, with a mean age of 32.38 and 14 patients with four corner fusion, with a mean age of 40.43 years. The mean follow-up was 26.26 months. We evaluated the ranges of motion, pain, wrist grip strength, DASH (disability shoulder hand arm) and return to work.

Results: In group carpectomy, the patients showed 65.5% range of motion of the unaffected side and the other group, 55.01%. In the subjective evaluation of pain (VAS) in group of FCF obtained 3.46 and 3.71 in the other group. The grip strength was 51.77% of the uninvolved side, the group’s of the four corner fusion, and 72.10% in the PRC group. The DASH group of carpectomy was 11 and 13 in another group. As for work 84.61% (11/13) of patients in group carpectomy and 64.3% (9/14) in another group, returned to some work activity. Complications of 7.1% (1/14) in the FCF group and 7.69% (1/13) on the PRC group.

Conclusion: Both surgical methods applied in this trial showed statistically significant clinical and functional improvement and increased quality of life of patients. When undergoing proximal row carpectomy, patients experience an improvement in the degree of wrist grip strength statistically higher than those who underwent four corner fusion.

A-0013 Collagenase, experience in six Madrilenian Hospitals

A García Olea1, A Dudley Porras2, M Ocampos Hernández2, MªD Gimeno Andrade4, M Del Cerro Gutiérrez2, MªJ Pérez Ubeda1, H Fahandezh-Saddi Díaz2, F Corella Montoya3, C Ortega Sánchez1,

1 Hospital Universitario Puerta De Hierro Majadahonda
2 Hospital Universitario De La Princesa
3 Hospital Infanta Leonor
4 Fundacion Hospital Alcorcon
5 Hospital Beata Maria Ana, Madrid, Spain

Purpose: Review of results obtained in six different hospitals from Madrid when treating Dupuytren’s Disease (DD) with collagenase

Methods: 151 Patients–161 fingers have been treated with collagenase in six different Hospitals in Madrid from June 2011 to 20 November, 2012.

A common protocol for review was made. Some of the items registered were: name, side, profession and labor activity intensity, personal medical history-predisposing factors like smoking and alcohol, diabetes ..., DD duration, DD previous surgery, associated hand pathology like carpal tunnel or trigger finger ..., another diathesis factors like age <45, affected family, bilateral DD, another body locations of fibromatosis ..., and finally; finger and joint affected, degree of contracture and joint elongation obtained. Side effects were also registered.

Results: 151 patients were treated with collagenase. Fingers treated were 161, so 10 patients were treated on more than one finger/joint. Minimum follow up was six months. Medium age at moment of treatment was 64 years. The sum of Diathesis factors was 1.5 per patient. Finger most frequently affected was ring. Finger most seriously affected was little. MCP joint was affected in 120 cases andPIP was affected at the same time as MCP in 48 cases while affected alone in 26 cases. Joint elongation was much greater or complete in majority of MCP cases and kept maintained overtime. Treatment of MCP in cases of both joints, MCP and PIP, affected usually obtained complete MCP elongation and PIP partial or complete elongation depending on degree of contracture of the second. Patients who had PIP joint affected obtained worse results and tend loose elongation. Collagenase side effects like edema and hematoma was always present in different degrees. Local puncture pain was very variable and disappeared after a very variable time. Another side effect: skin rupture occurred in very few cases. Complete healing was evident with no sequelae after three weeks.

Conclusions: Collagenase is a good method for treatment of DD. Patients feel very comfortable as side effects are few and mild, results of joint elongation maintain over time in majority of cases and patient can avoid the operating theater. This prospective study is to be prolonged in time, so the treatment can be evaluated properly and evolution can be correlated with all the factors registered like diathesis factors, age, contracture severity, joint affected, number of joints or fingers to treat, etc.

A-0015 More than 60 years of tendon repair

G Brunelli, –L Monini
Medical School, Brescia University, Brescia, Italy

Purpose: The 62 years’ lasting experience of the principal author is presented.

Methods: Starting with the Sterling Bunnel technique, with pull out, published in 1952 continuing with the personal technique that uses a slip-knot taking the proximal stump and passing the nylon thread inside the distal stump up to the pulp of the finger,
without pull out, allowing immediate mobilisation and avoiding scar adhesions.

**Results:** an almost complete flexion and extension has been obtained: this technique has several advantages as related to various other tendon sutures: it does not require a large opening of the skin, it allows immediate mobilisation (as published in Acta Orthopedica Belgica, 1958), it consents the atraumatic removal of all the suture material at the end of the treatment, i.e. at 25–30 days.

More than 300 flexor tendon lesions in zone 2 have been operated on with complete satisfactory results. Also, the Brunelli’s permanent active tendon prosthesis is presented to be used when the local conditions do not allow a gliding tendon suture. The prosthesis has been used in 15 cases.

**Conclusions:** the tendon suture technique of Brunelli allows very good results in almost all the cases and is recommended rather than other more difficult techniques, but early mobilisation and complete gliding of the tendon after surgery cannot be allowed.

**A-0016 Development of a novel four-dimensional preoperative simulation system for the elbow and forearm using an anatomical rotation axis**

M Yamamoto1, Y Murakam2, M Ota2, M Tatebe1, T Muraki2, H Hirata1
(1) Department of Hand Surgery, Nagoya University Graduate School of Medicine, Nagoya, Japan
(2) Toyota Caelum Incorporated, Nagoya, Japan

**Introduction:** A four-dimensional movie can be created by computer-aided design adding the joint axis of rotation to the three-dimensional CT images. Best fit method is mentioned to calculate the joint axis of rotation when we use the images at only one position. The "best fit" method is used to calculate the axis of elbow flexion-extension by converting the surface of the distal humerus into a pillar. The proximal rotation axis of the forearm can be identified using the "best fit" methods applied to the radial head and the base of the styloid ulnar process. The radius transposition plane was computed using the two axes. The center of rotation of angulation (CORA) was identified on this plane. Then, the radius was cut at the CORA and transported to the original axis keeping the distance of the proximal and the distal radioulnar joints.

**Results:** Elbow osteoarthritis Open or arthroscopic arthroplasty was performed according to the preoperative four-dimensional simulation. The surgeon could easily identify the bony impingement lesion and debridement arthroplasty was performed until the appropriate elbow ROM was achieved. Mean elbow flexion-extension arc was improved from 84 to 125° at final follow-up.Forearm fracture malunion The closing wedge osteotomy was done and fixed with a plate in accordance with the preoperative simulation. The osteotomy site was united three months after surgery. Forearm rotation was recovered in both supination and pronation. The maximum supination and pronation range at final follow up were 90 and 80°, respectively.

**Conclusion:** The combination of “best fit” and “optional” methods could determine the elbow and forearm axis of rotation. Adding this axis to the three-dimensional CT images enabled us to make a four-dimensional preoperative simulation. This method can reduce the amounts of radiation exposure and be useful for elbow and forearm bone and joint surgery.

**A-0021 Retrospective review of central slip injury management and the outcomes**

SS Jing, L Ygot, M Sood
Department of Plastic Surgery, Broomfield Hospital, Broomfield, Essex, UK

**Background:** Functional outcome of central slip injury has been poorly defined. We aim to review the surgical repair and rehabilitation of central slips injuries.
**Methods:** Retrospective three years' review of acute central slip injuries management was performed including analysis of complexity of injury, surgical repair, rehabilitation protocol and functional movements of affected digits.

**Results:** 94 patients with mean age of 38.8 years (103 digits, 46.7% dominant) underwent primary surgical repair of acute central slips injuries. 37 (35.9%) injuries were complex, associated with capsuloligamentous or bony injuries. There were five cases of peri-operative infection. Commonest surgical repair and rehabilitation received were Prolene mattress suture repair and extensor dynamic splint respectively. Mean follow-up period was nine weeks. Mean final proximal interphalangeal joint and distal interphalangeal joint flexion were 76.6° and 46.4° respectively. Mean extensor lag at the proximal interphalangeal joint was 11.3°. Functional outcome using Modified Strickland formula (1989) were 58% excellent, 35% good and 7% fair. There was no poor result. Adverse factors affecting outcome were complex injuries involving a crush or infective mechanism.

**Conclusion:** Central slip injuries are unique from other extensor tendon injuries. Complex injury is associated with poor functional outcomes. Standardised assessment and post-operative rehabilitation are warranted.

**A-0022 Investigation of the effects of calcium channel blockers with cigarette smoke exposure to nerve healing at peripheral nerve injuries**

MN Selimoğlu¹, FE Karabekmez², MR Toksöz², M Karamaşe³, Z Tosun⁴, N Savacı⁴

(1) Konya Education and Research Hospital, Konya, Turkey
(2) Bolu İzzet Baysal University Medical Faculty Department of Plastic Surgery, Bolu, Turkey
(3) Necmettin Erbakan University Meram Medical Faculty Department of Plastic Surgery, Konya, Turkey
(4) Selcuk University Selçuklu Medical Faculty Department of Plastic Surgery, Konya, Turkey

Peripheral nerve injury caused by trauma is a serious condition that leads to physical as well as psychosocial and economic problems. The healing time is quite long and leads to a serious loss of function. Even today, there is no therapeutic form that can provide an excellent sensory and functional return. The importance of the timing of repair in peripheral nerve surgery is accepted by everyone. However, many experimental pharmacological agents are used to reduce cell death and accelerate the healing of the nerve. Yet, no agent is available for clinical use. In the light of this information, a study was planned to investigate the effect of exposure to cigarette smoke and the effects of calcium channel blockers in experimentally induced sciatic nerve injuries, and to evaluate these effects stereologically to obtain quantitative data. A total of 28 female Wistar rats were used in this study. The sciatic nerve was cut on one side in all the groups, and repair was performed in hour 0. After repair, a single daily dose of 1 ml of 0.9% saline was administered to group 1, 90 days, 30 minutes, cigarette smoke to group 2, 1mg/kg calcium channel blocker to group 3, 90 days, 30 minutes, cigarette smoke and 1mg/kg Calcium channel blocker was given to group 4. At the end of the 12th week, gait analysis at and sciatic function index (SFI), the number of myelinated axons, axon areas and myelin diameters were assessed. There was a significant difference between the measured values of SFI in group 1 and group 3 and 4, and there was a significant difference between group 2 and group 3 and 4 (p < 0.05). In addition there was a significant difference between the number of axons in group 2 and group 3 (p < 0.05). As a result, after peripheral nerve laceration repair, calcium channel blockers have a positive effect on the sciatic function index while cigarette smoke has a negative effect. In addition, according to the sciatic function index the negative effect of cigarette smoke can be resolved with calcium channel blockers. But, these data are not supported by the number of axon, axon area, and the myelin diameter. In terms of the number of axons, the significant difference between group 3 that was given calcium channel blocker and group 2 that was given cigarette smoke shows that calcium channel blockers have a positive effect on nerve healing.

**A-0023 Arthroscopic interposition associated to arthroscopic dorsal capsuloligamentous repair and wide styloidectomy in SLAC 2**

C Mathoulin
Institut de la Main, Clinique Jouvenet, Paris, France

**Introduction:** In late chronic scapholunate ligament dissociation, when the arthritis appeared (Slac 2-Slac 3) the treatment often involves heavy palliative techniques such as resection of the first row or four bones fusion. We propose a simpler technique of arthroscopic interposition of a polylactide implant (PLA) or palmaris longus tendon, combined with a wide styloidectomy of scaphoid fossea of distal radius and a dorsal capsuloligamentous repair to stabilize the scapholunate dissociation.
Materials and Methods: All patients were operated on in one-day surgery under local regional anesthesia. Resection of the scaphoid fossa of the radius was performed arthroscopically. PLA implant or palmaris longus tendon were then placed between the radius and the first row, set at the radial styloid and TFCC. After reduction of scapholunate space, if necessary, a dorsal capsuloligamentous repair was performed by arthroscopy. We operated 12 patients, nine men and three women, whose average age was 57 years (between 41 and 74). The initial trauma was unknown in nine cases. They had arthritic lesions limited to the radiocarpal (SLAC 2) in 10 cases and (SLAC 3) in two cases. In all cases x-rays showed a DISI deformity.

Results: Our mean follow-up is 28 months (range 14 to 46 months). The pain disappeared in most cases, simply remaining moderate in two cases. Mobility, muscle strength and DASH were improved in 11 cases. Eight patients developed temporary inflammatory reactions. The preoperative DISI was improved in all cases, with persistence of a gap SL in two cases. We have only one failure in patient Slac 3.

Discussion: Arthroscopic interposition associated with a wide styloidectomy and a dorsal capsular liga-ment repair to stabilize the scapholunate dissociation have given us encouraging results in patients with SLAC 2-3. The technique is really convenient for the patient and doesn’t burn the bridges for other operations. A longer follow-up will be necessary to check if it is a simple process of waiting, or if it can be considered as a new treatment option.

A-0030 The first 20 wrist arthroscopies, an Iranian experience
S Nazerani, T Nazerani, A Ebrahimpoor
Firuzgar Medical Center Tehran University of Medical Sciences, Tehran, Iran

After two learning sessions in The Netherlands and France I began to do Wrist Arthroscopies. The problems I had to solve and the hurdles I had to overcome alone will be discussed as well a background to my training in Rotterdam and France. The first ten cases were the most difficult and the anatomy was also confusing, but by gaining experience I did the next ten cases with confidence and achieved results.

A-0051 Isolated thumb interphalangeal joint stiffness
R Habenicht, M Mann, W Huelsemann
Catholic Children’s Hospital Wilhelmstift, Hamburg, Germany

Introduction: With an increasing knowledge of the development of the hand plate we get a better understanding of the possible changes in the dorsoventral development of the hand which we can observe in our patients.

Clinical material: Up to now we observed dorsoventral differentiation disturbances in 12 hands of nine patients: five male, four female. Bilateral involvement in three patients. Seven patients showed combined malformations.


Discussion: Dorsoventral differentiation disturbance due to disrupted Wnt7a and Shh regulation as well as ectopic Shh expression can also cause dorsoventral deformity at the ulnar and at the radial border of the hand and even in central rays.

A-0050 Dorsoventral differentiation disturbance
R Habenicht, M Mann, K Oberg
(1) Children’s Hospital Wilhelmstift, Hamburg, Germany
(2) Loma Linda University, California, USA

Introduction: Up to now there are no reports about an isolated stiffness of the interphalangeal joint of the thumb. We have seen 12 patients with this diagnosis. The thumbs have no extension and flexion creases at the level of the interphalangeal joint, no real active motion and little or no passive mobility. Some show a slight ulnar deviation. All thumbs show an increased active metacarpophalangeal joint flexion.

Clinical material: We have seen 19 thumbs in 12 patients: 11 male and one female. Bilateral involvement: seven, unilateral five. Age of first examination: between new-born and nine years old.

Clinical findings: Normal thenar in 14 thumbs, mildly hypoplastic thenar in five thumbs. Normal carpometacarpal joint mobility in 15, mildly reduced in four thumbs. All thumbs had an increased active metacarpophalangeal joint flexion. The active and passive interphalangeal joint mobility was reduced or impossible in all thumbs. None of the thumbs showed an interphalangeal hyperextension.

Radiological findings: In 11 thumbs we found initial radiological changes such as a broader distal phalanx, a rudimentary triphalangism, an elongated epiphysis and a wing-shaped epiphysis. In three cases which initially did not show radiological changes, deformities of the head of the proximal phalanx and the base of the distal phalanx appeared in the age of twelve years.
Discussion: The interphalangeal joint stiffness of the thumb is a rare condition that can be seen in children without other malformations. The etiology is still unknown. Radiologically the changes can be seen in adolescence.

A-0052 Interposition arthroplasty with a new bioreplaceable implant for small joints RegJoint – five year experience in hand surgery

B Mai, –S Mai
Vitos Orthopädische Klinik Kassel, Kassel, Germany

Introduction: Rheumatoid arthritis (RA) and osteoarthritis (OA) as well as other diseases can cause destruction of the carpometacarpal I (CMCI) and finger joints. The treatment of severely destructed joints is surgical replacement with joint prosthesis manufactured from flexible silicone or other materials or arthrodesis. Silicon prostheses (Swanson’s prostheses) have been used worldwide since 1964. However, the material used in silicon prostheses may not be strong enough in the long term and several reports of breakdown of the prostheses have been published. The long-term results have also shown that bony resorption around the implant may occur. The known weaknesses of the current endoprosthesis used in the surgical treatment of destructed joints have lead researchers to look for new materials.

Material: Novel scaffolds (RegJoint) were developed by researchers from Tampere University Hospital in Finland using a well-known poly-L/D-lactide copolymer with L/D-monomer ratio 96/4 (PLDLA). The PLDLA scaffolds are fibrous, porous cylinders enabling the in-growth of fibrous tissue, which then forms a functional joint for the patient. The scaffold will bioabsorb and be replaced with fibrous tissue in approximately 2–3 years.

Method: This study is part of a prospective randomised international multi-center study that was supported by the European Commission and surveyed by an Ethical Committee. The new bioreplaceable devices were implanted in hands (CMC, MCP, PIP and DIP) and compared to the standard treatments (Swanson Prosthesis, Arthrodeses). For the assessment of the results the DASH score and VAS evalation, for statistics SPSS were used.

Results: Since 2004 we included 122 patients who were operated on 155 joints in hands. 101 RegJoints were implanted. The DIP joint remained with a slight lack of extension and satisfying flexion but slight instability of the ligaments. The PIP and MCP joints have a similar outcome as the Swanson prosthesis. The CMCI joints gained significantly more force with a scaffold interposition. The majority of all patients are pain free. Complications occurred only in DIP and PIP joints: four infections, four times stiffness and one fatality.

Summary: The surgical treatment of small joins destructed by osteoarthritis or rheumatoid arthritis with implants, arthroplasties or arthrodesis is not always satisfying. The new bioreplaceable scaffold RegJoint made of PLDLA seems to be another good option especially for CMC I and stable MCP joints. Only long term assessment though will show if we have achieved the expected lasting benefit for the patient.

Literature:

A-0055 In-vivo confirmation of the functional significance of the dart thrower’s motion of the human wrist

G Brigstocke¹, A Hearnden¹, C Holt², G Whatling²
(¹) Department of Trauma and Orthopaedics, The Royal Surrey County Hospital NHS Foundation Trust, Guildford, UK (²) Cardiff School of Engineering, Cardiff University, Cardiff, Wales, UK

Purpose: The dart thrower’s motion (DTM) is a wrist rotation along an oblique plane from radial extension to ulnar flexion. The intricate anatomy of the individual carpal bones, the arrangement of intraosseous ligaments and muscle insertions facilitate a smooth transition of the distal carpal row from radial extension to ulnar flexion along the DTM with minimal muscle force and a unique degree of radiocarpal stability. The aim
of this study was to record and analyse the DTM of the human wrist in a truly dynamic fashion to confirm in vivo the utilisation of the DTM plane during activities of daily living (ADL).

Methods: Global wrist motion of ten right hand dominant male volunteers was recorded using a 3D opto-electronic motion capture system, in which digital infra-red cameras track the movement of retro-reflective marker clusters. Following the attachment of the markers each volunteer performed a simulated dart throw to define the plane of the DTM and nine ADL tasks. Standardized descriptions of the joint coordinate systems were used to conform to the recommendations of the International Society of Biomechanics. Six degrees of freedom analysis was used to describe the relative movement of the adjacent rigid bodies constructed from the marker clusters attached to the volunteer’s hand and forearm. Correlation analysis of the recorded roll and pitch of the hand relative to the forearm was performed and the angular orientation of the plane of global wrist motion relative to the sagittal anatomical axis of the forearm was calculated. A Levene’s test of homogeneity of variance and a one-way analysis of variance with a post-hoc Bonferroni test were used to identify any significant difference ($p < 0.05$) between the defined DTM plane and the plane of global wrist motion during the ADL tasks.

Results: Analysis of global wrist motion during each of the ADL tasks revealed that wrist motion approximated to the DTM when hammering a nail, throwing a ball, drinking from a glass, pouring from a jug and twisting off and on the lid of a jar. No consistent plane of wrist motion was evident when combing hair or when manipulating buttons; these tasks were therefore discounted from further analysis. The plane of global wrist motion used by the volunteers and the defined DTM plane did not statistically differ when hammering a nail ($p = 1.00$), throwing a ball ($p = 0.436$), drinking from a glass ($p = 1.00$), pouring from a jug ($p = 1.00$) and twisting off and on the lid of a jar ($p = 1.00$). Furthermore, the plane of global wrist motion during these five ADL tasks did not statistically differ from one task to the next.

Conclusions: This study has demonstrated that the oblique plane of the DTM is an important functional axis of the human wrist. It is well documented that the DTM is associated with minimal radioscapohumate motion and therefore this study predicts that arthrosis of the radiocarpal joint instead of the midcarpal joint for carpal instability refractory to soft tissue stabilisation procedures will allow better wrist function during most ADL tasks by preserving midcarpal motion.

A-0056 Early results of Capitate forage: a new treatment method of Kienboeck disease

Hİ Bekler, Y Erdag, G Pehlivanoğlu, SA Gümüştaş
Dr Lütfi Kirdar Kartal Research Hospital, Department of Orthopaedic Surgery, Istanbul, Turkey

Kienböck disease is a type of avascular necrosis, which destructs the biomechanic of the wrist with the changes it creates in lunate bone. Its treatment generally consists of osteotomies that intend to resolve the compression over the bone, pedicle bone grafting applications aiming to increase bone blood supply and salvage procedures.

Capitate forage was applied to six patients, average ages were 32 (26–40), and four of the patients were defined as stage 2, one of them as stage 3a and the other as stage 3b. The wrist was placed to a radiolucent table by keeping the lunate bone in the center. Capitate bone was detected. Edge of K-wire was forwarded through capitate bone. By a mini incision, 4–5 pieces of drillings (forage) were applied to central area of capitate bone not covered by cartilage.

Elastic bandage was applied following to dressing. Wrist radiographies were taken after the surgery and the forage was controlled. Control examinations of the patients were done on post-op 1st, and 6th months; MRI examinations of wrist were done in order to detect the vascularity of the lunate bone.

None of our patients had any decrease in their strength of grasping. It was also noted that the range of motion was preserved, while four of the patients had full range of motion, two patients had only 20% of loss detected. It was detected that all our patients were moderately satisfied. While doing forceful motions, pain occurred slightly (four patients) or moderately (one patient). One of our patients stated presence of pain in daily activities. Beside clinical recovery of our patients, it was noted in MRI examinations that the vascularity was also increased in the lunate bone.

Lunate bone is the keystone of the wrist biomechanique. With lunate excision; scaphoid flex not sup. Lunate bone is the keystone of the wrist biomechanique. With lunate excision; scaphoid flex not supported by lunate, and this flexion inevitably causes arthritis in the wrist.

Negative ulnar variance; lunate weakly covered by distal ulna, the contact surface decrease. Increased compressive forces may cause chondropathy, like acetabular dysplasia, but not avascular necrosis. Under compression, primarily cartilage surface should be affected. Arthritis must be observed.
Radial shortening and ulnar extension osteotomies are recommended and treatment results are agreed to be successful. We believe that the reason of the success is osteotomy. Osteotomies should be applied not on the front arm but on the capitate bone because it is easy to reach a part of its surface where there is no cartilage and it is closer to the lunate bone.

With the forage applied to capitate bone, an osteotomy effect is created in the bone but no deformation occurs in stability. Increase of vascularity occurred in capitate and lunate bone via forage is detected in MRI images. All positive effects created by the osteotomy are observed in the lunate bone proven most positively by MRI images. There is no negative effect; no loss of stability, no loss of strength, no immobilization, and no loss of motion.

A-0061 Is there extension deficit in transposing the EIP after spontaneous rupture of the EPL?

F Corbi Aguirre, –C Diago Guiral, –V Rico Ramirez, –J Roig Llopis, –M Oldrati
Fundación Hospital de Manacor, Manacor, Balearic Islands, Spain

Background: There have been many treatments for ruptured extensor pollicis longus (EPL) like primary repair, tendon graft and tendon transfer. Transposition of the extensor indicis proprius (EIP) is recommended because it has the same amplitude and direction as the EPL and maintains an independent function, associating minimal complications. What we want to demonstrate is that implementation of this tendon is safe and leaves no extension and strength deficits at the donor site.

Material and methods: From 1999 to 2010, nine patients (seven women and two men) with EPL rupture underwent surgery for transposition of the EIP as treatment. The mean age at the time of surgery was 65 years (19 to 84). The causes of rupture are: rheumatoid arthritis (1), Lupus erythematosus (1), traumatic (1), spontaneous (3), after fracture of distal radius (3). The mean time between repair and surgery was 2.5 months. The post-operative follow-up is 4.5 years (1-11). The affected side was six in the right and three on the left. The affected side coincided with the dominant three cases. The study has assessed:

–Range mobility index: Mobility as both extension to flexion of the metacarpophalangeal joint and the proximal interphalangeal both the healthy and the affected side.

Dependent and independent–Extension: Comparison of extension lag dependent and independent manner.

–Bending: Bending Grade presenting the index after surgery.

Force-extension: We measure the strength of the donor finger compared with the contralateral index finger

–Feature: QuickDASH through a valued functional satisfaction.

Results: We observed a deficit in the extension of the index finger MTCF in three of nine patients compared with the healthy side. There is a loss of flexion in MTCF and IFP in virtually all patients with a deficit range of 0° –30°. Found difference dependent and independent extension with an average difference in the mobility range of 17° (5° –35°). There is a gap to the extension force of 0.86 lbs (0.25 to 1.75). In the satisfaction personal index it is observed that three are very happy, one happy, and five unhappy.

Discussion: In all patients there is an extension strength deficit in the donor side compared with the healthy side. Regarding the range of motion, it is seen that there is a greater extent in the dependent compared with the independent, dependent being normal. We found no finger flexion gap donor, which is consistent with that described in the literature. Deficits in daily life are due to lack of power for small daily activities.

A-0067 Reinnervation of glabrous skin after end to end reconstruction in rat

Erasmus MC, Rotterdam, Netherlands

Introduction: The current golden standard for transected nerves is an end-to-end reconstruction. However, it is unknown how subgroups of nerve fibers regenerate in time after an end-to-end reconstruction. Previous studies in neuropathic pain models show changes in the composition of the subgroups of fibres towards more CGRP-positive fibres. In patients, occasionally neuropathic pain is seen following an end-to-end reconstruction. The symptoms of neuropathic pain are spontaneous burning or shooting pain, mechanical and thermal hyperalgesia.

Methods: In a sciatic nerve repair model in rats we quantified the density of peptidergic and non-peptidergic nerve fiber innervation in the glabrous skin of the rat hind paw. Furthermore, the innervation area by the healthy n. saphenous was visualized using the Evans Blue extravasation technique.
In addition we examined the effects of a sciatic nerve repair on thermal en mechanical hypersensitivity, which are main features of neuropathic pain.

**Results:** The cold and hot plate test indicated significantly lower paw-withdrawal latency 20 weeks after reconstruction compared to sham-operated rats. This thermal hypersensitivity was accompanied with a significant increase in peptidergic epidermal CGRP-IR fibers, which returned to control levels 30 weeks after end-to-end reconstruction. However, a significant decrease ($p < 0.0001$) was seen in the density of non-peptidergic epidermal P2X3-IR fibers at all time points after reconstruction. Remarkably, sprouting of the healthy n. saphenous was seen five weeks after end-to-end reconstruction showing a significant increase in innervation area of the glabrous skin, which returned to control values after 10 weeks.

**Conclusion:** A positive correlation was found between thermal hypersensitivity and numbers of peptidergic, CGRP-positive epidermal nerve fibers 20 weeks after end-to-end reconstruction, which returned to control values 30 weeks after reconstruction. These results show that there is no neuropathic pain after end-to-end reconstruction. Remarkably an increased innervation area of the denervated skin was seen by the healthy n. saphenous five weeks after end-to-end reconstruction, which returned to control values after the n. ischiadius was fully regenerated and reinnervated the skin 10 weeks after end-to-end reconstruction. From this we can conclude that the cutaneous reinnervation begins from the intact neighbouring fibers, which is later replaced upon regeneration of the original sciatic nerve.

**A-0069 Percutaneous, intramedullary fixation for metacarpal neck fractures using cannulated screws – a case series**

V Teoh, –A Fox, Andreas R Tejero, Ricardo – J Ahmed, Jamil M James
St Thomas' Hospital, London, United Kingdom

**Introduction:** We describe a novel technique for the percutaneous fixation of unstable metacarpal head or neck fractures. These fractures are challenging with little or no extra-articular bone available to achieve fixation. Current techniques include percutaneous and intramedullary K wire fixation, or open reduction and plate fixation.

**Methods:** We present 10 cases using cannulated headless compression screw to achieve fixation and allow immediate mobilisation. With the metacarpophalangeal joint (MPJ) flexed to 90°, the metacarpal head is exposed via a 10 mm incision and extensor tendon split performed. Following reduction, temporary fixation was achieved with a K-wire passed through the head into the medullary cavity. A headless, cannulated screw was then inserted, through the articular surface and buried within the subchondral bone. The MPJ haematoma was washed out and the extensor closed with PDS 4/0. Early active motion was commenced immediately. A protective thermoplastic splint can be applied when not mobilising the joint.

**Results:** At six weeks post-surgery, all patients regained functional, pain-free, active range of movement. The mean metacarpophalangeal joint flexion was 85°, with no patients exhibiting extensor lag. Full ‘roll-up’ was achieved in all patients. No complications were recorded.

**Conclusion:** This is the first reported case series of percutaneous cannulated screw fixation techniques for closed, metacarpal fractures. Our experience shows this to be a simple and potentially superior technique in the management of metacarpal head and neck fractures.

**A-0072 Triangular FibroCartilage Complex tears: clarification, study about 157 patients with more than two years follow up**

M Gras1, C Mathoulín2
[1] Institut Nollet, Paris, France
[2] Institut de la Main-Clinique Jouvenet, Paris, France

**Introduction:** Since Nakamura’s work in 2000 and Atzei’s in 2007, the knowledge about functional anatomy and physiopathology of the TFCC increased. There is one distal peripheral insertion and one foveal proximal insertion on the ulnar head. Therefore, Palmer’s classification is questionable. We reviewed 157 patients according to this new concept.

**Patients and method:** We report the results of a retrospective study on 157 patients [52 women – 105 men] with ulnar TFCC injury. 129 were athletes, 35 of them were high level (fencing, tennis, golf). Average age was 36 years [15 to 59]. The average delay between injury and arthroscopy was 21 weeks [1 to 60]. According to Ewas and Atzei new classification, we found 91 peripheral distal tears, 21 isolated foveal tears, 44 complete tears (foveal and distal) and one case non-repairable. All cases with foveal tears were associated with distal radio ulnar instability. The patients had reinsertion under arthroscopy by distal peripheral suture, foveal refixation with anchor, or both.

**Results:** The average follow up was 42 months [24 to 65]. Pain disappeared in 128 cases [81.5%] and the
mobility was the same as the opposite side in 128 cases (81.5%). The strength was the same as the opposite side in 132 cases (84%). At the longest follow up, the De Smet score was 70.25 (42 to 80) and the Mayo Wrist score 90.28 (65 to 100). All patients recovered their sport level.

Discussion: The TFCC is more complex than we thought. Wrist arthroscopy allowed us to analyze the proximal and distal insertions by systematic study of radiocarpal and distal radioulnar joint, and to describe the reality of the TFCC tears. Adapted treatment avoided the reinsertion failures and reached to treat distal radioulnar instability.

A-0087 Emergency index-pollicisation in severe thumb injuries
E Fritsche, –U Hug, –U von Wartburg
Hand- und plastische Chirurgie, Kantonsspital Luzern, Switzerland

The index-pollicisation is a good option of thumb reconstruction after severe thumb injuries, if the injured thumb can not be salvaged and the patient does not want to have a microsurgically performed toe transfer. This operative procedure is generally accepted, when at the same time the index finger is also damaged and only the non injured part of the index is transferred in the position of the thumb. But what options do we have, when the injured thumb is not replantable or otherwise salvable? Is it justified to perform the index pollicisation with an uninjured index finger as an emergency procedure? We want to present cases of classical emergency index pollicisations, but also our results of emergency index pollicisations with uninjured index fingers. The indications and contraindications are discussed and the aesthetic and functional results are presented.

A-0090 The administration of nerve growth factor (NGF) improves neuronal regeneration in tubes in an experimental model of rabbit sciatic nerve injury
O Móricz1, LG Nöt1, Z Pfund2, L Vámhidy1
(1) Department of Traumatology and Hand Surgery, Institute of Musculoskeletal Surgery, School of Medicine, University of Pécs, Pécs, Hungary
(2) Department of Neurology, School of Medicine, University of Pécs, Pécs, Hungary

Purpose: Neurotrophic factors play a key role in the regeneration process of damaged peripheral nerves. In response to nerve injury, expression of the nerve growth factor (NGF) in Schwann cells has been reported to be significantly increased, which mechanism facilitates the Schwann cell proliferation and helps to prepare the reception of the regenerating axon. Therefore, the aim of the study was to evaluate the rate of nerve regeneration in the presence or absence of NGF treatment, using either silicon tubes or autolog veins as a bridge for the neuron defect in an animal model of nerve injury.

Methods: White Canadian rabbits were used in the study. Animals were divided into four groups (n = 10 in each group). In the Control groups, under general anesthesia, a 10 mm long part of the sciatic nerve was resected and then, the ends were connected, leaving a 10 mm long gap, either in a silicon tube (n = 10) or in an autolog vein (n = 10), filled only with autolog plasma. In the NGF-treated groups (n = 10–10 animals), silicone tubes or autolog veins were filled with NGF (3 mg / mL), diluted in normal saline. Electrophysiological examinations were performed 2, 4, 6 and 8 weeks following surgery. Histological examinations were done on the post-operative 2nd, 4th and 6th week on 2–2 animals and on the post-operative 8th week on 4–4 animals in each group.

Results: The regeneration analyzes demonstrated that the NGF-treated nerves had already become more mature and organized by the post-operative 4th week. The rest of the fibers were still demyelinated, however, there were more myelinated fibers in the NGF-treated groups. On the 6th week, the regenerated parts were formed into small fascicules, showing a diffuse pattern of myelinated and demyelinated fibers. By the 8th week, the fascicules became strengthened with the signs of longitudinal vascularization. We have also found significantly higher number of myelinated fibers in the NGF containing tubes, compared to the Controls.

Conclusion: Here we demonstrated that the NGF-treated nerves had already become more mature and organized by the post-operative 4th week. The rest of the fibers were still demyelinated, however, there were more myelinated fibers in the NGF-treated groups. On the 6th week, the regenerated parts were formed into small fascicules, showing a diffuse pattern of myelinated and demyelinated fibers. By the 8th week, the fascicules became strengthened with the signs of longitudinal vascularization. We have also found significantly higher number of myelinated fibers in the NGF containing tubes, compared to the Controls.

A-0091 Evaluation of current treatment techniques for distal radius fractures amongst Belgian orthopaedic surgeons
D van Schaik1, P Wernaers1, T Scheerlinck2, J Goubau2, C Goorens2
(1) Regional Hospital, Tienen, Belgium
(2) University Hospital, Brussels, Belgium
Purpose: In the treatment of distal radius fracture, several different surgical options are still in use: closed reduction, K-wiring, external fixator and plating. Although there is a trend towards an increasing use of volar plating, current literature lacks conclusive evidence favoring one technique over the other. This study was created to verify whether Belgian orthopaedic surgeons follow the trend of volar plating as treatment of preference. Orthopedic surgeons were invited to fill in an online questionnaire.

Methods: In the online questionnaire we proposed two cases: an extra-articular fracture, with dorsal displacement (Frykman type I) and an intra-articular fracture, with dorsal displacement (Frykman type VII). Treatment of choice and follow up protocols were questioned.

Results: We received 158 responses. In case of a Frykman type I fracture, the majority of surgeons would have performed a MUA and K-wiring (37.3%) or a volar plating (34.8%). MUA and casting (19.6%), casting alone (5.1%) and external fixation (6%) were less favorable treatment options. Upper limb specialists (64.1%) preferred volar plating compared to other (sub-specialized) surgeons. In case of a Frykman type VII fracture, less diversity was measured. Volar plating was the treatment of choice (66.5%). MUA and K-wiring was second best (24.7%) and external fixation very rare (4.4%). Volar plating was common sense for the upper limb specialists (92.3%) and residents (92.3%). Surgeons indicated as primary justification for their treatment choice, that it provides the best functional outcome, respectively 45.5% and 64.6% in cases one and two. The post-operative protocols varied distinctly in the number of follow-up consultations and follow-up radiographs. Paracetamol was the most prescribed analgesic in both cases (97.4/97.5%) over other drugs (NSAID, tramadol). Only 7% of the surgeons prescribed vitamin C in both cases as a standard treatment.

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Conclusions: In the case of persistent ulnar wrist pain and/or instability it is mandatory, even in children and adolescents, to focus our attention on DRUJ injuries as we do with adult patients. Diagnostic procedures should be applied in a similar manner and surgical treatment should also be proposed in selected cases.

A-0095 TFCC lesions in children and adolescents

S Pfanner
SDOC Chirurgia e Microchirurgia della Mano Direttore: M. Ceruso CTO - AOU CAREGGI, FIRENZE

Purpose: Lesions of TFCC in children and adolescents are very infrequent if compared to other wrist post-traumatic pathologies. When these occur, they pose complex diagnostic and therapeutic challenges for the surgeon.

Methods and Results: We report on a small series of eight pediatric and adolescent patients (9 yrs–17yrs), three of the patients were males, five were females affected by tears of the triangular fibrocartilage complex and symptomatic ulnar styloid non-union, with or without an associated TFCC lesion. The study evaluates surgical technique, subjective – objective outcomes of patients treated using an open surgical approach. Preoperatively, ulnar side pain was the most significant factor, as well as joint instability. All cases were reviewed. At an average 37 month follow-up, results show reduction of pain in all cases and a complete recovery of AROM and stability.

Conclusions: In the case of persistent ulnar wrist pain and/or instability it is mandatory, even in children and adolescents, to focus our attention on DRUJ injuries as we do with adult patients. Diagnostic procedures should be applied in a similar manner and surgical treatment should also be proposed in selected cases.

A-0102 Trapeziometacarpal arthrodesis using locking plate fixation for elderly women: surgical technique and clinical results

Y Abe, T Ebata, S Tokunaga, Y Takahashi
Sakura Orthopaedic Hospital, Hand Surgery Center, 4-3-5, Osakidai, Sakura, Japan

Purpose: In recent years, trapeziectomy with or without ligament reconstruction and tendon interposition has increasingly become the procedure of choice for osteoarthritis of the trapeziometacarpal joint. In our experience, there has been major concern about resultant pain and proximal migration of the metacarpal by excision of the trapezium. Although arthrodesis provides durable pain relief and stability, it is commonly thought that arthrodesis should be reserved for the treatment of post-traumatic arthritis in high-demand, younger patients. Because of a disadvantage of the procedure, a 7% to 10% risk of non-union, arthrodesis is not recommended for elderly patients with greater risk for non-union. Orthopaedics has gained much through the use of rigid fixation constructs such as locking plates. Those devices allow earlier motion of an extremity and often improve results. In the present study, we describe the technique and clinical results for trapeziometacarpal joint arthrodesis using locking plate fixation for elderly women.
Methods: This is a case series of 18 patients with Eaton grade 3 osteoarthritis of the trapeziometacarpal joint. All the patients were female in their fifth decade or beyond with follow-up over 12 months. The average age at the surgery was 66 years (range; 55–84 years). Through the Wagner approach, 18 trapeziometacarpal joint arthrodeses were performed using L-shaped locking plate and 2.3mm locking screw fixation. In all cases, any post-operative immobilization was not applied. Autogenous bone graft was used in two cases. Patients were evaluated at a minimum of one year with radiographs, measurements grip strength, tip pinch strength, and the Kapandji opposition score. The DASH (disability of arm, shoulder and hand) questionnaire, Numeric Rating Scale for pain (NRS), were also evaluated pre- and post-operatively.

Results: There were no major complications including painful nonunion, or infection. Hardware malposition occurred in one arthrodesis but was asymptomatic. No patient demonstrated evidence of scaphotrapezium- trapezoid arthritis at the follow-up examination. Three patients had hypalgesias developed in the distribution of the superficial sensory branch of the radial nerve; those lasted within three months in all cases. Average grip strength was 18 kg, in 89% of on the contralateral side, average tip pinch strength was 6.6 kg, and average key pinch strength was 9.5 kg. At the final follow-up, mean Kapandji opposition score was 7.3 points. Mean post-operative DASH was improved 54 to 8.8, and the mean NRS was improved 8.3 to 0.6.

Conclusions: Our series demonstrates excellent clinical outcomes with pain relief and high patient satisfaction. This technique restored thumb function with a pain-free and stable joint. It can be an alternative procedure for the patients with Eaton grade 3 osteoarthritis of the trapeziometacarpal joint including elderly women.

A-0109 Contribution of arthroscopic synovectomy with intra-articular lavage in case of septic arthritis of the wrist: A nine cases series

A Hariri, F Lebailly, A Zemirline, S Hendriks, S Facca, P Liverneaux
Department of Hand Surgery, Strasbourg University Hospitals, Illkirch Cedex, France

Septic arthritis of the wrist is a diagnostic and therapeutic emergency. Synovectomy and lavage by arthroscopy is often followed by stiffness. The purpose of this study was to evaluate the diagnostic and therapeutic contribution of emergency arthroscopic synovectomy with intra-articular lavage. Nine patients were operated for a wrist with septic appearance. All had signs of local inflammation, 3 loco-regional, 3 were febrile. One patient had a multi-articular involvement. All patients underwent emergency surgery using radio-carpal joint puncture, arthroscopic exploration, intra-articular lavage and synovectomy at both the radiocarpal and midcarpal levels. The results were evaluated by pain, QuickDASH, grip strength, and wrist range of motion.

In 3 cases, joint fluid appearance was clear, in 3 it was cloudy and in 3 purulent. Gram stain and culture revealed bacteria in 4 cases. Average pain was 5.3/10 preoperatively and 2/10 at the last clinical encounter. The mean grip strength was 23.3Kg for the affected side versus 33.5Kg; the mean flexion was 55° for the affected wrist against 68°; the mean extension was 52° for the affected wrist against 59°. No patient was reoperated. In all cases, there was no sign of local inflammation, regional lymphadenopathy or systemic infection at the last follow-up. One patient died of metastatic cancer. One other patient developed a severe CRPS1. Our results suggest three principles of management of wrist arthritis with septic appearance: extended surgical indication, emergency operation and arthroscopic procedure.

A-0112 Feasibility of an endoscopic approach to the axillary nerve and the nerve branch of the long head of the triceps with the help of the Da Vinci Robot

PM Porto de Melo1,2, JC Garcia Jr1, E Frasson de Souza Montero3, T Atik4, PA Liverneaux4,6
(1) Center for Advanced Studies in Orthopedics and Neurosurgery, São Paulo, Brazil
(2) Neurosurgery Department, São Paulo Military Area Hospital, Brazilian Army, São Paulo, Brazil
(3) Department of Surgery, LIM-62, FMUSP, University of São Paulo, Brazil
(4) Central Jersey Hand Surgery, PA, Eatontown, NJ, USA
(5) Department of Hand Surgery, Strasbourg University Hospitals, Illkirch, France
(6) École Européenne de Chirurgie, Université Paris Descartes, Paris, France

Backgrounds: The surgery to transfer the axillary nerve and the nerve of the long head of the triceps presents 2 obstacles: the access portals are not standardized and are for the most part approached through large incisions. The goal of this study was to explore the feasibility of an endoscopic microsurgical approach.

Methods: The posterior part of a cadaver shoulder was approached through 3 communicating mini-incisions. The Da Vinci robot camera was installed on a central...
trocort, and the instrument arms on the adjacent trocers. An insufflation of gas distended the soft tissues up to the quadrilateral space. The branches of the axillary nerve and the nerve of the long head of the triceps were identified.

**Results:** The dissection of the trunk of the axillary nerve and its branches was easy. The circumflex vein and arteries were dissected as well without difficulty. Finding the nerve to the long head of the triceps was found to be more challenging in light of its deeper location.

**Conclusion:** The properties of the robots allow us to perform conventional microsurgery: elimination of the physiologic tremor and multiplication of the movements. It also facilitates the endoscopic approach of the peripheral nerves, as seen in our results on the terminal branches of the axillary nerve and the nerve of the long head of the triceps.

**A-0116 Mini-propeller flaps in fingers' reconstruction**

AV Georgescu, –I Matei, –I Capota, –F Ardelean
*University of Medicine Iuliu Hatieganu, Cluj Napoca, Romania*

**Purpose:** The possibility of harvesting flaps based on digital perforators located at DIPJ was described by Koshima, for covering very distal finger defects. We will demonstrate that it is possible to harvest such flap also more proximal. More, in those cases when the direct closure of the donor site is not possible, a bilobed flap blood supplied by the same perforator vessels can be used.

**Methods:** We will present the advantages of using these mini flaps based on perforators emerging from the digital arteries, at any level of the fingers, including the thumb. In our service were practiced 25 transposition island perforator flaps for covering tissue defects in fingers, from which four were for the thumb. In two cases we used the perforator flap as a crossfinger flap, to cover a defect on an adjacent finger. The transposition flaps have an oval shape, are harvested from one side of the finger, without sacrificing the digital artery. After the subfascial undermining of the flap on its entire surface and identification of the vascular pedicle represented only by the perforator, the flap can be rotated 90–180° and can cover dorsal and volar finger defects. The flap’s donor site is generally directly closed; if its direct suture is not possible, a free skin graft from the forearm can be used. In the attempt to avoid this disadvantage, we developed a bilobed pedicled flap blood supplied by the same perforator vessels, which allows the donor site closure without any morbidity. This flap was used in 13 cases.

**Results:** These transposition flaps had an uneventful evolution, with complete integration of the flap and good quality functional recovery. In two cases we registered a minute partial superficial necrosis, which spontaneously healed. The bilobed flaps had also an uneventful evolution. The recovery for all the patients was between 14–21 days.

**Conclusion:** We consider that the perforator island transposition flaps have the advantages of using similar tissues in reconstruction, not damaging another area, they do not require main vessels sacrifice, can be sensate, and the donor site can be generally directly closed. When the direct closure of the donor site cannot be realised, this one can be achieved by using a free skin graft or the bilobed flap as a variant of the perforator flap.

**A-0118 Long-term results after muscle-rib flap transfer for reconstruction of composite upper limb defects**

AV Georgescu, –I Matei, –F Ardelean, –I Capota
*University of Medicine Iuliu Hatieganu, Cluj Napoca, Romania*

**Introduction:** Direct traumatic open fractures or their complications, as osteomyelitis and nonunion, represent the main etiology of bone defects. If soft tissue defects are also present, the management of these lesions becomes more challenging. The most used flaps in these cases are the vascularized fibula osteoseptocutaneous flap, the vascularized iliac osteocutaneous flap, and the vascularized muscular-rib flap. We previously reported about the advantages and the few complications by using the muscle-rib flap, and about the advantages of all-in-one reconstruction in complex injuries of the limbs involving both bone and soft tissue defects by using these flaps.

**Materials and Methods:** The study refers to 23 patients operated for acute or sequelar traumatic composite bone and soft tissue defects in upper limb, between March 1997 and March 2011, five females and 18 males, with an average age of 30.5 years (range, 5 to 66 years). The etiology of the defects was an acute trauma in 11 cases, and a post-traumatic complication in 12 cases. The average length of the bone defect was 5.2 cm (range, 3 to 8 cm), and the surface of soft tissue defect ranged between 6 and 475 cm². The flap used was the SA-R in 12 cases, the LD-R in six cases, and the LD-SA-R in the remaining five cases; from these, 17 were free flaps, and six pedicled flaps.

**Results:** The average follow-up in our 44 patients was 23.1 months (range, 12 to 48 months). We had complete flap survival in all the cases. In only one
case we registered a superficial wound infection, which was solved conservatively. Regarding the long term results, we registered a rate of primary bone union of 100%, with an average time of 6.6 months. **Conclusions:** The vascularized rib(s) as part of a composite flap represents a good indication especially in bone defects associated with large soft tissue defects.

**A-0119 New surgical treatment for the traumatic mallet finger**

Georgescu, Alexandru Valentin - Capota, Irina - Matei, Ileana
University of Medicine Iuliu Hatieganu, Cluj Napoca, Romania

**Introduction:** Mallet finger deformity is one of the most frequent pathological entities after extensor tendons injuries, which appears as result of the disruption of extensor tendon continuity over the distal interphalangeal joint. Despite the fact that a lot of methods were used in managing this deformity, the treatment of mallet finger is still a much debated subject.

**Material and methods:** We’ll try to demonstrate the advantages of a new surgical method by using a dorsal de-epidermised flap reinserted through the bone. The procedure starts by maintaining the DIP joint in 0° of extension by using a Kirschner wire. Then we performed an intra-dermal incision that delimitates a flap on the distal 2/3 of the dorsal aspect of the second phalanx, the distal end of the flap coinciding to the DIP joint; the width of the flap is of 3–5 mm. The flap is de-epidermised and raised superficial to the tendon. At the level of extensor insertion on the distal phalanx a hole of 1–1.5 mm is done. A 4/0 steel thread is passed through the distal end of the dermo-adipose flap and is then passed through the intra-osseous hole and knotted palmary in a tie-over manner. The extensor tendon is sutured with 4/0 absorbable threads to the flap. The skin is closed over the flap. Post-operatively we immobilize only the DIP joint. The Kirschner wire is removed after three weeks, the steel thread after four weeks and the immobilization after five weeks. After that, the DIP joint is gradually weaned from the immobilization. We used this method in 97 cases.

**Results:** The patients regain 95–100% of DIP stability and mobility, with an extension deficit of 0 to 10°.

**Conclusion:** This simple and effective method avoids a prolonged and uncertain immobilization and has a significantly high percentage of success. The method uses local resources and avoids the rejection phenomenon related to allograft materials. The distal trans-osseous reinsertion and centro-medular wiring are important technical adjuvant and improve the final results.

**A-0120 Intraoperative 3D imaging of scaphoid fracture reduction and fixation**

S Luria, –G Zinger, –O Safran, –R Mosheiff, –M Liebergall
Hadassah-Hebrew University Medical Center, Jerusalem, Israel

**Purpose:** We examined the clinical benefit of intraoperative 3-dimensional (3D) imaging techniques for the reduction and fixation of scaphoid fractures. Two modalities were used: 1.) A mobile isocentric C-arm [Siremobil ISO-C-3D, Siemens AG, Germany]; 2.) A novel imaging technique – C-InSight, utilizing the standard C-arm (MAZOR Surgical Technologies, Israel). Our hypothesis was that 3D imaging may aid in fracture reduction and fixation in comparison with fluoroscopy.

**Methods:** Twenty-five consecutive patients with a scaphoid fracture or fracture non-union comprised the study group. After reduction and primary fixation had been obtained successfully with a Kirschner wire (K-wire) using standard fluoroscopy, an intraoperative 3D visualization was performed. The first 10 patients were examined with ISO-C and the following 15 with C-InSight. The factors examined included quality of fracture reduction, K-wire position through the center of the proximal half of the scaphoid and extrusion of the K-wire in order to correctly assess the adequate screw length.

**Results:** In two of the 25 cases, after 3D visualization, malreduction of the fracture was seen and the reduction was revised. This included one case performed using the ISO-C and one case using the C-InSight. In one of the 25 patients the reduction of the fracture displaced during the scan itself, and was treated by a revision of the reduction. In five of the 10 cases with the ISO-C scans, either the central location of the wire or its protrusion could not be assessed due to artifacts. The C-InSight images had less artifact but the results were dependant on technician performance and were not as consistently clear.

**Conclusion:** Although intraoperative 3D imaging has some advantages, the technical difficulties in the use of the current modalities make their routine use in scaphoid fracture fixation less practical.
A-0121 Hand surgery for epidermolysis bullosa

S Luria¹, G Zinger¹, S Radwan¹, S Eylon²
(1) Hadassah-Hebrew University Medical Center, Jerusalem, Israel
(2) Alyn Hospital, Jerusalem, Israel

Purpose: Epidermolysis bullosa (EB) is a group of inherited, mechanobullous disorders caused by mutations in various structural proteins in the skin. The manifestation of this disorder in the hand is of digital contractures and pseudosyndactyly or “cocon hand”, causing significant functional impairment. The surgical treatment of these patients involves separation of the digits from the palm and between them, primarily the adducted thumb. The aim of this study was to focus on the unique stages needed in the care of these patients, including anaesthesia, surgical technique, dressing considerations and rehabilitation.

Methods: Four patients, two males and two females, whose average age was 11 years, were treated surgically by the separation of all their digits and by coverage with skin grafts. The follow-up period was between six months and three years.

Results: Partial recurrence of the pseudosyndactyly was noted in all patients and is thought to be dependent on the constant use of splints or bandages to separate the digits as well as the use of the hand. Recurrence was more pronounced in the non-dominant hand, especially between the digits and of flexion contractures but did not preclude the use precision or oppositional pinch at final follow up. The patient with the longest follow up has been referred for revision surgery to gain further release of contractures. Significant rehabilitation goals were achieved in all four patients after surgery. After six months, both of the younger patients were measured for finger dexterity which showed lower scores than the norm although this was felt to be dependent on which daily manual activity they were more familiar with. These tests could not have been performed prior to surgery.

Conclusion: All patients and families felt the effort was worthwhile. Separating the thumb and straightening the digits was found to be significant although the indication for separating all the digits is debatable and the need for revision surgery, in order to maintain the digit function, is clear.

A-0122 Visual estimation of wrist and elbow position: how good are we?

G Zinger, –E Apt, –S Luria
Hadassah-Hebrew University Medical Center, Jerusalem, Israel

Aim: The aim of this retrospective study is to investigate the variables that might have an effect on the results of open surgical release of stiff elbow.

Material and Methods: 52 of 74 patients who had a regular follow-up period of more than 6 months enrolled in to the study. 10 patients had extrinsic, 42 patients had intrinsic pathology. 19 patients had

A-0125 Factors effecting the results in open surgical release of the stiff elbow: long term follow-up

H Gündeş¹, –L Buluç¹, –B Gümüşlü², –B Tosun², –A Şarlık²
(1) Şifa Health Group, Ataşehir Hospital, Istanbul, Turkey
(2) Kocaeli University, Faculty of Medicine, Kocaeli, Turkey
lateral release, 33 patients had lateral and medial (progressive) release. The mean follow-up period was 64 months (6–180). Preoperative and post-operative flexion and extension measures, preoperative and post-operative total joint range of motion (ROM) and preoperative and post-operative MAYO elbow scores have been recorded during the follow-up period. Students’ t-test and Pearson correlation test have been used in statistical analysis.

**Results:** Some form of complication has been observed in 26 patients (50%). 13 transient cold intolerance, nine transient ulnar nerve paresthesia, eight reoperation for recurrent contracture (15.3%), four superficial infections, and one heterotopic ossification that needs radiation have been detected. There was no correlation between the complications and the type of the surgery. There was no correlation between the etiology (intrinsic versus extrinsic) and results (MAYO score, post operative total joint ROM and post-operative flexion and extension measures). Post-operative flexion and extension measures has been significantly better in lateral release group, compared to lateral and medial release group (0.001). This significance did not affect the post operative total joint ROM and MAYO score. Preoperative flexion and extension measures have a positive correlation with post-operative flexion and extension measures (0.002). Post-operative total joint ROM (0.004) and post-operative MAYO scores (0.006). Post-operative flexion and extension measures has a strong correlation with post-operative MAYO score (0.000). Increase in post-operative ROM has no correlation with post-operative MAYO score (0.000). Post-operative flexion and extension measures have a strong correlation with post-operative MAYO score (0.000), preoperative (0.006) and post-operative MAYO scores (0.006). Post-operative flexion and extension measures has an positive correlation with post-operative flexion and extension measures (0.002), post-operative total joint ROM (0.004) and post-operative MAYO scores (0.006). Post-operative flexion and extension measures has a strong correlation with post-operative MAYO score (0.000). Increase in post-operative ROM has no correlation with post-operative MAYO score (0.000). Pre-operative flexion degree of the elbow joint has statistically significant influence on post-operative range of motion and pre-/post-operative MAYO elbow scores (0.000/0.004).

Time spent between the contracture and index operation has a negative effect on pre-operative ROM (0.038). It has an inversely negative effect on post-operative increase in ROM (0.031). The variables that effect the post-operative MAYO score are; pre-operative MAYO score (0.000), preoperative (0.006) and post-operative flexion and extension measures (0.000). Increase in post-operative ROM has no effect on post-operative MAYO score.

**Conclusion:** Open surgical release of stiff elbow is prone to complications, independent to the type of surgical exposure. Surgical results do not change according to the etiology of the stiffness. Preoperative flexion and extension measures have utmost importance on post-operative measurements and patient satisfaction. This variable has an inverse relation with the time spent between the contracture and index surgery. According to the MAYO elbow score, post-operative flexion and extension measures are more important for the patients than the total increase in post-operative ROM. This means no matter how much increase you achieve compared to preoperative measurements, there is a threshold value for each patient that represents the functionality of the extremity.

**A-0127 The safe length of screws in fixation of volar locking plate for distal radius fracture**

H Yoon, –J Kee Nho, –K Hwi Choi, Min

Department of Orthopaedic Surgery, Soonchunhyang University College of Medicine, Seoul, South Korea

**Purpose:** The purpose of this experimental study is to determine the safe length of screw in volar locking plating for distal radius fracture by measuring the length of the each part of the distal radius at plain radiograph and computed tomograph (CT) in the adult population of Korea.

**Methods:** Plain radiographs and CT scans of 135 cases of distal radius with no particular pathologic lesion were reviewed. Average age was 38.8 (range 20–69), and 109 cases were male and 26 cases female. Maximal width of the distal radius perpendicular to the radial shaft was measured in plain x-ray. In addition, Anteroposterior (AP) lengths of the four points – Lister’s tubercle, extensor pollicis longus (EPL) groove, extensor digitorum communis (EDC) groove and most ulnar part-perpendicular to a tangent line of volar cortex were measured in axial view of CT scan. All these values were analyzed in various methods.

**Results:** The AP length was longest at Lister’s tubercle, average of 23.9 mm, and the shortest length at EDC groove was 21.0 mm. Maximal AP length was the same as the length of Lister’s tubercle but minimal AP length was 20.7 mm. The ratio of maximal and minimal length was average 86.8% (range 76.0–95.3%) and the difference of them was average 3.2 mm (range 1.0–6.1 mm). Maximal width of the distal radius was average 33.0 mm. The maximal width to AP length ratio was biggest at Lister’s tubercle, average 72.7% (range 59.2–85.75) and smallest at EDC groove, average 63.8% (range 53.7–73.8%).

**Conclusions:** The safe length of the screws at ulnar part of the Lister’s tubercle can be decided as 76% of the maximal AP length of the distal radius in lateral radiograph, and the safe length at Lister’s tubercle should not be longer than 3.2 mm, which can prevent the screw from penetrating dorsal cortex. The safe
A-0130 Microsurgical reconstruction of the forearm in children with congenital deformity

A Govorov, –S Golyana, –V Zavarukhin
The Turner Scientific and Research Institute for Children’s Orthopedics Department of Reconstructive Microsurgery and Hand Surgery, St Petersburg, Russia

Introduction: In children with involvement of one of the forearm bones, clinical symptoms are the hand deviation and dysfunction of the wrist joint. Depending on the degree of affection of one of the bones, we have identified three degrees of deformity. First degree is an affection not exceeding 50 per cent of the length. Second degree is an affection of more than 50 per cent of the length. The third degree a complete absence of one of the bones is observed.

Objective: Reconstruction of the forearm by vascularized autografts.

Materials and Methods: At the Department for Reconstructive Microsurgery and Hand Surgery the microsurgical reconstructions of the forearm in 15 children were carried out. Age of patients ranged from 3 to 10 years. Affections that required reconstruction of distal forearm were: radial and ulnar club hand. In all cases, we used vascularized tissue complexes. In lesions less than 50 per cent, the autotransplantation of 2nd metatarsal bone was carried out. When the affection exceeded 50 per cent, the vascularized autografts from fibula were used. These autografts were diaphyseal or epimetadiaphyseal ones. All patients underwent radiological examinations. Some patients underwent CT for more detailed examination of the forearm. In the late period, the cosmetic state of the restored limb and the function of the wrist joint were estimated. Examination of the donor area was necessary in all cases.

Results: The maximum follow-up was 7 years. In eight children after microsurgical reconstruction, a full restoration of the function of the wrist joint was observed. No further surgical correction was required. Radiological and clinical examination showed an increase of linear dimensions of the autograft. When a vascularized graft was used with preservation of blood supply for the growth plate, its active functioning was marked. In three patients, an accelerated longitudinal growth of the reconstructed bone, when compared with the opposite side, was observed. It was explained by a reduced function of the growth plate on the opposite side due to sustained disease. In five children the correction of the length of the whole forearm was performed. In one child no marked improvement was noted.

Conclusion: Thus, the use of autografts with axial type of blood circulation in children is an effective method for correction of forearm deformity and reconstruction of the wrist joint function. The use of the vascularized autografts with the blood supply for the growth plate ensures the limb growth and can prevent the development of recurrence.

A-0133 Minimally invasive screw fixation for larger bony mallet fractures

J Imatani, –S Moritani, –H Kondou, –Y Kirita, –M Hayashi
Department of Orthopaedic Surgery, Okayama Saiseikai General Hospital, Okayama, Japan

Purpose: Bony mallet finger fracture is a common injury. The extension block technique is a useful surgical procedure for the treatment of this fracture. However, its complications are pin tract infection, flexion contracture of DIP joint and delayed union or nonunion. We report a new minimally invasive screw fixation (MISF) technique for this fracture. Although the twenty one cases in the current series are recent, we believe the quality of clinical results is of interest.

Materials and Methods: Twenty one patients who sustained larger bony mallet fractures with a fracture fragment measures more than 40% of the joint surface were treated with our new surgical technique. Firstly, closed reduction of the mallet fragment was performed by creating an extension block pinning. Next, one or two Leibinger screws were inserted to this fragment through the dorsal stab skin incision. The patients were followed for an average follow-up of 12 months.

Results: According to the Crawford’s evaluation criteria, 13 cases were excellent, seven cases were good and one case was fair. The DIP flexion averaged 74°. The DIP extension averaged –1.2°. One patient showed 0.5 mm step-off from the joint surface of the DIP joint. Neither infections nor skin compressive ulcers occurred.

Discussion: We acknowledge that this is a short-term study of a small series, but they assert that the patients were followed up systematically on a regular basis for both clinical radiological evaluations. The current study indicates that adaptation of MISF may be efficient to minimize soft tissue damage, stabilize the fracture fragment and mobilize the joint at an early stage for the larger bony mallet fracture.
A-0135 Oberlin technique versus intercostals nerves transfer for the reanimation of elbow flexion in brachial plexus palsies

T Stamate, –AR Budurca, G Mazilu, –M Stamate, –I Topa
University of Medicine and Pharmacy “Gr.T.Popa”, Iasi, Romania

Purpose: The priority in the management of brachial plexus palsies (BPP) is the restoration of elbow flexion. Nervous repair in brachial plexus injuries using nerve grafting and nerve transfers look on the restoration of the shoulder, elbow and hand function. The transfer of intercostals nerves (ICN) for recovery of elbow flexion is possible by using a sural nerve graft to the musculo-cutaneous branches for biceps (MCBB). Recovery of triceps offers the possibility of the restoration of elbow flexion by Carroll muscular transfer. The Oberlin technique is very simple with functional results obtained in a short time. The aim of this retrospective study is to evaluate comparative results between neurorrhaphy using ICN and Oberlin technique in brachial plexus palsies with injured C5 and C6 +/- C7 roots.

Methods: We operated 71 on BPP, in 18 of them we used ICN (14 biceps and four triceps) and in five patients we used Oberlin technique. Patients were reviewed at 6, 12 and 36 months after nerves transfer. The average age of the patients was 31 years. The average time to surgery after occurrence of the injury was six–nine months. Biceps and triceps reinervation and strength of elbow flexion or extension were evaluated according to European Medical Research Council (EMRC).

Results: The average time required for biceps reinervation was 12–14 months and for triceps 9 months after intercostals nerves transfer and four–six months in Oberlin technique. There was no motor or sensory deficit related to the ulnar nerve. After ICN transfer, nine patients achieved M3–M4 elbow flexion according to EMRC grading system, three patients with M1–M2 and two with M0. For triceps, two patients achieved M3–M4 elbow extension – to which we performed Carroll transposition for elbow flexion recovery – one M1–M2 and one M0. From five patients using Oberlin technique, four achieved M4 and one M3. The clinical evolution was evaluated after 6 and 9 months by electromyography (EMG). In all cases with Oberlin technique EMG showed the best results for biceps reinervation.

Conclusions: Transfer of ICN into the nerve of MCBB for elbow flexion recovery is a reliable procedure in brachial plexus palsy. Transfer of ICN for triceps long head for the restoration of elbow extension offers an alternative for the cases in which the recovery of elbow flexion is failed. Oberlin technique is simple and offers better results in a short time and is an effective and safe option.

A-0136 A multi-disciplinary approach to treating self-inflicted lacerations to the wrist: 15 years’ experience

JH Gu¹, S-H Jeong², S-K Han², W-K Kim²
[1] Dankook University Hospital, Cheonan, Korea
[2] Korea University Guro Hospital, Seoul, Korea

Purpose: Self-inflicted wrist lacerations have the potential to lead to crippling sequelae and repeated suicide attempt. Some authors reported that 3.7% of patients died from suicide within 1 year after initial wrist cutting and 13% of patients ended their lives by suicide. Therefore to obtain best results after treatment of these injuries, hand surgeons should be familiar with not only surgical management but also psychological consultation. This study aims to review traumatological and psychological features of these types of injuries and suggest optimal treatment principles.

Methods: From January 1996 and December 2010, a total of 108 patients with self-inflicted wrist lacerations were admitted to the Korea University Medical Center, Seoul, Korea. The medical records of all these patients were reviewed retrospectively. Traumatologic data including wound features and injured structures and psychological data related to behavior characteristics and mental status were collected. All patients had been interviewed preoperatively by psychiatrists to obtain past psychiatric history and evaluate suicidal intent. To facilitate assessment, severity was classified. A severe injury involved complete transaction of at least three major structures, including at least one nerve or a vessel. A moderate injury was defined as an injury involving complete transaction of more than one major structure and a mild injury was not injuring any major structures. Assessment of functional outcomes, and comparative analysis of various psychological parameters were conducted.

Results: The number of patients in each severity group was as follows: 24 patients (22.2%) in the mild group, 55 patients (50.9%) in the moderate group, and 29 patients (26.9%) in the severe group. The central point of the lacerations predominantly located on the radial one-third of the wrist (70.8%), followed by central one-third and ulnar one-third. The most frequently injured structure was the palmaris longus followed by the flexor carpi radialis, the flexor carpi ulnaris and the median nerve. Twenty three patients (21.3%) had suicidal intent...
and major depressive disorder was the most frequently found psychological problem. Although only thirty-two patients (29.6%) had pre-injury psychiatric history, 73 patients were found to have psychological problems by post-injury examination. Seventy-eight patients (72.2%) presented excellent or good functional outcomes and only eight patients (7.4%) obtained poor results, but all suffered from severe functional loss. Five patients reattempted wrist cutting with suicidal intent during follow-up. Alcohol ingestion and presence of associated injuries was significantly different between severity groups. There was a statistically significant difference between the suicide attempt group and the non-suicidal self-injury group for alcohol ingestion, presence of associated injuries and presence of pre- or post-injury psychiatric diagnosis. Presence of suicidal intent was irrelevant to injury severity and functional recovery (p < 0.001).

Conclusions: The overall prognosis of self-inflicted wrist lacerations was favorable. However, in order to minimize catastrophic disability and repeated suicide attempts, a balanced approach considering traumatic-logical and psychological aspects of these injuries is essential.

A-0137 Clinical outcomes of modified technique of the hemiresection-interposition arthroplasty (HIA) for the distal radioulnar joint (DRUJ) arthritis

A Iida1, S Omokawa1, R Fujitani2, Y Tanaka2 (1) Nara Medical University, Kashihara, Japan (2) Ishinkai-Yao General Hospital, Yao, Japan

Purpose: The DRUJ osteoarthritis is a significant source of ulnar wrist pain with restriction of forearm rotation. Treatment options include implant arthroplasty, distal ulnar resection (Darrach procedure), arthrodesis with partial ulnar resection (Sauvé-Kapandji procedure), and the hemiresection interposition arthroplasty (HIA). Uniqueness of the HIA is the interposition of autogenous soft tissue between the radius and ulna to function as an arthroplasty and prevent radioulnar impingement. The aim of this study was to evaluate the clinical and radiological results following our modified technique of the HIA in the treatment of DRUJ osteoarthritis.

Methods: Ten consecutive patients (two males and eight females) with DRUJ osteoarthritis treated by modified technique of the HIA were evaluated. Patient’s age at surgery averaged 60 years. The average follow-up period was 28 months. The most common etiology of the arthritis was the fracture malunion of the forearm (distal radius fracture in four cases, ulnar shaft fracture in one case, Essex-Lopresti fracture-dislocation in one case). Four cases were idiopathic, and one case was congenital dysplasia of the radius. In performing the HIA, the distal 2/3 of the extensor retinaculum was harvested as an ulnar-based retinacular flap from the 2–6th extensor compartment. After hemiresecting the ulnar head, the flap was circumferentially wrapped around the ulnar head, and radioulnar ligaments were firmly reattached to the center of the head. Pre and post operative visual analogue pain scale, the range of forearm rotation, the grip strength, Mayo wrist score, Disabilities of the Arm, Shoulder and Hand (DASH) score, Patient-Rated Wrist Evaluation (PRWE) score were compared using student’s t-test. We also measured the radioulnar distances by x-ray at the final follow-up.

Results: Post-operative complications were seen in one patient, who had transient dorsal ulnar nerve irritation. The averaged pre- and post-operative visual analogue pain scales was 72 and 20 mm (p < 0.01). The forearm supination averaged 55 and 79 degrees (p = 0.06), the forearm pronation averaged 79 and 79°, and the grip strength averaged 12 and 16 Kg (p < 0.05), respectively. Average Mayo wrist score were 47 and 70 (p < 0.05), DASH score averaged 37 and 19 (p = 0.15), and PRWE score averaged 74 and 34 (p < 0.05), respectively. Radioulnar distance at the final follow-up averaged 4.2 mm (ranging 1.7 to 7.0 mm) in the posteroanterior view of the wrist radiographs.

Conclusions: Circumferential wrapping of the extensor retinaculum around the ulnar head may reduce the imbalance of tension of the DRUJ capsule and the retinaculum, and reattachment of the radioulnar ligaments is important to restore DRUJ stability. Our modified HIA technique achieved successful short to middle term clinical results. The visual analogue pain scale, the grip strength, Mayo wrist score, and PRWE score were improved significantly. Despite a small series of patients, this technique may be useful for DRUJ osteoarthritis as a modified HIA.

A-0138 Prospective study of needle fasciotomy for Dupuytrens contracture with one-year follow-up

J Stromberg, –AI Sorensen
Department of Handsurgery, Sahlgrenska University Hospital, Gothenburg, Sweden

Purpose: Needle fasciotomy is a relatively new alternative to open fasciectomy in selected cases of Dupuytrens contracture in Sweden. The advantage of
needle fasciotomy is a very short recovery combined with high cost effectiveness compared to open surgery. The technique is not wide spread in Sweden yet. The purpose of this study is to report results of needle fasciotomy in respect to reduction of contracture, complications and early recurrence after one year.

**Method:** This study is a prospective study of patients with Dupuytren contracture treated with needle fasciotomy. The main indication was contractures of the MCP joint, but PIP-joint contractures with well defined fibrosis were also included. The patients were evaluated preoperatively, per-operatively, at two, 12 and 26 weeks and after one year. The degree of the contracture, grip strength, pain, complication, recurrence, need for reoperation and sick leave were recorded. Forty-one patients with 55 fingers were operated. Of these 19 forth and 24 fifth fingers were operated. Four of the operated fingers were recurrence after fasciotomy. Median age 67.8 (43-83) years, the vast majority were men. 13 patients were employed preoperatively. The patients were allowed to use the hand for their job or daily activities directly after the procedure.

**Results:** Preoperative Median MCP / PIP extension lag were 45° (–30 to 92) respectively 45 (6 to 94). 44 fingers were assessed after one year. The active extension lag was 0° for both MCP and PIP joints (–5 to 65 and –20 to 74 respectively). Recurrence (defined as >20 degrees extension deficit compared to post-operative result) was observed in five cases: three PIP and two MP joints. There was one case of transient hemic-digital paraesthesia. No cases of lesions of flexor tendons, hematomas or infections were registered. In 16 fingers the stretching of the fingers after the fasciotomies were complicated with a superficial skin lesion with a median length of 4 mm (3–6) which all healed in one to two weeks.

**Conclusion:** Needle fasciotomy is a good alternative to fasciectomy in cases with well-defined fibrosis because of these preliminary good results and low morbidity. Longer follow-up of this study will evaluate further recurrence rate.

**A-0140 Motor branches of the ulnar nerve to the forearm: an anatomical study and guidelines for selective neurotomy**

R Paulos, –C Leclercq
Institut de la Main – Clinique Jouvenet, Paris, France

**Purpose:** Precise knowledge of motor nerve branches is critical in order to plan selective neurotomies for the treatment of spastic limbs. Our objective is to describe the muscular branching pattern of the ulnar nerve in the forearm and suggest an ideal surgical approach for selective neurotomy of the flexor carpi ulnaris.

**Methods:** The ulnar nerve was dissected under loop magnification in 20 upper limbs of fresh cadavers and its branches to the flexor carpi ulnaris muscle (FCU) and to the flexor digitorum profundus muscle (FDP) were quantified. We measured their diameter, length and distance between their origin and the medial epicondyle. The point where the ulnar artery joined the nerve was observed. The position in which the ulnar nerve gave off each branch was noted (ulnar, posterior or radial) and the Martin-Gruber anastomosis, when present, had its origin observed and its diameter measured.

**Results:** The ulnar nerve gave off two to five muscular branches, among which, one to four to the FCU and one or two to the FDP. In all cases the first branch was to the FCU and in four specimens it arose above or at the level of the medial epicondyle. The mean diameter of the branches to FCU was 1,39mm and for the FDP, 1,97mm. The average length of the branches to FCU was 33,8mm and for the FDP, 32,7mm. The mean distance between the origin of the first branch to the FCU and the medial epicondyle was 13,6mm and concerning the FDP, this average was 50,4mm. All the branches to FDP but one arose from the radial aspect of the ulnar nerve. A Martin Gruber anastomosis was present in nine cases, with a mean diameter of 0,94mm. All motor branches arose in the proximal half of the forearm and the ulnar nerve didn’t give off distal branches to the point where it was joined by the ulnar artery.

**Conclusions:** The number of motor branches of the ulnar nerve to the FCU varies from one to four. An ideal approach for selective neurotomy of the FCU should start 4 cm above the medial epicondyle, and extend distally to 50% of the length of the forearm or just to the point where the ulnar artery joins the nerve.

**A-0144 Long-term results of CMC arthroplasties in the treatment of trapeziometacarpal osteoarthritis**

M Martin-Ferrero, –A Mayo, –C Simon, B Coco
Medicine School; University of Valladolid; Spain

**Introduction:** Total joint replacement has been an effective treatment of this condition, because of the earlier post-operative recuperation and better replica of axes of rotation of the original joint that substitute, but the problem is the durability of these implants over time.

**Purpose:** The purpose of this paper is to present the results of long-term follow-up (more than 10 years) of
a total arthroplasties cementless HA-coated unconstrained for trapezial-metacarpal osteoarthritis treatment.

Methods:Total joint arthroplasties for the treatment of trapezio-metacarpal osteoarthritis has been performed on 83 thumbs of 77 patients (72 women and five men) to treat advanced osteoarthritis (Eaton and Littler stages III and IV). The prostheses were done from May 1999 to March 2003. The 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. The implants in this series were, 81 Arpe prosthesis, and two Ivory. The average follow-up time was 10.8 years. Kaplan Meier analysis was applied.

Finally 78 implants in 74 patients have been reviewed. Seventy four of the implants [94.9%] remain in place, and in four [5.1%] the implant has been removed and we have done a LTRI.

Kaplan-Meier analysis, considering all the removed implants and not-functional implants has been 93.91 (confidence interval 95% [2.01%, 17.68%]). Considering functionality the absence of pain, range of movement over 90%, and that thumb opposition reaches the base of small finger. Sixty nine (93.2%) of the 74 that remain in place, are functional, and five (6,8%) are not. The average preoperative Dash was 52 points (40–63) and in the final revision 21 points (13–35). Radiographic studies at the final follow-up evaluation did not show signs of implant loosening, although some of them show an appearance of subsidence of the components, due to periosteotic ossifications.

Complications:One of the patients (the third of the series) with the prosthesis luxated from the early post-op refused the surgical revision. Five prostheses of this series have been surgically revised: the first due to a luxation of the components when removing the cast, which was successfully corrected and in the final follow up is functional. Three other because of loosening of the cup: one resolved with bone graft and a new cup, and the other two with an LTRI of Zancolli. In one the medium size neck has been changed to another long sized, and the prosthesis is now functional.

Conclusions:Total joint arthroplasties of CMC joint of the thumb non-cemented and non-constrained has proved to be efficacious improving the movement, strength, and pain stop. The implants have also passed the time test (similar to hip or knee implants). We currently recommend this technique in patients with low/medium activity demands.

Key Words: non-cemented and non-constrained prosthesis; long-term results; CMC osteoarthritis; Thumb.
and fibrosis on the capitellar cartilage can be still detectable on MRI after eight-year period of radial head fracture but, they do not reach the clinical importance in long-term follow-up.

A-0149 Collateral ligament injury in displaced radial head and neck fractures: correlation with fracture morphology and management strategy to the torn UCL

Dept. of Orthopaedic Surgery, Pohang SM Christianity Hospital, Pohang, South Korea

Background: The purpose of our study was to correlate the morphology of the displaced radial head and neck (DRHN) fractures with associated ligament injuries and to evaluate the outcomes of management of the torn ulnar collateral ligament (UCL).

Methods: Twenty-nine surgically-treated patients presenting with a DRHN fracture were classified using the Charalambous classification by 3-dimensional CT. Accordingly, the collateral ligament and overlying muscle injuries and bony contusions were investigated in MRI. The valgus stress test was performed intraoperatively on twenty patients with MR-confirmed complete UCL rupture. If there was no firm end point, the UCL was repaired (group B). The others were treated conservatively (group A).

Results: Charalambous type 3D and 4D tended to have a higher incidence of complete UCL rupture than type 1D and 2D (p = .110). But, type 1D and 2D tended to have a higher incidence of complete UCL rupture and lateral bony contusion than type 3D and 4D (p = .126, p = .139). There was a trend toward a higher incidence of complete UCL rupture in Charalambous type 3D and 4D (p < .110) and complete UCL rupture in Charalambous type 1D and 2D (p < .126), although the statistical significance was not found. Rupture of the overlying muscles was more common in group B than in group A (p < .05). With regard to the functional outcome, there was no significant difference between the two groups.

Conclusion: DRHN fracture is always a complex fracture accompanied by collateral ligament injuries. Type 3D and 4D tended to have a higher association with UCL rupture, compared to type 1D and 2D, types commonly associated with UCL rupture. The MRI-confirmed torn UCL could be managed conservatively if there was a firm end point on valgus stress test.

A-0152 Reliability and accuracy of magnetic resonance imaging (MRI) for diagnosing foveal avulsion injury of the triangular fibrocartilage complex (TFCC)

S Omokawa, –A Iida, –R Fujitani, –Y Tanaka
Department of Orthopedics, Nara Medical University

Purpose: To compare reliability and diagnostic accuracy of a radial plane MRI when compared to a standard coronal plane technique in the detection of foveal avulsion of the TFCC.

Methods: The wrist MRI scans (1.5 Tesla) of a prospective cohort of twelve consecutive patients with foveal avulsion of the TFCC treated by open or arthroscopic repair were evaluated. Nine wrists had a complete tear, and three had a partial radioulnar ligament tear. The wrist MRI scans of 10 healthy subjects were evaluated as a negative control. The focal area of high signal intensity at the ulnar foveal insertion of the TFCC on a T2*-weighted image was defined as foveal avulsion. In addition, partial or complete ligament tear was determined depending on the presence or absence of the continuity of a low signal intensity band extending from the distal radius to the ulnar fovea. Three board-certified hand surgeons blinded to patient status assessed the coronal and radial plane MRI images. The inter-rater and intra-rater reliability and diagnostic accuracy of the wrist MRI for TFCC foveal avulsions were analyzed.

Results: In the 22 cases evaluated, kappa values in assessing the high signal intensity area at the fovea were 0.59 (inter), 0.52 (intra) in the coronal MRI, and 0.49 (inter), 0.62 (intra) in the radial MRI. These values were in moderate to substantial agreement. In the twelve patients with foveal avulsion injury, kappa values in assessing the continuity of a low signal band were 0.33 (inter), 0.57 (intra) in the coronal MRI, and 0.63 (inter), 0.65 (intra) in the radial MRI. Sensitivity and specificity for diagnosis of foveal tears were 83% and 80% in the coronal MRI and 90% and 82% in the radial MRI; those for diagnosing any tear, whether partial or complete, were 67% and 100% in the MRI showing both planes.

Conclusions: A focal area of high signal intensity at the ulnar fovea was a reliable and useful finding for detecting foveal avulsion injury of the TFCC in both the coronal and radial plane MRI. Reliability of interpretation of the ligament continuity in the radial plane MRI was higher than that in the coronal plane MRI. The presence of the continuity of a low signal band between the radius and ulna was a highly specific finding to distinguish partial from complete ligament tear of the TFCC.
A-0153 Pollicization without pollicization – could we name surgery this?

I Shvedovchenko, –A Koltsov, –B Kasparov
St. Petersburg Albrecht Research Centre for Occupational Expertise, Prosthetics and Rehabilitation, St. Petersburg, Russia

Purpose: To consider a new variant of thumb reconstruction for prehension restoration in which we used principles of pollicization.

Materials and Methods: The surgical interventions in a thumb were performed in 10 patients with congenital anomalies of upper limb. Four patients had congenital ulnar deficiency syndrome with 2-3-rayed hand. Six patients had hand consisted of two rays, where thumb and small finger were in the same plane. For all patients the thumb opposition was built using the principles of pollicization (finger transfer on neurovascular bundle) which had essential distinctions with the classical method. In those cases a thumb underwent 90–120° rotation. Distinctions between this method and classical pollicization consisted in the following: In five cases we performed circular cross-sections near the base of transferring thumb, in the other five cases we used Buck-Gramcko sections. Long muscles tendons were mobilized, points of short muscles attachment were cut off distally in six cases, proximally in four cases. For finger rotation metacarpal osteotomy was used in eight cases and carpometacarpal joint capsulotomy – in two cases. Rotation was performed within 90–120°. Fixation using wires was carried out eight times, using Mini-fix device – twice.

Results: Classical operative technique of pollicization consists of the following main stages: planning and performing skin incisions, identification and releasing neurovascular bundles, transfer of hand short muscles and work with long muscles tendons, finger separation from its metacarpal bone and transferring into thumb position in frontal plane, re-attachment of muscles, skin graft transferring.

In our patients, principles mentioned above were modified for the main purpose – for existing thumb rotation within a rather wide angle (90 to 120°). Previously we used other techniques of thumb rotation. In all those methods the main problem was the deficit of skin in the first intermetacarpal space which appeared after creation of opposition. The mobile fasciocutaneous flap was utilized, it required additional skin grafting

Conclusions: The use of pollicization principles for thumb rotation makes it possible to provide necessary shift range and to reduce surgery traumatism.

A-0156 Anterior radial head subluxation after obstetric brachial plexus palsy

J Bahm, –W Elkazzi, –F Schuind
Department for Orthopaedics and Traumatology, ULB Erasme University Hospital, Brussels, Belgium

Purpose: Anterior subluxation of the radial head is a rare complication in children having suffered from obstetric brachial plexus palsy. Exact pathophysiology and treatment modalities are debated. We present our experience in surgical correction of this progressive deformity.

Methods: So far four children have undergone complete surgical correction including an open reposition of the radial head with inspection of the cartilage quality and shape on the head, radial diaphysis shortening and rotational osteotomy if necessary followed by plate ORIF and transposition of the biceps tendon onto the ulna.

Results: The congruence of the radio-humeral joint may be maintained (follow-up period 2–4 years); the passive and active prosupination remain limited. The risk of further outgrowth of the radial head leaving the proximal radio-ulnar joint is decreased, but the complexity of active prosupination restoration has yet to be improved in these cases.

Conclusion: Presenting the complex pathophysiology and treatment options for this condition is mandatory, as a stable reposition of the radial head is feasible, but more concern should be given to the improvement of passive and active prosupination in these cases to increase the overall forearm function.

A-0158 Arthroscopic dorsal capsuloligamentous repair in chronic scapholunate ligament injuries

C Mathoulin, ALWahegaonkar
Institut de la Main, Clinique Jouvenet, Paris, France

Introduction: Scapholunate ligament injuries usually result due to a fall on the outstretched hand leading to scapholunate instability. The natural history of untreated scapholunate instability remains controversial and usually results in late arthritic changes – the so-called “SLAC” wrist. The advent of wrist arthroscopy helps in early diagnosis and treatment of these serious injuries. In selected cases with reducible scapholunate instability (Garcia-Elias stages 2, 3 and 4) we propose a new “all arthroscopic dorsal capsuloligamentous repair” with the added advantage of early rehabilitation and prevention of post-operative stiffness.
Material and Methods: We report the results of our series of 57 consecutive patients suffering from chronic wrist pain refractory to conservative measures. All patients underwent a thorough clinical examination in addition to a standard set of radiographs and MRI exam; and they were treated by an all arthroscopic dorsal capsulo-ligamentous repair under loco-regional anesthesia on an ambulatory basis. All patients were available for follow-up at regular intervals during the post-operative period. At follow-up, the wrist ROM in all directions, the grip strength, DASH questionnaire and pain relief based on the VAS were recorded for both the operated and contra-lateral sides.

Results: There were 34 males and 23 females with a mean age of 38.72 ± 11.33 years (range 17–63 years). The dominant side was involved in 52 cases. The mean time since injury was 9.42 ± 6.33 months [range 3–24 months] and the mean follow-up was 30.74 ± 7.05 months [range 18–43 months]. The mean range of motion improved in all directions. The mean difference between the post- and preoperative extension was 14.03° [SEM=1.27°; p < 0.001]; while the mean difference between the post- and preoperative flexion was 11.14° [SEM=1.33; p < 0.0001] with flexion and radial deviation reaching 84.3% and 95.72% respectively of the unaffected wrist. The mean difference for the VAS score was −5.46 (SEM=0.19; p < 0.0001). The mean post-operative grip strength of the affected side was 38.42 ± 10.27 kg [range 20–60 kg] as compared to mean preoperative grip strength of 24.07 ± 10.51 kg [range 8–40 kg] (p < 0.0001). The mean post-operative grip strength of the operated side was 93.4% of the unaffected side. The DISI was corrected in all cases on post-operative radiographs. The mean difference between the post- and preoperative SL angles was −8.95° [SEM=1.28°; p < 0.0001]. The mean post-operative DASH score was 8.3 ± 7.82 as compared to mean preoperative DASH score of 46.04 ± 16.57 [p < 0.0001]. There was a negative co-relation between the overall DASH score and the post-operative correction of the DISI deformity with a lower DASH score associated with increasing SL angles.

Discussion: The dorsal portion of the scapholunate ligament is critical for the stability scapholunate articulation, largely due to its attachment to the dorsal capsule. We have recently conducted a multi-centric anatomical study with international collaboration demonstrating the critical importance of this dorsal scapholunate complex. The all-arthroscopic capsulo-ligamentous repair technique provides reliable results in addition to avoiding post-operative stiffness. The overall results at a mean follow-up period of more than 2 years in our series of young, active patients appear to be encouraging.

A-0159 Complications and revision rate as the type of total elbow arthroplasty – long term outcome of total elbow arthroplasty

SE Park¹, SK Rhee¹, SY Kwon², SW Cho²
(1) Daejeon St. Mary’s Hospital, Daejeon, Korea
(2) Yeouido St. Mary’s Hospital, Seoul, Korea

Background: To evaluate their long-term outcomes including complications and revision rate of total elbow arthroplasty (TEA) as the types for average 13 years of follow-up in our institution.

Methods: Since 1984, total 84 cases of primary TEA was done in 77 patients. Their average age was 54.2 years old. We used the unlinked TEA in 35 [Pritchard ERS 18 since 1984, Kudo type 3 17 since 1991], and the semilinked TEA in 49 cases (Pritchard Mark II 14 since 1997, Coonrad-Morrey 35 since 2001), and assessed them for compliance to daily living guideline (not to exceed 2.25kg for repetitive lifting and 4.5kg for single episode lifting). We had followed them for an average of 13 years after primary TEA from 1984 to 2010, and analysed their results by their complications and revision rates as the type of TEA.

Results: The Mayo elbow performance scores (MEPS) was improved from preoperative 34 points to 84 points post-operatively. Active flexion-extension elbow motions were increased from preoperative 25°–94° to 12°–130° post-operatively. The complication rate was overall 44.0% (37/84 cases), statistically higher in unlinked group (62.9%, 22/35 cases) than in semi-linked group (30.6%, 15/49 cases). The revision rate was overall 27.4% (23/84 cases), higher in unlinked group (34.3%, 12/35 cases) than in semi-linked group (22.4%, 11/49 cases).

Conclusions: The semi-linked TEA are more favorable than the unlinked one in its complications and revision rates, but we thought the new design of TEA to permit more forearm rotation, development of more rigid cementing techniques and support of daily living activities in elderly osteoporotic patients to reduce complications and revision rate are needed continuously in future.

Level of Evidence: Level III, Retrospective comparative study, Treatment study.

Key words: elbow; total elbow arthroplasty; revision; complication; design.

A-0160 Osteoarthritis of the pisotriquetral joint and enthesopathy of the flexor carpi ulnaris: prevalence in a donor population

KE Kofman, −AH Schuurman, −MC Mulder, −SAMW Verlind, −LM Gierman, −PJ van Diest, −RLAW Bleys
Department of Plastic Surgery, University Medical Centre, Utrecht, the Netherlands
**Purpose:** This study determined the prevalence of osteoarthritis (OA) of the pisotriquetral (PT) joint and of enthesopathy of the flexor carpi ulnaris (FCU) tendon in a donor population. In addition, the correlation between radiologic, macroscopic and microscopic findings was investigated. Also, the anatomy of the PT-joint in microscopic sections was well documented.

**Methods:** Twenty wrists were obtained from 10 cadavers from the Anatomy Department of UMC Utrecht. The population consisted of nine women and one man with ages ranging from 65 to 94. Radiographs of all wrists were taken with the hand in pisotriquetral view. Ten wrists were macroscopically dissected, the remaining ten wrists were sagitally sectioned at a thickness of 10μ at three levels, with an interval of 300μ. The sections were stained with: HE for a general overview, Azan to visualize collagen fibers, Safranin-O for cartilage and Elastic van Gieson (EvG) to demonstrate elastic and collagen fibers. Evaluation was by three of the authors. The wrists were scored according to the OARSI (Osteoarthritis Research Society International) criteria for OA.

**Results:** On x-ray five out of 20 wrists were considered osteoarthritic by all three independent observers. Two out of 20 wrists were considered normal. Thirteen out of 20 wrists were judged differently by the observers. They agreed on diagnosis (OA, slight OA or no OA) in seven wrists and did not agree on diagnosis in 13 out of 20 wrists. One wrist showed signs of enthesopathy, characterized by calcifications at the site of the attachment of the FCU tendon. On macroscopy nine out of 10 wrists showed osteoarthritic changes, characterized by cartilage damage and exposure of subchondral bone, of which five were severely affected. At microscopic evaluation, all ten wrists showed some degree of OA (ranging from surface discontinuity of the cartilage layer to denudation of subchondral bone) at either one of the three section levels. Signs of enthesopathy such as disorganisation of collagen fibers at the volar side of the enthesis, fibroblast hyperplasia or angiogenesis were seen in seven wrists.

**Conclusions:** According to the present study, pisotriquetral OA and FCU enthesopathy have a high prevalence in the older donor population and should therefore be considered in the differential diagnosis of ulnar sided wrist pain. By performing clinical examination of the wrist with these pathologies in mind, diagnosis could be a lot faster without the current delays of about one year. While radiographs should be taken to rule out other diagnoses, they are not sufficient as the only diagnostic tool in suspected pathology of the PT-joint and FCU-enthesis.

**A-0163 Results of thumb reconstruction in congenital hypoplasia. What are possible complications?**

I Shvedovchenko, –A Koltsov, –B Kasparov
St.Petersburg Albrecht Research Centre for Occupational Expertise, Prosthetics and Rehabilitation, St.Petersburg, Russia

**Purpose:** To analyze complications after thumb reconstruction in congenital aplasia of grades III–IV.

**Materials and methods:** Surgical treatment of congenital thumb hypoplasia of grades III–IV in 123 patients was performed, among which there were 66 cases of pollicization and 57 cases of reconstruction. Reconstructive surgery provides thumb preservation, restoration of the first metacarpal bone and carpo-metacarpal joint, achievement of opposition and effective mobility of thumb. We analyzed outcomes of the reconstruction main stages, such as: plasty with local tissues at the thumb basis; bone grafting of the first metacarpal bone; tendon grafting in the reconstructed thumb. So, we determined the principal methods which helped us to correct complications after prime surgery.

**Results:** Plasty with local tissues at the thumb basis as a preparatory stage was required in 18 cases in hypoplasia of grade IV. We encountered no complications associated with either disturbed circulation or post-operative wound healing. Thumb reconstruction in thumb hypoplasia of grades III–IV includes the 1st metacarpal bone and the 1st carpo-metacarpal joint formation and relocation thumb into opposition. The loss of opposition and formation of adduction contracture took place in 17 cases. This deformity was corrected during the next stage – thumb opponens plasty, but it demanded additional skin flapping. Such a frequent extension of adduction makes us think of modernization of using methods. We began to apply Mini-fix devices for thumb fixation during a month or more. In seven cases graft resorption after the 1st metacarpal bone reconstruction took place. In four cases re-grafting was successful, in three cases after failure in re-grafting we had to perform index pollicization. This operation was technically very complicated, and the main problem was to provide steady venous drainage. Thumb opponens plastic surgery was performed as the final stage of treatment in 50 cases, and we had no complications. We also used the transposition of superficial flexor of 4th finger, in
one case we had to form thenar using the adductor digiti minimi transfer following the patient’s demand. **Conclusions:** In congenital thumb hypoplasia of grades III–IV we used both pollicization and underdeveloped thumb reconstruction. The latter has considerably more complications than pollicization; reconstruction requires more stages of treatment which include bone, tendon and skin grafting, outcomes are less predictable. In spite of this, thumb reconstruction in thumb underdevelopment of grades III–IV is a reliable method, because patients and their parents often demand to retain a five digit hand.

**A-0164 The creation of a user friendly and data secure database to analyse the use of Xiapex injection in Dupuytren’s contracture**

D Warwick, –D Graham
*University Hospital Southampton, United Kingdom*

When Xiapex was introduced in our centre, we wanted to collect comprehensive data on the patients, their disease and their response to the drug. We recognised that this would need a database which is easy to input and easy to interrogate, as well as meeting the legislated data protection requirements. We therefore constructed a database on a Microsoft Excel platform. The database is password protected and names are excluded, thus fulfilling legislative requirements. We collected patient data (name, email, telephone, funding status, QuickDASH, Southampton Dupuytren’s Score), disease data (previous treatment, digit[s] involved, joint[s] involved), injection data (date, cord treated, ease of manipulation, complications). The database has elegant in-built drop-down menus to help input. Using the retained contact details, we are accumulating data on recurrence, symptom improvement and patient satisfaction. The database has inbuilt self-filling reporting charts which continually update themselves. Over 140 patients have been uploaded so far. We will demonstrate this user-friendly valuable tool to the meeting.

**A-0165 Dupuytren’s treatment with lipofilling and multiple cordotomies: five-year follow up results**

F Bergamin, –M Borsetti, –C Cerato, –A Clemente
*SOS Chirurgia della mano; Reparto di Chirurgia Plastica e della Mano, Ospedale Maria Vittoria, Turin, Italy*

**Purpose:** Surgical therapy with fasciectomy is the most widely used treatment but the demand for percutaneous needle fasciotomy (PNF) to treat Dupuytren’s disease is increasing because it is less invasive, less expensive and less time-consuming and has a good short-term effect. However, PNF has been associated with a high recurrence and complication rate. With the aim of reducing recurrence and complication rates, while maintaining the advantages of PNF in terms of limited invasiveness and fast recovery times, we developed a new approach that combines fasciectomy and lipofilling. **Methods:** We selected 30 patients with Dupuytren’s disease at stage N, 1 or 2 according to Tubiana’s classification. The mean duration of the condition before surgery was 16.5 months. N-stage disease was treated to rectify the “nodule palm skin appearance” [in patients who wanted an aesthetic result] and to reduce pain if present. Aponeurotomies are performed through one or two mini-open ports (0.5–0.8 cm) with each digital contracted ray clearly visible at the level of the distal palmar crease and/or of the proximal phalanx. The cord is isolated, pulled up with Kelly forceps and severed. The purified fat is injected through the open wound around the cord in the subcutaneous plane and in the subfascial plane, and also in the area of the digital rays not affected by the disease. Surgery lasted a mean of 25 min. One week after surgery, patients were allowed to return to full work activities. **Results:** In the 23 patients who underwent surgery, we encountered no complications other than two instances of abdominal ecchymosis. Scar formation was minimal in all cases. We obtained a reduction of more than 90% of the degree of contracture in all digital rays operated on. No palpable cords occurred during a median follow-up of 33 months. Two patients developed a new nodule on an adjacent ray that was not affected at the time of surgery. Regarding pain relief and aesthetic outcome among the seven N-stage patients, all reported a high score. Some stage 2 patients referred tingling of the fingers for a number of weeks presumably due to stretching of digital nerves or a mepivacaine nerve block. **Conclusions:** Our combined approach, i.e., fasciectomy followed by lipofilling, to early-stage Dupuytren’s disease proved to be safe, without serious complications, and without recurrence during a 33-month follow-up. Our combined technique has several advantages: a safer dissection than classical PNF thanks to direct vision of the cord and the neurovascular bundles; it is minimally invasive with the patient returning to normal activities within a week; good restoration of skin tenderness; a rejuvenating effect; and a reduction in the recurrence rate in medium-term follow-up since our findings seem to suggest that fat grafts can change the biology of the disease. Lastly, it should be
underlined that further studies are required to determine the long-term results of our technique.

**A-0168 The comparison of treatments mini plaque+screw and isolated screw in spiral and oblique metacarpal and phalangeal fractures**

H Başar¹, ME İnanmaz¹, O Başçı², İKÇ Köse³, C Tetik³,  
(1) Department of Orthopaedics and Traumatology, Sakarya Training and Research Hospital, Sakarya, Turkey  
(2) Department of Orthopaedics and Traumatology, Marmara University School of Medicine, Istanbul, Turkey  
(3) Department of Orthopaedics and Traumatology, Acibadem Maslak Hospital, Istanbul, Turkey.

**Purpose:** We compared mini plaque+screw and isolated screw fixation techniques in spiral and oblique metacarpal and phalangeal fractures.

**Methods:** The study included 43 patients with displaced, non-reducible, unstable spiral and oblique metacarpal and proximal phalangeal fractures. Phalangeal fracture group included 22 patients (four female, 18 male; mean age 33.8 years old; range 20–50), metacarpal fracture group 21 patients (three female, 18 male; mean age 29.6 years old; range 18–45). The mean follow-up was 19.2 ± 5, four months for phalangeal fractures, 20.9 ± 7, three months for metacarpal fractures. 14 metacarpal fractures were oblique, 10 were spiral fractures; phalangeal fractures were 14 oblique and eight spiral fractures. For functional evaluations, total active range of motion and grip strength were measured and the Q-DASH (Quick-Disabilities of the Arm, Shoulder and Hand) score was administered.

**Results:** All the patients went back to their work but the time was shorter in the mini plaque+screw fixation than isolated screw fixation in both metacarpal and phalangeal fractures. TARM and Q-DASH score of the metacarpal fractures were not significantly different between mini plaque+screw and isolated screw fixation techniques, however, in phalangeal fractures the isolated screw fixation technique gave better results. Moreover, mini plaque+screw and isolated screw fixation technique gave better results in the metacarpal fractures than phalangeal fractures according to TARM. In both fixation techniques the strength of finger grasping did not differ in phalangeal fractures in early (one month) and final control, on the other hand in mini plaque+screw fixation method the strength of finger grasping was better in the metacarpal fractures in early period (one month). The final control results for the strength of finger grasping were better for metacarpal fractures than phalangeal fractures in both fixation techniques.

**Conclusions:** In spiral and oblique phalangeal fractures mini plaque+screw fixation should be avoided and surgical incision and dissection should be kept short. Especially if the patient works in tough physical jobs mini plaque+screw fixation technique should be chosen in spiral and oblique metacarpal fractures.

**Key Words:** Metacarpal fracture, phalangeal fracture, mini plaque and screw fixation, isolated screw fixation.

**A-0169 Comparison between proximal row carpectomy and four-corner fusion using dynamic assessment**

HP Singh¹, M Brinkhorst², JJ Dias¹, H Slijper², R Feitz², T Moojen², S Hovius³  
(1) University Hospitals of Leicester NHS Trust, UK  
(2) Erasmus Hospital, Rotterdam, Netherlands  
(3) Hand and Wrist Clinic, Zeist, Netherlands

**Introduction:** Cohort studies and systematic reviews have previously compared proximal row carpectomy (PRC) with four-corner fusion (4CF) for stage 2 and 3 of SNAC and SLAC wrists but none have used dynamic assessments of range of motion or grip strength. We assessed the effect of either procedure on the circumduction of the wrist with flexible biaxial electrogoniometry in standard 90° pronated position of wrist for kinematic assessment of movement in orthogonal planes. We also used force time curves to compare the outcome of proximal row carpectomy and four-corner fusion more than six months after surgery.

**Methods:** Forty-nine subjects with a mean age of 57 years participated in this study. Twenty-five patients had undergone proximal row carpectomy and twenty-four had four-corner fusion. The range of motion was assessed with flexible electrogoniometry in standard fully pronated position. A software package was used to further analyse the characteristics of the circumduction curves such as the shape, size, rate, smoothness and orientation. MIE grip analyzer was used to assess the maximum grip and sustainability of the maximum grip for 60 seconds of the affected and unaffected hand. MHQ and PEM questionnaires were used to measure outcome.

**Results:** The flexion-extension in the operated wrist was 66% in the PRC group and 50% for 4CF group
compared to the contralateral unaffected wrist. However, there was a greater reduction of the radio ulnar deviation component of circumduction in the PRC group (49%) than in FCF group (58%) compared to contralateral side. Area and circumference of circumduction was similar in PRC patient group (1309ºº) and the 4CF patient group (1233ºº). The orientation of the oblique plane of circumduction was 28° for PRC patients but the plane was closer to the orientation of the flexion extension plane for patients with 4CF patients (7°). Velocity of the wrist movement during circumduction was faster in PRC group compared to 4CF group and the difference was significant in the all the four quadrants except for velocity in extension. The time taken to complete one cycle of circumduction is less in PRC group compared to 4CF group. The peak grip strength was similar in the two groups but are lower in deviation compared to 4CF. PRC has greater area under force time curve on grip strength assessment and also functional outcome is better after PRC.

A-0170 Tension band suture technique for unprotected early active movement without dorsal block splint in zone II flexor tendon rupture

H Başar1, O Başçı2, B Erol2, C Tetik3
(1) Department of Orthopaedics and Traumatology, Sakarya Training and Research Hospital, Sakarya, Turkey
(2) Department of Orthopaedics and Traumatology, Marmara University School of Medicine, Istanbul, Turkey
(3) Department of Orthopedics Surgery, Acibadem Maslak Hospital, Istanbul, Turkey

Purpose: The aim of our study is to develop a suture technique that is stronger than the ones being used at the present time and a resistant suture technique to the force applied to the tendon after starting unprotected active movement.

Methods: 32 fingers of six fresh human cadavers were divided into two groups. FDP tendons in the study group were repaired by Tension Band suture technique, those in the control group were repaired by Modified Kessler suture technique. Flexion and extension movements were performed with 10N of load increasing 1N at a time to the tendons in both groups. Rupture and significant gap formation was evaluated up to 20N of load. In the study, to evaluate the resistance to unprotected early active motion, 1000 times flexion and extension motion cycle was performed with a load of 20N. The succeeding repaired tendons was also tested with flexion and extension movements increasing the load 1N at a time.

Results: In the Tension Band suture technique, failure and significant gap formation on the repair zone was not observed after 20N of load and 1000 times cyclic flexion and extension movements for resisting to unprotected early active motion. The rupture and significant gap formation was observed on an average load of 98.43 ± 0.47N. In the Modified Kessler suture technique, on the eight tendons before reaching the 20N of load for resisting to unprotected early active motion, and the remaining eight tendons, during the 20N loaded motion cycle essential for unprotected early active motion, rupture and significant gap formation was observed. The failure and significant gap formation was observed on an average load of 18.37 ± 1.89N. It is measured that by accompanying Tension Band suture to the Modified Kessler suture technique, the resistance was increased up to five or six times.

Conclusions: By the Tension Band suture technique, early active motion can be started with the finger without a dorsal block sling immediately after the surgery.

Key Words: Zone II Flexor Tendon Injury, Tension Band Suture.

A-0171 Nerve transfer revisited: anterior interosseous nerve to the deep branch of the ulnar nerve – histomorphometric and anatomic observations

Klinik und Poliklinik für Plastische Chirurgie und Handchirurgie, Klinikum rechts der Isar, Technische Universität München, Munich, Germany

Purpose: Ulnar nerve lesions can be severely debilitating and often carry a poor prognosis due to insufficient sensory and intrinsic muscle recovery. In the last decade the use of peripheral nerve transfers has become an established method for restoring hand function in ulnar nerve palsies. Nerve transfers are especially relevant in severe mid- and high level
injuries where, compared to nerve reconstruction at the level of injury, distal nerve transfers allow faster regeneration. This contribution focuses on the anatomical and histomorphometric background of the nerve transfer of the anterior interosseous nerve (AIN) to the deep branch of the ulnar nerve (DBUN).

Methods: This study was performed on 15 cadavers. The ulnar nerve and the AIN were dissected and the nerve transfer performed. A favourable site for coaptation was chosen and its location described using relevant anatomical landmarks. Nerve samples of donor and recipient nerve were histomorphometrically analyzed and compared.

Results: Our anatomic results indicate that the AIN is a suitable donor for the DBUN. It appears that proximal to where the AIN enters the pronator quadratus muscle is a favourable site for coaptation. We identify this point lying at 202 ± 4 mm distal from the medial epicondyle of the humerus. The superficial and the deep ulnar branches have to be separated retrograde from their division at the pisiform for a length of 66.7 ± 3 mm to reach the site of coaptation. The dorsal cutaneous branch of the ulnar nerve could be conserved in all cadavers. The AIN presented with smaller nerve diameter, smaller fascicle and nerve cross-sectional areas, less fascicles and axons, but comparable axon density. Conclusions: This data provides the surgeon with anatomic background for this procedure and shall help planning of the operation. The histomorphometric inferiority of the AIN as a donor should raise the question whether the AIN should be transferred to the entire DBUN or just to selected parts of it.

A-0172 Ligament reconstruction and tendon interposition arthroplasty of the trapeziometacarpal joint with the use of the full thickness of the flexor carpi radialis tendon

H Baar¹, –O Başçi², –B Ero², C Tetik³
(1) Department of Orthopaedics and Traumatology, Sakarya Training and Research Hospital, Sakarya, Turkey
(2) Department of Orthopaedics and Traumatology, Marmara University School of Medicine, Istanbul, Turkey
(3) Department of Orthopaedics and Traumatology, Acibadem Maslak Hospital, Istanbul, Turkey

Objectives: We analyzed the clinical outcomes of the ligament reconstruction and tendon interposition arthroplasty of the trapeziometacarpal joint with the use of the full thickness of the flexor carpi radialis tendon.

Methods: We controlled 19 patients (18 women, one man) 23 thumbs (14 right, nine left) followed mean 59.69 ± 15.14 months. Radiologic evaluation was made according to the Eaton classification and 11 thumbs were found grade 2, 12 thumbs were found grade 3. Preoperative and final evaluation were made according to VAS, Buck-Gramcko score, grip and pinch strengths, the ability to touch the thumb to the palmar crease of the little finger.

Results: The preoperative VAS was 7.13 ± 0.86 and thumb web space was 23.30° ± 2.40°. The preoperative strength was 13.15 ± 0.74 kg for grip strength, 2.78 ± 0.47 kg for tip pinch strength and 4.13 ± 0.86 kg for lateral pinch strength. The trapeziometacarpal subluxation was found in varying proportions (10%-80%). None of the thumbs could touch the palmar crease of the little finger. The final outcome was 0.91 ± 1.44 for VAS, 19.28 ± 1.38 kg for grip strength, 4.45 ± 0.33 kg for tip pinch strength, 5.60 ± 0.52 kg for lateral pinch strength and 38.17° ± 2.38° for thumb web space. Mobility of the thumbs were improved; 19 thumbs could touch the base of the fifth finger, and five thumbs could touch the crease of the proximal interphalangeal joint. We compared only one side operated 15 patients’ hand with healthy hand, the grip strengths were measured as 82.5%, tip pinch strengths was measured as 78.3%, lateral pinch strengths was measured as 74.8%. Radiographically, all thumbs remained stable. There was no subluxation of the metacarpal base or loss of the height of arthroplasty space. Clinical results, according to Buck-Gramcko scores, were excellent in 12 patients, good in six, and fair in one patient.

Conclusions: Ligament reconstruction and tendon interposition arthroplasty with the use of the full thickness of the flexor carpi radialis tendon relieves pain and provides stable and functional restoration of the thumb.

Key words: Trapeziometacarpal osteoarthritis, ligament reconstruction and tendon interposition arthroplasty, metacarpophalangeal joint surgery, thumb surgery.

A-0183 Short and long-term effects of fibrin conduit with human mesenchymal stem cells and immunosuppression after peripheral nerve repair

A McGrath, R Wiberg, M Brohlin, P Kingham, L Novikov, M Wiberg, L Novikova
(1) Department of Integrative Medical Biology, Section for Anatomy, Umeå University, Umeå, Sweden
(2) Department of Surgical and Perioperative Science, Section for Hand and Plastic Surgery, Norrland’s University Hospital, Umeå, Sweden
Despite improvement in surgical techniques and substantial experimental efforts, nerve gap repair still results in suboptimal outcome. Recently, we showed that an artificial nerve conduit molded from fibrin glue and supplemented with human mesenchymal stem cells (hMSC) and cyclosporine A (CsA) treatment can drastically enhance the regeneration distance across a 10 mm sciatic nerve gap three weeks after immediate nerve repair (McGrath et al., 2012). The present study investigated the long-term effects of this conduit on neuronal regeneration, recovery of muscle weight and muscle morphology following sciatic nerve injury and repair in adult rats. Human MSC were characterized using mesenchymal stem kit against surface marker antigens and extracellular matrix. RT-PCR analysis of these cells revealed expression of neurotrophic and angiogenic factor transcripts NGF, GDNF, NT-3, BDNF, IGF-1, VEGF-A and angiopoietin-1. After rat sciatic nerve transection, the injury site was repaired with: (i) fibrin conduit containing diluted fibrin matrix, (ii) fibrin conduit containing diluted fibrin matrix in combination with CsA treatment, and (iii) fibrin conduit containing fibrin matrix with hMSC and CsA treatment. A reversed autologous nerve graft was used as a control. At 12 weeks after sciatic nerve injury and repair with autologous nerve graft, 1770 ± 73 S.E.M. spinal motoneurons regenerates across the distal nerve-graft interface. Fibrin conduit supported regeneration of 34% of spinal motoneurons when compared with the nerve graft group. CsA treatment alone or in combination with hMSC promoted regeneration of 67% and 64% motoneurons, respectively. The gastrocnemius muscle weight after nerve grafting was 62.20 ± 2.63% of the contra-lateral side and was significantly reduced to 21.40 ± 2.20% when the sciatic nerve was repaired with fibrin conduit containing fibrin matrix alone. The mean area and diameter of fast type fibers were also significantly decreased. Treatment with CsA alone or CsA combined with hMSC transplantation induced recovery of the muscle weight and the size of fast type fibers to the control levels of the nerve grafting group. The results indicate that although hMSC expressed growth-promoting factors necessary for successful nerve regeneration, the neuroprotective and growth-promoting effects of CsA treatment alone were similar to CsA treatment combined with hMSC transplantation.

A-0188 Wrist trauma in children and adolescents causes distal radioulnar joint instability

J Andersson1, –T Lindau2, J Karlsson1, –J Fridén1

Purpose: Children’s fractures of the distal radius, ulna and forearm are typically assumed to be simple to treat and that they remodel easily. Consequently, these injuries are most often treated non-surgically with closed reduction and cast immobilization. We have gained increasing experience over the last decade that wrist trauma diagnosed as fractures and/or sprains, are often not simple injuries that all do well. It is also presumed that destabilizing ligament injuries are unusual in children and adolescents, as the weak point is the bone. As a consequence, little is known and published about post-traumatic course in children and adolescents. The aim of this study was to analyze long-term consequences of wrist trauma in children and adolescents.

Methods: We reviewed medical records and radiographs of all patients that were referred for second opinion due to ulnar-sided wrist pain between 2006–2011 to the Department of Hand Surgery, Gothenburg, Sweden. We identified 85 patients who had sustained a significant wrist trauma with or without a fracture before the age of 18. We assessed the type of trauma, treatment, time to diagnosis of distal radioulnar joint (DRUJ)-instability and number of operations. Median age at trauma was 14 years (range 6.6–17.8 years). The left non-dominant side was more commonly injured (64%, 54 cases), mainly in girls (55%, 47 cases).

Results: The median time from trauma to diagnosis of DRUJ-instability was 3 years (range 0–18 years). Sixty-seven of the 85 patients (79%) demonstrated a fracture at the initial trauma. The remaining 18 patients (21%) had no fracture; yet presented with an isolated DRUJ-instability at the long-term follow-up. The most common skeletal injury related to DRUJ-instability was Salter-Harris type II fractures (in total 20 of 67 fractures). The second most common skeletal injury was distal radius fracture (in total 16 of 67). Both of these injuries most often had a significant initial displacement and/or a concomitant fracture of the ulnar styloid. In 19 patients (22%) the DRUJ-instability were caused by malunion after displaced fractures and growth arrest after Salter-Harris III–IV fractures. Eighteen of the 85 cases presented with late DRUJ-instability without having any previous fracture. Fourteen of those 18 were diagnosed having a TFCC-tear, either by arthroscopy, open surgery or MRI. Altogether, 105 operations were performed in the 85 patients (mean: 1.3 operations/patient). We did arthroscopically assisted or open TFCC-reattachment.
in 23 cases and radius corrective osteotomy or ulnar shortening osteotomy preferably in the cases of malunion.

**Conclusions:** We found a significant amount of late presented DRUJ instability after fractures and sprains in children or adolescents. There was a significant delay from trauma to diagnosis. We also found DRUJ-instability caused by isolated TFCC-tears without any associated fracture, which previously has been almost unheard of in this population. We suggest more caution in dealing with wrist trauma in children, especially displaced Salter-Harris type II fractures.

**A-0189 Is simple decompression enough for the treatment of cubital tunnel syndrome: a prospective comparative study analyzing the outcomes of simple decompression versus medial epicondylectomy**

O Şahin, MS Şahin, RC Akgün, I Kuru, İÇ Tuncay, G Çakmak
Baskent University Hospital, Ankara, Turkey

**Purpose:** The gold standard treatment method for cubital tunnel syndrome is controversial. The purpose of this study is to compare the clinical and functional outcomes of simple decompression, and medial epicondylectomy surgeries for the treatment of cubital tunnel syndrome.

**Materials and Methods:** Forty-five patients who had undergone cubital tunnel surgeries were included in this study. All patients' syndromes were graded according to McGowan grading system before surgeries. 21 patients underwent simple decompression without any transfer (group 1) and 24 patients underwent medial epicondylectomy (group 2). Subjective parameters of visual analog scale (VAS), subluxation, sensory and motor symptoms and DASH (disabilities of arm, shoulder and hand) scores were recorded before and after surgery. Two-point discrimination, Tinnel, Froment, Wartenberg, atrophy, clawing, pinch and key holding forces were evaluated as objective parameters. In final control, all patients were graded according to McGowan grading system and clinical results were obtained with modified Wilson and Krout system. Results were compared statistically between two groups.

**Results:** Twenty-five male, 20 female patients, average age 41.2 (range 34–47) and average follow-up 27.3 months (24–36). There was no statistically significant difference between two groups in regard to subjective and objective parameters. According to McGowan grading system, the success rate was found as 88.8% (40/45). Two patients in group 1 and one patient in group 2 had poor clinical results. All other patients had excellent, good or fair results.

**Conclusion:** We believe that, surgeon experience and choice is the mainstay of the treatment. Simple decompression is enough to obtain comparable clinical and functional results. Nevertheless, it has some drawbacks. To achieve an acceptable decompression, an extensive ulnar nerve dissection is necessary leading to risk of nerve ischemia. On the contrary, with medial epicondylectomy, as the nerve is transferred anteriorly with elbow flexion, no extensile nerve dissection is necessary for decompression.

**A-0192 “The double lesion” of the TFCC injury**

Y Abe
Saiseikai Shimonoseki General Hospital, Shimonoseki, Japan

The TFCC tear is recognized as a major cause of ulnar-sided wrist pain. We have sometimes encountered two different tears coexisting in one wrist, an injury we define as “the double lesion” and describe here. Records of 336 wrists subjected to arthroscopy were examined retrospectively, and the double lesion was identified in 28 wrists. The patterns were combinations of a slit tear and an ulnar styloid tear (n = 18 wrists), a dorsal tear and a loveal tear (n = 3), a slit tear and an unlocarpal ligament tear (n = 2), and other various combinations (n = 5). Of the 28 wrists, 24 demonstrated the combination of a disk tear and a peripheral tear. Our results suggest that surgical treatment should involve not only debridement of disk tears but also repair of peripheral tears. Surgeons need to be cognizant of “the double lesion” injury of TFCC.

**A-0196 An alternative endoscopic portal for suprascapular nerve: an anatomic study**

A Üzümçügil¹, G Huri², S Biçer³, M Ayvaz¹, H Öztürk⁴, MN Doral⁵
(¹) Hacettepe University, Ankara, Türkiye
(²) Johns Hopkins University, Baltimore, USA
(³) Çukurova University, Adana, Türkiye
(⁴) Mersin University, Mersin, Türkiye

**Introduction:** Suprascapular nerve entrapment has been noticed as a cause of shoulder pain and dysfunction. It is usually caused by compression at suprascapular notch by superior transverse scapular ligament (STSL). Although there are clearly defined decompression procedures in the treatment, arthroscopic release has not been as popular as the open procedures. Arthroscopic portals for suprascapular nerve are case dependent because they are defined as distances from reference points. Aim of this study is to evaluate applicable anatomic landmarks in a
cadaveric model that can be identified using proportions rather than distances, for reliable and reproducible endoscopic release of STSL.

**Material and Methods:** 24 shoulders of 12 cadavers were used in the study. Average age of the cadavers was 55.8 years (range 45–72 years). No specimen had prior history of significant trauma or previous upper extremity surgery. Open dissection of suprascapular notch was done to the left and endoscopy was performed to the right shoulders. A straight line was drawn between the posterolateral prominence of acromion (PLA) and spinous process of T1 (SPT1). Then dissection of the suprascapular notch (SSN) and nerve was performed to left side in prone position. PLA, SSN and SPT1 were marked with K-Wires. Distances between PLA-SSN and PLA-SPT1 were measured by using a digital caliper and repeated three times by different investigators. The proportions of the distances between PLA-SSN to PLA-SPT1 were calculated (PLA-SSN/PLA-SPT1) and average of the proportions was recorded. Then, an arthroscopic portal, which was thought to be an applicable anatomic landmark to approach SSN, was supposed according to this average proportion. The accuracy of the portal was then checked by standard shoulder arthroscopy through the lateral portal.

**Results:** The average distance between posterolateral acromion and spinous process of T1 were calculated as 180.4 mm (range 167.3–205.4), and the average distance between posterolateral acromion and suprascapular notch was calculated as 73.9 mm (range 68.1–85.8). The average of the proportions between PLA-SSN to PLA-SPT1 (PLA-SSN/PLA-SPT1) was 40.9%. The accuracy of using this proportion to define the endoscopic portal was found consistent in endoscopic SSN approach. Arthroscopic investigation, it is observed that the portal that is created away from SLA up to 41% of PLA-SPT1 distance through the line between PLA-SPT1, allows easy approach to SSN.

**Conclusion:** The portal that is located at the lateral 41st percent of PLA-SPT1, is safe, applicable and reproducible not only for SSN endoscopy, but also for open procedures.

**A-0200 Critical analysis of causality between negative ulnar variance and Kienböck's disease**

S Stahl1, A Santos Stahl2, C Meisner3, P Hentschel1, S Valina2, O Luz4, H-E Schaller1, O Lotter1

[1] Department of Plastic, Hand and Reconstructive Surgery, Burn Center, BG-Trauma Center, Eberhard-Karl University of Tübingen, Tübingen, Germany

**Background:** Negative ulnar variance (UV) has been associated with Kienböck’s disease (KD), supporting both a causal link and providing a basis for therapeutic recommendations.

**Questions/purposes:** The aim of this study was to determine if there is a causal relationship between negative UV and KD.

**Patients and Methods:** The causal relationship between negative UV and KD was assessed using three methodologies, including: 1) an analysis of the quantitative and qualitative distribution of UV in a case-control study of 80 patients with KD and a control group of 212 healthy wrists; 2) a systematic literature search and meta-analysis of five case-control studies (including the herein presented case-control study) to test for association between negative UV and KD; and 3) a determination of causal relationship by the Bradford Hill criteria.

**Results:** The case-control study indicated that when KD is associated with negative UV (n = 57), negative UV was equal (29/57) or less (18/57) pronounced on the contralateral healthy side. The odds ratio generated from the meta-analysis demonstrated a significant association between KD and negative UV (odds ratio: 2.01, 95% confidence interval: 1.06–3.81, p = 0.03, random effects method). Six out of nine Bradford Hill criteria do not support a causal relationship.

**Conclusions:** The significant association between KD and negative UV can be explained by selection bias since the ulnar impaction syndrome is an exclusion criterion of the KD group. The application of the Bradford Hill criteria does not provide sufficient scientific evidence to support a causal relationship between negative UV and KD.

**A-0206 Extensor tendon ruptures after volar locking plate fixation for unstable distal radius fractures**

Y Chung, S Kang, J Lee, SK Choi, M Joo, J Chung

Department of Orthopedic Surgery, College of Medicine, The Catholic University of Korea, Seoul, Korea

**Purpose:** Volar locking plates have been widely used with the advantage of reduced dorsal soft tissue complication (extensor tendon rupture or tendonitis), a major complication of dorsal plate fixation. However,
extensor tendon ruptures still occurred after volar locking plate fixation. We analyzed extensor tendon ruptures occurred after volar locking plate fixation for unstable distal radius fractures retrospectively.

Materials and Methods: This study included a total of 280 patients with unstable distal radius fractures who underwent open reduction and internal fixation (ORIF) between November 2003 and September 2011. Of these patients, 152 underwent ORIF with Synthes vertical T-plates or Synthes oblique T-plates (Synthes, Solothurn, Switzerland), and 128 underwent ORIF with Acu-loc Targeted distal radius plates (Acumed, Hillsboro, OR). The mean follow-up period was 15.2 months (range: 6–54 months). Of these patients, extensor pollicis longus (EPL) rupture occurred in seven patients, and extensor indicis proprius (EIP) rupture occurred in one patient. The mean time interval between the operation and the diagnosis of extensor tendon rupture was 7.9 months (range, 3–15 months). The mean age of the patients was 56.8 years (range, 14–87 years). As for the fracture pattern, there were six cases of AO classification type C3 and two cases of type C2.

Results: Of the 152 patients undergoing ORIF with Synthes plates, six (3.9%) developed extensor tendon rupture (EPL: 5, EIP: 1). Of the 128 patients undergoing ORIF with Acu-loc palates, two (1.6%) developed EPL rupture. However, there was no significant difference in the occurrence of EPL rupture between different plate groups (P > 0.05). For the treatment of EPL rupture, EIP tendon transfer was performed in five patients, and EPL trimming was performed in one patient. The EPL ruptures were related to the protrusion of screw tips in four patients, under-reduced dorsal fragments in two patients, drill bit penetration during the initial operation in two patients.

Conclusion: Extensor tendon rupture after volar locking-plate fixation still remains a problem. The potential causes of this complication include screw tip protrusion, drill-bit penetration and under-reduced dorsal fragments, and these causes, alone or in combination, lead to tendon rupture. Proper selection of implants and special care for those causes during surgery are necessary to prevent extensor tendon injury.

A-0210 Results after volar radioscapholunate arthrodesis with resection of the distal scaphoid pole as salvage procedure related to intra-articular arthrosis after volar fixed angle plating

C Pezzei, S Quadlbauer, J Jurkowitsch, M Leixnering, T Beer
Lorenz Böhler Trauma Hospital, Vienna, Austria

Purpose: Volar fixed-angle plating of displaced distal radius fractures has become a very popular technique in the past years. In some cases malunion leads to bad clinical results with massive radiocarpal arthritis and furthermore to stiffness and pain. Also, secondary loss of reduction, especially under osteoporotic conditions, or volar translation of the carpus may cause an intra-articular 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: 14 patients were treated from March 2006 to March 2009. The average age of the patients was 50.6 years (range 41–66). The surgical technique contains a volar approach, previously placed hardware removal if necessary, distal scaphoidectomy, cancellous bone graft and radioscapholunate arthrodesis with a locking frame plate placing each two 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 relief 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-0214 The economic and socio-political implications of the disparity of hand surgery training in Europe

E Melikyan
University Hospital Southampton, Southampton, UK

The speciality of hand surgery has been present under various specialty umbrellas since the early part of the 20th century. However specialist training and accreditation pathways for hand surgery are still poorly defined with major discrepancies between European countries. Furthermore, frequent regulatory changes contribute to the confusion. The aim of this study is to model the costs of training a hand surgeon in different FESSH countries and to establish the differences of accreditation requirements in Hand Surgery in Europe.
Latest guidance of the UEMS (European Union of Medical Specialists) was assessed as well as the current legislation of FESSH countries from a viewpoint of hand surgery training and accreditation. The average cost of training a specialist hand surgeon was calculated using economic data from the OECD. The results show that there is a wide variation of the expenditure required to train a hand surgeon. The degrees and diplomas leading to specialist certification are also diverse.

We conclude that closer alignment of training and accreditation in hand surgery between the FESSH countries is long overdue. There is unnecessary duplication of exams, titles and training pathways in these countries with no transparency and comparability of degrees awarded. This leads to division of Europe’s scientific and clinical acumen and is economically unsustainable at a time of austerity. Ongoing disparity of degrees and qualifications significantly impairs professional interaction and freedom of movement for professionals in Europe. Most importantly, modelling of training costs indicate that the current training pathways are not sustainable.

A-0215 Percutaneous cannulated screw fixation in the treatment of extra-articular distal radius fractures: a comparative study

A Gereli, U Nalbantoglu, B Kocaoglu, M Turkmen
Acibadem University Department of Orthopaedics and Traumatology, Istanbul, Turkey

Purpose: Closed reduction with percutaneous pin fixation has been the most common treatment method for unstable extra-articular distal radius fractures. However, specific limitations have decreased its popularity over time. These disadvantages may have contributed to the reported trend toward open reduction and volar locked plate fixation in surgical techniques for distal radius fracture. There are different options available for fixation of distal radius fractures without the risks of open surgery. Cannulated screw technology is one of these options. The present retrospective study was designed to demonstrate the efficacy of cannulated screw fixation by comparing it with volar locking plate fixation.

Methods: We analysed outcome data for 55 patients aged between 18–60 with AO type A 2–3 fractures treated with closed reduction, percutaneous cannulated screw fixation (CRPCS n:30) or open reduction volar locking plate fixation (ORVLP n:25). Data was gathered to compare the wrist range of motion, grip strength, Gartland and Werley and QuickDASH scores at two-months after surgery, and the final follow-up (mean:31 months). Operative time and return to independent function were reviewed. Deterioration in radiographic parameters were compared. Complications were analysed. A difference was considered to be statistically significant when p < 0,05 and p < 0,01.

Results: At the two-months follow-up, there were no significant differences between the groups with respect to grip strength or range of motion, except pronation; it was better in the CRPCS group (p:0,044). Difference between the groups in supination was pronounced, but did not reach significance (p:0,092). At the final follow-up ,the range of motion, grip strength, Gartland-Werley and QuickDASH scores were similar for each group and lacked statistical significance. Return to pre-injury activity level was 2,5 [SD:0,8] months in the CRPCS group and 2,1 [SD:0,8] months in the ORVLP group. There were no significant differences between the groups (p:0,093). CRPCS group had significantly shorter operative time (p:0,001). In the CRPCS group, the mean loss in radial height and ulnar variance were smaller, but reached significance (p = 0,014 and 0,001, respectively). Losses of volar tilt and radial inclination did not differ significantly between the early post-operative and final follow-up (p:0,248 and 0,062 respectively). In the ORVLP group, the mean loss in volar tilt (p:0,002), radial height (p:0,022), radial inclination (p:0,001) and ulnar variance (p:0,029) were smaller but reached significance between the early post-operative and final follow-up. Group comparison for the deterioration of radiologic parameters showed no significant difference. Tendon irritation was detected in one patient in each group.

Conclusions: Open reduction and volar locking plate fixation provides no clear advantage over closed reduction and percutaneous cannulated screw fixation in the treatment of extra-articular distal radius fractures. Cannulated screw fixation provides shorter operative time and internal fixation without open surgery. It appears to be an effective means of allowing immediate range of motion of the wrist. This results in a rapid and comfortable functional recovery while maintaining alignment to bone healing similar to volar plating. It may be consider as a treatment option in the case of young, active individuals with extra-articular distal radius fracture.

A-0216 The use of local anesthesia with adrenaline to give higher comfort to the patient in hand surgery: a prospective randomized trial

B von Maydell, M Richter
Order of Malta Hospital, Bonn, Germany
The use of local anesthesia with adrenaline in hand surgery (‘wide awake surgery’) offers the deletion of tourniquet control, which is supposed to give higher comfort to the patient. In a prospective-randomized trial we analyzed if this is given in small hand surgery procedures and if the method bears any other advantages or disadvantages.

We block-randomized patients suffering from carpal tunnel syndrome (CTS, n = 84) and trigger finger (TF, n = 42) to receive either local anesthesia with lidocaine and tourniquet control (LAT-group) or lidocaine with adrenaline without tourniquet (WAS-group). Surgery was exclusively performed by two senior hand surgeons. Patients were asked to score the amount of pain during injection, their comfort during the procedure and their level of anxiety about future surgery using a 1–10 visual analogue scale (VAS) four days after surgery. We compared the time we needed for surgery, the complications and the operation results.

The average time for carpal tunnel release was 11 min in the WAS-group and 9,5 min in the LAT-group (7,5 min (LAT)/8,3 min (WAS) in trigger finger release). Despite a high patient satisfaction with “wide awake” surgery at the time of operation, in the assessment of pain, comfort and anxiety four days after surgery there was no difference between both groups. The short-time operation results were similar but in the WAS-group we had one incomplete release.

In short surgical procedures such as carpal tunnel and trigger finger release there seems to be no significant difference in the patients’ retrospective assessment although patient comfort is much higher in “wide awake” hand surgery at the time of surgery. Length of time of surgery and overall results are almost the same. As hand surgery with adrenaline vasoconstriction is not as bloodless as with exsanguination and tourniquet we recommend this method should be used by experienced hand surgeons.

A-0220 Clinical examination of extrinsic ligaments of the wrist: a new method

E Camus1, L van Overstraeten2
SELARL Chirurgie de la Main, Lesquin, France
HFSU, Tournai, Belgium

Ligament injuries of the wrist are often unknown or neglected diagnoses. A clinical examination allows to estimate fairly the state of intrinsic scapholunar or lunotriquetral ligaments. But carpal instability implies lesion of one or more extrinsic ligaments in addition to the intrinsic lesion. Currently, the diagnosis of extrinsic lesion is rare. It is based on the arthroCT, difficult to interpret, and arthroscopy, not quickly available. The authors propose a clinical examination to assess five extrinsic ligaments, which are considered important secondary restraints in the overall stability of the carpus.

Course, origin and ends of the radio-scapho-capitate (RSC), long radio-lunate (LRL), dorsal radiocarpal (DRC), dorsal intercarpal (DIC) and triquetro-hamate (TH) ligaments were identified from the literature and confirmed on cadaveric preparations. Thirty intact wrists have been clinically and fluoroscopically tested on fifteen volunteers to assess a clinical database. A clinical testing of drawer shift could be set for each of these ligaments.

The RSC ligament is tested by a dorsal and ulnar shift of the wrist from a posture combining extension / ulnar inclination / supination.

The LRL ligament is tested with an ulnar-dorsal shift from a posture associating extension / radial tilt / supination.

The DRC ligament is tested with an ulnar shift from a posture associating flexion / radial tilt / pronation.

The DIC ligament is tested with an ulnar shift from a posture associating flexion / ulnar tilt / pronation.

The THC ligament is tested with a volar-radial shift from a posture associating extension / ulnar tilt / supination.

This examination needs to be evaluated with traumatic and degenerative wrists to confirm the interest of those tests.

A-0221 The Scapholunate Complex: a new concept. The role of the dorsal capsulo-scapholunate septum as secondary stabilizer. A cadaveric arthroscopic and fluoroscopic study

L van Overstraeten1, E Camus2, A Wahegaonkar3, J Messina4, A Tandara5, A Cambon Binder6, C Mathoulin6
(1) HFSU, Tournai, Belgium
(2) Polyclinique du Val de Sambre, Maubeuge, France
(3) Hand Surgery Associates, Pune, India
(4) Istituto Ortopedico Gaetano Pini, Milano, Italia
(5) Heidelberg University Hospital, Frankfurt, Germany
(6) Institut de la main Clinique Jouvet, Paris, France

Introduction: The Dorsal Capsular Scapholunate septum (DCSL) connects the dorsal capsule, the Dorsal InterCarpal ligament (DIC), the Scapholunate InterOsseous ligament (SLIO), the scaphoid and the lunate bones. It could play an important role as scapholunate stabilizer. The goal of this study is to verify if the DCSL participates to the scapholunate stability.
Material and Methods: Arthroscopic sequential sections of DCSL, SLIO, DIC have been performed on ten fresh cadaverous wrists. An arthroscopic checking of ScaphoLunateSL stability and fluoroscopic checking with and without axial load have been performed after each ligamentary sectioning.

Results: Arthroscopic instability increases significantly with the number of sectioned ligaments (p < .0005). The DCSL sectioning produces an arthroscopic SL dissociation without any fluoroscopic change. The combined DCSL and dorsal SLIO sectioning increases the arthroscopic predynamic instability. But it gives only a very little and inconstant fluoroscopic dynamic instability with load, and no static instability. The supplementary DIC sectioning gives a severe arthroscopic instability, an inconstant fluoroscopic dynamic instability and a very little static instability.

Discussion: The only DCSL sectioning produces no more than a pre-dynamic arthroscopic SL dissociation. The associated dorsal SLIO and DCSL sectioning produces an arthroscopic dissociation at least pre-dynamic which becomes fluoroscopically dynamic or static. The complete arthroscopic SL dissociation needs the associated dorsal SLIO, DCSL and DIC sectioning.

Conclusion: This added sectioning of DIC produces a fluoroscopic SL dissociation. However it doesn’t seem to be the same as the SL dissociation obtained after dorsal SLIO sectioning. This produces a gap without horizontalization of the scaphoid. The sectioning of DIC ligament produces a scaphoid horizontalization without measurable radiological SL gap.

A-0224 Motor nerve recovery after autologous nerve graft is not enhanced by vascular endothelial growth factor administration in the rat

J-Y Lee1, G Giusti2, P Friedrich2, A Bishop2, A Shin2
1) Department of Orthopedic Surgery, the Catholic University of Korea
2) Microvascular Research Laboratory, Mayo Clinic, Rochester, USA

Purpose: It has been known that vascular endothelial growth factor (VEGF) stimulates Schwann cell invasion and new vessel formation which might be beneficial for nerve regeneration. We hypothesized that administration of VEGF enhances motor nerve recovery after autologous nerve graft in the rat model.

Methods: Sixty-nine rats were randomly divided into three experimental groups and a unilateral 10 mm sciatic nerve defect was made. Group I was repaired with reversed autograft, group II received an osmotic pump with VEGF, and group III added a silicone tube around the nerve graft to decrease the surrounding blood supply. Nine animals in each group were sacrificed on Day 3 to evaluate improvement in capillary formation using imaging software. Fourteen animals in each group were sacrificed on 16 weeks after initial procedure to evaluate the functional motor nerve regeneration using compound muscle action potential, maximum isometric tetanic force and wet muscle weight of the tibialis anterior and passive ankle plantar flexion angle.

Results: The average capillary density on Day 3 was 10.7 ± 3.8% in group I, 21.4 ± 5.3% in group II, 0.9 ± 0.9% in group III. These differences were significant (p < .001, p < .001, respectively). However, the average maximum isometric tetanic force at 16 weeks was 54.4 ± 10.6% in group I, 57.5 ± 13.6% in group II, 47.6 ± 14.2% in group III. No difference was found with or without VEGF administration (p = 1.000). Although the muscle force was generally worse in group III, this difference was not statistically significant (p = .232, p = .643, respectively).

Conclusions: Early capillary formation on autologous nerve graft is enhanced by VEGF administration. However, the neovascularization effect of VEGF administration does not translate into better motor nerve recovery in the long term.

A-0225 Does the addition of a nerve wrap to a nerve repair affect motor outcomes?

J-Y Lee1, T Parisi2, P Friedrich2, A Bishop2, A Shin2
1) Department of Orthopedic Surgery, the Catholic University of Korea
2) Microvascular Research Laboratory, Mayo Clinic, Rochester, USA

Purpose: Primary nerve repair is often complicated by fibroblastic scar formation and traumatic neuroma formation. The use of bioabsorbable conduit has been shown to decrease epineural connective tissue formation, which may improve outcomes of these repairs. We hypothesized that the use of a Bioabsorbable nerve conduit improves motor nerve recovery after primary nerve repair in the rat model.

Methods: Forty rats were randomly divided into two experimental groups according to the type of repair of the rat sciatic nerve: group I had primary suture repair; group II had primary suture repair and bioabsorbable collagen nerve conduit (NeuraGen® 1.5 mm, Integra LifeSciences Corp., Plainsboro, NJ) wrapped around the repair. At twelve weeks, the rats were sacrificed to evaluate the functional motor nerve regeneration...
using compound muscle action potential, maximum isometric tetanic force, wet muscle weight of the tibialis anterior and nerve histomorphometry.

Results: At twelve weeks, no significant difference in the percentage of recovery between the primary repair and the primary repair plus conduit was observed with respect to compound muscle action potentials, isometric muscle force and muscle weight (p = 0.816, p = 0.698, p = 0.861, respectively). Histomorphometric analysis as compared to the non-operative sites was also not significantly different between the two groups in terms of total faszicular area, number of myelinated axons, nerve fiber density and myelin area (p = 0.801, p = 0.368, p = 0.589, p = 0.677, respectively). However, epineural connective tissue formation was significantly greater in the primary suture repair group than in primary repair plus conduit wrapping group.

Conclusions: Wrapping bioabsorbable nerve conduit around primary nerve repair can decrease epineural connective tissue formation. However, the scar-decreasing effect of bioabsorbable nerve wrap does not translate into better motor nerve recovery.

A-0229 Innervated digital artery perforator flap: description of a new technique and preliminary results

H Ozcanli1, OK Coskunfirat2, G Bektas2, A Cavt1
(1) Akdeniz University Faculty of Medicine Department of Orthopedics, Antalya, Turkey
(2) Akdeniz University Faculty of Medicine Department of Plastic and Reconstructive Surgery, Antalya, Turkey

Purpose: The fingertip is the most commonly injured part of the hand. Replantation of the fingertip is the first option in the treatment of amputation. In cases where the amputated part is not available for replantation, reconstruction of composite tissue loss in the fingertip can often be difficult. Described herein is a new technique for covering digital defects of the fingers: the innervated digital artery perforator (IDAP) flap.

Patients and Methods: A total of 17 patients were operated on with the IDAP flap. The size of the flaps varied between 2 x 1 cm and 3.5 x 2 cm. Post-operative evaluation of the patients consisted of the Semmes Weinstein monofilament (SWM) test, static two-point discrimination (s2PD), patient satisfaction, active range of motion, and complications.

Results: All IDAP flaps survived completely. None of the patients required secondary interventions. The mean follow-up period was 7.1 (Range: 6–10) months. The SWM test results ranged from 3.22 to 3.84. The s2PD in the flaps ranged from 2–4 mm (mean 3.4 mm), compared to a range of 2–3 mm (mean 2.7 mm) on the contralateral hand. For the reconstructed fingertips there were no joint contractures, two patients had mild hook nail deformity, one patient had mild cold intolerance and one patient showed mild post-operative hypersensitivity.

Discussion: Several fingertip reconstruction techniques are reported in the literature. The advantages of the IDAP flap include less invasive surgery, a reliable, versatile flap, and the ease of the technique for different-sized, or fingertip defects reconstructions, with few complications. The IDAP flap is a versatile flap and should be considered for use in all acute fingertip amputations and revisions of previously reconstructed fingers.

A-0231 Volar perforators of common digital arteries and their possible implications in skin reconstruction: anatomical study

V Gasiunas, S Valbuena, P Valenti, D Le Viet
Clinique de l’Alma, Paris, France

Purpose: The skin of the palm triangle is an area highly vascularised by perforator arteries arising from the common digital palmar arteries (CDPA). The aim of this paper was to perform an anatomical study to systematize the palmar cutaneous perforators of CDPA and irrigation of the palm that allows a design of a new palmar perforator flap.

Methods: Sixteen fresh anatomical specimens were included in this study, 12 of which were injected with coloured silicone. The purpose of the dissection was to identify and quantify the number of perforator arteries of each CDPA in the 2nd, 3rd, and 4th intermetacarpal space, measure the distance between them, measure the distance between the distal perforator and corresponding commissure, as well as the distance between the most proximal perforator artery and the superficial palmar arch.

Results: We found at least four constant perforator arteries on each CDPA. Four to eight perforator arteries were arising from the CDPA of the 2nd, 3rd, and 4th intermetacarpal space. The average distance between the perforator arteries was 6.5 mm. The mean distance between superficial palmar arch and proximal perforator artery was 8.1 mm. The distance between the distal perforator artery and the corresponding commissure to the digital collateral artery was on average 6.3 mm.

Conclusions: This study shows a possibility to raise a “propeller” flap based on constantly found CDPA perforators.
A-0233 Second ray transposition in cleft and synbrachydactyly

A Aydin, O Berkoz, U Aydin, T Ozkan, M Erer, Z Yildirim, S Ozkan
Istanbul Medical Faculty Plastic and Reconstructive Surgery Department, Istanbul, Turkey

Purpose: Cleft hand deformity and synbrachydactyly are rare congenital anomalies. In order to achieve a wide 1st web, to correct radialised second finger and fill the gap between second and fourth fingers, second ray transposition is frequently performed by hand surgeons. We would like to present our experience in cleft and synbrachydactyly patients, with the pitfalls and results about this technique.

Methods: We operated six cleft and four cleft type synbrachydactyly patients between 2006–11 [age 3–19]. Metacarpal osteotomy of the second ray, transposition on the third ray and fixation with K-wires were performed. Metacarpal ligament reconstruction was utilised with A1 pulley bond between new third ray and fourth ray. Adductor pollicis muscle release and reconstruction, dorsal interosseous muscle release were also added. Post-operative regime was after four weeks of immobilisation thermoplastic orthosis was used for at least two months.

Results: The osseous union was good in all cases but radial deviation of the second ray was observed in two needing longer orthosis application. Although the alignment and aesthetic appearance of the transposed ray was good, the function was disappointing in terms of flexion, probably because of joint problems.

Conclusions: There are important steps in second ray transposition, to avoid circulation, bone instability complications and although the goal of transposition is gained; function of the finger can not be expected because of the joint and brain plasticity problems.

A-0234 Ultrasonographic quantification of intrinsic hand muscle cross-sectional area: reliability and validity for predicting muscle strength

B Mohseny1, THJ Nijhuis1, CA Hundepool1, JB Jaquet2, X Smit1, SER Hovius1, JH Coert1, WGM Janssen3, RW Selles1
[1] Department of Plastic, Reconstructive and Hand Surgery, Erasmus Medical Center, Rotterdam, the Netherlands
[2] Department of Plastic, Reconstructive and Hand Surgery, Maasstad Hospital, Rotterdam, the Netherlands
[3] Department of Rehabilitation Medicine, Erasmus Medical Center, Rotterdam, the Netherlands

Purpose: Adequately assessing the rate and quality of nerve regeneration after nerve reconstruction can result in better rehabilitation, but can also provide hand surgeons a tool to monitor progress. Dynamometry often measures combined strength of several muscles, which does not directly represent regeneration of one specific nerve. Furthermore, dynamometry can only be used in patients who score MRC grade III or more with manual muscle testing. Also their measurements are influenced by many factors. A more applicable technique, which allows monitoring early re-innervation in particular, is needed. The purpose of this study was to assess whether ultrasonographic measurement of the cross-sectional area (CSA) of the intrinsic hand muscles can be used as a valid and reliable method to monitor muscle re-innervation in patients suffering from peripheral nerve injury.

Methods: In 31 healthy adults and 11 patients with ulnar and median nerve injuries between the wrist and the elbow, ultrasound and strength measurements of the intrinsic hand muscles were conducted bi-laterally. The CSA of two intrinsic hand muscles innervated by the ulnar nerve (the abductor digiti minimi and the 1st dorsal interosseus muscle) and two muscles innervated by the median nerve (the abductor pollicis brevis and the opponens pollicis muscle), were assessed using a portable ultrasound device. Before measurements were performed, the locations for measuring the CSA of the muscles were standardized to find the most reproducible measure of the intrinsic hand muscles at, or close to, their thickest point. To establish validity CSA measurements were related to strength measurements of the same muscles, conducted with the Rotterdam Intrinsic Hand Myometer (RIHM). Repeated measures were conducted to assess reliability. Between-limb comparison was conducted to assess whether the contralateral side can serve as internal control for patients with unilateral injuries.

Results: CSA of the assessed muscles strongly correlated with the strength measurements, with correlations ranging from 0.82 to 0.93 (p < 0.01) in healthy volunteers and 0.94 (p < 0.01) for the opponens pollicis muscle and 0.97 (p < 0.01) for 1st dorsal interosseus muscle in the patients. The repeated measurements of the CSAs with the ultrasound showed excellent intra-rater reliability (ICCs ranging from 0.99 to 1.00, p < 0.01) and good inter-rater reliability (ICCs ranging from 0.88 to 0.95, p < 0.01) in the healthy volunteer group. Normalized smallest detectable difference (SDD) ranged between 4% to 8% for the intra-rater reliability and between 15% to 25% for the inter-rater reliability. Between-limb comparison showed a side-to-side variability of 3% to 5% for the CSAs and 5% to 10% for the RIHM measurements.
between the dominant and the non-dominant hand in the healthy volunteers.

**Conclusions:** Ultrasound appears to be a valid and reliable method to monitor muscle re-innervation in patients suffering from peripheral nerve injury. The normal contralateral side can be used as an internal control, taking into consideration minor side-to-side variability. These preliminary results indicate that ultrasound can be a valuable addition to dynamometry in assessing (early) reinnervation in peripheral nerve injury.

**A-0237 Complications of pediatric humerus lateral condyl fractures**

M Atsiz, Hi Bekler, R Tanlı, A Çakmakçı
Dr Lütfi Kırdar Kartal Training and Research Hospital, Department of Orthopaedics and Traumatology, Istanbul, Turkey

We assessed possible complications for pediatric humerus lateral condyl fractures. Twenty-nine patients from 2003 to 2009 were evaluated, 21 male and eight female patients were included in age range of two–12. Hospitalization period was 7.65 ± 5.07 day. None of the patients was late admittance and none of them had coexisting pathology, no open fracture.

Seven patients were diagnosed Milch type 1, 22 patients Milch type 2. Patients were followed up to 44.34 ± 25.75 week. Open reduction and internal fixation was done to 27 patients and closed reduction and percutaneous pinning was done to two patients. We did not observe statistically significant relation between complication and fracture type, age, surgery timing. Avascular necrosis was observed on five patients, one of them had 5° extension, 40° flexion loss. We observed cubitis valgus, instability, subluxation. We observed lateral condyl overgrowth in two patients, none of them had functional loss, all of them had permanent bulging on elbow. Large incision scars were observed in 22 patients. Eleven patients had lateral spur, two of them had mild varus deformity and 15 degree functional loss.

Fish tail deformity was observed in three patients. One patient had varus deformity causing 10 degree flexion contracture, which we supposed was secondary to avascular necrosis. Six patients had cubitis varus. Average difference between carrying angle was 8.3°. Two patients had painful elbow and mild functional loss. Delayed union was observed on seven patients and on follow-up union completed. Early late term vascular problem, compartment syndrome, and neurologic deficit were not observed.

**A-0242 Arthroscopic approach to avascular necrosis of carpal bones**

T Kira1, S Omokawa1, K Murata1, H Ono2, T Shimizu2, Y Kobata1, Y Nakanishi1, K Nakano1, Y Tanaka1

(1) Department of Orthopaedic Surgery, Nara Medical University, Kashihara city, Nara, Japan
(2) Department of Orthopaedic Surgery, Kokuho Central Hospital, Tawaramotocho, Nara, Japan

**Purpose:** There are several treatment options for avascular necrosis of the carpal bones. Wrist arthroscopy is a useful tool to evaluate carpal instability and the integrity of articular cartilage. Since 2008, we have treated eight consecutive patients with advanced carpal necrosis based on arthroscopic evaluations. The purpose of this prospective cohort study was to assess the clinical results following arthroscopic resection arthroplasty in the treatment of osteonecrosis of the carpal bones.

**Methods:** There were five males and three females (mean age of 59 years) who underwent arthroscopic evaluation and intervention. In seven patients with the lunate necrosis, six had stage 3C (carpal mal-alignment with the lunate fragmentation) according to a new classification by Lichtman, and one had stage 4. One had avascular necrosis of the capitate with a marked collapse. Based on arthroscopic evaluation of cartilage lesions and carpal mal-alignment, we determined appropriate procedures. Arthroscopic total or partial lunate resection was conducted in five patients, and the proximal pole of the capitate was resected in three patients. As an associated procedure, chondral abrasion and synovectomy were performed in all patients, radial styloidectomy was done in three patients, and temporary pinning in three others. Pre- and post-operatively, we examined visual analogue pain scale (VAS), the range of flexion/extension motion (ROM) of the wrist, the grip strength (GS), and Mayo wrist score. Disabilities of the Arm, Shoulder and Hand (DASH) score and Patient-Rated Wrist Evaluation (PRWE) score were used as a validated outcome measure. We measured radiological parameters of carpal height ratio (CHR) and radioscapoid angle (RSA). Preoperative data of functional outcomes and radiographic measurements were compared with those at the final follow-up period. Significant differences were set at a p-value of less than 0.05.

**Results:** The average follow-up period was 19 months. Post-operative complication included a migration of temporary pinning in one patient. The mean VAS score was improved significantly from 50 preoperatively to seven post-operatively (p = 0.02). The average ROM increased from 75 to 95° (p = 0.02),
and the mean PRWE score was improved from 40 to 16 (p = 0.03). Mayo wrist score was improved from 54 (poor) to 76 (fair) (p = 0.003). Post-operative grip strength had a trend to increase from 52% to 64% at a ratio of the affected to the opposite (p = 0.14). The average DASH score was improved from 28 to 13, despite there being no significant difference (p = 0.08). Radiographic parameter of the CHR decreased from 0.47 to 0.44 (p = 0.006), and the RSA didn’t change significantly (57 to 58°, p = 0.4).

Discussion: Based on the current results, arthroscopic resection arthroplasty improved wrist pain and disability in patients with advanced carpal necrosis. Arthroscopic resection of the proximal pole of the capitate may reduce compressive loading to the lunate bone, leading to prevent lunate collapse. Despite a small series of patients with a limited follow-up, arthroscopic surgery provides minimally invasive approach to difficult wrist problems because of the maintenance of the ligament structures in the wrist and may be a useful alternative for advanced carpal bone necrosis.

A-0243 Changes in the teardrop angle (TDA) affect clinical outcomes in intra-articular distal radius fractures

S Santo1, S Omokawa2, R Fujitani3, A Iida4, Y Tanaka2
(1) Saiseikai Nara Hospital, Nara, Japan
(2) Nara Medical University, Nara, Japan;
(3) Ishinkai Yao General Hospital, Osaka, Japan
(4) Hanna Central Hospital, Nara, Japan

Purpose: Medoff introduced the importance of teardrop angle (TDA) as a radiographic parameter of intra-articular displacement in distal radius fractures. Fujitani showed the reliability of TDA measurement and indicated significant correlation between the TDA and the articular gap and step on the computed tomography. We hypothesized that changes in the TDA would contribute to adverse clinical outcomes. The purpose of this study was to investigate the relationship between the changes in the TDA and post-surgical outcomes in patients with distal radius fractures.

Materials and Methods: We studied 18 intra-articular fractures on patients who had a significant displacement of more than 2 mm gap and step and were treated by volar locking plating. Patients’ ages averaged 62 years. We measured the volar tilt (VT) and TDA on the lateral views in both the uninjured and injured wrists at the time of injury and the final follow-up. The TDA was measured between the central axis of the teardrop and the radius shaft. The grip strength as percentage of the uninjured wrist and the Disabilities of the Arm, Shoulder, and Hand (DASH) score were used as an outcome measure. Indeed the TDA is an indicator of the intra-articular displacement; we evaluated the one subtracting the VT from the TDA (TDA-VT) to reduce the effect of the extra-articular displacement. We analyzed the correlation of the TDA-VT values in the pre- and post-operative injured wrists with the outcome measures by using the Spearman’s correlation coefficient. We compared the TDA-VT values between the uninjured and the post-operative injured wrists in order to find whether plate fixations adequately reduce the fractured wrists to a comparable alignment to the uninjured wrists. A statistical analysis was performed using R® software version 2.2, and significant differences were set at a p-value of less than 0.05.

Results: The mean follow-up period was 31 months. Mean value of the TDA-VT of the uninjured and pre- and post-operative injured wrists was 46, 38 and 44, respectively. There was no significant difference between the TDA-VT in the post-operative injured wrists and those in the uninjured wrists. At the final follow-up, the mean DASH score was 13 (ranging 1 to 48). The mean percent grip strength was 100%. There was a significant correlation between the DASH scores and the TDA-VT values in the preoperative injured wrists (p < 0.05, R=0.52). There was no significant correlation between the DASH scores and the TDA-VT in the post-operative injured wrists. Regarding the grip strength, we found no significant correlation with either pre- or post-operative TDA-VT.

Discussion: Previous studies showed that the TDA is a reliable radiographic parameter and changes in the TDA indicate articular displacement when the VT is adequately reduced. In this study, we identified the significant correlation between the pre-operative TDA-VT in the injured wrists and the post-operative DASH scores. This result indicates that the magnitude of articular displacement at the time of injury affects upper extremity function. The result of no correlation between the post-operative TDA-VT and the outcome may be due to the adequate fracture-site reduction by volar plating.

A-0249 Effects of exercise training on functional status of obstetrical brachial plexus palsy

D Oskay1, E Ünal2, G Leblebicioğlu3
(1) Gazi University Faculty of Health Sciences Department of Physiotherapy and Rehabilitation, Ankara, Turkey
(2) Hacettepe University Faculty of Health Sciences Department of Physiotherapy and Rehabilitation, Ankara, Turkey
Purpose: Healing in OBPP can be seen in a few months, but it can also continue until pre-school time. Delay in nerve regeneration and muscle reinervation decrease quality of healing. In peripheral nerve injuries, proprioceptive mechanism which can be affected because of the motor and sensorial defect can decrease movement quality and functional status by time. The aim of the study is to assess the effects of exercise training on functional status of OBPP.

Methods: Forty children between the ages of seven to 12 with diagnosis of upper truncus OBPP were randomly divided into two groups. Passive, active and active assistive range of motion (ROM) and stretching exercises were planned as home exercises for Home Exercises Group (HEG). In addition to home program proprioceptive exercises were planned for the Proprioceptive Training Group (PTG) and performed by the therapist for five days a week. Both of the groups have done the exercises for six weeks. Functional status were assessed before and after the treatment with Active Movement Scale (AMS).

Results: Pre- and post-treatment results in subparameters of AMS were increased but it was significantly meaningful in only some of the subparameters (p < 0.05). When AMS results were compared in both groups, no significant differences were signed (p>0.05).

Conclusions: In conclusion, proprioceptive sense was increased in both treatment groups. All gained benefits affected functional status on positive way in both groups.

Key Words: Obstetrical brachial plexus injuries, proprioception, proprioceptive training, functional status

A-0252 Biomechanical study of Landsmeer’s oblique retinacular ligament

H Ueba1, N Moradi2, H Erne2, T Gardner2, R Strauch2
(1) Oumikusatsu Tokushukai Hospital, Kusatsu Shiga, Japan
(2) Columbia University Medical Center, New York, USA

Background: The aim of this study was to analyze the contribution of the Landsmeer’s oblique retinacular ligament (ORL) to distal interphalangeal (DIP) joint extension force with varying angles of proximal interphalangeal flexion, and to ascertain its anatomical consistency.

Methods: Ten fresh-frozen cadaveric hands (40 fingers) were used for this study. The index, middle, ring, little finger rays were disarticulated at the carpometacarpal joints. The skin and subcutaneous tissue was excised to identify the ORL on both sides of the finger. Each ray was mounted in a custom-designed jig through Kirschner wires and external fixator to measure the force needed to flex the DIP joint at six varying positions of the MP/PIP joint flexion [MP0, PIP0; MP0, PIP30; MP0, PIP60; MP0, PIP90; MP45, PIP0; MP90, PIP0]. Instron 5848 Micro-Tester (Instron Corporation, Norwood, MA) instrumented with a 100N load cell was used to measure the force.

Results: The ORL was present on the radial and ulnar aspects of all but two fingers. The ORL tended to be the most robust in the ring finger. In the intact specimen, DIP flexion resistance force was maximum at 30° of PIP joint flexion and minimum at 90° of PIP joint flexion. There was a significant difference between the 90° position and all other positions of the PIP joint with respect to flexion force in the intact specimen. This meant that less force was required to flex the DIP joint at 90° of PIP joint flexion. Sectioning of the ORL revealed that it contributed 25% to the total force required to flex the DIP joint with the PIP joint at 0°, 31% at 30°, 18% at 60°, and 3% at 90° of flexion. The MCP joint position had no effect. Sectioning the central slip produced a significant increase in force required to flex the DIP joint at 90° of PIP joint flexion.

Conclusions: In this study, the ORL was usually present, and it contributed up to 30% of the passive resistance to DIP joint flexion. The intact central slip accounted for the decrease in DIP joint extensor tone at 90° of PIP joint flexion.

A-0260 Examination and treatment of children with brachymetacarpia

V Zavarukhin, A Baindurashvili, S Golyana, A Govorov
The Turner Scientific and Research Institute for Children’s Orthopedics, Saint-Petersburg, Russia

Introduction: Brachymetacarpia (or brachydactylya type E, according J. Bell classification) is a rare disease of the shortening of one or several metacarpal bones. Typically, this pathology is detected in children eight–twelve years old, due to the premature termination of growth plate at the age of seven–eight years. Literary descriptions of this pathology are quite few and mostly of individual cases.

Purpose: The purpose of this work is to study the characteristics of brachymetacarpia, evaluation of cosmetic and functional abnormalities, as well as defining approach to treatment for this group of patients.

Materials and methods: The examination and surgical treatment of 15 patients with brachymetacarpia [21
hands) aged 12–16 years old was fulfilled. In addition to the clinical examination and the standard x-ray, CT examination was performed, including the contrasting of the vascular, the MRI, study of electroneuromyography and reovasography before and after the treatment and on stages. Operative treatment included one-step bone grafting and lengthening by Ilizarov method. In the post-operation period various methods to prevent contractures of joints were used. Maximum follow-up period was seven years.

**Results:** The amount of shortening ranged from 0.8 to 3 cm. All patients did not like the cosmetic appearance of the hand, the majority had complaints of pain during exercise and moderate restriction of function. In 13 patients the shortening was eliminated completely. When the distraction lengthening by Ilizarov method was used, the average index of the osteosynthesis was 69.7 days/cm. Contractures were formed in all joints of the digital ray, the most efficient prevention is therapy during the distraction, including dynamic orthosis.

**Conclusions:** Brachymetacarpia is a disease which causes not only esthetic, but also functional disturbances. Shortening of up to 1 cm may adjust one-stage bone grafting. More than 1 cm shortening requires distraction method. Contractures occur in all joints of the digital ray, the most efficient prevention is therapy during the distraction, including dynamic orthosis.

**A-0264 Microsurgical reconstruction in treatment of children with electric burns of upper extremities**

S Golyana, A Baindurashvili, M Sviridov
The Turner Scientific and Research Institute for Children's Orthopedics, St. Petersburg, Russia

**Introduction:** Tissue damage involved with electric injury can be so deep and serious (especially in high-voltage electric injuries), that after necrosectomy it might become impossible to apply traditional techniques of skin grafting. In such cases the microsurgical methods of treatment have to be employed to cover the exposed anatomically important structures. The use of vascularized tissue complexes in children with electric burns accompanied by deep defects in cutaneous covering, fascia, muscles and bones allows to restore, in a single-stage procedure, the full-value cutaneous covering as well as, when necessary, the muscular tissue and the bone tissue, which can be included in autotransplants.

**Purpose:** To evaluate the possibility of microsurgical reconstruction in treatment of children with electric burns of upper extremities.

**Materials and Methods:** Fifteen children with electric burns in early stages and four children with after-effects of electric burns have been operated on in our clinic since 2010. All patients have undergone autotransplantations of vascularized tissue complexes on the vascular pedicle. Nine of the operated children had low-voltage electric injuries and eight of the operated children had high-voltage electric injuries. The variants for use of vascularized autotransplants in treatment of children with extensive tissue injuries can be divided into three groups according to the aim to be achieved:

1. In order to restore the integumentary system function – skin-fascia grafts such as Littler graft, radial graft, graft from the basin of one TMA and thoracodorsal graft have been used.
2. In order to restore the active muscle function – skin-fascia muscle grafts such as thoracodorsal graft with the inclusion of a transplant from the broadest muscle of back have been used.
3. In order to restore the frame function of bones – composite tissue complexes with a bone fragment such as a tissue complex on the basis of the broadest muscle of back with a rib fragment or a fragment of the lateral border of a blade bone.

**Results and Conclusions:** The data obtained from the analysis of treatment results prove that the microsurgical transplantation of tissue complexes has very good prospects and is indispensable when treating children patients with heavy injuries involved with electric burns of upper extremities. The method also allows early surgery to be performed and to restore, in a single-stage procedure, the full-value cutaneous covering as well as, when necessary, the muscular tissue and the bone tissue of upper extremities.

**A-0266 Nerve reconstruction with processed allograft (Avance®) – one year experience**

E Voegelin, B Juon Personeni
Department of Plastic and Hand Surgery, University Hospital of Bern, Inselspital, Bern, Switzerland

**Purpose:** The gold standard for nerve reconstruction in a nerve gap is the use of an autologous nerve graft. Donor nerves are limited or in the case of contraindications, the use of processed nerve allograft (Avance®) is an alternative. It is a dezellularized and cleansed extracellular matrix from donated human peripheral nerve. We report our results with a follow-up of at least one year.

**Materials:** Avance® was used in a total of 40 nerve reconstructions in 31 patients. The majority of nerve reconstructions included digital nerves (n = 28).
Twelve reconstructions involved sensory (n = 8; 3× superficial radial nerve, 1× superficial ulnar nerve, 1× genitofemoral nerve, 1× saphenous nerve, 2× superficial peroneal nerve) or mixed nerves (n = 4; median nerve in axilla, ulnar nerve at elbow, motor component of ulnar nerve at wrist, tibial nerve at ankle joint). Surgery was immediately performed after the accident in 19 patients (n = 27). Reconstruction was delayed in 11 patients [n = 13] on average of 10 months (range 3–35). Six of these 11 patients suffered from a chronic pain syndrome. There was only one non-traumatic nerve defect reconstruction after resection of a schwannoma. Patients with a minimal follow up of 12 months (range 12–32) were included. Static 2 point-discrimination (2pd) and Semmes Weinstein Monofilaments Mapping (SWMM) were documented regularly and the nerve grafts were controlled by ultrasound at least one year after surgery. Pain was recorded with a numeric rating scale [0–10] NRS.

Results: There were no implant complications or adverse events related to the use of Avance®. Mean gap length was 23.2 mm. The cross section of the nerves to be reconstructed was 2.4 mm. Twenty-one of 31 patients were pain free. Nine patients complained of light pain NRS 2–3. Two patients suffered from pain at NRS 5 and more. Of seven patients with chronic regional pain syndrome, two became pain free (superficial peroneal nerve, genitofemoral nerve) and the remaining two patients improved from NRS 7 and 9 to NRS 3 (tibial nerve, superficial ulnar nerve). The mean static 2pd reported in 15 digital nerve reconstructions was < 6 mm. In the remaining 13 digital nerve reconstructions, a mean static 2pd was 10.2 mm. There was no patient without measuring a 2pd. Eight other sensory nerve reconstructions of the hand revealed diminished light touch discrimination without a conclusive 2pd. The reconstructed median nerve at the level of the axilla did not reveal any sensory or motor recovery 28 months after the repair. All nerve reconstructions at the lower extremity were successful. Ultrasonographic examination revealed no increased edema, enhanced scar formation indicating an inflammatory response to the allograft. However, in 12.5% nerve reconstructions there was a thickening at the neurorrhaphy site seen, even a year after repair.

Summary: Our experience with processed allograft reconstructions in 40 nerve defects demonstrated good regeneration and integration potential in sensory nerve reconstructions, comparable to the reported results of autologous nerve grafts while circumventing any donor site morbidity. Furthermore, we obtained reasonable improvements in patients with chronic pain syndrome after nerve lesions.

A-0267 Distraction lengthening of the thumb in congenital malformations

M Mann, W Hüseemann, R Habenicht
Katholisches Kinderkrankenhaus Wilhelmstift, Hamburg, Germany

Purpose: The thumb is the most important digit of the hand. We find a short or hypoplastic thumb in many types of congenital malformations. If we need more length of the thumb the distraction lengthening will be an option.

Material: Since 1996 we did 24 procedures of distraction lengthening of the thumb in 23 patients, in recent years we have mainly used the Litos Cube Fix. The average age when the distraction was started was seven years and five months. The distractions were done in cases of symbrachydactyly, constriction band syndrome, brachymetacarpia, cleft hands and Apert-syndrome.

Results: The average distraction in metacarpal bones was 75%, but up to 105% could be reached. The phalangeal bones were lengthened by 90% on average although a lengthening of up to 133 % was possible.

Complications: In two cases we had to stop the distraction due to pin infections. In three cases we had problems with an early consolidation of the bone. One patient developed problems with a pseudarthrosis of the distracted bone. It healed after bone grafting and osteosynthesis.

Conclusion: The metacarpal and phalangeal distraction lengthening of the thumb is a useful technique for ray reconstruction in congenital malformations of the hand. It is possible to lengthen a bone by more than 100%. In cases of delayed callus formation and in order to accelerate bone healing, it is possible to shorten the period where the fixator remains in the bone by the implantation of a bone graft.

A-0270 Dynamic anatomical study to prevent the injury of the dorsal sensory branch of the ulnar nerve (DSBUN) during wrist arthroscopy

M Esplugas1, A Lluch2, M Garcia-Elias3
(1) Activamutua, Tarragona, Spain
(2) Hospital Vall d’Hebrón and Institut Kaplan, Barcelona, Spain
(3) Institut Kaplan, Barcelona, Spain

Purpose: The dorsal sensory branch of the ulnar nerve (DSBUN) is at risk when setting the 6U portal wrist arthroscopy. The anatomical proximity of that
portal to the DSBUN has been studied. Unfortunately, those studies did not assess the distance of the DSBUN to the 6U portal when the upper extremity is held by the arthroscopy tower in different wrist positions. The present study was designed to evaluate the positional changes of the DSBUN relative to the 6U portal under axial traction, flexion, pronation and supination.

**Methods:** Six fresh cadaver arms were used in this study. A 20 x 10 mm skin and subcutaneous window over the medial border of the wrist was excised leaving the DSBUN intact. Arms were set vertically under axial traction. The forearm bones were blocked in neutral rotation by a transverse Steinman pin. The 6U portal was localized and marked with a coloured needle. The distance between DSBUN and the needle was measured in four wrist conditions: full intracarpal supination, full intracarpal pronation, neutral rotation and 20° flexion.

**Results:** The distance between DSBUN and 6U portal is minimal [average: 0 ± 1 mm] when hand and wrist are pronated over a fixed forearm. Hand and wrist supination brings the nerve away from the 6U portal and average of 4mm ± 1 mm. Wrist flexion loosens the nerve and separates it from the portal an average 5 mm ± 1 mm. Forearm rotation does not modify the distance between DSBUN and 6U portal.

**Conclusions:** If the 6U portal is formed when the forearm is fixed in neutral rotation and the carpus is pronated relative to the radius, the chances of injuring the DSBUN is high, particularly if the nerve is taut by traction and the wrist is slightly extended. Usually, wrist arthroscopy is performed using a tower, with the forearm fixed in neutral rotation, the surgeon facing the back of the hand. To facilitate insertion of the knife in the volar edge of the ECU tendon, most surgeons rotate the hand into pronation; indeed, the medial border of the hand cannot be seen from the back. By doing so, the risk of injury to the DSBUN is high. Based on our study, we recommend to unblock the forearm or flex the wrist before setting the 6U portal.

**A-0276 The outcomes and complications of vascularized bone grafting for avascular necrosis of the carpal bone**

N Kodama, Y Takemura, –H Ueba, –Y Matsusue
*Department of Orthopaedic Surgery, Shiga University of Medical Science, Shiga, Japan*

**Purpose:** The purpose of this study was to evaluate the outcome and complication for the treatment of avascular necrosis of the carpal bone with vascularized bone grafting (VBG) to consider the appropriate indications and methods.

**Methods:** From January 2004 through August 2011, 22 carpal bone disorders: Kienbock Disease (n = 13), scaphoid nonunion (n = 5), Preiser Disease (n = 3) and the avascular necrosis of the capitale (n = 1), were treated with VBG using of dorsal vascular pedicle. It contained 1,2-intercompartmental supraretinacular artery (ICSRA), 4,5 extensor compartmental artery (ECA) and the dorsal 3rd metacarpal artery. Fifteen male and seven female patients averaging 41-years-old were followed up for an average of 12 months. The scaphoid lesions were treated with VBG based 1,2 ICSRA. Kienbock disease and the capitale lesion were treated with VBG based 4,5 ECA or 3rd metacarpal artery. The clinical evaluation (with the modified Mayo wrist score and DASH) and the radiographic evaluation was performed.

**Results:** All cases went on to union at an average of 15.4 weeks after surgery. The wrist functions were improved in all cases. Some complications included the radial and ulnar deviation limited, the palmar flexion limited and discomfort on dorsal wrist.

**Conclusion:** Vascularized bone graft is efficacious in the treatment of the carpal bone disorders with avascular necrosis. The procedure requires less extensive dissection not to cause the complications and the discomfort on dorsal wrist.

**A-0280 Complications following surgical treatment of unstable dorsally displaced distal radius fractures in elderly patients**

J Rois, A Meznik, G Gudernatsch, R Johanna, L Greiner
*UKH Meidling, Vienna, Austria*

The purpose of our retrospective study was to analyse the post-operative complications of elderly patients [older than 65 years] with unstable dorsally displaced distal radius fractures treated with a palmar fixed angle plate.

Between 2009 and 2011, 125 patients with 127 unstable dorsally displaced fractures of the distal radius were treated surgically. There were 110 women and 15 men, their average age was 72.8 years (65 to 88 years). The fractures were classified using the AO/ASIF classification system: A2 (n = 20), A3 (n = 66), C1 (n = 26), C2 (n = 14) and C3 (n = 1). In all cases open reduction and palmar internal fixation with a locking plate (Stryker-Matrix, Medartis-Aptus 2.5, Synthes VA-LCP 2.4) was performed and followed by cast fixation for four weeks. We did not use bone grafting or bone substitute bone materials. The records of these patients were reviewed. The preoperative, post-operative and after cast removal radiographs were evaluated.
The overall complication rate was 19.6% (25/127). The complications included: Carpal tunnel syndrome (n = 4), rupture of flexor pollicis longus tendon (n = 2), rupture of extensor tendon (n = 1), CRPS (n = 1), intra-articular screw cut-out (n = 5), loss of reduction (n = 4), loosening of a single screw (n = 4) and hardware failure (n = 4). Revision surgery was performed in nine cases. The volar locking plate is a good option to treat unstable dorsally displaced distal radius fractures in elderly patients despite existing osteoporosis. For minimizing the complication rate a thorough understanding of the potential complications is important.

**Conclusion:** PRC is a well tolerated procedure in stage III Kienböck’s disease with few complications. Subjective values improve significantly. In contrast to previous literature, PRC does not preserve motion, even though this characteristic does not affect post operative subjective patient satisfaction. Only positive correlation with better DASH / MAYO score is post operative power grip measurement. There was no correlation between the DASH / MAYO scores and degenerative changes seen on radiography.

**A-0281 Long term results of proximal row carpectomy at stage III Kienböck’s disease**

L Buluç¹, H Gündes¹, T Baran², Ö Selek²
(1) Şifa Health Group, Ataşehir Hospital, Istanbul, Turkey
(2) Kocaeli University, School of Medicine, Kocaeli, Turkey

**Aim:** The aim of this retrospective study is to investigate the variables that might have an effect on the results of proximal row carpectomy at stage III Kienböck’s disease.

**Material and Methods:** 48 patients with various wrist derangements had Proximal Row Carpectomy (PRC) between 1997-2011. Thirty of 48 patients who had stage III Kienböck’s disease with a regular follow-up period of more than 12 months had been enrolled into the study. There were 20 female and 10 male patients. Fourteen patients had stage 3A, 16 patients had stage 3B Kienböck’s disease. In all, patients PRC had been performed by dorsal approach. The mean follow-up period was 50 months (12-175). Preoperative and post-operative Disabilities of the Arm Hand and Shoulder (DASH) scores, post operative total joint range of motion (ROM) of the normal and index wrist, grip and pinch strength of the normal and index side and post-operative MAYO wrist scores have been recorded during the follow-up period. Direct radiographic measurements of the wrist degeneration had been measured during each follow-up. Student’s t-test and Mann Whitney – U tests have been used in statistical analysis.

**Results:** Reflex sympathetic dystrophy has been observed in two patients (6.6%). There was no correlation between the complications and the type of the surgery. There was no correlation between the disease’s stage (whether IIIA or IIIB), dominance, gender, age at the time of the operation and the results (MAYO scores, DASH scores and ROM measurements). Post operative ROM measurements (flexion, extension, radial and ulnar deviation) and grip/pinch strength values have been significantly decreased in both groups compared to normal side. In contrary, DASH scores have been significantly better (subjective well-being) in both groups compared to preoperative values. Only positive correlation with better DASH / MAYO score is post-operative power grip measurement. There was no correlation between the DASH / MAYO scores and degenerative changes seen on direct radiography.

**A-0286 Long term results after major upper limb replantation**

P Tos, D Ciclamini, B Panero, E Magistroni, M Bertolini, I Pontini, B Battiston
GIM – Reconstructive Microsurgery Unit, Orthopedic Department, C.T.O. Hospital, Torino, Italy

**Introduction:** The goal of replantation must be focused not only on replanting the amputated limb but also on achieving a good functional outcome. The indications to replantation are extending year after year to older patients, to higher level of amputation or to avulsion injury. This is due to the improved microsurgical techniques and to the possibility to perform secondary procedures.

**Material and Methods:** Between 1996 and 2009, 73 patients underwent major upper limb replantation in CTO Hospital of Turin. A retrospective review of 45 patients with 48 major reimplantations was carried out (10 amputations through the upper arm, seven disarticulations through the elbow, nine amputations of the proximal forearm, 11 of the medial forearm and 11 of the distal arm). The average follow-up was 3.1 years (range: two to five years) in order to assess the survival rate, global upper extremity functional outcome (Chen), complications’ rate, number of secondary procedures. Intraoperative decision-making principles we considered were: bone shortening – ORIF, elemenarization, noble structures cover, all-in-one procedure if possible and fasciotomy.

**Results:** Limb survival rate was very high (95%) despite the severity of the injuries; two cases required a secondary amputation at 10 and 20 days after surgery. Successful reimplantations at the level of the distal and middle third forearm provided a better...
functional result than in arm and proximal forearm replantations; sharp lesions provided better functional results than crush injury. The complications developed were: non-union (8%), bone infection (5%), skin or muscle necrosis (15%), bleeding (5%) and brachial plexus palsy (3%). Some patients required secondary surgery for tendon transfer (44%), skin graft (36%), non-union treatment (19%), nerve graft (16%), tenolysis-arthrolysis (13%), free functional muscle transfer (8%), free flaps (8%), brachial plexus repair (5%), but some did not.

Discussion: Level of amputation and mechanism of amputation significantly influenced the functional result. A good result is often possible depending on number of secondary reconstruction and on patient's collaboration and motivation. In spite of the possible complications discussed, proper patient selection, good surgical skills and post-operative care are extremely important in achieving a high success rate in replantation and a better functional outcome.

A-0288 Severe osteomyelitis of forearm treated by means of vascularized fibular graft

P Tos1, M Innocenti2, R Adani2, C Baldrighi2, P Titolo1, B Battiston1
[1] Reconstructive Microsurgery Unit – C.T.O. Hospital, Torino, Italy
[2] Reconstructive Microsurgery Unit – C.T.O. Hospital, Firenze, Italy
[3] Hand Surgery Unit, Verona, Italy

Introduction: Severe infections at the forearm level are difficult to treat not only in terms of sterilization but also in terms of functional restitution. Classic concepts of radical debridement are very important but reconstruction of the excised tissues is sometimes managed with difficulty by traditional techniques. At the forearm level, local flaps generally are not sufficient to cover big defects. Bone reconstruction is the biggest problem. Conventional bone grafts may be resorbed or have difficulty in healing in infected and hypovascular tissue bed.

Material and Methods: We retrospectively studied 24 cases of severe chronic osteomyelitis – fourth degree of Cierny-Mader classification – of the radius and/or the ulna treated with free vascularized fibula bone grafts (between 1997 and 2011). The bone defect involved the radius in 16 cases and the ulna in six; in one patient both bones were treated. The mean age of our patients was 35 years and ranged between 16 and 65 years. In 20 cases a two-stage treatment was performed. All patients were reviewed and classified according to the Tang system, which is based on clinical and radiological findings. All the patients had previously undergone repeated procedures: the number of interventions ranged from one to six (mean 3.7). The elapsed time between initial trauma and final reconstructive surgery ranged from four to 96 months (average 24 months).

Results: In all 24 cases the infection never recurred. According to Tang’s classification, the following results were obtained: excellent clinical evaluation in 13 patients, good in nine, fair in two and poor in none; excellent radiographic evaluation in 13 patients, good in seven, fair in three and poor in one. There were no cases of fractures of the grafted bone. Distal screw loosening was seen in two patients. A second operation was necessary in three cases to remove the previous plate and replace it with a new plate associated with bone graft to achieve bone healing. No complication was registered on the harvesting site. All patients returned to everyday routine activities.

Conclusions: Free vascularized fibula is definitely the best option when dealing with complex forearm reconstruction. The fibular shaft matches the forearm bones in terms of both size and shape. This flap can be harvested along with a large coetaneous island for simultaneous soft tissue reconstruction. In the forearm the vascularised fibular graft is indicated in patients where conventional bone grafting has failed or large bone defects are present (exceeding 5 cm).

A-0293 Supraretinacular endoscopic carpal tunnel release

J Ecker, N Perera
Hand and Upper Limb Centre / Western Orthopaedic Clinic, Perth, Western Australia

Hypothesis: Supraretinacular endoscopic carpal tunnel release was developed to avoid subretinacular endoscopic techniques which can be associated with transient neurological deficits. It was also developed to improve vision in the distal forearm and the carpal canal when performing the endoscopic carpal tunnel release.

Methods: Supraretinacular endoscopic carpal tunnel release is performed using a speculum with a dual light source. The speculum is inserted above the flexor retinaculum, no further than the distal extent of the flexor retinaculum (i.e. the hook of the hamate). Using an endoscope to see, the retinaculum is divided under direct vision with scissors. The procedure is performed using a 2.5 cm transverse incision in the proximal wrist flexion crease in the distal forearm.
The median nerve is visualised in the distal forearm and the carpal canal.

**Results:** 130 supraretinacular endoscopic carpal tunnel operations were reviewed. The technique was found to be safe and has a low complication rate. There has been one case of retinacular fibrosis which resolved and four cases of suture infection.

**Summary Points:** Supraretinacular endoscopic carpal tunnel release can be performed safely. It improves visualisation compared to other endoscopic techniques. It allows endoscopic carpal tunnel release to be performed in severe carpal tunnel syndrome with marked compression of the median nerve. The anatomical variations of the recurrent motor branch of the median nerve can be seen during the procedure. The technique and the endoscopic anatomy will be demonstrated.

**A-0296 Hand dysfunction in patients with chronic renal failure receiving haemodialysis: a pilot study**

Z Tuna¹, D Oskay², S İnal²

(1) Gazi University Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Ankara, Turkey
(2) Gazi University Faculty of Medicine, Department of Internal Medicine, Division of Nephrology, Ankara, Turkey

One of the vascular access options required for haemodialysis treatment is arteriovenous (AV) fistulae in the upper extremities. Patients generally tend to avoid using the upper extremity with AV fistulae and it results in impairment of hand functions. Limited data are available about impairment associated with hand complications in patients who receive haemodialysis for chronic renal failure. The aim of this pilot study is to evaluate how the hand grip and pinching strengths and functional level of both hands in patients receiving haemodialysis for chronic renal failure. The aim of this pilot study is to evaluate how the hand grip and pinching strengths and functional level of both hands in patients receiving haemodialysis for chronic renal failure. The aim of this pilot study is to evaluate how the hand grip and pinching strengths and functional level of both hands in patients receiving haemodialysis for chronic renal failure.

**Methods:** We clinically reviewed 15 thumbs (13 patients) that had undergone a trapeziectomy with LRTI for the treatment of TM joint osteoarthritis between 1993 and 2001 inclusive. Subjective and objective outcomes were assessed including participant satisfaction, pain relief as well as pinch and grip strength. We also asked to complete DASH (Disability of the Arm Shoulder and Hand) questionnaire and a Patient Rated Wrist Evaluation (PRWE). In addition, we asked participants if they ever had a period of complete pain relief following their operation. We defined a poor outcome was one were the participant was dissatisfied, experienced ongoing pain or had revision surgery.

**Results:** Our participant group had a mean follow up of 13.5 years (range: 10.5–17.5). No participants had revision surgery. Eleven participants were very satisfied, two were satisfied, one was unsatisfied and one was very unsatisfied with the outcomes of their surgery. Mean DASH score at review was 29.03 (95%CI: 10.99–46.06) and mean PRWE was 34.20 (95%CI: 13.8–54.6). 60% of participants of experienced symptoms;
the most common and most severe symptom was weakness. We found that 80% of participants experienced complete pain relief post-operatively but only 53% of participants had complete pain relief at the time of review. Grip and pinch strength were comparable between operated and non-operated hands.

**Conclusion:** This is the first study to report on the long-term outcomes of trapeziectomy with LRTI. More than half the participants in this study experienced poor long-term outcomes. Participants were experiencing long-term symptoms, particularly pain, despite reporting that they are satisfied with the outcome of their surgery. Trapeziectomy with LRTI needs to be challenged as the gold-standard surgical technique, and other techniques should be investigated as there is room for improvement in the surgical treatment of advanced TM joint osteoarthritis.

**A-0300 Prospective outcomes of arthroscopic hemitrapeziectomy without interposition in CMC 1 arthritis**

A Koch, QRJG Tummers, B Weitenberg, S Kouwenhoven  
_Haga Hand- en Wrist Center, The Hague, Netherlands_

**Purpose:** Carpometacarpal (CMC) I joint osteoarthritis is a common and often disabling problem of the hand. When conservative treatment fails, surgical intervention can be considered. However, the most optimal surgical technique still has to be confirmed. Theoretical advantages of arthroscopic hemitrapeziectomy include fast pain reduction, shorter restoration of hand function and less morbidity. In this study arthroscopic hemitrapeziectomy without interposition as treatment for CMC 1 arthritis was evaluated prospectively.

**Methods:** Fifteen patients with isolated CMC 1 arthritis (Eaton stage III), were included. Disability of the Arm, Shoulder and Hand (DASH) questionnaire and Visual Analogue Score (VAS) were obtained preoperative, three and six months post-operative, as were pinch and wrist grip and palmar abduction. Radiographic findings of the thumb base before and six months after surgery were reviewed.

**Results:** At three months after surgery, VAS was improved from 6.5 kg to 5.1 kg (P < 0.06). Pinch grip decreased from 6.5 kg to 5.1 kg (P = 0.01), while wrist grip and palmar abduction remained unchanged.

**Conclusion:** These encouraging preliminary results of arthroscopic hemitrapeziectomy without interposition as treatment for Eaton stage III CMC 1 arthritis show a significant pain reduction and reduction in DASH score. Longer follow-up and a randomized controlled trial are in preparation.

**A-0302 Treatment of neglected distal radius fracture**

M Armangil, A Merter, M Chavush, SS Bilgin  
_Ankara University School of Medicine, Department of Hand Surgery_

**Purpose:** Inadequately and imperfectly treated fracture of distal radius, especially in young or high demand patients, can impair hand and wrist functions substantially. Cases with malunion of distal radius fracture and poor radiographic alignment before complete healing of the fracture are candidates for early correction. Correction from original fracture line seems difficult but gives opportunity of anatomic restoration. This report describes pros and cons of early correction of distal radius malunion.

**Methods:** Fourteen patients (12 male, two female; average age 34 years, range: 17 to 54 years) with poor radiographic alignment before complete healing of the fracture were included in this study. The malunions occurred after initial conservative treatment of unstable distal radius fractures. Mean interval between injury and corrective surgery was 10 (range: four to 15) weeks. Three patients had intra- and extra-articular malunion and nine had an extra-articular malunion. Volar correction was made in ten patients and dorsal correction in four. Results were evaluated radiologically and functionally using the Mayo wrist score.

**Results:** Bony healing was established after all early correctional procedure at an average of eight (range: five to 16) weeks. The average preoperative dorsal deformity was 28° and was corrected to 4° of volar tilt post-operatively. Patients had a positive ulnar variance with an average of 5 mm initially and less than 1 mm post-operatively. Radial inclination was corrected from an average of 9° preoperatively to an average of 20° and the average post-operative Mayo wrist score was 84. Tenotomy of brachioradialis was useful for the correction of radial inclination, especially in old cases. Structural (corticocancellous) grafting was used in only one patient. All patients returned to their previous functional level.

**Conclusion:** Advantages of early corrective osteotomy include anatomic restoration at the original fracture line, a shortened healing and disability period. Locking plate systems lead to decreased need for structural bone grafting and morbidity due to graft harvesting. Disadvantages are that the recreation of the original fracture line is technically
demanding and patients must be cooperative to achieve a successful outcome.

**A-0306 Intra-articular fractures of the thumb metacarpal base**

S Uludağ, E Gudemez, Y Ataker

Vkf American Hospital, Istanbul, Turkey

*Introduction:* The purpose of the treatment of fractures of the trapeziometacarpal joint is to restore the articular congruity to prevent late arthritis and to return the patients to active daily living with early post-operative mobilization protocol. This retrospective cohort study presents the functional and radiological results after open reduction and internal fixation using plate and/or screws in Bennett and Rolando fractures.

*Methods:* Fifteen consecutive patients (11 men and four women) who had intra-articular fractures of the thumb metacarpal base were treated between October 2007 and December 2009. The average age of the patients were 36.4 years (range, 16 to 56 years) at the time of surgery. Eight Bennett and seven Rolando fractures were operated at an average of 3.3 days after the trauma (range, three to 10 days). Seven fractures were operated using only screws, and eight fractures using plate and screws. A bulky spica dressing was applied to all of our patients for ten days and active rehabilitation program was performed with an average of 16.8 sessions (range, 10 to 20 sessions). The subjective outcome was measured using VAS score and DASH questionnaire. Clinical examination included range of motion measurements of the trapeziometacarpal joint, grip and pinch strength evaluations.

*Results:* The average follow-up period was 15.62 months (range, 12 to 36 months). Radiological analysis demonstrated complete bony union with less than 1 mm metacarpal base gap/step-off in all of the cases. Thirteen patients (87%) were free of symptoms at follow-up. The average VAS score was 1.06 (range, 0 to 3) and DASH score 13.5 (range, 10 to 21) at the final follow-up examination. An average of 32.5° (range, 25° to 40°), 34.06° (range, 30° to 40°), and -3.4° (range, -10° to 0°) respectively in followed-up palmar and radial abductions, and flexion of the trapeziometacarpal joint were recorded. Twelve patients demonstrated 92.5% weakness in grip strength (range, 85 to 100%) compared to the uninjured hand. All of the patients had decreased key pinch as 84.6% (range, 80 to 95%) compared to the uninjured site.

*Conclusion:* If the exact anatomical restoration of the articular surface can not be obtained by closed reduction, open reduction and rigid internal fixation with early mobilization for the fractures of the trapeziometacarpal joint can be performed. The subjective and objective variables and parameters of this retrospectively evaluated study with a prospective data collection showed the efficacy and reliability of the surgical technique and post-operative rehabilitation protocol for these complicated fractures.

**A-0312 The classification of distal ulna fractures revisited**

D Power, M Gupta, S Maclean, C Simpson

Birmingham Hand Centre University, Hospitals Birmingham, Birmingham, UK

*Background:* Fracture classification systems aide communication, research and fracture management. A good classification is intuitive and reproducible with little inter- and intra-observer error. The current popular classification systems for distal ulna fractures do not fulfill these prerequisites and are outmoded in the light of new implant technology.

*Methods:* A radiological and case note review was undertaken to identify all distal radius fractures presenting to a regional major trauma unit over a five-year period. Additionally the operative records of 500 consecutive cases of distal radius fracture were reviewed to identify all patients having surgical management of a distal ulna fracture. The ulna fracture was stabilised when there was instability following anatomical reduction and fixation of the associated distal radius fracture. The implant choice was made by the treating surgeon. Post-operative radiographs were assessed for alignment and union and case notes used to identify all complications and need for further surgery including metalwork removal.

*Results:* The Frykman, Fernandes and AO classification systems were used to describe the fractures of the distal radius and ulna based on the primary radiographs. Additionally where a CT was undertaken the fracture was reclassified to identify common areas of under-estimation of the fracture severity. The commonest upgrading of the fracture on CT was where the DRUJ involvement was only seen on axial and coronal reconstruction CT images. There is a trend towards locking plate fixation of comminuted distal ulna fractures with anatomical pre-contoured plates.

*Discussion:* The current classification systems for distal ulna fractures are inadequate to define the range of fracture configurations identified and provide no guide to optimal method of fixation. A proposed inclusive classification will be described with future validation and assessments of inter and intra-observer reliability.
A-0314 Cerebral changes following median nerve injury, a long term follow-up in patients injured at an age below 21 years

A Chemnitz1, A Weibull2, B Rosén1, G Andersson3, L Dahlin1, A Björkman1
1 Department of Hand Surgery, Lund University, Skåne University Hospital, Malmö, Sweden
2 Department of Medical Radiation Physics, Lund University, Skåne University Hospital, Malmö, Sweden
3 Department of Clinical Neurophysiology, Lund University, Skåne University Hospital, Malmö, Sweden

Purpose: The clinical outcome following a peripheral nerve injury (PNI) is generally significantly better in children than in adults. We investigated the long term effects of a PNI in the upper extremity in childhood with focus on changes in the central nervous system.

Methods: Twenty-one patients operated on for a complete median nerve injury at an age below 21 years during the years 1970–1989 participated in the study. Median time since the injury was 27 years. Cortical activation during tactile finger stimulation of the injured and healthy hands was monitored using functional magnetic resonance imaging (fMRI) at 3 Tesla. Electroneurography was used to evaluate the function of the peripheral nerve and the clinical outcome was assessed using standardized protocols. The participants were divided into three groups based on age at injury, injury below the age of eight years (n = 7), injury between 12–15 years (n = 7) and the last group had sustained their injuries between age 16–20 years (n = 7). A age and gender matched control group of healthy subjects were also included for comparison. Furthermore historical data from cortical activation seen in patients operated on for median nerve injury at adult age were included for comparison.

Results: The cortical activation pattern following sensory stimulation of the injured hand was highly dependent on age at injury. Subjects injured at age below eight years showed a completely normal cortical activation in the somatosensory areas in both brain hemispheres, the activation was identical to healthy controls. Subjects injured at age between 12 to 15 years showed, compared to controls, cortical changes with a disorderly activation in the somatosensory areas in both brain hemispheres. Similar changes were seen also in those injured at age 16 to 20 years. These two later groups showed almost identical cortical activation patterns as was seen in subjects who had injured their median nerve as adults. Clinical outcome was significantly (p = 0.001) better in those injured in childhood, age below eight years, compared to the two older groups. All subjects, regardless of age at injury, displayed a pathological electroneurography indicating incomplete peripheral nerve regeneration.

Conclusion: The mechanisms behind the difference in clinical outcome seen in subjects operated on for median nerve injury at an age below 21 years are likely to be found in the brain.

A-0315 Nerve transfers in the lower limb for restoration of motion and function

L Mathys, N Badur, B Juon, E Vögelin
University Hospital Bern, Bern, Switzerland

Introduction: Nerve transfers are a successful treatment option for peripheral nerve lesions in the upper extremity along with nerve grafting and tendon transfers. However, in the lower extremity, published experience with nerve transfers are still sparse and other treatment options often lack a satisfactory result.

Patients and Method: Between 2010 and 2012 eight patients underwent a nerve transfer in the lower extremity at our institution. Mean age was 50 years (range 19 to 73 years). Seven patients were treated for a common peroneal nerve injury with a partial tibial nerve transfer to innervate a motor branch of the anterior tibial muscle in five cases and a partial common peroneal nerve transfer (proximal to the lesion) to a branch of the tibial nerve innervating the lateral head of the gastrocnemius muscle with transfer of this muscle to the anterior tibial muscle in two cases. One patient underwent a partial obturator nerve transfer to a muscle branch of the femoral nerve to innervate the quadriceps muscle. Indications for nerve transfer included any injury that did not show any signs of clinical or electromyographic recovery of dorsal extension of the ankle after knee trauma in six patients within four months. In two patients the peripheral nerves showed a large defect, in one case the common peroneal nerve was damaged due to the initial trauma and in the other case the femoral nerve was resected in the setting of tumor surgery.

Results: Follow up is still short with a mean of 16 months (range three to 28 months). As re-innervation takes longer in the lower limb compared to the upper limb, the definite results for recovery of function are still pending in most of the patients. The patient with the longest follow-up of over two years (gastrocnemius muscle transfer after neurotization) successfully regained a good functional result with a grade 4 for ankle dorsiflexion and walks without any orthosis as do two patients who regained a grade 3 after partial tibial nerve transfer to a muscle branch of the
anterior tibial muscle. Four other patients show first signs of regeneration but still depend on their leg brace. One patient developed a progressive neuritis of unknown etiology.

**Discussion:** Stimulated by the positive results of neurorotation in the upper extremity after nerve injuries and by single case results and recently published case series we utilized this principle for nerve injuries in the lower extremity. Recognized other treatment options as nerve grafting, leading to poor function, tendon transfers resulting in weak function and foot orthotics provoking discomfort and mobility issues do not achieve satisfactory results. Nerve transfer as a potential option to restore movement and function in the lower extremity decreases the time to regeneration by performing the neuropraxy close to the end organ. However the time to regeneration and rehabilitation takes longer than in a comparable innervations distance in the upper limb.

**A-0317 Trigger wrist caused by multiple etiologies**

IJ Park, SK Rhee, YM Lee, HM Kim, SW Song, SH Kang
Department of Orthopaedic Surgery, The Catholic University of Korea, Seoul, Korea

**Purpose:** Trigger finger is one of the most common causes with painful click during finger motion. On the other hand, trigger wrist has low incidence rate, therefore many hand surgeons hardly experienced these cases during their practice. The term “trigger wrist” means the painful click or catching sensation around the wrist joint during finger or wrist motion. It is often associated with a longstanding CTS and most commonly involves flexor tendon pathology. Tumor or a rheumatoid nodule in the flexor tendons inside the carpal tunnel, an anomalous muscle belly in the carpal tunnel, or a combination of both are the possible causes of trigger wrist.

**Methods:** We have seven cases with trigger wrist; 3 cases of anomalous muscle belly of flexor digitorum superficialis, 2 cases of fibroma around flexor tendon sheath within carpal tunnel, and 2 cases of severe tenosynovitis in the flexor tendons inside the carpal tunnel. Carpal tunnel syndrome was confirmed by EMG in 6 cases out of 7.

**Results:** Snapping during finger motion and tingling sensation were disappeared after surgery in all cases. Average three months after operation, all patient was free from symptoms.

**Conclusions:** Trigger wrist is often misdiagnosed. To make precise diagnosis, careful physical examinations are necessary. For example, vague pain on palm, absence of point tenderness on A1 pulley area, difficulties in full flexion of fingers, and clicking palpable mass on the wrist area might be clues for suspicion of trigger wrist. In these situations, further imaging evaluations (e.g., sonography or magnetic resonance imaging) were helpful. In conclusion, the accurate examination and proper diagnosis are mandatory to avoid ineffective conservative treatment or inappropriate surgical procedure for patients with trigger wrist.

**A-0318 Ultrasonographic approach to proximal interphalangeal (PIP) joint contracture associated with trigger finger**

Y Nakanishi, S Omokawa, Y Kobata, Y Tanaka
Nara Medical University, Kashihara, Japan

**Purpose:** Flexion contracture of the proximal interphalangeal (PIP) joint is associated with trigger finger, and the patients often complain of pain in this joint. We hypothesized that there would be inflammatory changes around the PIP joint based on our experience with effective pain relief to be achieved by steroid injection in this area. This study aimed to analyze the morphological changes of the PIP joint using ultrasonography in patients with painful flexion contracture of the PIP joint following trigger finger, and to evaluate the effectiveness of steroid injection.

**Methods:** We enrolled a prospective cohort of 10 consecutive patients who complained of painful contracture of the PIP joint accompanied with trigger finger. Bouchard’s node and other inflammatory diseases, such as rheumatoid arthritis, were excluded. Nine cases were located in the middle finger, and one case was in the ring finger. Four of the 10 cases had developed the contracture after trigger finger surgery. We evaluated the morphological changes in the volar aspect of PIP joint with the use of high resolution B-mode sonography, and changes in vascularity were assessed as well in power Doppler images. Following the evaluations, we injected 10 mg of triamcinolone (TC) between the volar plate and the flexor tendon under ultrasound guidance. At three weeks after the injection, we evaluated again the clinical symptom, improvement of the range of finger motion (ROM), and sonographic changes in thickness and vascularity of the volar plate.

**Results:** Sonographic evaluations revealed the presence of an irregular swelling (increase of thickness) in the membranous proximal portion of the volar plate in all cases. In eight of the 10 fingers, we found increased vascularity in the membranous portion in power Doppler images. Following the TC injection,
PIP joint pain had disappeared, and the mean degree of extension lag in the PIP joint was improved from 16 to 3°. The average thickness of the volar plate decreased from 3.6 to 2.8 mm, and power Doppler images showed a markedly reduced blood flow around the volar plate.

Conclusions: Based on the current observation, we found two new ultrasonographic findings in the painful contracture of the PIP joint accompanied with trigger fingers. One was increase in thickness of the membranous proximal portion of the volar plate, and another finding was increased vascularity at this lesion. These abnormal findings were improved after the injection of TC, and the pain and the ROM of the PIP joint was improved as well. Although the mechanism of PIP joint contracture associated with trigger finger is still obscure, increased thickness with hypervascularity in the volar plate may contribute to painful contracture of the PIP joint.

A-0319 Flexor tendon injuries after volar plate fixation for distal radius fractures

SH Kang, HM Kim, JY Lee, SW Song, SE Park, YH Kim, IJ Park
Department of Orthopaedic Surgery, The Catholic University of Korea, Seoul, Korea

Purpose: Tendon injuries are major complication in treating fractures of the distal radius. The risk factors of injury to the flexor tendons following volar plating are: the plate being located more distal to the watershed line, and the plate moving away from the cortical bone and being protruded at the volar side. Authors have experienced eight cases of flexor tendon injuries after treating a distal radius fracture using volar plate fixation. The radiologic locations of the volar plates in the eight cases were analyzed, and the correlation between the location of the plate and the degree of risk were also analyzed through a case control study.

Methods: From March 2005 to March 2012, eight cases in which damage to the flexor tendons were identified. Six were female, and the mean age was 63.6. The mean time of tendon ruptures was postoperative 15.12 months. Of the eight cases, three were complete ruptures and five were attritional injuries. In order to perform a case-control study, a control group, three times the pool of the subject group (gender, age range, and implant matched). Three board-certified orthopedic surgeons analyzed the location of the volar plates using X-ray lateral imaging. As for the factors of the study, the relationship between the extent of plate protrusion and the volar critical line, as reported by Soong and colleagues, was determined (Grade 0, 1, 2). The distance between the plate and the volar critical line (PCL), and the distance between the plate and the volar rim of the distal radius (PVR), as reported by Kitay and colleagues, were measured. Finally the volar tilt angle of distal radius was likewise measured.

Results: Of the eight cases of flexor tendon injury, six cases were G1 according to the Soong grade, and two cases were G2. The mean PCL was 6.71 mm, the mean PVR was 1.64 mm, and the mean volar tilt was 2.6 degrees. The control group showed five cases of G0, 18 of G1, and one of G2. The mean PCL was 1.48 mm, the mean PVR was 3.27 mm, and the mean volar tilt was 9.2 degrees. The subject group showed a higher PCL (p=0.024), and a lower volar tilt (p=0.016), but there was no significant difference in the PVR between the two groups (p=0.084).

Conclusion: The authors confirmed that the risk of flexor tendon injury increases when the PCL was greater than 2.67 mm. However, the PVR, which shows how distal the plate is located, did not show any significant difference. This study has critical limitations. The mean time of plate removal in the control group was postoperative 8.45 months, while the mean time of tendon ruptures was 15.12 months. This indicates that the effects of early plate removal cannot be overlooked. In conclusion, if the protrusion of the plate is greater than 2.67 mm and bone union is judged to have taken place, it is recommended that the plates be removed as early as possible.

A-0320 Gender differences in nerve regeneration after sciatic nerve injury and repair in healthy and diabetic rats

L Stenberg, M Kanje, LB Dahlén
Department of Hand Surgery; Department of Biology; Lund University, Malmö and Lund, Sweden

Purpose: The aim was to investigate if axonal outgrowth, as well as activation and cell death of Schwann cells, differed between diabetic and healthy female and male rats after a sciatic nerve transection and repair.

Methods: The sciatic nerve in diabetic Goto-Kakizaki (GK-rats) female and male rats and in healthy female and male Wistar rats was transected and instantly repaired by conventional nerve sutures. After six days the sciatic nerve was harvested, frozen and sectioned. By immunohistochemistry antibodies were used to stain for neurofilaments (length of axonal outgrowth from the nerve repair), for caspase 3 (number of apoptotic Schwann cells) and for
Activating Transcription Factor 3 (ATF 3; number of activated Schwann cells).

**Results:** Axonal outgrowth was longer in male rats than in female rats both with respect to healthy and diabetic GK rats. The length of axonal outgrowth was also longer in healthy female rats compared to diabetic female rats, but no differences were observed between healthy and diabetic male rats with respect to axonal outgrowth.

In healthy rats, there were no differences in activated and apoptotic Schwann cells between male and female rats. However, a higher number of activated Schwann cells were detected in male diabetic than in female diabetic GK rats. Generally, we found a higher number of apoptotic Schwann cells in diabetic GK rats than in healthy rats, both close to the site of repair and further down in the distal nerve segment.

**Conclusion:** We observed gender differences in the nerve regeneration process in healthy and diabetic GK rats; findings that may be important to consider when designing projects examining the mechanisms in nerve regeneration and also in the development of new nerve reconstruction techniques. Examination of the mechanisms in nerve regeneration in diabetic GK rats may be crucial in view of the globally increasing number of patients with diabetes.

**A-0321 Revisional TERA with autogenous strut fibular and iliac bone graft**

S-W Song, Y-M Lee  
Department of Orthopedic Surgery, Yoido St. Mary's Hospital, Catholic University of Korea, Seoul, Korea

**Purpose:** After primary TERA, stem loosening, osteolysis or infection need revisional operation. Reconstruction of humeral bone defect during revisional TERA is a challenging problem and its results affect long term clinical outcomes and longevity of prosthesis. The purpose of this study is to report clinical results of autogenous strut fibular bone graft bone for large bone defect and iliac bone graft for osteogenesis in revisional TERA.

**Materials and Methods:** Seven patients treated by revisional TERA with autogenous strut fibular and iliac bone graft from March 2003 to May 2012 were reviewed retrospectively. At first stage, we performed debridement of lytic bone and metallosis and applied external fixator for unstable elbow due to bone defect. After six weeks, we removed external fixator and applied elbow brace. Post-operatively six months later, we performed revisional TERA with triceps reflecting approach. Strut fibular bone was harvested from contralateral leg and iliac bone was harvested from iliac tubercle. Fibular bone was split longitudinally and grafted with iliac bone with wiring to wrap distal humeral stem.

**Results:** The mean age was 49.5 years (range, 26 to 78 years). There were five males and two females. Reasons for failure were aseptic loosening for five cases and infection for two cases. The mean range of motion at last follow-up was 95° (22° of pronation and 26° of supination). Bone union between host bone and grafted bone was completed after 4.5 months in average. Extension power of elbow joint was decreased to grade IV in two cases and recurrent low grade infection was detected in one case and treated by oral antibiotics.

**Conclusion:** The allogenic bone graft is frequently considered to reconstruct bone defect during revisional TERA. Although allogenic bone graft may provide large bone stock, it has several shortcomings such as delayed or nonunion between grafted bone and host bone, and possibility of infection. Revisional TERA with autogenous strut fibular and iliac bone graft can improve bone stock of distal humerus with high union rate and short union period. This procedure allows revision surgery using conventional semi-contained implants instead of salvage procedures such as elbow fusion or resectonal arthroplasty.

**A-0322 Is ultrasonography useful to predict flexor tendon rupture after volar locking plate fixation of distal radius fractures?**

S Tokunaga, Y Abe, Y Takahashi, T Ebata  
Sakura Orthopaedic Hospital, Sakura, Japan

**Purpose:** Flexor tendon rupture is a well-known complication after volar locking plate fixation of distal radial fractures. We evaluated the prognostic value of ultrasonography to predict tendon rupture.

**Methods:** Between July 2011 and August 2012, 23 wrists of 23 patients were examined after distal radius fracture repair with volar locking plates. Two patients were men and 21 were women. Nine wrists were right, 14 wrists were left, and the average age at the time of surgery was 64.8 years. Acu-Loc (Acumed, Hillsboro, OR, USA) was used in 13 wrists; APTUS (Medartis, Basel, Switzerland) in nine wrists; and VA-LCP (Synthes, West Chester, PA, USA) in one wrist. In all cases, the pronator quadratus was elevated from the radius and the plates were inserted underneath to preserve the muscle bellies. We performed ultrasonography just before plate removal and one month after plate removal. Patients were seated in a comfortable position with their arms on a table, forearms supinated, and the wrists and fingers in a neutral position.
position. We measured the distance between the Flexor pollicis longus (FPL) tendon and the distal edge of the plates before plate removal and the distance between the FPL tendon and the distal edge of the radius one month after plate removal. We also measured the distance between the FPL tendon and the distal edge of the radius in the contralateral normal wrist one month after plate removal for comparison. We inspected the tendons for damage during surgery.

**Results:** Plate removal occurred 158 to 831 days after surgery (average, 249.9 days). No patients suffered tendon rupture. The mean distance between the FPL tendon and the distal edge of the plate before removal was 0.45 mm (range, 0–2.2 mm) and in 14 wrists, the distance was 0 mm. The mean distance between the FPL tendon and the distal edge of the radius was 2.33 mm one month after plate removal, and 2.26 mm in the contralateral normal wrist. We found erosion of the FPL tendon in three wrists and of the flexor digitorum profundus tendon of the index finger in one wrist. In all four affected wrists, Acu-Loc was used and the distance between the FPL tendon and the plate was 0 mm before plate removal. In one wrist, ultrasonography showed abnormal gliding of the FPL tendon preoperatively.

**Conclusions:** In all cases with erosion of the flexor tendons, the distance between the FPL tendon and the plate was 0 mm before plate removal. Therefore, a distance of 0 mm between the FPL tendon and the plate may be a risk factor for flexor tendon rupture. Ultrasonography appeared to be a useful method to predict FPL tendon rupture.

**A-0324 Trans-scaphoid perilunate fracture dislocations: screw fixation of the scaphoid and Lunotriquetral ligament repair using a dorsal approach**

J Oh, S Rok Kwon, Min
Wonju Christian Hospital, Yonsei University, Wonju College of Medicine, Wonju, South Korea

**Purpose:** To evaluate clinical and radiological results after screw fixation of the scaphoid and lunotriquetral ligament repair using a dorsal approach in the treatment of trans-scaphoid perilunate fracture dislocations.

**Materials and Methods:** Seventeen patients who underwent operative management of a trans-scaphoid perilunate fracture dislocation were included in this study. Average follow up period was 58 months. In all patients, screw fixation of the scaphoid and lunotriquetral ligament repair with a suture anchor after open reduction was performed. Clinical evaluation was done by measuring range of motion and grip power and disabilities of arm, shoulder and hand (DASH) score evaluation for functional recovery at the last follow-up. Union of scaphoid, change in lunotriquetral distance, and development of any instability and arthritis of wrist joint were radiographically assessed.

**Results:** In clinical outcomes, 89.3% recovery of grip power and 87.5% recovery of range of motion compared to healthy side were observed at the last follow-up. Average range of motions of extension, flexion, ulnar deviation, radial deviation, supination and pronation were 51.8°, 58.4°, 21.2°, 16.2°, 74.3°, and 75.1°, respectively. Average DASH score was 13.2. Bony union of scaphoid was achieved in all cases at the average of post-operative 19.3 weeks. Lunotriquetral distance after the operation and at the last follow-up were 1.9 mm and 2.0 mm, respectively. There was no radiographic evidence of instability or arthritis.

**Conclusion:** Dorsal approach allows reduction of carpal bone, scaphoid fixation and lunotriquetral ligament repair in the treatment of trans-scaphoid perilunate fracture dislocations, providing satisfactory clinical and radiological results.
Objective: The purpose of this paper was to analyze the construct validity of the Performing Arts Module of the DASH instrument for measuring Specific Upper Extremities (UE) Disability in Musicians.

Hypothesis: The difficulty for playing an instrument (Performing Art Module score) will correlate positive with the Upper Extremities Disability (DASH score) and it will correlate negative with the level of Quality of Life (Q of L) (SF–36 scores).

Material and Method: Population Study. A total of 359 musicians were included in this study, 43.5% men and 56.7% women; 18 of whom were professionals; the remainder were students. The average age was 18.39, ranging from 16 to 50.

Clinical Design: A cross-sectional study.

Instruments and Measures: The Spanish version of the health instruments SF–36 (for measuring Q of L) and the DASH (for measuring Disability of the Arm, Shoulder and Hand) were self-administered in the target population, and all individuals answered the specific module of the DASH (performing art module with four items) and the Standard DASH (30 items).

Data Analysis: The Art Performing Module of the DASH was correlated with the DASH and with the SF–36 scores using a Pearson Correlation test with a level of significance of 0.01. Finally, a partial correlation analysis controlling the DASH variable was done in order to know how does the Upper Extremities Disability influence the relationship between “the difficulty to play an instrument” (Performing Art Module score) and the Q of L (SF–36 score).

Results: We observed a positive correlation between the Performing Art Module and the DASH ($r=0.564$, $p=0.000$); and a negative correlation between the “difficulty for playing an instrument” (Performing Art Module) and the Q of L (SD–36) [range $r=–0.2400$ to $–0.3398$]. The correlation coefficient decreased when the variable DASH was controlled in the partial correlation analysis [range $r=–0.1216$ to $–0.1920$].

Conclusions: There was a positive correlation between “difficulty for playing an instrument” and the DASH. There was a negative correlation between “difficulty for playing an instrument” and the Q of L (higher difficulty implied lower Q of L), and that negative correlation is influenced by the Disability of Upper Extremities (DASH). The results constitute an evidence of good construct validity of the Performing Art Module of the DASH for measuring specific upper extremities disability for playing an instrument in musicians.
A-0333 Construct validity and predict value of the QuickDASH for measuring upper extremities disability in carpal tunnel syndrome population

R Rosales, Y Martin Hidalgo, A Dorta Fernandez
Unit for Hand & Micro Surgery, GECOT, Tenerife, Spain

Objective: The purpose of this paper was to analyze the construct validity of the Spanish version of the QuickDASH and establish its mathematical relationship with the DASH.

Hypothesis: Research team established the following hypothesis: 1) The QuickDASH will correlate with the specific CTS instrument in the same way that the DASH instrument will correlate with the CTS instrument. 2) If there will be a close correlation between the DASH and the QuickDASH and if we can fit a mathematical model to the data which explains that relationship, then we will be able to predict the value of the DASH score from the QuickDASH score.

Material and Method: Population Study. A total of 38 patients with the diagnosis of CTS based on clinical and neurophysiologic criteria constituted the target population.

Clinical Design: A cross-sectional study.

Instruments and measures: The Spanish version of the DASH, CTS and QuickDASH instruments were self-administered to the target population.

Data Analysis: Based on the data following a normal distribution (Shapiro-Wilk test p>0.05) and with a homogeneity of variance (Levine test p>0.05), a Pearson correlation test was used with a level of significance of 0.01 to analyze the relationship between the QuickDASH, STC and DASH established in the hypothesis. Finally, a lineal regression model was used to analyze the predicted value of the QuickDASH, being the DASH the dependent variable (DV) and the QuickDASH the independent or predictor variable (IV).

Results: There was a significant correlation between QuickDASH and the symptoms severity scale STC instrument (SS-CTC) [r=0.473, p = 0.003], but there was not a significant correlation with the functional status scale STC instrument (FE-CTC) [r=0.245, p = 0.139]. Similar results were observed with the DASH related to the SS-CTC [r=0.427, p = 0.08], and to the FE-CTC [r=0.263, p = 0.111]. A very close correlation was seen between the QuickDASH and the DASH [r=0.954, p = 0.000]. The Regression analysis showed a linear relationship between the DASH and the QuickDASH, being statistically significant [F=363,938, p = 0.000] with an intercept value of 0.839 and a slope value of 0.897.

Conclusion: The results constitute an evidence of a good construct validity of the QuickDASH. Besides, we can use the QuickDASH instead of the extended version (DASH), and we can predict the score of the DASH from the QuickDASH score following the linear regression equation: \( \text{DASH} = 0.839 + 0.897 \times \text{QuickDASH score} \).

A-0337 Result of arm-level upper-limb transplantation in two recipients at 19- and 30-month follow-up

J Jablecki, L Kaczmarzyk, A Domanasiewicz, A Chelmonski, A Elsafaawy
Hand Trauma Center St. Hedwig’s Hospital, Trzebnica, Poland

Background: Arm transplantation (ATx) is a novelty in the field of upper-limb transplantation, with only seven procedures performed worldwide.

Case Report: In this paper we report on early results of unilateral arm transplantation recipients. Patient 1, a 30-year-old man, examined 30 months post-transplant, is able to actively flex the elbow, has 160 degree of ROM in the fingers of the grafted limb, and scored 92 points in the DASH questionnaire and 62 points in the Comprehensive Functional Score System (CFSS). The post-transplant period was complicated with one acute rejection episode due to CMV infection, and delayed bony union. Patient 2, a 55-year-old woman, examined 19 months post-transplant, is able to actively flex the elbow, has 180 degree of ROM in the fingers of the grafted limb, and scored 89 points in the DASH questionnaire and 64 points in the Comprehensive Functional Score System (CFSS).

Conclusions: The post-transplant period was complicated with a delayed bony union. The ATx seems to be a valuable reconstructive therapeutic modality.

A-0339 Partial wrist denervation as an adjunct to normal wrist arthroscopy

E Melikyan1, V Kefalas2, C Spicka1
(1) University Hospital Southampton, Southampton, UK
(2) Southampton Treatment Centre, Southampton, UK

Background: Partial wrist denervation is advocated as an adjunct to normal wrist arthroscopy. The results of this are variable, and the technique is not widely accepted. Partial wrist denervation is effective for treating pain especially when it is unrelated to mechanical disruption. Partial wrist denervation is generally recommended for use as adjunctive therapy.
treatment together with other procedures. The aim of our study is to assess the effectiveness of partial wrist denervation carried out at the same time as diagnostic wrist arthroscopy where no structural disruption is found.

Twelve patients who underwent partial wrist denervation at the same sitting as wrist arthroscopy were included in the study. The findings at wrist arthroscopy were as follows: A normal wrist in seven patients, dorsal synovitis in three patients and ulnar-sided synovitis in two patients. Following the arthroscopy, a partial wrist denervation was carried out involving the posterior and anterior interosseous nerve in all cases and in addition the articular branches of the superficial branch of the ulnar nerve in cases with ulnar-sided synovitis. Half of the patients underwent preoperative simulation injections using local anaesthetic.

The patients underwent a course of wrist physiotherapy and were followed up at six weeks. Nine out of twelve patients (75%) reported a significant decrease in pain levels. In the remaining three (25%) pain remained the same. There were no complications following surgery.

We would recommend partial wrist denervation at the same sitting as the diagnostic wrist arthroscopy where no mechanical pathology is found, based on our experience. The procedure is very straightforward to perform and has virtually no disadvantages. Preoperative simulation injections are a very effective tool to inform the preoperative consenting process and to ensure that patient expectations are realistic.

**A-0340 Prospective comparative study between volar locking plate and intramedullary nail for unstable distal radius fractures**

R Fujitani, S Omokawa, Y Utihara, A Lida, Y Tanaka

(1) Department of Orthopedics, Ishinkai Yao General Hospital, Osaka, Japan
(2) Nara Medical University, Nara, Japan

**Purpose:** Open reduction and internal fixation using a volar locking plate has gained popularity for the treatment of unstable distal radius fractures because of rigid stability to the fracture site by locking systems. Intramedullary fixation is a minimally invasive device that reduces soft tissue damage and minimizes tendon irritation. The purpose of this comparative study was to investigate whether intramedullary nail (IMN) or volar locking plating (VLP) allows for good clinical and radiological results for unstable extra-articular distal radius fractures.

**Materials and Methods:** Inclusion criteria were unstable Type A2 and A3 fractures according to AO/ASIF system. Unstable fractures were defined as a fracture with more than 30° of dorsal angulation and more than 3 mm of ulnar variance. Since 2005 to 2007, 47 consecutive wrists were treated with VLP (35 females and 12 males, average age was 58 years). Since 2008 to 2010, 16 consecutive wrists were treated with IMN (16 females, average age was 73 years). The wrists treated with the 47 VLP wrists were matched to 16 IMN wrists on the basis of sex, age, mechanism of injury and type of fracture. Functional outcomes of both groups, including Disabilities of Arm, Shoulder and Hand (DASH), the range of flexion-extension motion (ROM) of the wrist, and grip strength, were evaluated at three, six, and twelve months post-operatively. Radiographic outcomes including the ulnar variance (UV), radial inclination (RI), and volar tilt (VT) were evaluated when the bone union was achieved. These outcome measures were compared between the patients with the VLP and the IMN fixation. Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS). A p value of <0.05 was considered significant.

**Results:** There were no significant differences between these two matched cohorts with respect to sex, age, mechanism of injury and type of fracture. The radiological outcome of the average UV was 1.1 mm in the patients with IMN group, and 0.4 mm in the patients with VLP group, and these differences were statistically significant. There were no significant differences in the other radiological parameters between the two groups.

At three months post-operatively, the average DASH score was 32 in the IMN group, and 48 in the VLP group, respectively. There was a significant difference between the two groups (p < 0.05). The average percentage grip strength at three months post-operatively was 65% in the IMN group and 53% in the VLP group, respectively. There was a significant difference between the two groups (p < 0.05). The ROM at the three months follow-up in the IMN group (88%) showed a significant increase compared to VLP group (69%) (p = 0.04). At six and 12 months post-operatively, there was no significant difference between the two groups regarding the DASH, the grip strength, and the ROM, respectively.

**Conclusions:** The current results indicate that both procedures are highly effective in maintaining fracture reductions, except post-operative UV, which was better in the VLP group than the IMN group. The IMN fixation may provide earlier recovery of the wrist and upper extremity function in the early post-operative period.
A-0342 Partial capitate shortening in Kienböck's disease

T Özalp, G Kale, S Erkan, HS Yercan, G Okçu
Celal Bayar University, Medical Faculty, Department of Orthopedics and Traumatology, Hand Surgery Division, Manisa, Turkey

Purpose: Numerous surgical treatment options are proposed for the Kienböck disease since Dr Robert Kienböck but there has not been a consensus on the most appropriate method yet. The aim of this study is to present our experience on partial capitate shortening as a simple and effective method.

Methods: 34 patients with Kienböck’s disease were treated by partial capitate shortening between 2006 and 2012. The average follow-up period was 32.5 months (range 12–70 months). 20 patients were treated by only partial capitate shortening and 14 patients had a combined technique, partial capitate shortening and vascularized bone grafting from dorsal radius. Pre- and post-operative range of motion, pain and grip strength, radiologic parameters such as carpal height ratio, Stahl index, radioscaphoide and scapholunate angles were evaluated.

Results: The patients were composed of six stage II, thirteen stage IIIA and fifteen stage IIIB patients according to Lichtmann classification. Mean consolidation time was 7.5 weeks (5–10 weeks) There was no change in Stahl index, carpal height ratio and scapholunate angle. A slight improvement was observed in wrist mobility in all patients. Patient satisfaction from the operation was 89%. Pain has diminished considerably.

Conclusions: We believe that partial capitate shortening with or without vascularized bone graft has encouraging results and it is a good alternative in the treatment of Kienböck’s disease even in later stages except stage 4.

A-0343 Treatment of severe partial axonotmesis: a descriptive study

O Izquierdo, E Domínguez, J Castellanos
Parc Sanitari de Sant Joan de Déu, Hospital General, Barcelona, Spain

Introduction: Treatment of severe axonotmesis remains a challenge in peripheral nerve surgery. The axonotmesis involves axonal degeneration with preservation of the outer connective structures, leading to muscle denervation. The most widely used treatment consists of the observation of nerve regeneration and treatment of sequelae if it occurs. We present a series of cases of axonotmesis attended in our hospital, regarding to the epidemiological data and treatment followed.

A-0344 A fluoroscopic comparison of the behavior of four different types of loop design used in flexor tendon repair on loading using fluoroscopy

X Dong1, M He2, JC Fang1, T Karjalainen1, JS Sebatin3, A Chong
(1) Hand & Reconstructive Microsurgery, National University Hospital, Singapore
(2) Department of Orthopedic Surgery, National University of Singapore, Singapore
(3) Yong Loo Lin School of Medicine, National University of Singapore, Singapore
(4) Department of Surgery, Oulu University Hospital, Oulu, Finland
(5) Hand & Reconstructive Microsurgery, National University Hospital, Singapore
Purpose: The popular description of the hold of core sutures in flexor tendon repair as grasping and locking loops is based on the orientation of the transverse and longitudinal components of the suture to each other. We feel that these terms are misnomers and should be replaced by the arc, loop, and knot designs. The purpose of this study is to determine the pattern of deformation in each of these designs that occurs on loading the suture.

Methods: We used porcine tendons from the 1st ray. Four types of suture designs were used. Group 1 (n = 10) underwent an arc repair [transverse suture component deep to longitudinal component]; Group 2 (n = 10) underwent a simple loop repair [transverse component superficial to longitudinal component]; Group 3 (n = 10) underwent a complex loop repair [double loops at each corner]; and group 4 underwent a knot repair [two knots at each corner]. All repairs were done using stainless steel sutures and a suture purchase of 10mm was obtained. The tendons were mounted onto a mechanical testing machine (Instron 5543; Instron, Massachusetts, USA) and loaded to failure at a constant speed of 50 mm/min. During the loading anteroposterior and lateral radiograph videos were obtained using a Fluroscan Insight radiography system (Hologic, MA, USA) for 45 seconds.

Results: The arc and simple loop designs unravelled before pulling out. The complex loop and knot designs constricted first followed by pulling out.

Conclusions: The arc and simple loop designs fail faster and failure is by unraveling of the portion of suture holding the tendon. The complex loop and knot repairs fail by cutting through the portion of tendon fibrils.

A-0346 Surgical treatment of scaphoid nonunion with Acutrak screw

Y Chung, SK Choi, C Kim
Department of Orthopedic Surgery, College of Medicine, The Catholic University of Korea, Seoul, Korea

Purpose: For the treatment of scaphoid nonunion, bone grafting and rigid internal fixation are necessary. We evaluated outcome of scaphoid nonunions treated with bone grafting and Acutrak screw fixation.

Methods: Since 1 August 2005, 27 scaphoid nonunions were managed with pedicled vascularized bone graft or autogenous iliac bone graft combined with Acutrak screw fixation. The mean time interval from accidents to surgeries was 91 months. The locations of nonunions were at distal pole in six, at waist in 16 and at proximal pole in five patients. In 11 patients including eight ones with avascular necrosis of proximal fragment, one–two supraretinacular artery-pedicled bone grafts were performed and in the remaining 16 patients, autogenous iliac bone grafts were done. In all patients, Acutrak screws were used for stable internal fixation and an additional one–two K-wire fixation were performed in seven patients. Volar approaches were used in 11 patients and dorsal ones in 16 patients. Serial radiographic evaluations were done in every four–eight weeks for bone union. The mean follow up period was 22.1 months.

Results: Bone union was obtained in all 11 patients with pedicled vascularized bone graft. The mean union time was five months (ranged 3–9 months). Among 16 ones with autogenous iliac bone graft, 14 nonunions healed at a mean 4.1 month after 1st operation. In two failed patients, secondary procedure of removal of loose Acutrak screw, additional iliac bone graft and I/F with three–four K-wires or another Acutrak screw and K-wires were performed, which resulted in bone unions three–four months after the 2nd procedures. ROM of wrist joint at last follow-up was 87%, and the grip power was 85% of the normal side, respectively.

Conclusion: By combined bone graft and Acutrak screw fixation, bone union was achieved in 92.6% of patients with scaphoid nonunions. Pedicled vascularized bone graft from distal radius will be helpful to get bone union even in the cases of AVN of proximal fragments. In two out of eight patients with nonunions fixed with Acutrak screw only, screw loosening and persistent nonunion were developed. Additional K-wire fixation should be considered in patients with poor bone quality and/or in failed cases.

A-0347 The Eaton-Glickel classification cannot predict clinical outcome after total joint arthroplasty of the trapeziometacarpal joint

L Kirkeby, TB Hansen
Department of Orthopaedics, Section of Hand Surgery Regional Hospital Holstebro, Holstebro, Denmark

Purpose: The Eaton-Glickel classification is widely accepted for evaluation of degenerative changes in the trapeziometacarpal (TMC) joint including evaluation of subluxation and degenerative changes in the scaphoid-trapezium (ST) joint. In total joint arthroplasty of the TMC joint the clinical result may depend on the preoperative degenerative changes with subluxation of the TMC joint and degenerative changes in the ST joint and so far the influence of these changes on clinical outcome is unknown. We wanted to investigate if the clinical result after total joint arthroplasty
of the trapeziometacarpal joint could be predicted from preoperative degenerative changes evaluated using the Eaton-Glickel classification.

Methods: In a prospective study we included a total of 69 patients (14 males) mean age 59 years (range 41–77). All patients were operated with total joint arthroplasty of the trapeziometacarpal joint and clinical follow-up was done after three, six and 12 months. The preoperative degenerative changes were classified according to the Eaton-Glickel classification based on plain radiographs and CT scans. Eaton IV was defined as having discrete but clear degenerative changes in the ST-joint. Patients with severe degenerative changes in the ST joint were however excluded and treated with trapeziectomy.

Results: We found 26 patients with Eaton II, 30 patients with Eaton III and 13 patients with Eaton IV degenerative changes. All three groups had a good clinical effect of the operation regarding pain, grip strength and DASH score, and we found no significant difference between the three groups at any measure point in the study. Also we found no difference between different implant types.

Conclusions: Classification of degenerative changes in the trapeziometacarpal joint using the Eaton-Glickel classification cannot predict the clinical outcome after total joint arthroplasty, and discreet but clear degenerative changes in the ST-joint does not predict an inferior clinical outcome. Further research in better preoperative evaluation methods is needed.

A-0349 Results of neurotization of the biceps and/or brachialis muscles for elbow flexion

I Golubev, S Zhuravlev, M Merkulov
Department Hand Surgery and Microsurgery, Central Institute Traumatology and Orthopedics Surgery, Moscow, Russian Federation

Purpose: To investigate the results of Oberlin single and double nerve transfer for brachialis and/or biceps muscle reanimation after brachial plexus injury.

Materials and Methods: There were eight patients requiring elbow flexion restoration. In half of them there were performed single ulnar nerve fascicle to biceps branch and other four double transfers from medial nerve to brachialis branch and from ulnar to biceps one. There average age was 29,6 years old, the operative delay was an average of 11,3 months, and the follow-up was an average of 30,3 months. There were recorded the function of recipient muscle and also motor and sensetive deficit in donor nerve areas.

Results: In the simple transfer group (partial transfer of the ulnar nerve on the nerve of the biceps or brachialis muscles), only one patient recovered British Medical Research Council grade M3 and three patients had M2. There were noted by EMG a half of motor answer from FCU in comparison with contralateral hand. There was no sensetivity loss in the donor area. In the group double transfer, three patients recovered grade M4 and one patient had M3. The average time of restore to grade M4 was 12,3 months. Three of these patients experienced a sensory deficit in the area of innervation of the median nerve (II and III fingers). However, these patients expressed no discomfort. There was no motor deficit in medial nerve area.

Conclusion: The double neurotization gives superior strength of elbow flexion after brachial plexus injury. But there was noted essential loss of sensibility in median nerve area on the hand. Clinical and EMG investigation found a sensory deficit of three out of four cases in the group double transfer.

A-0362 Carpal height ratio and clinical outcome after midcarpal arthrodesis

M Gjika Ergys, S Pierre, S Kampfen, P Vostrel, J-Y Beaulieu
Unité de Chirurgie de la Main et des Nerfs Peripheriques Hôpitaux Universitaires de Genève, Genève, Switzerland

Introduction: Midcarpal osteoarthritis is the natural evolution of a wide variety of wrist diseases including inflammatory arthritis, scaphoid nonunion advanced collapse, scapholunate advanced collapse, and osteoarthritis. It is associated with carpal collapse with loss of carpal height and a DISI deformity. The place of lunatum correction in midcarpal arthrodesis procedure is now fully studied, but only few authors have given attention to carpal height modification. Our hypothesis was to prove that a significant carpal high modification after midcarpal arthrodesis, could be consequences of bad clinical et functional outcome.

Material and Method: Twenty-eight patients were included in our retrospective cohort, from 2001 to 2011, in the university hospital of Geneva. For each patient, we picked up clinical data as range of motion, pain, grip and pinch, work modification, MAYO wrist score and QuickDASH. These clinical values were compared to carpal height ratio, carpal translation index and capitolunate angle, from pre- and post-operative x-ray. At the end, a statistical description of this patient series was made, same as a statistical test, to find correlation between clinical outcome and x-ray measurements.
Results: Our cohort included two women and 26 men, with a mean of 56.9 years old (± 14.2) and a follow-up of 4.8 years (± 3). We found 20 SLAC, five SLAC, one midcarpal laxity, one midcarpal sepsis and one STT advanced osteoarthritis. After surgery, four patients were unable to work and three needed to change their job. The pain was decreased from 6.5 (± 1.4) VAS to 3.1 (± 3) after surgery. The mean grip strength was 22.8 kg (± 10.6) before surgery, contrary to 26.2 kg (± 10.7) after arthrodesis. The average range of motion before and after surgery was respectively 98.2° (± 38) and 60.7° (± 25.4) in flexion-extension, 33.2° (± 16.2) and 23.8° (± 14.6) in radial and ulnar deviation, 149.6° (± 33.5) and 144.5° (± 29.8) in pronosupination. The mean of carpal height ratio was 0.508 before surgery and 0.475 after, the carpal translation index was 0.340 before then 0.339 after and the capitolunate angle average was –10.1° before surgery (15 patients in DISI deformity) then –4.9° after surgery (10 DISI correction). The DASH mean was 33.1 and MAYO wrist score 68.6, after surgery, with 21 patients fully satisfied at the end. Finally, we found a statistical link between carpal height modification after surgery and poor DASH outcome (p < 0.005).

Discussion: Even if carpal height ratio was often described as predictor factor of rheumatoid arthritis progression in studies as Murakoshi et al. in 2009, some other authors had tried to find a clinical link with carpal height variation. Thus, Giannikas et al. in 2010 didn’t find any relationship between carpal height increase and clinical outcome in his eight patients’ series; contrary to Voche et al. who said that in order to obtain a good result in corner fusion, it suffices to stabilize the existing carpal collapse without attempting to restore carpal height.

Conclusion: Our study shows the importance of preserving carpal height ratio after midcarpal arthrodesis of wrist osteoarthritis.

A-0366 Bonegraft from the distal radius in childhood – a good alternative to the iliac crest?

E-M Baur¹, T Engelhardt¹, H Piza-Katzer², G Pierer²
(1) University Clinic of Plastic, Reconstructive and Aesthetic Surgery of Innsbruck
(2) Private Praxis, Vienna

Corrective osteotomy in childhood sometimes requires a bone graft to avoid loss of length. Usually the iliac crest is the donor site of choice. The distal radius is widely accepted as a donor site for bone grafts in adults.

In Innsbruck we have been taking bone grafts using exclusively the distal radius for paediatric cases since 2004: from 10/2004 to 5/2012 we treated 23 hands in 16 children with an age range between one and seven years. Two children required posttraumatic corrective osteotomy, the remaining operations were treatments of congenital malformations. Retrospectively we were looking specially for the bony healing and donor site complications.

Bone fixation was achieved by plates or K-wires depending on the condition and age. Bony healing was complete and without delay. Plates and K-wires were removed accordingly. There were no donor site complications and no special treatment required for the donor area.

For bone graft harvesting in the adult the distal radius is a widely accepted donor site. It can also be recommended for paediatric cases, avoiding an additional painful wound. Our patients had a good and radiological result (outcome). In order to avoid damage to the epiphyseal plate x-ray control in OR prior to graft removal is essential.

A-0367 Complications after conservative treatment of distal radius fractures in the elderly

S Quadlbauer, C Pezzei, J Jurkowitsch, T Beer, H Hertz, M Leixnering
AUVA Trauma Hospital Lorenz Böhler – European Hand Trauma Center, Vienna, Austria

Introduction: Distal fractures of the radius are becoming increasingly common, especially in women. It is the most common fracture of the upper extremity in individuals older than 65 years of age. Therapeutic options for this condition are controversially discussed in the published literature, especially in respect of elderly patients. Stable fractures can be treated by closed reduction and cast immobilization, but unstable fractures require additional fixation. However, open reduction and internal fixation with a palmar locking plate has been established as standard therapy in the last few years. Complications have been reduced by this approach.

Factors that determine the treatment of radius fractures in elderly patients are reduction and anatomic alignment on radiographs. Besides, the patient’s general health and the required functions of the hand in daily routine should be included in the decision regarding therapy. As radiological alignment does not necessarily reflect the functional outcome, conservative therapy is appropriate for elderly
patients in poor general condition who do not need to perform complex actions with their hand.

**Material and Methods:** All patients older than 75 years, who had suffered a distal radius fracture and undergone conservative treatment at Lorenz Böhler Trauma Hospital between 2006 and 2009, were analyzed retrospectively. Age, gender, AO fracture type, radial dorsal tilt, ulnar variance, loss of reduction, and complications were registered for statistical analysis. Range of motion and follow-up intervals were also recorded.

**Results:** In all 115 patients older than 75 years of age, with distal radius fractures, were analyzed retrospectively. The patients’ mean age was 83 ± 5 years; 86% were women and 14% men. The mean duration of follow-up was 49 ± 31 days. At follow-up the patients achieved 47% of normal range of motion in the sagittal plane, 65% in the frontal plane, and 88% of forearm rotation. The main ulnar variance was 3 mm. There was no significant correlation between range of motion and ulnar variance. Dorsal tilt showed a significant positive correlation with range of motion. Complications occurred in four cases (0.04%): one patient with a carpal tunnel syndrome and three patients with skin damage. No secondary operations were required.

**Conclusion:** The treatment of distal radius fractures in the elderly remains unclear, but conservative treatment is given preference because of fewer complications and the absence of a correlation between radiological and clinical outcomes. Conservative treatment is especially useful for patients in poor general condition who are not required to perform complex actions with their hand.

**A-0368 Ultrasound anatomy of volar plates in metacarpophalangeal and proximal interphalangeal joints - a cadaveric study with direct comparison to anatomical morphometric analysis**

NA Mueller1, T Lanaras1, P Ducommun1, M Vich2, P Giovanoli1, M Calcagni1

(1) Division of Plastic Surgery and Hand Surgery, University Hospital Zurich, Zurich, Switzerland (2) Institute of Anatomy, University of Zurich, Zurich, Switzerland;

**Purpose:** To study ultrasound (US) anatomy of the volar plate in PIP- and MP-joints and to validate the measurements through the direct comparison with anatomical dissections. These informations should be the base of a better understanding of the US results in case of injury in the acute and during the healing process.

**Methods:** 32 long fingers of 8 cadavers were evaluated (6 men, 2 women, average age 72 years, Thiel conserved). Postero-anterior and oblique radiographs of each hand were taken to exclude previous traumatic or degenerative changes. The volar plates of PIP- and MP-joints were investigated longitudinally and transversely using a high resolution linear-array transducer (frequency of 17–5MHz). After completion of the US the same fingers were dissected and the volar plate directly measured.

**Results:** The volar plate of PIP- and MP-joints can be well demonstrated by high-end ultrasound investigation. In the PIP-joint the length in US was 14.9 mm (range 7.3 – 19.5 mm) and width was 9.3 mm (range 7.0 - 12.4 mm). The dissection showed similar results: length was 13.6 mm (range 5.5-20.0 mm) with a correlation coefficient of r=0.9; width 10.8 mm (range 5.1 -15.0 mm) with a correlation coefficient of r=0.6. In MP-joint the length was 11.7 mm (range 8.2-14.8 mm), the width 9.9 mm (range 7.1 -16.2 mm). The dissection showed similar results: length 11.6 mm (range 7.9-15.6 mm), width 11.3 mm (7.2-15.3 mm) with a correlation coefficient in length of r= 0.8.

**Conclusion:** The present study enlarges the knowledge about ultrasound-anatomy of the volar plate of PIP- and MP-joints, especially because of the direct comparison to anatomical morphometric findings through dissection of the same joints. All US-measurements were similar to those obtained from anatomical dissection of the same joints. The correlation was optimal for length in PIP- and MP-joint. Ultrasound can be considered as a cost efficient diagnostic instrument for the volar plate of PIP- and MP-joint. A diagnostic protocol was developed that allows in few steps an optimal demonstration of the volar plate and enable for an accurate diagnosis of volar plate injuries.

**A-0369 Effects of early mobilization of distal radius fractures stabilized by surgery – a randomized, controlled trial**

M Leixnering1, S Quadlbauer1, B Kolmayer2, J Jurkowitsch1, T Beer1, H Hertz1, C Pezzei1

(1) AUVA Trauma Hospital Lorenz Böhler, European Hand Trauma, 1200 Vienna (2) AUVA Trauma Hospital Lorenz Böhler, Department of Physiotherapy, 1200 Vienna;

**Introduction:** In the last few decades, surgery has become the standard procedure for treatment of distal fractures of the radius. The main reason for open reduction and stabilization with a palmar locking plate is the possibility of early post-operative mobilization.
Studies comparing early post-operative mobilization after radius fractures against cast immobilization are few in number. The main aim of the present investigation was to determine whether early post-operative mobilization leads to a better clinical outcome than cast immobilization.

**Material and Methods:** Twenty-four patients with distal radius fractures treated by surgery in 2010 and 2011 were randomized into two groups. One group (“early mobilization”) received a removable plaster cast for one week and was permitted to move the wrist immediately after surgery. The second group (“control group”) received a non-removable cast for five weeks. Both groups underwent physiotherapy twice a week. Patients in the control group were only permitted to move joints in the immediate vicinity of the fracture. In the 6th, 9th, 12th post-operative week, six months and one year after the operation, the patients underwent measurement of range of motion (ROM) and grip strength; pain was rated on the visual analog scale (VAS). Hand function was analyzed according to the PRWE, Quick-DASH, and Mayo scores.

**Results:** Early functional post-operative treatment leads to significantly better results in terms of grip strength (p < 0.01) and active range of motion in dorsal extension (p < 0.05) as well as palmar flexion (p < 0.01). No significant differences were registered between the two groups in respect of hand function tests and the severity of pain.

**Conclusion:** Early post-operative mobilization after distal radius fractures leads to better functional outcomes than cast immobilization. No significant difference was registered in the severity of pain.

**A-0371 Early promising results of the dorsal and volar arthroscopic ligamentoplasty “B-T-CT” technique of the scapholunate ligament**

C Fernando1, –DC Miguel2, –G Ricardo-Larrainzar3, –O Montserrat1

(1) Section of Hand Surgery, Orthopaedic and Trauma Department, Infanta Leonor University Hospital and Hand Surgery Unit, Beata Maria Hospital, Madrid, Spain
(2) Hand Surgery Unit, Beata Maria Hospital, Madrid, Spain
(3) Headmaster, Orthopaedic and Trauma Department, Infanta Leonor University Hospital, Madrid, Spain

The treatment of the scapholunate ligament injuries is complex and unreliable. Various open techniques have been described for its reconstruction including capsulodesis, bone-ligament-bone transfers, tenodesis, etc. The development of wrist arthroscopy offers a new range of minimally invasive techniques including debridement; electrocaugulation, percutaneous fixation and capsuloligamentous repair without opening the wrist. But arthroscopic wrist ligament reconstruction is still very difficult.

We published in 2012 an arthroscopic technique for the reconstruction of the dorsal portion of the scapholunate ligament called “arthroscopic ligamentoplasty bone-tendon-tenodesis”.

This minimally invasive ligamentoplasty prevents the dorsal conflict between the radius and scaphoid of the scapholunate instability as the bone flexion is corrected with the first tenodesis and the pronation with the second one, linking the dorsum of the proximal scaphoid and the lunate.

However, if only the dorsal portion is reconstructed, there is only one linking point between the scaphoid and lunate and a rotational movement, in the sagittal plane, cannot be avoided, so a DISI could be developed. Also not making the reconstruction of the volar portion could result in an increase of the volar scapholunate gap. This should be one of the facts why, in many open techniques, the gap increases as time passes.

In order to prevent the rotational movement and the opening of the volar scapholunate gap, we have added one more surgical step to our “B-T-T ligamentoplasty” based on a recently published technique, about arthroscopically suturing the volar Scapholunate Ligament, by Dr Piñal. This new step consists of doing the capsoligamentous suture described in the paper, but leaving the strings out of the articulation on the volar side and knotting them to the plasty. In this way we have achieved what we have called a “capsulotenodesis”.

We have changed the name of the technique attending to the fixation points of the plasty: Bone (base of the second metacarpal) – Tenodesis (in the scaphoid and lunate tunnels) – Capsulotenodesis (in the volar capsule over the scapholunate volar portion).

An early mobilization protocol has been applied in all the patients. A “dart throwing movement” is allowed only 15 days after surgery; a complete range of motion is allowed four weeks after surgery and proprioception exercises of the forearm six weeks after surgery.

The aim of this oral communication is to explain the tricks of the technique, the mobilization protocol and to show the early promising clinical results in mobility, strength and function (DASH outcome measure) in our first twelve patients.
A-0379 Carpal tunnel syndrome caused by space-occupying lesions

Z Daliana, S Bougioukli, E Togia, S Varitimidis, V Kontogeorgakos, K Malizos
Department of Orthopaedic Surgery, University of Thessalia, Larisa, Greece

**Purpose:** Masses in or around median nerve are uncommon causes of carpal tunnel syndrome. The purpose is to elucidate the diagnostic approach and the incidence of underlying pathology in carpal tunnel syndrome.

**Methods:** In a 9-year period, among 1100 carpal tunnel syndromes that were treated in our department, 28 cases were correlated to a mass arising from the nerve or the surrounding tissues. The main symptoms were pain, numbness, tingling and weakness and in 19 patients a palpable mass was present. Diagnostic work-up involved nerve conduction studies, ultrasound and MRI evaluation. Decompression of the nerve and excision of the mass was performed in all cases, whereas in tumors arising from the nerve, grafting was necessary. Each patient was evaluated preoperatively and post-operatively by clinical examination, including evaluation of grip strength, two point discrimination test and VAS score.

**Results:** Median nerve compression was due to extraneural [lipomas (6), ganglia (2), tenosynovitis (7), vascular tumors (4), abnormal muscles (5), Dupuytren syndrome (11)] or intraneural [schwannomas (2), sarcoma (1)] masses. The follow-up ranged from two to 40 months. Post-operatively extra-neural masses were associated with a better outcome than nerve tumors. In the cases of extraneural lesion the mean VAS score was 0.3, whereas for the intraneural lesions the mean VAS score was 2.5 two months post-operatively [average score before surgery was 8.5]. The two-point discrimination test had a gradual improvement over the study period in all patients. The mean grip strength values after surgery recovered and exceeded their preoperative level, from an average of 27 before surgery to 31.5 in cases of extraneural masses and 27.5 in patients with intraneural masses after surgery.

**Conclusions:** A broad spectrum of space-occupying lesions may mimic carpal tunnel syndrome. Although rare, the surgeon should include these lesions in the differential diagnosis of carpal tunnel syndrome. Due to their small size they may be missed and unless a detailed clinical examination, nerve conduction studies and appropriate imaging studies are performed, symptoms can be misinterpreted leading to inadequate treatment. A high index of suspicion is thus necessary.

The extent, location and aggressiveness of the mass will dictate the approach and type of procedure.

A-0380 Second look findings of capsular repair of the peripheral injury of the TFCC

T Nakamura, N Matsumura, T Iwamoto, K Sato, Y Toyama
Department of Orthopaedic Surgery, School of Medicine, Keio University, Tokyo, Japan

**Introduction:** Arthroscopic capsular repair is widely accepted for peripheral injury of the TFCC, such as Palmer 1B tear. However, few were reported on second look finding of the capsular repair of the TFCC. We evaluated second look findings of our cases.

**Method:** From 1994 to 2011, 33 wrists in 33 patients of peripheral injury of the TFCC underwent arthroscopic capsular repair. Among them, we performed second look arthroscopy in 13 wrists of 13 patients with informed consent. There were 11 males and two female, with a mean age of 30.9 [range 16 to 45]. Periods from initial injury to the surgery were average 13 months [range three to 36]. TFCC tear indicated in the first wrist arthroscopy was 1B in four wrists, 1B+1A in one, 1B+1D in one in Palmer’s classification. Dorsal tear extended from ulnar avulsion tear was found in four wrists, palmar tear in two and horizontal tear with 1B tear in one, all of those were not classified in Palmer’s classification. Classic ulnar tear (1B) and dorsal tear were treated from 6R portal with outside-in suture technique using two 21 gauge needles, in which 4-0 loop stitch were set. For palmar tear of the TFCC, outside-in suture was done from 6U portal, using same technique. Second look arthroscopy of the wrist was done in average 8.5 months [range 6.5 to 18] after the initial arthroscopic capsular repair. We evaluated second look findings of our cases.

**Results:** In second look arthroscopy, 12 wrists indicated complete repair of the TFCC tear. Other one wrist indicated partial repair of the avulsion site of ulnar tear of the TFCC [classic 1B]. In the partial repaired case, additional outside-in repair of the TFC to the capsule was done and third look confirmed complete repair. Final clinical results obtained 10 excellent and three good.

**Conclusion:** Excellent clinical results of arthroscopic capsular repair for peripheral avulsion of the TFCC were reported, while second look findings of this procedure were seldom reported. Our second look arthroscopy of capsular repair for peripheral tear of the TFCC indicated complete healing in 12 among 13 wrists, with excellent and good clinical results.
A-0383 Early passive movement in acute flexor tendon injuries of the hand

S Quadlbauer1, C Pezzei1, J Jurkowski1, T Beer1, P Reb2, H Hertz1, M Leixnering1
(1) AUVA Trauma Hospital Lorenz Böhler
(2) European Hand Trauma Center, Vienna, Austria

Introduction: Flexor tendon injuries are underestimated in clinical routine as regards their consequences on the function of the hand. An inadequately treated flexor tendon may cause a 2-fold or a 2.7-fold greater inability to work. The treatment of acute flexor tendon injuries of the hand has been transformed since the 1960s: injuries of the flexor tendons were not treated primarily, but reconstructed secondarily. After publication of studies performed by Kleinert, Verdan and Kessler, the treatment of acute flexor tendon injuries underwent a fundamental change. Owing to better microscopic techniques, the injuries were sutured primarily. Given better clinical results, primary sutures of the flexor tendon combined with immediate physiotherapy in terms of “early passive movement” became the standard therapy for acute flexor tendon injuries of the hand.

Material and Methods: Flexor tendon injuries that had occurred between 2007 and 2009 were analyzed retrospectively. Age, gender, accidents at work/leisure activities, range of motion (ROM), follow-up intervals, the affected flexor tendon, and the zone of injury were included in the statistical analysis. The interval between injury and surgery was registered and classified into groups. The surgeon’s training level, complications, and concomitant injuries were noted. The Buck-Gramcko score was calculated on the basis of the range of motion. Excel 2011 and SPSS 19.0 were used for analysis and graphs.

Results: In all 116 flexor tendon injuries that had occurred between 2007 and 2009 were analysed retrospectively. The patients’ mean age was 36 ± 16 years. Men (69%) were more frequently affected than women (31%). Seventy-six (66%) patients suffered an isolated injury of the flexor tendon while 40 (34%) had an injury combined with at least one finger nerve. The mean duration of follow-up was eight months. After early passive movement, restoration of the normal range of motion was 91% for the MCP, 78% for the PIP, and 54% for the DIP. In general the patients achieved an excellent or a good clinical outcome on the Buck-Gramcko score. Ninety-four percent of patients achieved an “excellent” or a “good” clinical outcome. Complications occurred in a mere 2.6%: One secondary rupture (0.9%), two instances of tenolysis (1.7%), and one infection (0.9%) were recorded. The interval between injury and surgery had no impact on the Buck-Gramcko score.

Conclusion: Flexor tendon injuries are underestimated in clinical practice. They may lead to impaired function of the hand when not treated adequately. A primary Zechners’s suture combined with immediate post-operative physiotherapy in terms of early passive movement leads to an excellent clinical outcome and is associated with low complication rates.


A-0386 Results of the treatment of the unstable fractures of the fifth metacarpal bone with the external fixator according to Ellis

Z Posoldová, T Kozák, B Těknědžjan, R Hart
General Hospital Znojmo, Znojmo, Czech Republic

Purpose: Most metacarpal fractures occur in the active working population or young adults. Typically, metacarpal shaft fractures are produced by either axial loading or direct trauma. Fractures of the fifth metacarpal usually result from striking a solid object with a clenched fist. The indication to surgical treatment are nonreponibile, comminutive, redislocated fractures. The purpose of this study was to evaluate the treatment using external fixation.

Methods: From February 2009 to November 2012 we treated 60 patients with subcapital or diaphyseal fifth metacarpal closed fractures by using external fixator according to Ellis (Link, Hamburg, Germany). There were five women and 55 men. Average age at the time of surgery was 29 years [range from 14 to 96]. The external fixation was provided by original K-wires with thread placed transversely through the fractured metacarpal. Two K-wires were placed to the distal fragment of the fracture and other two K-wires were inserted in the proximal fragment. The wires were connected with the body of fixator. Appropriate post-operative care about external fixator was regularly provided.

Results: The external fixator was removed in outpatient ward after eight weeks on average [range, 6 to 12]. There was no loosening of the fixation observe. Two types of complication occurred. Superficial pin track infection was found in five cases. In these cases antibiotics were administered orally. The infection spontaneously resolved after fixator removal after bone healing. No deep infection or osteomyelitis was observed. The refracture after removal of external fixation was observed in one case. The refracture occurred after four months and was treated with plating. The clinical evaluation demonstrated no deviation in the transverse plane. In the sagittal plane the deviation didn’t exceed 20° following radiographic measurements. The full active range of motion in the metacarpophalangeal joint was achieved at six weeks after the removal of external fixation in all patients.
Conclusions: The advantages of the treatment of metacarpal fractures with external fixation are less invasivity, simple removal of the osteosynthetic material and the lower risk of the injury of tendons. After plating there is higher risk of the adhesions of the tendon which is accompanied by the metacarpophalangeal joint stiffness. We can avoid this by using the external fixator. Our experience is satisfying if the fixator application is technically well performed and completed with good post-operative care.

A-0391 A randomized prospective trial comparing two different surgical techniques for arthrosis of the carpometacarpal joint of the thumb

H Zajonc, B Grill, V Penna, F Lampert, SU Eisenhardt, GB Stark
Department Plastic and Hand Surgery, University of Freiburg Medical Center, Germany

Introduction: Arthrosis of the carpometacarpal joint of the thumb is the most prevailing arthrosis occuring in the hand and leads to intense pain and functional impairment. From our experience, a surgical treatment using resection of the trapezium and suspension is particularly suitable. In a randomized, prospective study we compared two different surgical techniques involving removal of the os trapezium and suspension via the abductor pollicis longus (APL) tendon strip.

Methodology: From 2009 to 2011 we included 36 patients with 38 thumb carpometacarpal joint arthroisis in this study. We examined motion, grip strength of the thumb and x-rays at three time points: preoperatively, three and nine months after surgery. Intensity of pain was recorded using a visual analog pain scale and the DASH-score. Both methods differ by the applied technique of suspension after the complete removal of the trapezium bone. In the method according to Lundborg, suspension is performed by the flexor carpi radialis (FCR) tendon. In the method according to Sirota, the FCR and extensor carpi radialis longus (ECRL) tendons are used in addition for fixation. The usage of the remaining tendon slip as interposition graft, replacing the trapezium bone, is common in both methods. All procedures were performed by the senior author. After five weeks of immobilization, intensive physiotherapy was started.

Results: We found improvement in all crucial categories: pain and DASH-score. The “Sirotakova” group showed quicker recovery and better development in grip strength. A significant improvement in mobility of the first carpometacarpal joint could not be verified for either method. After nine months the “Lundborg” group showed better results, though not statistically significant.

Conclusion: Both methods were reliable and led to a considerable alleviation of symptoms and improvement in quality of life. Based on our results we will recommend Sirota’s method to patients in need of a shorter recovery time and greater development in strength. Patients that require more dexterity and finer motor skills will be treated with Lundborg’s method.

A-0392 A systematic review of the etiopathogenesis of de Quervain’s tenosynovitis and a critical appraisal of its recognition as an occupational disease related to manual work

S Stahl, D Vida, P Hentschel,–O Lotter, H-E Schaller
Department of Plastic, Hand and Reconstructive Surgery, Burn Center, BG-Trauma Center Eberhard-Karl University, Tübingen, Germany

Purpose: To verify the classification of de Quervain’s tenosynovitis (dQ) in the European Union (EU), International Labour Organization (ILO) and World Health Organisation (WHO) List of Occupational Diseases, we systematically reviewed all etiopathological factors discussed in literature.

Methods: We searched the Ovid/Medline, Embase and the Cochrane Library for articles discussing the etiology of dQ published from 1900 until January 2012 in English, French or German. Literature was classified by the level of evidence presented, the etiopathological hypothesis discussed, the author’s conclusion about the role of the etiopathological hypothesis and the first author’s professional background. Observational studies were evaluated by the STROBE Statement checklist. The Bradford Hill criteria was used to evaluate causal relationship between dQ and occupational risk factors.

Results: A total of 179 references were found. Of the 81 articles included, 66 (81%) reached the evidence level IV (case series). The four most frequently discussed factors were occupational overuse (n = 49; 60%), overuse from leisure activities (n = 15; 19%), hormonal factors (n = 11; 14%) and anatomical variations (n = 9; 11%). Authors with a surgical background published on average 31 cases per article while occupational physicians referred to 11 cases per article on average. The quality of the cohort studies on occupational risk factors did not permit a meta-analysis to evaluate the strength of
association of dQ and: 1) repetitive, 2) forceful, or 3) ergonomically stressful manual work. Evidence for the lack of consistency, plausibility and coherence of the occupational overuse hypothesis was found. No evidence was found to support any of the nine Bradford Hill criteria for a causal relationship between dQ and occupational risk factors. Conclusion: A systematic review of 90 articles on the etiopathology of dQ and the application of the Bradford Hill criteria does not provide sufficient scientific evidence to confirm a causal relationship between dQ and occupational risk factors. Thus, dQ does not comply with the criteria of the ILO determining occupational diseases.

A-0395 Neuralgic amyotrophy or Parsonage-Turner syndrome constitute a relevant differential diagnosis in nerve surgical consultations

P Ducommun, M Calcagni, P Giovanoli, A Schiller
Division of Plastic Surgery and Hand Surgery University Hospital, Zurich, Switzerland

Objective: Evaluation of the frequency and assessment of prognosis of inflammatory nerve or plexus disorders of the upper extremity in a nerve-surgery outpatient clinic.

Patients and Methods: We conducted a retrospective review of outpatients with non-traumatic nerve lesions of the upper extremity referred for evaluation of nerve surgery between 1997 and 2011. All Patients were examined both by a hand surgeon and a neurologist and were investigated by electrophysiological evaluation. Some patients were investigated either by MRI or ultrasonography. Most of the patients (16/17) were examined by a neurologist on follow-up examination.

Results: 17 Patients were included in the study, six women, 11 men, 21–64 at age of onset. Thirteen cases were anterior interosseus nerve (AIN) palsies, two were long thoracic nerve palsies and two radial nerve palsy at the arm level. In 14/17 cases the onset was preceded by intensive pain of the affected extremity. Although there were comorbidities in some patients we could not determine a statistically significant factor. All the patients were treated conservatively. Outcome was classified as good, fair and poor. Of 14 cases of AIN palsies, 12 had a good outcome, one a fair outcome with some limitations in daily activities and one patient had no improvement after 12 months of follow up although there were signs of re-innervation in the EMG and we suspect there will be further improvement. Time to improvement was in the shortest five- and in the longest case 18 months. There was no correlation of initial pain onset and poorer outcome.

Conclusion: Neuralgic amyotrophy or Parsonage-Turner Syndrome of the upper extremity represents a frequently encountered entity among patients for surgical evaluation. The most frequent clinical presentation in our series is an anterior interosseous nerve syndrome. The reason that we did not encounter more cases with more extended brachial plexus affection is probably explained by prior neurological investigation of these particular patients. The outcome of most of these conservatively treated patients was good. We conclude that in acute non-traumatic nerve paresis, a thorough history, clinical evaluation and electrophysiological work-up is eligible for patients with neuralgic amyotrophy/Parsonage-Turner Syndrome where surgical intervention is not indicated. Complete spontaneous remission of the neurological deficit occurs in 90% of the cases and may take up to 18 months.

A-0397 Pediatric lateral humeral condyle fractures: internal oblique radiographs alters the course of conservative treatment

T Kurtulmuş, N Sağlam, G Saka, U Öztürk
(1) Umranıye Training and Research Hospital, Department of Orthopedics and Traumatology, Istanbul, Turkey
(2) Kirikkale University, Department of Orthopedics and Traumatology, Turkey

Purpose: Fractures of the lateral humeral condyle are the second most common elbow fracture, representing 17% of all fractures of the elbow in children. Proponents of nonsurgical treatment of non-displaced or minimally displaced fractures attempted to define radiological criteria to clearly establish which fracture was stable and amenable to nonsurgical treatment. We hypothesized that use of internal oblique radiograph would help to segregate the purely stable group of condylar fractures and diminish displacement during cast immobilization.

Methods: Total of 91 children were treated with a fracture of the lateral condyle. In all patients with a suspected lateral humeral condylar fracture, anteroposterior, lateral and internal oblique radiographs were scheduled for each patient. These two surgeons classified the fracture according to the criteria of Jakop et al.

Results: Treatment was performed in a range of first day to a maximum sixteenth day of trauma due to late referral of patients. The addition of internal oblique radiograph to the anteroposterior significantly decreased the
number of patients classified as Jakop group one from 27 to 11 and as Jakop group 2 from 30 to 21.

**Conclusion:** This study highlighted the importance of internal oblique radiographs in diagnosis and guidance of therapy. Use of radiographic criteria to differentiate stable fractures only on anteroposterior radiographs resulted in overestimation of the stability of some fractures. We concur with the others that internal oblique radiographs must be sine qua non of roentgenographic evaluation of these fractures.

**A-0402 Prospective case-control study on the etiopathology of de Quervain’s tenosynovitis**

S Stahl, D Vida, P Hentschel, O Lotter, H-E Schaller
Department of Plastic, Hand and Reconstructive Surgery,
Burn Center, BG-Trauma Center Eberhard-Karl University,
Tübingen, Germany

**Purpose:** The hypotheses on the etiology of de Quervain’s tenosynovitis (dQ) have been discussed in seemingly contradicting small case series and cohort studies with inadequate statistical power. A prospective case control study was conducted to analyze frequently discussed risk and causative factors.

**Methods:** 189 patients with dQ and 198 patients with wrist ganglia, operated between January 2003 and May 2011, were identified in the electronic database of our clinic. Patients with wrist ganglia were chosen as control-group because of similar gender and age distribution compared to the average German population and because a common etiopathology of wrist ganglia and dQ can be excluded. All patients with informed consent, a complete case report form and a follow-up of at least six months were included in a retrospective clinical study. The diagnoses were confirmed intraoperatively in all cases and by symptom relief post-operatively. Personal history including age, gender, handedness, ethnicity, education, occupation and employment status, prior treatment and medical history was recorded. Septation of the first extensor compartment and the numbers of tendons of the extensor pollicis brevis and the abductor pollicis brevis were evaluated from the medical chart.

**Results:** The inclusion rate was similar in both groups (77/189 with dQ and 70/198 with ganglia). Patients with dQ were on average 52 years old (median: 18; min: 7; max: 71; sex ratio: 15/62). By comparison, the control group had an average age of 39 years (median: 40; min: 18; max: 82; sex ratio: 56/44). No sports or leisure activities characterized by forceful or repetitive manual work were found in either group. An accessory tendon compartment was present in 36% (normal population: 26% –73%). The application of the clinical criteria of rheumatoid arthritis (ACR, 1987) resulted in one suspicion of rheumatoid arthritis in both groups. Carpal tunnel syndrome and trigger digit were only associated with dQ (16% respectively 13%). Trauma preceded the diagnosis of dQ in one case while no prior trauma was reported in the control group. The most common drug taken was L-thyroxine (dQ: 13%; ganglia: 2%; Fisher’s Exakt Test, p = 0.71) and beta-blockers (dQ: 8%; ganglia: 2%; Fisher’s Exakt Test, p = 0.71), fluoroquinolone were not used at all. 81% of women with dQ were post-menopausal, 27% of them had undergone hysterectomy.

**Conclusions:** The findings that 81% are women of whom 81% achieved menopause at the time of dQ diagnosis suggest a possible hormonal etiology. Anatomical variants and rheumatic disease were not significantly associated with dQ. Neither sex, age, hand dominance nor profession nor leisure activities support the hypothesis of manual overuse as being predisposing, risk or causative factors.

**A-0406 Impaired muscle force generation after anatomic repair**

T Winters, J Fridén, R Lieber, S Ward
University of California and Veterans Administration Medical Centers, San Diego, California, USA

**Purpose:** Tendon transfers and repairs are commonly used to restore function after motor nerve, spinal cord injury, and tendon rupture. Surgeons generally assume muscle properties are normal when determining the length at which a muscle should be realigned during the transfer or repair. However, the nature of muscle remodeling after injury and how this affects the repair is unclear. Therefore, the purpose of this study was to examine the effect of surgical tenotomy on muscle force generation and to understand the effects of muscle changes on surgical repair.

**Methods:** Six each of tibialis anterior (TA), extensor digitorum longus (EDL), and extensor digitorum II (EDII) muscles from New Zealand white rabbits were tenotomized (n = 18). Each animal was anesthetized and a 5 mm section of tendon was excised. Sham surgery was performed on the contralateral leg to serve as a control. After six weeks, the tenotomized and
control muscles were mechanically tested by measuring maximum isometric tension at various lengths via direct nerve stimulation. Muscles were then excised and fixed allowing normalized fiber length (Lfn) and physiological cross-sectional area (PCSA) to be measured. Forces were normalized to PCSA to calculate muscle stress, and histology (wheat germ agglutinin) was used to measure fiber area. Statistical comparisons were made using two-way ANOVA, and data are presented as a percentage ± SEM.

**Results:** Muscle stress production (force/area) at pre-injury lengths was significantly impaired after six weeks of tenotomy [TA -38.8 ± 8.7%, EDL -47.0 ± 11.9%, and EDII -43.2 ± 7.7%, p < 0.001]. This reduction in stress was caused by two main factors. First, each muscle shortened during the 6-week tenotomy period, which caused the muscle to be overstretched and to decrease when pre-injury lengths were restored. Physiologically, this means that each muscle's length-tension curve was shifted towards shorter lengths [TA -26.1 ± 3.2%, EDL 49.3 ± 6.3%, and EDII -43.2 ± 7.7%, p < 0.001]. Surprisingly, length-tension curves were also more broad [EDL 51.8 ± 18.3% and EDII 33.7 ± 12.2%, p < 0.001], which was not predicted by the shorter fiber lengths in these muscles. Second, the muscles experience significant fiber atrophy [TA -24.0 ± 4.6%, EDL -36.1 ± 3.7%, and EDII -77.0 ± 31.2%, p < 0.001]. This reduction in fiber atrophy, when muscles are subject to prolonged atrophy and fibrosis, can lead to vascular compromise when are twisted more than 90°. A propeller flap is an island flap that moves from one orientation to another by rotating around its vascular pedicle. It is now possible to design propeller flaps based on a single perforator, so-called “perforator based propeller flaps”. These flaps permit flap rotation up to 180°. We present the results of hand complex tissue reconstructions using perforator-based propeller flaps. We constructed a treatment strategy and some tricks based on the location of the soft tissue defect and the perforator anatomy to increase flap survival.

**Methods:** All perforator-based propeller flaps that were used for hand reconstruction were retrospectively analyzed. The parameters studied included the size and the location of the defect, the size and shape of the flap, the perforator that was used (length, location, the degree of twisting), the degree of perforator dissection, the management of the donor site and flap survival.

**Results:** In this study we investigated the circulatory compromise induced by twisting the pedicle on a true perforator flap. All flaps survived completely with the exception of partial skin necrosis in four cases. One of these cases required debridement and skin grafting. The donor site was closed primarily in the majority of cases.

**Conclusions:** Propeller flaps provide a reliable option for covering small to medium-size hand defects. They have the advantage of using similar tissue, they do not require main vessels sacrifice, and the donor site can be generally directly closed.

**A-0408 Propeller flaps in hand reconstruction**

F Ardelean, O Olariu, A Georgescu
UMF Iuliu Hatieganu, Cluj-Napoca, Romania

**Purpose:** Perforator flaps increasingly find acceptance and use in hand reconstructive surgery, but are more prone to vascular compromise when are twisted more than 90°. A propeller flap is an island flap that moves from one orientation to another by rotating around its vascular pedicle. It is now possible to design propeller flaps based on a single perforator, so-called “perforator based propeller flaps”. These flaps permit flap rotation up to 180°. We present the results of hand complex tissue reconstructions using perforator-based propeller flaps. We constructed a treatment strategy and some tricks based on the location of the soft tissue defect and the perforator anatomy to increase flap survival.

**Methods:** All perforator-based propeller flaps that were used for hand reconstruction were retrospectively analyzed. The parameters studied included the size and the location of the defect, the size and shape of the flap, the perforator that was used (length, location, the degree of twisting), the degree of perforator dissection, the management of the donor site and flap survival.

**Results:** In this study we investigated the circulatory compromise induced by twisting the pedicle on a true perforator flap. All flaps survived completely with the exception of partial skin necrosis in four cases. One of these cases required debridement and skin grafting. The donor site was closed primarily in the majority of cases.

**Conclusions:** Propeller flaps provide a reliable option for covering small to medium-size hand defects. They have the advantage of using similar tissue, they do not require main vessels sacrifice, and the donor site can be generally directly closed.

**A-0409 Distal biceps tendon ruptures – long term follow up**

N Szakács, A Pavlik, P Hidas
National Institute for Sports Medicine, Budapest, Hungary

**Purpose:** The aim of this presentation is to demonstrate the long term results of our patients operated with distal biceps tendon rupture.

**Methods:** In this retrospective study 64 patients (63 male, one female) underwent surgery from 1996 to 2011 because of acute distal biceps tendon rupture of a mean age of 44 years. In all cases the rupture had been brought by a forceful flexion of the elbow against resistance. In 48 cases the injury happened during training. At our department we perform the two incision technique of Boyd-Anderson, using transosseus suture fixation. The follow up time was 14–121 months (average 70 months). 58 patients were examined at follow-up, one patient died. The range of motion, the elbow flexion strength, the return to work and sport activity was measured, the subjective
satisfaction as well, and all patients underwent elbow x-ray examination.

**Results:** Compared with the contra lateral side, full extension was seen at 53 patients, five patients had mild extension loss [5–10°]. Full flexion was seen in all patients. Six patients had a mild loss of pronation and supination (less than 10°). The elbow flexion strength was the same as the contra lateral side in 50 patients, eight patients had a mild decrease (73–84%). Twelve patients had heterotopic ossification on the x-rays, six of them had palpable exostosis at the forearm. Five patients had transient neuropraxia at the radial nerve, complete recovery was seen in all of them after three months. One patient had wound infection. All patients returned to work and sport activity between eight–20 weeks. 57 patients would choose this operation once more.

**Conclusions:** The transosseal refixation of distal biceps tendon is a reliable method for acute ruptures, all patients returned to work and sport activity in two to five months, with full range of motion and good flexion strength in 86% of the patients. An advantage of this fixation method is that there is no need for foreign material. The results are similar with the other fixation methods (endobutton, interference screw, suture anchors) known from the literature.

**A-0410 Effect of sensory input-based home exercise program on shoulder and elbow function in children with upper trunk obstetrical brachial plexus palsy**

Y Tunç, T Fırat, Ç Ayhan, A Meriç, N Kırdı, G Leblebicioğlu
Hacettepe University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Ankara, Turkey

**Purpose:** The aim of the present study was to investigate the effect of sensory input on motor recovery in children with upper trunk obstetrical brachial plexus palsy (OBPP).

**Methods:** Thirty-eight children with upper trunk OBPP with Narakas Score 2, were included to the study. The mean age of children was 7.2 ± 3.6 months of age. Group 1 consisted of 19 children who were followed with regular home exercise program including passive range of motion, positioning, stretching of upper extremity muscles. Group 2 consisted of 19 children who were followed with sensory input including massage, weight bearing, scrubbing in addition to described home exercise program. Two assessments were performed in both groups. Shoulder abduction, flexion, external rotation, elbow flexion and extension were assessed with Active Movement Scale. Differences between two assessments were compared based on the groups.

**Results:** Group 2 showed higher scores than group 1 in all parameters ($p < 0.005$).

**Conclusion:** Sensory input provides better motor recovery and function in children with OBPP.

**A-0413 Epidemiology of flexor tendon injuries in Northern Finnish population 2004–2010**

M Manninen¹, J Määttä¹, T Flünkkitlä¹, T Karjalainen²
¹Oulu University Hospital, Oulu, Finland
²Central Finland Central Hospital, Jyväskylä, Finland

**Purpose:** The overall incidence of flexor tendon injuries in adult patients is unknown even though their significant economic burden to society has been indicated in previous studies. The aim of this study was to determine the incidence of flexor tendon injuries in adult population in a well-defined population in Northern Finland.

**Methods:** The data on flexor tendon injuries between the years 2004 and 2010 was retrieved from Oulu University Hospital patient records, which is the primary and only referral centre for flexor tendon injuries for the city population as well as 20 municipalities surrounding Oulu. The same data was retrieved from the patient records from the three private hospitals in the area concerned. Inclusion criteria for admittance for the study were: age of 15 years or older, a simple flexor tendon injury with or without injury to digital nerves. Patients with partial lacerations, fractures and critical arterial injury requiring microsurgical repair were excluded.

**Results:** There were 106 patients, 88 males (83% of patients) and 18 females (17% of patients), with flexor tendon injury between the years 2004 and 2010. The population at risk was 1,517,228 thus the annual incidence of flexor tendon injury was 7.0/100,000 person years (95% CI 5.7 to 8.5). The peak incidence rate was observed in the age group of 15–19 years, 16.1/100,000 person-years (95% CI 10.0 to 24.6) comprising in majority of young men. The incidence was in reverse relation with age. The most common finger to be affected by flexor tendon injury was the 5th digit with 47 tendon injuries in total (44% of all), either limiting to one digit or in combination with other digits. In 39 patients (37%), there was simultaneous injury to either of or both digital nerves. In our study, the overall rate of complication was 20%, and the reoperation rate was 16%. The most common complication was the development of adhesions. Rerupture rate for repaired tendons was 5.6%.

**Conclusions:** Our data shows that flexor tendon injury in adult population is relatively rare. The incidence of
flexor tendon injury was highest among young men, and in all, a flexor tendon injury was rare among females. Complications occurred frequently and may be more common than is generally believed. Our study helps to estimate the resources needed for repair and rehabilitation of flexor tendon injuries and increases our overall knowledge in this challenging area.

**A-0425 A free radical scavenger (Tempol) and its effect on intimal hyperplasia of vein grafts in rats**

A-G Türkmen, E Ayla, MN Koç, S Ulutas, M Doğan
Gaziantep University Faculty of Medicine, Department of Plastic, Reconstructive and Aesthetic Surgery, Gaziantep, Turkey

**Purpose:** Reversed vein grafting exposes the vessel to a period of ischemia, reperfusion and subsequent reactive oxygen species which may damage endothelial tissue, smooth muscle cell proliferation and later development of intimal hyperplasia. Tempol is a free radical scavenger that permeates biological membranes. This study has investigated the effects of a free radical scavenger [Tempol] on intimal hyperplasia of femoral vein grafts and the level of the reactive oxygen species in rats.

**Methods:** Arterial defect created in the femoral artery of rats and then repaired with an ipsilateral femoral vein graft. Tempol to group T and saline to group C were administered into peritoneum daily during the 28 days. Blood samples were measured. The veins were stained with H&E and Verhoeff’s elastic stains.

**Results:** Binary comparison revealed a statistically significant difference for intimal and medial thicknesses (p≥0.01).

**Conclusions:** This study found that a free radical scavenger [Tempol] prevents the early development of intimal hyperplasia by probably inhibiting the infiltration of polymorph nuclear monocytes (PNM) with evidence of increasing the level of anti-oxidant products and decreasing level of free oxygen radicals which are mediated injury to the endothelial of the vein grafts.

**A-0429 Radiation exposure from computerized tomography examinations of the upper limbs**

SD Iordache, N Goldberg, A Steinmetz, R Ben-Hur, J Peylan, L Paz
Beilinson Hospital, Petach Tikva, Tel Aviv

Computerized Tomography (CT) scans provide excellent imaging resolution when assessing musculoskeletal conditions involving bone and are used for both diagnostic purposes and for preoperative planning. However a typical CT scan delivers a much higher dose of radiation when compared to plain radiography. The purpose of this study was to investigate the extent of exposure to ionizing radiation derived from CT scans of the upper limbs [shoulder, elbow, wrist], and to assess the associated Lifetime Attributable Risk (LAR) of developing cancer as a result of this exposure.

All the CT examinations of the upper limbs performed in our institution in the last three years were identified. The indications for the procedure, the age and gender of the patients, the use of contrast, and the diagnostic reference dose values including the Computerized Dose Index by volume (CTDIVOL [mGy]), the Dose Length Product (DLP [mGy-cm]) and the x-ray tube voltage (kV) were noted. We used the Effective Dose per DLP (EDLP) coefficient for standardized CT scans to calculate the Effective Dose (ED) [mSv] and to estimate the amount of absorbed radiation. LAR was calculated as suggested by National Research Council (US) BEIR VII publication. There were 392 upper extremity CT examinations performed on 380 patients. The average ED was 5.05 mSv for shoulder CT scans and 4.61 mSv for shoulder CT-arthrography scans. The average ED for elbow scans was 0.11 mSv with the arm elevated above the head and 14.26 mSv with the arm over the chest. The average ED for wrist CT scans was 0.04 mSv. The LAR of developing cancer for a 20-year-old female was 0.8 cancers per 1000 patients for a shoulder CT scan and 2.28 cancers per 1000 patients for an elbow CT scan with the arm over the chest. The radiation doses administrated in CT scans of the upper limb are substantial, especially in scans of the shoulder and elbow region. Elevating the arm above the head decreases the radiation doses and the associated risk of cancer. The risks and benefits of performing CT scans of the upper limb should be carefully weighed and the use of alternative modalities such as MRI scans should be considered in young patients.

**A-0436 PRP (platelet rich plasma) injections can prevent surgical treatment of lateral epicondylitis: prospective analysis of 43 patients in work compensation environment.**

X Casanova, J De la Torre, C Unyó, L Solà, F Soler, E Abad
Egarsat, Terrassa, Spain

**Introduction:** Lateral epicondylitis (LE) is described as an angiofibroblastic degenerative tendinosis in the origin of the Extensor Carpi Radialis Brevis muscle.
PRP infiltration is one of the existing treatment options, but there is not concluding bibliography of its short and long term results.

**Objectives:** Analyse in a prospective study the effectiveness of PRP therapy on pain control and hand function in patients with chronic lateral epicondylitis.

**Methods:** From April 2011 to November 2012, 43 patients (28 male: 15 female) diagnosed of Lateral Epicondylitis by clinical examination and MRI were included in protocol for three PRP injections (fortnightly administrated) after pharmacologic and rehabilitation treatment failure; 24 patients received previously corticoid injection, the last one at an average of 5.13 months before. Four patients were excluded and three patients stopped PRP treatment after first or second injection. Only five patients developed LE on nondominant upper limb. Evaluation of pain (VAS), functionality (QuickDash) and maximal grasping force (Jamar dynamometer) had been done before of injections and 1, 3 and 6–12 months after them.

**Results:** VAS and QuickDash score improvement had been mainly observed during first three months, 26% and 15% respectively. The mean grasping force also improved after injections (37.62 to 46.14 kg) although most of the patients had not force deficit before them. Only seven patients stopped their working activity during the injections period. All MRI studies were assessed as irregular-distorted fibers in the epicondylar insertion of EDC, 10 with partial tendinous rupture, six with epicondylar edema and five with articular effusion. At an average of 11.4 months of follow-up 12 patients were finally operated because of pain persistence.

**Conclusion:** PRP injection could be an effective treatment with a very low complication rate for selected patients with Lateral Epicondylitis. More studies are needed to establish accurate indications for this treatment, according to the stage of the tendinopathy using either clinical and image criteria. It seems to be a cost-effective procedure related to one of the most prevalent occupational diseases in the work compensation environment. It is necessary to homogenize the method of preparation and administration of PRP to compare its effects and results among different studies and to universalize its use.

**A-0441 Particularly of post-operative care and rehabilitation in your children with congenital anomalies of the thumb**

S Golyana, A Ovsyannikova
**Turner Scientific Research Institute for Children’s Orthopedics, Saint-Petersburg, Russia**

**Introduction:** Restoring double gripper hand in children with congenital anomalies of the thumb is a complex task that requires a comprehensive approach. For this purpose, we used different types of surgery, the reconstruction of the thumb to index finger pollicization with a high degree of hypoplasia of the thumb. To achieve a good result, a combination of surgical techniques and appropriate rehabilitation measures aimed at training and fine motor movements of the thumb after its reconstruction. Here we can experience some problems. On the one side, it is necessary as soon as possible to create a two-sided hand gripper in a child with congenital anomalies of the thumb. On the other hand, young children cooperate poorly in post-operative care and rehabilitation, which results in fear, distrust, lack of understanding of the objectives, tolerance for pain, etc. Often, the child protect the affected hand and doesn’t use her new functionality.

**Purpose:** To improve treatment strategy in infants with congenital anomalies of the thumb.

**Materials and methods:** From 2007 to 2012, we observed 46 children with hypoplasia and aplasia of the thumb. Following the full consolidation of the bone fragments began rehabilitation period, which included physiotherapy (electrical myostimulation flexor and extensor digitorum), manual techniques in the form of massage and passive design of the finger joints. Taking into account the age of the patients the gaming system of rehabilitation methods together with manual techniques was used providing the necessary involvement of the child in the recovery process of active movements of the fingers. Education bilateral grip occurs through individual selection of rehabilitation. After the appearance of bilateral grip ability, add games to develop fine motor skills, speed, agility and strength of the brush after the reconstruction of the thumb.

**Results:** This technique has allowed the patient to get active movement in the first days after the period of immobilization in most cases. Individually selected rehabilitation means significantly reduced time of appearance of bilateral grip after pollicization in young children.

**Conclusions:** The lack of involvement of young children in the process of rehabilitation is making difficulties for medical rehabilitation therapy. Rational and individual approach to the system of rehabilitation in the post-operative period provides a good functional result after reconstruction of the thumb in young children, reduces the rehabilitation period and the time for the child to learn new forms of grip.
A-0443 Results of arthroscopic debridement of impinging dorsal synovitis for ulnar-sided wrist pain in the absence of triangular fibrocartilage-complex tear

S Masud, A Bebbington, D Newington, D Russell
Swansea Hand Unit, Morriston Hospital, Swansea, United Kingdom

Purpose: Ulnar-sided wrist pain can be difficult to treat as it has many causes. One of the less commonly described causes is impinging dorsal synovitis. The diagnosis is made more difficult as it is often not recognised on MRI scan. Patients present with sharp catching pains on the ulnar side of the wrist and can be difficult to distinguish clinically from TFCC tear. We present a series of patients with ulnar-sided wrist pain who underwent arthroscopic debridement of impinging dorsal synovitis with an intact TFCC.

Methods: Our wrist arthroscopy database, containing 282 consecutive wrist arthroscopies (2003 to July 2012), was searched to identify patients who had arthroscopic debridement of impinging dorsal synovitis, using a coblation wand, and were found to have an intact TFCC. The case notes were then retrospectively reviewed. All patients were followed up until discharge.

Results: Sixteen patients (5.7%) with ulnar-sided wrist pain were identified, with one lost to follow-up. Male to female ratio was 6:9. Mean age was 38 years (16–76 years), and mean follow-up was 15 weeks (5–51 weeks). Nine patients had complete relief of their ulnar-sided pain. Five patients had some mild residual symptoms, but not enough to warrant any further intervention. One patient made a good initial recovery, but had a relapse of his symptoms after returning to his normal activities as a gardener. At arthroscopy he was noted to have dynamic instability of the lunotriquetral joint.

Conclusions: Arthroscopic debridement of impinging dorsal synovitis is an effective treatment for ulnar-sided wrist pain in the absence of TFCC tear. This diagnosis should be considered in patients with mechanical symptoms when there is no radiological evidence of TFCC tear and arthroscopy offered.

A-0447 Nerve reconstruction with processed nerve allografts: outcomes of from a National Multicenter Registry

B Safa1, R Weber2, J Zoldos3, B Rinke4, J Chao5, W Thayer6, J Greenberg7, G Buncke8
(1) The Buncke Clinic, San Francisco, CA, USA
(2) Institute for Nerve, Hand, and Reconstructive Surgery, Rutherford, NJ, USA
(3) Arizona Center for Hand Surgery, Phoenix, AZ, USA

Purpose: In 2008, a multicenter registry was initiated to capture data on the use of processed nerve allografts (Avance Nerve Graft, AoxGen, Inc.) in today’s clinical practice. As the utilization of these grafts has been incorporated into standard treatment algorithms, we seek to provide additional understanding of their clinical utilization and expected outcomes. Here we report our findings from the second data milestone from this ongoing registry (RANGER) on the utilization of processed nerve allograft.

Methods: The RANGER registry, established in 18 centers with 36 surgeons, is designed to continuously monitor and incorporate injury, repair, safety and outcomes data using standardized case report forms entered into a centralized database. Centers followed their own standard of care for treatment and follow-up. Outcome measures were reviewed and reported. A secondary review and analysis was completed. Meaningful recovery was defined by the MRCC scale at S3–S4 for sensory and M3–M5 for motor.

Results: Upon completion of the first data milestone, additional subjects and follow-up were incorporated increasing available data by 74% to result in a database of 176 subjects with 230 repairs. Repairs reporting sufficient follow-up data for outcomes analysis increased by 49% to 113 injuries with quantitative data available in 90 repairs (62 sensory, eight motor, 20 mixed). Mechanisms of injury included: 32 lacerations by power saws, 19 general lacerations, nine injuries by an unspecified mechanism, seven chronic neuromas, six crush/compression injuries, four amputations, four avulsions, four blast, and five gunshot injuries. Concomitant injuries were reported in 70% of the subjects. The mean ± SD (minimum, maximum) age was 42 ± 16 (18–70). The mean gap was 23 ± 12 (5–50) mm. Quantitative outcomes data reported meaningful recovery in 86% of the repairs. The average ±2PD was 8 ± 2.7mm (n = 40). Return to light touch or greater was demonstrated in 26 of 35 repairs reporting SWMF scores. No graft related adverse experiences were reported.

Conclusions: Comparisons of the 1st and 2nd data milestone continue to demonstrate processed nerve allografts provide consistent levels of meaningful recovery for sensory, motor, and mixed nerve reconstructions between 5–50 mm. These outcomes compare favorably to historical data in the literature for nerve repair with autograft and exceed that for conduit. Continuation of this registry will provide additional clinical data to further define treatment algorithms and expectations of recovery in subgroup populations.
A-0448 Retrograde locked intramedullar nail for acute humeral shaft fractures in patients subject to sick-leave compensation

E Urrutia, P Sotelo, P Vergara, R Ide, S Mandiola, S Monge
Hospital del Trabajador, Santiago, Chile

Purpose: To evaluate bone healing, complications, sick-leave period and elbow and shoulder range of motion of patients subject to sick leave compensation, with acute diaphyseal humerus fractures without radial nerve injury treated with retrograde intramedullar nail.

Methods: Retrospective case series of patients, subject to sick leave compensation, treated with retrograde locked unreamed intramedullar nail for diaphyseal humeral fractures between January 2007 and December 2010. 66 adult patients (67% male) were included. Open fractures and patients presenting with radial nerve palsy at admission were excluded (n = 3). Variables measured were demographic data, type of fracture (AO–ASIF classification), associated injuries, operation time, complications within and after surgery, radiographic results, post-operative radial nerve paresia/palsy, fracture healing time, sick leave days, need for second procedures and shoulder and elbow movement.

Results: The mean age was 41.87 (sd 12.59). 43% affected the dominant side. Most frequent fracture were type A3 (46%) and A2 (27%). 34% had associated injuries. Mean operation time was 114 minutes (60–255). Seven patients had intra operative complications, six required plate osteosynthesis instead of intended nail. All patients had adequate bone contact in post-operative x-rays with 11% presenting fracture gap > 2 mm. Four patients had post-operative radial nerve palsy, one with long term motor sequelae and another with sensory sequelae. Two patients had radial nerve paresia with full recovery. 15.8% had other complications (shoulder capsulitis, delayed bone healing). 95.2% fractures healed in mean time of 143 days (sd 123). Mean sick leave period was of 176 days (sd 137). Mean follow up was six months.

Results: All flaps survived and the early post-operative periods were uneventful. All flaps provided adequate soft tissue cover for the exposed structures. No donor site complication was encountered with a graft-take of 100%. Donor site morbidity was minimal with an acceptable scar, and tendon gliding under skin graft was sufficient without producing any deficit in the functions of index finger.

Discussion: The pedicle running under the fascia of the first interosseous muscle gives multiple terminal branches to the periosteum that run under the sagittal band of the extensor mechanism. These vessels course transversally to nourish the dorsal proximal phalangeal skin. By extending the flap proximal to the MP joint, some multiple short perforators perpendicular to the skin at this level will be attached to the flap while inclusion of a muscle cuff around the pedicle will prevent possible unintentional injury to the delicate pedicle. By dissecting under the extensor hood, a thicker vascular tissue is possibly attached to the flap.

Conclusion: To cover the most distant defects of the thumb, the first dorsal metacarpal artery flap can be harvested reliably with a tail extending proximally beyond the MP joint.
A-0456 “Foucher Plus”: use of osseo-cutaneous pedicled islanded flap based on 1st dorsal metacarpal artery for segmental defect of 1st metacarpal

M Cheema, C Simpson, D Chester, D Power  
Birmingham Hand Centre, University Hospital Birmingham, Birmingham, UK

Purpose: First dorsal metacarpal artery flap was popularised by Foucher. It is a common reconstructive option for soft tissue defects on pulp of the thumb. We describe our experience of using a block of 2nd metacarpal with a Foucher skin flap for reconstruction of non-union of proximal phalanx of thumb and dorsal skin.

Methods: A 36-year-old right hand dominant, medically fit man presented to our unit after a circular saw injury to his left thumb. In the past, he had a partial amputation of his left index finger through proximal phalanx. Clinically he had an open fracture of the proximal phalanx of the thumb.

Results: Initial fixation with k-wires resulted in a non-union. A bone block consisting of the head and distal shaft of 2nd metacarpal was harvested with a Foucher flap and inset to replace the proximal 2/3rd of the proximal phalanx of the thumb and to arthrodesis the MP joint. The patient’s last follow up was 18 months after the osseo-fasciocutaneous flap operation. He is not back to full function. The IP joint is pain-free but fixed in 20° of flexion. His grip strength is 12 kg on the affected (48 kg on the contra-lateral) side. He is able to lift light objects and pinch against long finger.

Conclusions: Osseo-fasciocutaneous Foucher flap is a versatile and reliable pedicle even in presence of previous injury.

A-0457 Comparison of peer reviewed academic output of European orthopaedics, hands and plastic surgery units

M Cheema¹, A Sharif², SN Ali², V Rajaratnam³  
¹(1) Birmingham Hand Centre, University Hospital Birmingham, Birmingham, UK  
²(2) GPVTS, West Midlands Rotation, Birmingham, UK  
³(3) Khoo Teck Puat Hospital, Singapore

Purpose: Research and publication activity is an integral aspect of the medical profession. It publicises evidence based on current and emerging practices, helps in establishing guidelines, allows a large audience to learn from the experience of others and generates new ideas. The time and effort involved in peer reviewed publications is an indirect marker of a trainee’s commitment to the speciality and contributes to their professional development. In 2006 a new training system was implemented to train the next generation of doctors in UK. One of its focus’s was to improve teaching standards and promote education. The aim of this study is to find if there has been any difference in scientific publications before and after that change and compare that with Continental Europe and rest of the world. Peer reviewed publications by hand surgery as well as orthopaedics and plastic surgery units were used to study this effect.

Methods: Eight mainstream scientific journals were identified for analysis of their content. These were Annals of Plastic Surgery [Anns], British Journal of Plastic Surgery [BJPS], Journal of Plastic, Reconstructive and Aesthetic Surgery [JPRAS], Injury, The Journal of Bone and Joint Surgery, American edition [JBJS-Am], British/European edition [JBJS-Eu], The Journal of Hand Surgery [JHS-Am], The Journal of Hand Surgery: European Edition [JHS-Eu] and Plastic & Reconstructive Surgery [PRS]. BJPS and JPRAS were considered as a single journal for the purpose of this analysis. BJPS was investigated from 2003–2005 (inclusive) and JPRAS from 2009–2011 (inclusive) only. Publications in the other journals were assessed from 2003–2005 (inclusive) and 2009–2011 (inclusive). The publication abstracts were downloaded in XML format from PubMed using its EUtilities interface on 23rd January 2012. These were batch processed to an Excel spreadsheet with a customised script written in Perl programming language. This tabular data was analysed with “R” open source statistical package and plotted using the Google visualisation API.

Results: There were 8629 scientific articles published in the eight journals from 2003 to 2005 (before introduction of MMC, period 1) as recorded in PubMed database, of which 6508 had the author affiliation recorded. From 2009 to 2011 (after introduction of MMC, period 2) 10,280 articles were published, of which 8518 had the author affiliation recorded. There was a 13.2% decrease in the number of publications from UK and 25.8% decrease from Turkey. Almost all other countries showed an increase in the number of their scientific publications. The biggest increase (224%) in published articles was from China. The commonest MESH heading was “surgical flaps”. Details of types of publications were also calculated.

Conclusions: There has been a significant decrease in the number of scientific publications from UK and Turkey across three surgical specialties, from period 1 (2003–2005) to period 2 (2009–2011) in the eight journals investigated. This change is not mirrored by any other developed country.
A-0463 Upper limb peripheral nerve compression in NF2 patients are more prevalent, more severe but equally responsive to surgery

C Bendon, H Giele
Oxford University Hospitals, Oxford, United Kingdom

Introduction: Neurofibromatosis 2 patients have peripheral nerve symptoms and signs secondary to tumours or peripheral neuropathy, but may also develop upper limb compressive neuropathies. NF2 might obscure the diagnosis, or affect the surgical outcomes. We studied the prevalence and outcomes of upper limb compressive neuropathies in NF2 patients to see if this differed from the general population, as this has not previously been studied.

Methods: We reviewed 93 NF2 and 12 schwannomatosis patients for evidence of upper limb peripheral nerve entrapment. Clinical data were recorded as well as neurophysiology, coexisting peripheral neuropathy, nerve tumours, and surgical outcomes.

Results: We identified 11 nerve compressions (six carpal and five cubital) in eight patients. Preoperatively there was weakness in six cases, and wasting in four. Coexisting peripheral neuropathy was identified in two, and nerve tumours affecting the same limb in five cases. Combined our cohort’s prevalence was 5.7% (CTS) and 4.76% (cubital tunnel) compared to 7–16% and 0.7% in the general population. Six patients had decompression, with symptom resolution in four, and symptomatic relief but residual weakness in two.

Discussion: Cubital tunnel syndrome is more prevalent in NF2, age adjusted carpal tunnel syndrome is also probably more prevalent. The increased prevalence may be due to increased susceptibility of the NF2 diseased nerve to compression. The relative increased rates of wasting and weakness seen in NF2 patients reflects diagnostic delay, increased susceptibility to compression, or NF2 neuropathy. Despite this NF2 patients show as good outcomes following surgical decompression as unaffected patients. Hence upper limb peripheral nerve compression symptoms and signs should be sought and treated in NF2 patients.

A-0464 Outcomes of upper limb schwannoma excision in NF2 are as good as in non-NF2 patients – a case control study

C Bendon, D Furniss, H Giele
Oxford University Hospitals, Oxford, United Kingdom

Introduction and aims: Patients with neurofibromatosis type 2 (NF2) are an important subgroup of those undergoing excision of upper limb peripheral nerve schwannomas, however, data on their outcomes are lacking. Co-existing peripheral neuropathy can complicate the clinical presentation and recovery in NF2.

Methods: 30 peripheral nerve (including brachial plexus) schwannoma excisions from 98 NF2 patients were compared to 30 excised isolated schwannomas, matched for age, size, nerve and level of involvement. Final outcomes were scored on a scale of 0 (no improvement) to 3 (complete resolution). Data were analysed by Student’s, Mann-Witney and Fisher’s exact test.

Results: NF2 patients were younger, had multiple lesions and had more preoperative weakness (20% vs 6.7%) and sensory loss (27% vs 6.7%). Early recovery with no neurological symptoms occurred in 57% of NF2 and 37% of controls (p = 0.20). Final outcome scores of 2.4 in NF2 and 2.2 in controls (p = 0.62) indicate great improvement or complete resolution in the majority. Some persistent symptoms occurred in 33% NF2 and 40% controls.

Discussion: Outcomes in the NF2 group are equivalent or superior to controls, despite NF2 patients having more significant preoperative deficit and co-existing neuropathology. Surgical management should be offered to NF2 patients with peripheral nerve schwannomas.

A-0478 Ulnocarpal abutment syndrome: management with arthroscopic wafer procedure combined with triangular fibrocartilage complex thermal shrinkage

T Egi, K Yano
Division of Hand Surgery, Department of Orthopaedic Surgery, Osaka Rosai Hospital, Sakai, Japan

Purpose: Ulnocarpal abutment syndrome (UCAS) is characterized by painful compression between the distal ulna and the proximal lunate and triquetrum. In the management of patients with UCAS who have positive ulnar variance, decreasing load-sharing through the ulnar carpus by ulnar recession is necessary to relieve symptoms. Moreover, UCAS is usually associated with degenerative triangular fibrocartilage complex (TFCC) lesions. We hypothesized that the arthroscopic wafer procedure combined with TFCC debridement and thermal shrinkage would be an effective treatment for management of UCAS. This study examined post-operative outcomes in patients who underwent the combination procedure.

Methods: From 2006 to 2012, we conducted a retrospective study which included 15 patients (5 females; 10 males); 13 idiopathic UCASs and two post distal radius
Introduction: Nerve fascicle transfers have revolutionized functional reconstruction after peripheral nerve injuries during recent years, while selective partial neurotomy can reduce muscle spasticity.

Objective: This paper is dedicated to the widely unknown anatomist and orthopaedic surgeon Adolf Stoffel [1880–1937] who pioneered selective neurotomy and nerve transfers in the upper and lower extremity after cross-sectional nerve studies more than 100 years ago.

Results: Stoffel worked at the University Institute of Anatomy in Heidelberg before entering his orthopaedic surgical training with Oskar Vulpius (1867–1936). Based on his cross-sectional studies on motor and sensory fiber distribution in peripheral nerves, he devised a selective neurotomy operation used in spastic upper and lower limbs which until today bears his name (Stoffel operation) in 1911. Rarely recognized, he also described multiple selective nerve transfer operations as early as 1910, such as transfer of radial nerve fascicles to the long or medial triceps head to reanimate the paralyzed axillary nerve. He co-authored a book on “Orthopaedic Operations” with Vulpius (3 editions 1913, 1920 and 1924) which presented selective transfers of dispensible radial nerve fascicles to the paralyzed musculocutaneous nerve or median nerve, transfer of the subscapularis nerve (branch to teres major) to the axillary nerve and transfer of median nerve fascicles to restore intrinsic ulnar nerve function. In the lower extremity, he described neurotization of the gluteal nerves by sciatic nerve fibres to restore function of the paralyzed glutaei maximus, medius and minimi, neurotization of the femoral nerve by the obturator nerve and of superficial and deep peroneal nerves by tibial nerve fascicles. Notably, Stoffel utilized intraoperative electrical nerve stimulation to identify dispensible donor fascicles at the level of the recipient nerve damage or below.

Conclusions: Adolf Stoffel appears as eminent protagonist of peripheral nerve anatomy, selective neurotomy and nerve transfer whose innovative work deserves a thorough reconsideration.

A-0481 The use of autologous undifferentiated adipose-derived stem cells (AU-ASCs) in terms of musculoskeletal tissue engineering

E Ntouvali1, Z Dailiana2
[1] Diagnostic & Therapeutic Center HYGEIA SA, Athens, Greece
[2] Department of Orthopaedic Surgery, Faculty of Medicine, School of Health Sciences, University of Thessalia, Biopolis Larissa, Greece
Introduction: The use of autologous adult stem cells, including (but not limited to) bone marrow; muscle; and adipose derived stem cells (i.e. BMSCs; MSCs; and ASCs, respectively), has been replacing embryonic as well as allogeneic stem cell transplantation in the experimental field over the past two decades, owing to the obvious advantages of the former. In addition, a relatively recently patented method allowing collection of autologous, undifferentiated, adipose-derived stem cells (AU-ASCs) in large numbers within a short period of time by centrifugation has rendered the concept of using this cell type to ameliorate the outcome of current and future musculoskeletal tissue engineering approaches even more appealing.

Objective: The purpose of this study was to review the applications of autologous undifferentiated adipose-derived stem cells (AU-ASCs) in terms of musculoskeletal-tissue engineering.

Material and Methods: Our MEDLINE® search revealed a plethora of articles on the applications of ASCs in musculoskeletal-tissue assisted repair and regeneration, which was limited to a much shorter list when we focused on AU-ASCs.

Results: The use of AU-ASCs represents, by far, a more rapid and convenient option compared to stem cells (SCs) derived from other sources with regard to the ease of harvesting and the abundance of stem cells that may obviate the need for subsequent culture and passaging. In addition, it is not linked to the ethical or practical considerations of an embryonic or allogeneic (SC)-transplantation. AU-ASCs have been shown to be equivalent or even superior to SCs from alternative sources (e.g. bone-marrow derived [BMSCs] or amnion-derived [AMNSCs]), as far as their pluripotency and ability to differentiate into multiple connective-tissue lineages is concerned. Their proven immunomodulatory properties (mainly immunosuppression) and trophic effects on cells at the repair site outweigh their proliferative potential, yet there have been no direct (i.e. “head-to-head”) comparisons between differentiated and undifferentiated ASCs on this topic to date. Their aforementioned properties are presumably source – and context – dependent, as they have been shown to vary considerably according to their site of harvest; the carriers / scaffolds (e.g. activated autologous platelet – rich plasma [PRP]; activated autologous thrombin; sol-to-gel scaffolds; biodegradable scaffolds composed of biopolymers, etc.) and growth factors with which they are combined; and the presence of inflammation. Finally, cryopreservation in view of creating cell banks for future use in transplantations seems to result in attenuation of the above-delineated properties of ASCs, including AU-ASCs.

Conclusion: The use of AU-ASCs combined with appropriate carriers or biomaterial scaffolds and growth factors constitutes an attractive and viable option for musculoskeletal-tissue engineering.

A-0484 Schwannomas of the upper extremity: analysis of 31 cases
R Adani1, –L Tarallo2, –S Colopi3
(1) Department of Hand Surgery and Microsurgery, University Hospital of Verona, Italy
(2) Department of Orthopaedic Surgery, University of Modena and Reggio Emilia, Modena, Italy
(3) Department of Radiology, University of Modena and Reggio Emilia, Modena, Italy

Purpose: Schwannomas are the most common benign tumors developing in peripheral nerves. They account for 5% of all tumors in upper extremity. They usually present as a slow-growing mass, sometimes associated to pain and paresthesia. The aim of this study is to define the correct preoperative diagnosis, the surgical treatment and to verify for a neurologic deficit at a long term follow-up.

Materials: In the period 1995–2010 we have treated 31 patients affected by schwannoma to the upper limbs [16 male and 15 female]. Age ranged from 21 to 77 years [mean 49 years]. In 14 patients the tumor was located on the ulnar nerve, in 8 on the median nerve, in one on the radial nerve, in one on anterior interosseous nerve, in two on the muscle-cutaneous nerve, and in five on the digital nerves. Topographically seven tumors were in the arm, 15 in the elbow-forearm, nine in wrist-hand. In 27 patients the tumor was clinically palpable, 24 had peripheral nerve symptoms, such as paresthesiae to the territory of the damaged nerve and presented a positive Tinel sign. Pain was present in 24 cases. No patient had motor paralysis. In 30 cases MRI scan was performed to study the lesion. Specifically a 1.5-T superconductive magnet [Signa, GE Medical Systems, Milwaukee, USA] was used. SE T1 sequences were weighted both with and without par-magnetic contrast and SE T2 sequences were weighted both with and without fat saturation. All patients were surgically treated using meticulous dissection under the microscope.

Results: The diagnosis was confirmed by the histological examination in all cases. The enucleation of the mass was possible without fascicle lesion in 16 cases. In 14 cases a resection of the indissociable fascicles was performed. In only one patient the tumor could not be removed without damaging the median nerve motor branch. Post-operative paraesthesiae was present in 29 of the 31 treated patients. This clinical sign
Seven years’ of experience

A-0485 Treatment of complex intra-articular fractures of the distal radius by replacement and resurfacing prosthesis: seven years’ of experience

J-L Roux
Institut Montpellierain de la Main, Montpellier, France

Purpose: Since 2005 we have used a replacement and resurfacing prosthesis for complex intra-articular fractures of the distal radius. The prosthesis is composed of a radial stem and an epiphysial-metaphysial block articulating both with the carpal condyle and the ulnar head. This prosthesis is used in elderly and osteoporotic patients when reconstruction of the distal radius is too difficult, particularly when comminution and central impaction are associated.

Methods: Since March 2005, 16 prosthesis were implanted on 16 patients. Fifteen women and one man, the mean age was 77 years old, from 38 to 88. 15 cases concerned elderly and osteoporotic patients: 11 times for complex intra-articular fracture and four times for malunion. In one case the procedure concerned a young man with a pathologic fracture (geant cell tumor).

The patients were reviewed at three weeks, six weeks, three months, one year and then each year.

Results: 13 patients are regularly control. The mean follow-up is 36 months from three months to 85 months. All the patients are satisfied or very satisfied. Nine patients had no pain, four patients complain of some pain during strength activities. The DASH score is 28. The mean mobility is: extension 62°, flexion 37°, ulnar deviation 26°, radial deviation 24°, pronation 77°, supination 72°. The mean strength was 73% of the contralateral strength. The implants are perfectly stable on the x-rays with a mean follow-up of 36 months. A patient operated in 2005 died in 2010, she retained a good result at the wrist. Two patients are lost of follow-up.

Discussion: The replacement and resurfacing of the distal radius by a prosthesis articulating both with the carpal condyle and the ulnar head is a simple solution for a very difficult problem. This concept allows the treatment of the most complex distal radius fractures with metaphyseal instability and intra-articular comminution. The clinical results are good, better than those obtained with complex reconstruction surgery. Mobility is greater than that obtained with palliative surgery: radio-lunate or radio-scapho-lunate arthrodesis. The extension of the wrist allows these old patients to push up on their hands.

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

A-0487 Distraction management of post-traumatic proximal interphalangeal joint contracture

S Houshian, SS Jing, T Moghaddam, E Mohammad
Broomfield Hospital, Broomfield, UK

Purpose: Management of chronic post-traumatic flexion contracture of the proximal interphalangeal (PIP) joint remains challenging. We present the long-term outcome of joint distraction using mono-lateral external fixation in the treatment of such injury.

Methods: Between September 2001 and October 2011, 94 consecutive patients (98 PIP joints) with a mean age of 43 years [range: 17–69 years] were treated with external fixation following chronic flexion deformity of the PIP joint from trauma. The average time from injury to surgery was 48 months [range: 6–84 months] and duration of joint distraction was ten days [range: 7–22 days]. Patients were followed-up for a mean period of 54 months [range: 12–72 months].

Results: The mean range of motion gained post-operatively was 67° [range: 30°–90°]. There was no loss of gain during follow-up. Patients aged less than 40 years fared slightly better than compared with those aged more than 40 years, but the difference was not statistically significant. Two patients had swelling, pain and redness during treatment, which were resolved by temporarily stopping distraction. We had 12 superficial pin site infections and related discharge managed successfully by oral antibiotics, but no
serious complications. The outcome was not affected in all cases.

Discussion: External fixation is a simple and effective treatment modality for chronic PIP joint contractures with good predictable long-term results. Careful patient selection and monitoring are important.

A-0492 Rehabilitative follow-up after trigger finger release: comparison between open and endoscopic procedure

MAA Yousef1, L Pegoli2, G Pivato3, S Seppi4
(1) Hand and Microsurgery Unit, Sohag Faculty of Medicine, Sohag, Egypt
(2) Clinical Surgical Science Department, University of Pavia, Pavia, Italy
(3) Hand Unit, Trauma and Sports Service, Plastic Surgery Department, University of Milan, Policlinico
(4) Multimedica IRCCS, Italy

Background: The trigger finger is one of the most common chronic inflammatory diseases affecting the hand. Many surgical procedures have been described including percutaneous, open and endoscopic one. Although Open trigger finger release is thought to be a low-risk procedure by most practitioners, the rate of minor complications was surprisingly high and related mostly to wound complications or loss of finger range of motion. Excessive scaring after surgery may increase the duration of hand dysfunction and impair the ability to return to the normal activities.

Purpose: To develop a standard rehabilitation protocol after trigger finger release and evaluate the rehabilitative difference in terms of functional recovery in the treatment of trigger finger between open and endoscopic release.

Methods: Ninety-two patients from January 2008 to July 2011 underwent surgical release of trigger finger; 37 patients by open surgery (group A) and 55 patients by endoscopy (group B). All patients were evaluated preoperatively according to Green’s Scale and active range of motion (AROM). All patients followed a post-operative protocol with the use of night dynamic extension splint and underwent four rehabilitative sessions. All patients were evaluated by independent hand therapist at a follow-up of two, 14, 21 and 28 days post-operatively after the rehabilitative sessions using the total active motion (TAM) scoring system of the American Society for Surgery of the Hand and Visual Analogue Scale for pain (VAS).

Results: Excellent TAM scores were reported in 27 patients (72.97%) of group A and in 51 patients (92.72%) of group B after the final rehabilitative session. As regard the VAS detected at the final session, patients of group (B) achieved a mean score of 1.98 compared to 2.65 in patients of group (A) with a statistically significant difference between the two groups.

Conclusion: The findings of the study demonstrate the effectiveness of the proposed protocol of rehabilitation and the advantages of the endoscopic technique compared to the open one, therefore, it is considered to be a more favorable and effective alternative.

A-0499 The comparison of two surgical techniques for osteoarthritis of the trapeziometacarpal joint: interposition arthroplasty versus hematoma and distraction

M Corain, R Adani
Hand Surgery and Microsurgery Department, Verona, Italy

Purpose: To compare two groups of patients treated by two different surgical techniques for osteoarthritis of trapeziometacarpal joint: the interposition arthroplasty versus the distraction after trapeziectomy procedure.

Methods: Two groups (64 patients for group 1 and 56 for group 2) were created and only stage 3 and 4 of Eaton classification were considered. We analyzed and compared the results of strength, pain, patient satisfaction, radiographs and complications after an average follow-up of at least three years.

Results: Both groups gained good and excellent results in range of motion, pain relief and strength restore. All the patients were satisfied and at radiographs no bony collapses were detected.

Conclusions: The analysis of patients’ clinical data and radiographs showed no significant differences between the two techniques. We tend to prefer the trapeziectomy, capsuloplasty and temporary distraction with a K-wire for a shorter surgical time, smaller exposure, faster rehabilitation and absence of complications.

A-0500 Scaphotrapeziumtrapezoid arthrosis: our results of treatment with the scaphoid trapezium pyrocarbon implant

MJ Perez-Ubeda, MD Gimeno, G Gutierrez-Argumosa, L Lopez-Duran
Hospital Clínico San Carlos, Madrid, Spain

Purpose: Symptomatic scaphotrapeziotrapezoid (STT) arthritis, is frequently observed by the hand surgeon. This pathology presents with thumb basilar pain and is often coexistent with carpometacarpal arthritis of the thumb. Operative treatment consists primarily of fusion of the STT joint,
although alternatives include trapeziectomy, fibrous arthroplasty, and prosthetic replacements. The current study presents the results of an interposition arthroplasty using a scaphoid trapezium pyrocarbon implant (STPI, BIOProfile). The aim of this prosthesis is to restore the scapho-trapezial mobility, preserving the length of the scaphoid, without destabilising the carpal bones. This technique also avoids the loss of wrist movement after a STT fusion. Our purpose is to show the results of our treatment of the STT arthrosis with a pyrocarbon implant.

**Methods:** Fourteen cases of STT arthrosis were studied with a mean follow-up of 44 months (range: 24–67 months). There were 11 women and three men. Average age was 68 (range, 57 to 74). Surgical indication was pain refractory to medical treatment and loss of wrist mobility, specially radial deviation and dorsal flexion. Preoperative data collected included VAS pain scale, range of motion and strength (grip and pinch one). Preoperative x-rays in all cases identified a degenerative arthritis of the scaphotrapeziotrapezoid joint (stage 2–3 of Crosby’s classification). Type of lunate (by Viegas), radiocarpal and midcarpal angles were also considered preoperatively. In three of the cases a simultaneous treatment of the trapeziometacarpal arthrosis was associated (one case with an Ivory arthroplasty and two with a Pyrodisk one). Another case was treated previously with a trapeziometacarpal arthrodesis. We used a dorsolateral approach in all of the cases and a dorsal capsulorraphy to tighten the dorsal scaphotrapezial capsule. Post-operative data included the same as preoperative and were collected at post-operative months three, six, twelve and at the end of the study.

**Results:** Average time of post-operative immobilization was less than three weeks (range, 2–6). Following surgery, VAS pain scores improved significantly and most patients had minimal restrictions in function. Mean grip strength was 72% and pinch strength 75% compared to the non-operated side (in the cases with no contralateral disease). Overall, 72% of patients were highly satisfied with the results of their surgery. There were three cases of implant volar subluxation, all of them improving after removing the implant. Angular measurements on radiographs showed no modification post-operatively.

**Conclusions:** The results of this study suggest that STPI interposition arthroplasty may be a good alternative to STT fusion for STT arthrosis. In cases of failure, it is possible to use any other revision procedure. We think it is contraindicated in cases with previous carpal instability and in young manual workers.

**A-0507 Prognostic factors for patients with idiopathic carpal tunnel syndrome treated by minimal open carpal tunnel release**

K Yano, T Egi
Department of Orthopaedic Surgery, Osaka Rosai Hospital, Sakai, Japan

**Purpose:** Carpal tunnel syndrome (CTS) is a compression neuropathy of median nerve at the wrist and most commonly found in the upper extremity. The complaints of CTS are consisted of numbness, aching in the median nerve distribution of the hand, and motor weakness. After carpal tunnel release, we sometimes encountered patients whose symptoms are little improvements or worse compared to preoperative condition. In this study, we examined the clinical outcome of patients with CTS treated surgically and analyzed the factors affecting to subjective symptoms.

**Methods:** 101 patients of idiopathic CTS (80 females, 21 males) treated by minimal open carpal tunnel release from 2007 to 2011 were included in this study: 127 hands (bi-lateral: 26 patients), followed over oneyear after surgery. Mean duration of symptoms before surgery was 40 months (range, 1–269). Mean age at the time of the surgery was 69 years (range, 28–84). Mean follow-up period after surgery was 41 months (range, 13–68). Post-operative symptoms including numbness, pain, and satisfaction based on verbal or written description from patients are defined as clinical outcomes. For numbness and pain, latest symptoms compared to preoperative condition were classified into complete relief, improvement, unchanged, and worse. Satisfaction is scored from 0 to 10 and 10 means very satisfied. Sex, age at surgery, duration of preoperative symptoms, smoking, alcohol, diabetes mellitus, hypertension, hypercholesteremia, hyper triglyceridemia, vascular event (myocardial infarction, cerebral infarction, arterio-sclerosis obliterans, valvular disease of heart), body mass index (BMI), preoperative nerve conduction study (classified into four groups: 1) absence of sensory nerve conduction velocity (SCV) and motor distal motor latency (DML); 2) absence of SCV; 3) delay of SCV and DML, and 4) delay of SCV) were considered as prognostic factors. The relationship between clinical outcomes and prognostic factors was examined statistically.

**Results:** Preoperatively, all patients complained numbness and 71 hands complained pain. At post-operative assessment, numbness was complete relief in 76 hands, improvement in 35, no change in 10, and worse in six, and pain was complete relief in 63 hands, improvement in six, and worse in two. Mean satisfaction score was eight. Post-operative status of numbness was significantly associated
with hypercholesteremia. Post-operative status of pain was significantly associated with the result of nerve conduction study. Satisfaction was significantly associated with age over 65 years, duration of preoperative symptoms, hypercholesteremia, vascular event, and BMI. Conclusions: The complete relief or improvement of pain and numbness were obtained in 97%, and 87%, respectively. Post-operative pain and satisfaction were associated significantly with abnormal metabolism of lipids. Our results are useful suspicion for post-operative outcome of each patient with CTS.

A-0508 The effect of stem cells for bridging peripheral nerve defects: a systematic review

CA Hundepool, THJ Nijhuis, B Mohseny, RW Selles, SER Hovius
Department of Plastic, Reconstructive and Hand Surgery, Erasmus MC, University Medical Center, Rotterdam, The Netherlands

Purpose: Today’s golden standard for reconstructing a large peripheral nerve defect is the use of the nerve autograft. However, reconstruction of a nerve defect with a nerve graft and with the support of stem cells has been increasingly studied. The purpose of this systematic review is to summarize the effect of stem cells as a luminal additive in reconstructing a peripheral nerve defect with a nerve graft performed in animal experimental studies.

Methods: A literature search in the databases of Medline and Embase was performed from inception to April 2012, searching for animal experiments on peripheral nerve transection reconstructed with a nerve graft with and without the support of stem cells. Results: Fifty studies were included in the final analysis. They had consistent outcome measurements: walking track analysis, muscle mass ratio, and electrophysiology. The data were categorized according to the stem cell type used: bone marrow derived-, adipose cell derived- and other stem cells. Forest plots of the three outcome measurements showed the positive effect of stem cells on the reconstruction of peripheral nerves at different time points.

Conclusions: This study is the first to systematically analyze the different studies using stem cells as a luminal additive for bridging a large peripheral nerve defect. All different stem cell types showed a true beneficial effect compared to reconstruction without stem cells. Comparing the three different groups of stem cells [i.e. adipose, bone marrow and other], bone marrow stromal cells proved to support the regeneration process the most.

A-0515 A change in the stress of the distal radius in different wrist positions: a finite element analysis

Department of Orthopaedic Surgery, Graduated School of Medicine, Chiba University, Chiba, Japan

Introduction: Some authors had reported that immobilization with the wrist dorsiflexed is better than palmar-flexed position to maintain reduction for Colles’ fracture. For this reason, they hypothesized that a stress would be higher at palmar side where cortical bone is preserved than dorsal side where cortical bone is comminuted in wrist dorsiflexed position. However, there was no biomechanical study to confirm this hypothesis.

Objectives: In the present study, we performed a finite element analysis to investigate an equivalent stress in three different wrist positions at a distal part of a radius.

Material and Methods: The geometry of the finite element models was obtained from 3-dimensional construction of computed tomography images from healthy wrist joint. Scans were performed from metacarpals to a middle portion of a forearm in three different wrist positions (45° flexion position, functional position, and 45° extension position). CT data was imported in Mechanical Finder software version 6.2 (Research Center of Computational Mechanics, Inc., Japan) and was analyzed. We created a mesh for a trabecular bone as tetrahedral elements with a size of 1–2 mm and it for cortical bone as triangular-plate with a size of 0.2 mm. Axial loading of 50N was applied on the each metacarpal except a thumb, and a total of loading was 200N and a middle portion of a forearm was completely restrained. An equivalent stress was measured at dorso-ulnar, dorso-radial, palmo-ulnar and palmo-ulnar aspect in each three positions. Finally, equivalent stress ratios (dorso-ulnar/ palmo-ulnar and dorso-radial/ palmo-radial) were calculated.

Results: In 45° flexion position, an equivalent stress was 4.3652 MPa at dorso-ulnar aspect, 4.1048 at dorso-radial aspect 2.0498 at palmo-ulnar aspect and 1.7088 at palmo-ulnar aspect. In functional position, an equivalent stress was 3.1278 MPa at dorso-ulnar aspect 2.5281 at palmo-ulnar aspect and 1.7088 at palmo-ulnar aspect. In 45° extension position, an equivalent stress was 1.5791 MPa at dorso-ulnar aspect, 1.002 at dorso-radial aspect, 0.9445 at palmo-radial aspect. In 45° flexion position, the equivalent stress ratio was 2.1 in ulnar side.
A-0518 Emergency post-traumatic finger reconstruction with toe-to-hand transfer

A. Georgescu, P. Tos, B. Battiston, I. Matei
(1) Clinic for Plastic Surgery and Reconstructive Microsurgery, Hospital for Rehabilitation, Iuliu Hatieganu University of Medicine and Pharmacy, Cluj-Napoca, Romania
(2) Reconstructive Microsurgery Unit, Orthopaedic Department, Trauma Center CTO Hospital, Torino, Italy

Introduction: Emergency free flap reconstruction is a well-established method in reconstructive surgery. Many authors stated as the immediate restoration of all damaged structures is the goal whenever possible. Absolute indications of emergency free flaps are represented by an exposed vital structure, high risk of infection, flow-through flaps and salvage flaps; relative indications are represented by finger reconstruction with toes. It is well known as in the mutilated hand microsurgical toe-to-hand transplantation provides thumb and finger reconstruction that is superior to conventional techniques in appearance and function. We will report a retrospective series of 31 cases of early toe-to-hand transfer for the reconstruction of mutilated hand.

Material and Methods: The overall results of 31 consecutive procedures performed as emergency reconstruction of mutilated hand with loss of thumb and/or fingers over a 10-year period in our institutions. We review 20 thumb reconstructions and 11 reconstructions of long fingers. The transfer was performed at a mean time from the admission in hospital to surgery of eight hours. We evaluated retrospectively the results with regard to kind of lesion and reconstruction, function, length of hospital stay, complications (e.g., infection, reexploration, reoperation), donor site morbidity. The mean follow up was three years (range, 18 months to seven years). Tip and tricks and rationale of these reconstructions are described.

Results: The success rate of these series was 100%. The rate of reexploration was 10% (venous thrombosis). The recuperation of mobility was between 70%–90% (bigger for the thumb) of the ROM of transferred digit; the sensibility was 60% of a normal finger (mean mTPD 12 mm). About the donor site morbidity we did not report problems doing sports or normal activity, only morphological dysfunction. About the satisfaction of patients we report a rate of 70% of very satisfied patients, 24% of satisfied and 6% of unsatisfied patients from an aesthetic point of view.

Conclusion: The data reported suggest that finger reconstructions using toes can be safely and reliably performed during the initial presentation in selected patients; cooperative and interested young patients are the ideal candidate for toe transplantation. Early toe transfer provides some advantages over the elective procedures in acute hand injuries, such as psychological benefit, single stage reconstruction, short hospital stay without any significant differences in the success rate, functional results and frequencies of complications if compared to other elective case series.

A-0522 Long term outcome of trapeziectomy with ligament reconstruction/tendon interposition versus thumb basal joint prosthesis

L. Vandenberghe, I. Degreef, K. Didden, S. Fiews, L. De Smet
Department of Orthopaedics, Hand Unit, University Hospitals Leuven, Pellenberg, Belgium

Several surgical techniques to treat thumb basal joint arthritis have been described. In this study we compared the results of a cemented thumb basal joint with trapeziectomy with a ligament reconstruction and tendon interposition. A questionnaire was sent to all 519 patients, 322 (with 382 procedures) responded. No significant differences were found when comparing impairment, pain, patient satisfaction and disability. Given the fact that the superiority of a prosthesis cannot be proven and the cost of the implant is greater, we recommend the trapeziectomy with ligament reconstruction and tendon interposition as opposed to arthroplasty as the first choice in the treatment of basal joint osteoarthritis of the thumb.

A-0524 Arthroplasty in the upper extremity using costal osteochondral autograft

K. Sato, T. Iwamoto, N. Matsumura, Y. Toyama, T. Nakamura
Department of Orthopaedic Surgery, School of Medicine, Keio University, Tokyo, Japan

Purpose: Articular cartilage disorders have a great influence on joint function. For the purpose of achieving anatomical reduction as precisely as possible, we have performed osteochondral grafting harvested from the costo-osteochondral junction for cartilage disorders or
defects in fingers and elbows. The purpose of this study is to introduce arthroplasty using costal osteochondral autograft as a novel treatment modality for articular cartilage disorders in the upper extremity.

**Technique and Methods:** Fifty finger joints (eight MCP joints, 36 PIP joints, three DIP joints, and three DIP joints) and 49 elbow joints in 57 patients with articular cartilage disorder due to trauma, osteochondritis dissecans (OCD), or other causes were treated with arthroplasty using costal osteochondral autograft. Fifty-four out of 58 elbows were OCD of the elbow. There were 100 males and six females, ranging in age from five to 68 (mean, 23) Arthroplasty was performed under general anesthesia. After resection of the lesion the graft bed was enlarged sufficiently by curettage. The graft was generally obtained from the 5th or 6th costo-osteochondral junction, trimmed to fit the defect with adequate contour, and fixed as firmly as possible using low profile screws or Kirschner-wires. After surgery the joint was immobilized with a splint for 1–2 weeks, followed by range of motion exercises. Clinical assessment was based on radiographic findings, the range of motion, the Japanese Society for Surgery of the Hand version of the Disability of the Arm, Shoulder and Hand questionnaire (DASH-JSSH), and the clinical rating system by Timmerman and Andrews. Two-sided paired t-test was utilized to compare pre- and post-operative range of motion, DASH-JSSH score, and the clinical rating system.

**Results:** The average clinical follow-up was 35.2 months (range, 6–160 months). Radiographs demonstrated complete union of the bony part of the graft to the base in all patients. Donor site pain persisted only 2–3 days after surgery, and raised no particular problems except for post-operative scar. The mean arc of motion in finger joints was 8° before surgery versus 62° after surgery, with mean increase of 54°. Four cases needed an additional collateral ligament reconstruction in the base in all patients. Donor site pain persisted only 2–3 days after surgery, and raised no particular problems except for post-operative scar. The mean arc of motion in finger joints was 8° before surgery versus 62° after surgery, with mean increase of 54°. Four cases needed an additional collateral ligament reconstruction and another two cases needed tenolysis. All patients had no pain or instability at the joint and were satisfied with the treatment. Mean preoperative DASH-JSSH score was 36 (range, 24–58), improving significantly to nine (range, 2–19) post-operatively (p < 0.001). The mean range of extension and flexion of the elbow significantly increased –4°/135° post-operatively from preoperative –26°/116°, with a mean increase of 41° of total range. Of 54 OCD patients the mean clinical score significantly improved from 95 to 190 post-operatively (P < 0.001). Overall evaluation was excellent in 43 patients and good in 11. Fifty-one of the 54 patients returned to the original sports (baseball in 50, gymnastics in one), whereas the remaining two did not return to baseball. The two patients changed their sports activity, despite acceptable or satisfactory clinical results.

**Conclusion:** Arthroplasty using costal osteochondral autograft demonstrated successful and satisfactory reconstruction in the treatment of articular cartilage disorders in upper extremity.

**A-0541 Timed Sollerman hand function test: comparison between proximal row carpectomy and four-corner fusion**

ME Brinkhorst¹, HP Singh², JJ Dias², RW Selles¹, R Feitz³, TM Moojen³, SER Hovius¹

(1) Department of Plastic, Reconstructive and Hand Surgery, Erasmus MC – University Medical Center, Rotterdam, The Netherlands
(2) Department of Orthopaedic Surgery, University Hospitals of Leicester NHS Trust, United Kingdom
(3) Xpert Clinic, Hilversum, The Netherlands

**Purpose:** Proximal Row Carpectomy (PRC) and Four-Corner Fusion (FCF) are commonly used surgical techniques to manage stage 2 SNAC or SLAC wrists. Both surgeries lead to different post-operative wrist mobility and therefore to a different ability to make commonly-used hand grips. Until now, the range of motion has been used to compare functional outcome after PRC and FCF, but the effect of both surgeries on different handgrips and daily tasks remains unknown. In this study, we timed all the tasks of the Sollerman hand function test to determine which tasks, and its related handgrips, were more compromised in FCF and PRC patients.

**Methods:** The hand function of the operated and non-operated hand was assessed by the modified Sollerman hand function test in 25 PRC patients and 24 FCF patients, at least six months after surgery. The Sollerman hand function test consists of 20 tasks used in daily living. Every individual task was related to one or a combination of seven of the eight handgrips (as described by Sollerman). All tasks of the Sollerman hand function test were timed and compared. All patients were asked to complete the Michigan Hand Questionnaire and the Patient Evaluation Measure. The results were analyzed using the independent student T-test.

**Results:** For operated hand, the mean time to complete the Sollerman hand function test was significantly shorter (216.1 seconds) for the PRC patients than for the FCF patients (240.1 seconds, p = 0.015). For the individual tasks, we found that PRC patients completed the pulp pinch grip task, five finger pinch grip task and the transfer volar grip task significantly quicker than the FCF patients (p = 0.01, p = 0.033, and...
p = 0.01 resp.). In contrast, FCF patients completed the diagonal volar grip task and the spherical volar grip task quicker than the PRC patients (p = 0.036 and p = 0.00, respectively).

**Conclusions:** The timed Sollerman hand function test is an effective measurement to assess the functional outcome of the wrist after surgery. Overall, the PRC patients completed the different tasks quicker than the FCF patients, except for activities requiring wrist torque strength like opening jars or turning a screwdriver.

**A-0542 Structural, functional and quantitative-morphological pathologic changes in the wrist of the patient with the Kienböck’s disease**

S Strafun, V Grigorovsky, S Timoshenko  
*State Institution “Institute Of Traumatology And Orthopaedics Of Academy Of Medical Science Of Ukraine”*, Kiev, Ukraine

**Purpose:** Research objective was: to estimate pathomorphologic, functional and wrist instability relationship expressiveness associated with Kienböck’s disease. The wrist joint osteoarthritis, frequency of their occurrence and correlation dependencies in dynamics of osteoarthrosis formation owing to Kienböck’s disease.

**Methods:** As research material has been served biotyped and resected wrist bones that were obtained from 20 patients. Also wrist instability parameters (radio-scaphoid angle, carpal height index) and DASH-score and Mayo Wrist score has been revealed.

**Results:** It was found that ischemic bone necrosis of wrist bones is characterised by presence of persistent foci of lesion with perifocal zone of organization and bone tissue remodelling. It is probably that owing to action of mechanical trauma the ischemic necrosis foci can arise not only in lunate, but also in wrist scaphoid and triquetrum bones. In bones where developed ischemic osteomedular necrosis, and also in adjacent wrist bones the articular cartilage remains vital, nevertheless it undergoes dystrophic-destructive changes which correspond to the 1st and the 2nd osteoarthrosis stages. In the overwhelming majority of Kienböck’s patients the wrist bone lesion is combined with non-specific joint synovitis, a consequence of which becomes evident, in particular, fibrosing of an articulate capsule layer. Between expressiveness degree of a wrist bones osteoarthrosis, that are adjacent to defeated and synovitis activity, and also – between hypertrophy and hyperplasy expressiveness of synovial layer and synovitis activity – positive moderate correlation has been revealed. In addition the fibrosing of an articulate capsule layer has positive moderate correlation with arthritic changes and synovitis activity with wrist instability parameters (radio-scaphoid angle, carpal height index) has been revealed.

**A-0545 Combined fractures of the scaphoid and distal radius**

Y Gurbuz, K Ozaksar, ST Sugun, T Toros, M Kayalar, E Bal  
*Hand and Microsurgery, Orthopaedics and Traumatology (EMOT) Hospital, Izmir, Turkey*

**Purpose:** The aim of this study is to evaluate the clinical and functional results of distal radius fractures and concomitant scaphoid fractures.

**Patients and Methods:** Twenty-one combined fractures were evaluated retrospectively in 480 distal radius fractures and 72 scaphoid fractures, between 2000 and 2010. Nineteen patients (16 male, three female) with a mean age of 29 [range 19–50] years were included. Two patients had bilateral injuries. Cause of injury was fall from a substantial height in 14, workplace accident in two, and traffic accident in three patients. The mean time from injury to surgery was 1,5 [range 0–6] days. According to AO classification, there were two type B(B1), and 19 type C (4 C1, 2 C2, 13 C3) fractures. Two of the fractures were type 1 open according to Gustillo classification. The volar locking plate fixation was applied in 10, screw fixation was performed in two, external fixator was applied in two and closed reduction and K-wire pinning was performed in seven distal radius fractures. Additional dorsal plate fixation was used in three patients. All scaphoid fractures were type B (19 type B2, two type B1) according to the Herbert-Fischer classification. K-wire fixation was applied in two and cannulated screw fixation was performed in 18 fractures. Pinch power, grip power, range of motions were evaluated. Functional evaluation was performed using patient rated wrist evaluation score (PRWE).

**Results:** The average follow up period was 26,9 (6–97) months. All scaphoid fractures healed. Implant failure of distal radius was observed in a patient with bilateral injury that ulnar artery and nerve injury was grafted as a result of open injury. This patient was excluded from functional results. Nineteen to Twenty fractures of 18 patients were evaluated. Active wrist motion averaged 49° of flexion, 52° of extension, 25.6° of radial deviation,47.8° ulnar deviation. Mean grip/pinch strength were 32,4/9.2. Mean PRWE was 3,7(range: 0–8,5). Eighteen to 19 patients returned to preoperative job.

**Conclusion:** Scafoid fractures accompanying distal radius fractures are results of high energy injuries.
Ulnar artery and nerve injuries can be seen in open fractures. Excepting scaphoid fractures as a part of the intraarticular fracture and wrist joint as a whole, good functional results can be achieved with surgical treatment of both fractures.

### A-0546 Treatment of complex hand injuries using microsurgery and external fixator

H Gotani¹, Y Yamano¹, K Sasaki¹, Y Tanaka²
¹Osaka Trauma and Microsurgery Center, Osaka, Japan
²Shizuoka Institute of Science and Technology University, Shizuoka, Japan

**Purpose:** Reliable initial treatment with a view toward 2-stage reconstruction and a treatment plan centered on post-operative rehabilitation are important to improving the function of replanted fingers and reconstructed hand after severe trauma.

**Subjects and Method**
1) Thirty-one cases including incomplete amputation, severe crush injury, burn at the level of the forearm and the hand underwent reconstruction by free or pedicled tissue transfer. Twenty-two cases underwent tissue transfer secondary to replacement of severe scarring which had caused adhesion of tendon and nerve in the traumatized tissue. Nine cases underwent tissue transfer in the emergency operation to avoid the occurrence of severe scar formation which is believed to cause loss of tendon and nerve function in the future.
2) Thirteen replanted fingers who wore a hinge type external fixator for the purpose of traction of a proximal interphalangeal (PIP) or metacarpophalangeal (MCP) joint and ROM exercise. The structure of the modified Ilizarov minifixator™ for joint ROM (Global hinge fixator™) was unique. We can use this fixator for solid bone fixation at the primary operation and change its structure two to four weeks later to make it suitable for ROM exercises without taking off the wires.
3) Twelve hands in which contracture with the first interdigital space was released with an Ilizarov mini external fixator.

The patients ranged in age from 15 to 72 years old (mean: 48 years), 35 males and six females. Post-operative follow-up periods after secondary reconstruction ranged from four to 61 months.

**Results and Discussion:** Functional outcome of major group was estimated by Chen’s criteria. The final outcome was as follows, five cases in grade IV, eight cases in grade III, nine cases in grade II and nine cases in grade I. The average TAM of the replanted finger was 56.5%. Functional assessment by the Japanese Society for the Surgery of the Hand yielded a score of 65 points (Good). First web contracture group, the preoperative passive distance between the thumb and index finger was 41% in radial abduction, and 33% in palmar abduction. In order to reconstruct the function of the traumatized forearm and hand, it is necessary to prevent the occurrence of severe adhesion around the tendon and nerve by replacing the scar tissue using flaps. 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 study treatment’s costs and incapacity time of each treatment and patient satisfaction with each procedure.

Enzymatic fasciectomy with Clostridium Hystoliticum collagenase is a new procedure in Spain. It’s use was approved in September 2011. We describe the proceedings method and compare with open fasciectomy that have been used for a long time. All cases have been treated in the same period of time.

**A-0552 Reconstruction surgery versus open release retinaculum’s open release in patients with carpal tunnel syndrome: multicenter randomized trial**

MR Gutierrez¹, AA Flores¹, EH Gutiérrez², VJ Espinoza³, VF Opazo⁴, NM Rivera⁵
(1) Instituto Traumatologico de Santiago
(2) Hospital de Talagante
(3) Hospital San Borja Arriarán
(4) Universidad de Chile
(5) Universidad Pedro de Valdivia

**Objective:** Compare the clinical effectiveness in the short- and medium term of flexor retinaculum reconstruction surgery versus open retinaculotomy in patients with severe carpal tunnel syndrome.

**Material and Methods:** Randomized parallel group (double blind: patient and evaluator) followed for 12 month multi-center study.

**Inclusion Criteria:** Patients over 18-years-old with severe primary carpal tunnel syndrome, first episode, without concomitant pathology and informed consent sign.

**Sample Size:** Sample size 57 patients in each group.

It will be calculated with the state IC software using a command to detect the mean difference between independent variables with alpha 0.05 and statistical power of 80%. Considering the Lin Xu et al. study, which reported that the group treated with retinaculum reconstruction surgery, a 36% improvement was confirmed.

**Measurements:** One measurement preoperative and monthly measurement for one year.

**Results:** We evaluated patients with carpal tunnel syndrome diagnosed by clinical and electromyography. The evaluation of the intensity of symptoms and functional assessment was performed with the Boston Score, also the strength as performed with the Jamar dynamometer calibrated with standard technique. All patients have complete remission of paresthesia, two present had ulnar pain. There weren’t recurrences but without statistically significant differences in the recovery of force during the evaluation period.

**Conclusions:** The retinaculum reconstruction surgery with has proved superior to the traditional technique in functional recovery and also decreased the severity of symptoms. Score measured with Boston. No significant difference in the recovery of strength.

**A-0554 Time course of post-operative range of dart-throwing motion following intra-articular distal radius fractures**

Y Dohi¹, K Kasubuchi², H Ono³, S Omokawa⁴, Y Tanaka⁴
(1) Todaiji Medical and Educational Center, Nara, Japan
(2) Hakuho Women’s College, Nara, Japan
(3) Kokuho Central Hospital, Nara, Japan
(4) Nara Medical University, Nara, Japan

**Introduction:** Intra-articular distal radius fractures often cause post-traumatic stiffness of the wrist joint. We hypothesized that radiocarpal joint stiffness would occur following treatment of intra-articular distal radius fractures, while dart-throwing motion tends to be recovered in the early post-operative period.

**Materials and Methods:** Twenty-one cases of the intra-articular distal radius fractures treated with a volar locking plate were prospectively enrolled in this study. The patients included seven men and 14 women with an average age of 60 years old (ranged from 25 to 78). Two patients had AO type B fracture, and 19 had AO type C fracture. The dart-throwing motion (DTM) was defined as a movement from radiodorsal to ulnopalmar and oblique to the sagittal plane, and the arc of the DTM plane was measured using a custom-made goniometer at one, three, six and twelve post-operative months. The flexion-extension motion (FEM) and radio-ulnar deviation were measured with a standard goniometer as well. At each visit, the radiolunate angle (RLA) and capitolunate angle (CLA) were measured in the lateral view radiographs during maximum wrist extension and flexion, and dynamic changes of these parameters were calculated. All parameters of the contralateral wrist were measured as a control. One way analysis of variance (ANOVA) and post hoc Tukey correction were used to demonstrate significant differences between each measurement during the post-operative course and the control (SPSS, version12).

**Results:** There were significant differences in all parameters between each measurement during the post-operative course and the control (FEM: p < 0.001; RUD: p < 0.001; DTM: p < 0.001; CLA: p = 0.002). The arcs of the FEM, RUD, and DTM at one post-operative month were significant smaller than that of control. The arcs of the FEM and RUD at three
post-operative months and the FEM at six and twelve post-operative months were significantly smaller than that of control. The arcs of the CLA and RLA at one post-operative month were significant smaller than that of control. The arcs of the RLA at three post-operative months were significantly smaller than that of control.

Discussion: The CLA, which indicate the midcarpal function, recovered in the early post-operative period and the DTM recovered at the same period. The RLA, which indicates the radiocarpal function, subsequently recovered following the CLA. The radiocarpal function was restricted in early post-operative period of the distal radius fracture but wrist function was maintained by dart-throwing motion only. Careful rehabilitation protocol to improve the radiocarpal dysfunction would be considered early recovery of the total wrist function after intra-articular distal radius fractures.

A-0556 Elevated serum chrome and cobalt in patients with metal on metal articulation in trapeziometacarpal total joint arthroplasty

L Dremstrup, TB Hansen, M Stilling
Department of Orthopaedic Section of Hand Surgery and the Orthopaedic Research Unit Regional Hospital, Holstebro, Denmark

Serum chrome and cobalt was measured in 50 patients operated with trapeziometacarpal total joint replacement with metal-on-metal articulation and compared to serum chrome and cobolt values in 23 patients with trapeziometacarpal total joint replacement with metal-on-polyethylene articulation. In 10 of 50 patients with metal-on-metal articulation slightly elevated serum chrome or cobolt values were found compared to only one in 23 patients with metalon-polyethylene articulation. The mean DASH score was 10 in patients with elevated serum chrome or cobolt compared to 24 in patients with normal values (p < 0.05) indicating a clinical relevance of the elevated serum chrome or cobolt values, and we recommend that patients with trapeziometacarpal total joint replacement with metal on metal articulation are followed to detect possible complications from metal debris.

A-0559 The outcome of coverage of soft tissue defects of the hand with radial perforator forearm island flaps

S Prashanth, W Abhijeet, -N Chetan, T Ajeet
Hand Surgery Associates, Pune, India

Purpose: The traditional reverse radial forearm fascial flap is widely used in soft-tissue reconstruction of the hand, which incorporates the radial artery from the forearm and is perfused by retrograde flow through the palmar arch. In patients with an abnormal Allen test because of an incomplete palmar arch, the traditional reverse radial artery flap is contraindicated unless a vein graft is used to reconstruct the radial artery. A simpler alternative approach for hand reconstruction in such patients is a distally based Radial Perforator Forearm Island Flap based on radial artery perforators, which preserves the radial artery. The Island flap stem is kept outside the skin which is divided at the end of six weeks. The purpose of this study was to evaluate the outcomes of this procedure in 20 consecutive patients operated by a single surgeon and also to evaluate the functional and aesthetic outcomes. Donor site morbidity was also studied.

Methods: We used this flap based on radial artery perforators in twenty patients who had palmar or dorsal soft-tissue loss. All surgeries were performed on an emergency basis after the patient presented to the ER with soft-tissue loss.

Results: All twenty patients recovered full hand function, and as complications we had three cases of distal flap margin necrosis, all of which healed without any intervention. One patient had a superficial necrosis which required a full thickness skin graft. One patient had partial loss of donor site skin graft. All patients reported a satisfactory outcome and were pleased with their aesthetic result. All patients went back to their previous level of activities after complete recovery.

Conclusion: The radial artery perforator flap based on distal radial artery perforators is suitable for coverage of soft-tissue defects in hands with either a complete or an incomplete palmar arch. This flap is a thin flap and provides excellent cosmetic results and allows for early rehabilitation.

A-0561 Instability of the distal radioulnar joint (DRUJ): a description of the problem and own experience with early mid-term results

A Wahegaonkar, S Prashanth, - C Nerpagar, A Tiwari
Hand Surgery Associates, Pune, INDIA

Purpose: The distal radioulnar joint (DRUJ) is important for rotation of the forearm and stability of the ulnar wrist. Any DRUJ injury can cause limitation of the range of motion, decreased strength, pain, and instability. This paper deals with DRUJ instability, and reviews treatment methods and outcomes. Instability
due to injury may be acute or chronic in nature. Most acute problems are best treated conservatively. Chronic problems resulting in disability may require surgical treatment.

**Methods:** 22 patients (seven female, 15 male); with an average age of 35.55 ± 12.41 years (range 17-55 years) with DRUJ instability were included in this study. Eighteen of the 22 patients had a history of previous trauma and there was one patient with a Madelung deformity and three with an ulna positive variance. Different operative procedures were used due to the variety of clinical presentations: 10 patients underwent a Sauve-Kapandji procedure, four patients were treated with Adams-Berger anatomic ligament reconstruction, three patients underwent an arthroscopic TFCC repair, two patients underwent a Breen-Jupiter procedure, and one patient each underwent an arthroscopic Feldon procedure, ulnar shortening osteotomy and ORIF for non-union of type II ulnar styloid fracture. The average follow-up was 6.77 ± 3.73 months (range one–14 months).

**Results:** Pain reduced significantly (p < 0.05) in all patients. The range of motion post-operatively did not differ significantly (p > 0.05). DRUJ stability was restored in all cases.

**Conclusion:** DRUJ instability can result in significant disability. In such cases surgical treatment restores stability and decreases symptoms. Return to pre-injury activities is possible following treatment in carefully selected cases.

**A-0562 Alteration of sympathetic tone by peripheral periarterial sympathectomy for the treatment of trophic changes in chronic digital ischemia**

A Wahegaonkar, S Prashanth, C Nerpagar, A Tiwari
*Hand Surgery Associates, Pune, INDIA*

**Purpose:** Chronic digital ischemia from vasospastic events can occur in a number of conditions including Raynaud’s disease and scleroderma. These conditions are pathologic and cause inappropriate arterial or venous tone that persists in the presence of physiologic demands for increased flow. Inappropriate cold sensitivity, the most common symptomatic manifestation of vasospastic states, is frequent and affects 5% to 10% of the general population and 20% to 30% of premenopausal women. Although the majority of patients can be managed with nonoperative modalities, treatment of vasospastic disorders must be individualized. Management options include medical therapy, biofeedback, microvascular reconstruction, and digital sympathectomy. Unfortunately, drugs that directly affect sympathetic tone are often difficult for patients to tolerate with frequent side effects. Surgical options may restore nearly normal physiologic function or provide short- to intermediate-term palliation for patients with vasospastic or occlusive disease. The purpose of this study is to compare the mid-term results (minimum follow up 18 months) of periarterial sympathectomy for patients with chronic digital ischemia secondary to Raynaud’s disease, scleroderma or generalized atherosclerotic disease.

**Methods:** 14 patients presenting with symptoms and signs of chronic digital ischemia were included in this study from a retrospective chart review. All patients had pain, ulcer, or gangrenous change in the affected digits and were unresponsive to pharmacologic or other nonsurgical therapies. Twelve (eight females and four males) out of the 14 patients underwent peripheral periarterial sympathectomy. Ten patients were diagnosed to have Raynaud’s disease and two had scleroderma. None of the patients had any atherosclerotic disease.

**Results:** All but one patient had symptomatic improvement on a minimum follow-up of eight months. One patient developed gangrene and required an amputation of the digit. All ulcers and trophic changes healed over time (average 6–8 weeks). Pain improved significantly in all patients.

**Conclusions:** Periarterial sympathectomy can lead to complete healing and decrease in ulceration with symptomatic improvement in patients with digital ischemia from vasospasm. This procedure improves perfusion to ischemic digits and may avoid amputation in patients with Raynaud’s disease who do not respond to conservative treatment.

**A-0564 Anatomical reattachment of the TFCC using ECU half-slip tendon: a long-term outcome**

T Nakamura, M Nishiwaki, N Matsumura, T Iwamoto, K Sato, Y Toyama
*Department of Orthopaedic Surgery, School of Medicine, Keio University, Tokyo, Japan*

**Purpose:** Since 1998, we treated 39 wrists of ulnar detachment of the TFCC by reattachment technique using half-slip of the extensor carpi ulnaris (ECU) tendon with a very small interference screw. We examine the long-term outcome of this procedure with a minimum of five years follow-up.

**Methods:** The technique indicates that the ECU half-slip induced inside the TFCC, was tightly sutured to the remnant TFCC, and pulled out through the bone tunnel that was made at the center of the
fovea by 2.5 mm diameter drill. The ECU half-slip was subsequently anchored to the ulnar fovea with a small titanium interference screw. There were 17 wrists of 16 cases (12 right, three left, one bilateral, mean age, 40 years) with an average follow-up of 6.4 years (range, 5–12 years). The neutral ulnar variance was indicated in 13 wrists and positive in four. In the positive variance wrists, the ulnar shortening equalized the abutment before the reattachment. Diagnosis was done by Arthrogram, MRI and DRUJ arthroscopy findings. Clinical and radiographic results were evaluated.

Results: At final follow-up, 13 wrists indicated no pain, three wrists demonstrated mild pain, and one wrist, severe pain. Two wrists indicated loss of supination range by 30°. Complete re-stabilization of the DRUJ was noted in 12 wrists, moderate instability in four wrists. Severe DRUJ instability remained in one wrist. One wrist indicated expansion of the bone tunnel, which is considered a major problem in the ligament reconstruction, size of the bone tunnel was unchanged in nine wrists, as opposed seven wrists indicated closure of the bone tunnel. There were 11 excellent, one good, four fair and one poor results with modified Mayo wrist score.

Conclusion: Anatomical reattachment technique of the TFCC to the ulnar fovea using ECU half-slip tendon was long lasting. Bone tunnel expansion was only seen in one wrist (poor result case) among 17 wrists at final follow. On radiographs, seven wrists indicated bone tunnel closure, while the bone tunnel still existed in nine wrists.

A-0565 Pancarpal arthritis: Amandys® or RCPi®?
J-Y Beaulieu, P Vostrel, A De Smet, J Van Aaken, S Kampfen
Unité de chirurgie de la main et des nerfs peripheriques
Hôpitaux Universitaires de Genève, Genève, Switzerland

Introduction: Treatment of pancarpal arthritis remains controversial concerning the use of the most appropriate surgical procedure. We report our experience about two different pyrocarbone implants. One implant is an interposition spacer (Amandys®) and the other one is a radio capitare implant (RCPi®).

Method: Eight patients were operated on with an interposition spacer (Amandys®) and all of them participated to the follow-up control. There were preoperatively two SLAC lesions, two SNAC lesions, three post-traumatic pancarpal arthritis and one infectious pancarpal arthritis. QuickDASH and Patient Wrist Ratio Evaluated (PWRE) scores were obtained in four patients out of eight. Seven patients were operated with a radio capitare implant (RCPi®) and five patients participated to the follow-up control. There were preoperatively two Kienböck diseases, two SLAC lesions and one posttraumatic pancarpal arthritis. QuickDASH and Patient Wrist Ratio Evaluated (PWRE) scores were obtained in three patients out of five. Mobility and grip strength were measured preoperatively and at the final control by all patients.

Results: Amandys® group: four patients had to be operated again in this group: two patients because of implant instability requiring in one case a temporary stabilization by arthrosis and in the other case a repositioning of the implant. Two other patients because of a painful mechanical conflict requiring in one case a change of the implant and in the other case a total wrist fusion. The two patients with arthrosis and arthrosis were excluded from the study. The mean age was 55 years (35–70). The mean post-operative time at control was 15 months (5–25). Preoperative flexion was 31° (15°–70°). It decreased from 12° at the final control (0°–40°). Extension decreased from 17° after the operation. Pronation remained unchanged after the surgical procedure, but the mean supination improved from 9°. Grip strength of the operated wrist represented preoperatively 30% of the contralateral wrist and raised to 38% at the last control. QuickDASH and PWRE score were 28 and 53 points respectively. RCPi® group: One patient had to be operated again after 18 months [total wrist fusion] and was excluded from the study. The mean age was 55 years (30–68). The mean post-operative time at control was 28 months (12–56). Preoperative flexion was 54° (40°–90°). It decreased from 14° at the final control (20°–70°). On the other hand, extension improved from a mean of 15° (20°–60°). Prono-supination also improved from 11° and 12° respectively. Grip strength did not change significantly and represented 50% of the contralateral side. QuickDASH and PWRE score were 30 and 54 points respectively.

Conclusion: The use of a pyrocarbon spacer implant such as Amandys® remains an option in the treatment of pancarpal arthritis. Nevertheless, there is a high rate of reoperation (50%) with a decrease of the total post-operative arc of motion of nearly 50%. RCPi® implant represents a more attractive alternative because it preserves the total preoperative arc of motion and that the rate of reoperation is less important. There are no significant differences between the two implants in term of grip strength and functional scores.
A-0568 Dye punch distal radius fractures: open or arthroscopic approach?

JC Messina, F Torretta
Hand Surgery Unit, Gaetano Pini Orthopaedic Institute, Milano, Italy

Introduction and Aim: Dye punch fractures are included in AO group B3 and C and involve the articular lunate fracture of distal radius, mainly in the posterior part. X-rays can be suggestive but CT scan is the best method to visualise the fracture and plan surgical treatment. Volar open approach is generally not sufficient to reduce the fracture as this cannot be fully visualised by volar approach and usually requires a dorsal approach or a combined volar/dorsal approach to visualise the joint and reduce the fracture. The development of wrist arthroscopy has allowed the visualisation of radiocarpal joint with a minimally invasive approach and the reduction of articular fracture fragments as well as the identification of associated intracarpal lesions. Aim of this study is to compare two groups of patients, one group treated by open approach alone, and the second group treated by open approach with arthroscopic assistance.

Materials and Methods: In one year we have treated 122 distal radius fracture, of those 15 were dye punch fractures. All patients were treated by ORIF of distal radius by dorsal plating or volar plating. Nine patients were treated by open procedure alone and six cases with arthroscopic assistance. Mean age of patients was 40 years old (range 16–58) all were males. All patients were reviewed at a mean follow-up of 11 months (min 8–max 22 months). ROM; grip, DASH, mayo score were evaluated.

Results: According to the Mayo Wrist Score all patients had excellent or good results. In the arthroscopic group all patients had excellent results while in the open group four patients had good results and five excellent. No substantial differences were recorded in the DASH test and in the evaluation of grip strength between the two groups but four patients in the open group had stiffness in flexion which was not present in the arthroscopic group.

Conclusions: Arthroscopic assistance provides a better visualisation of the joint and thus allows an excellent reduction of the fracture. It is always necessary, in these type of fractures, to associate internal fixation with plating by volar or dorsal approach in order to stabilise the fracture and insert bone graft if necessary to sustain articular fragments. Arthroscopy in this small group of patients seems to give an improvement of the results, with reduction of stiffness but a longer operating time is needed to perform the procedure.

A-0578 Observation on the gross anatomy of oblique retinacular ligament

M Alp1, SM Akkın2, T Marur2, S Demirci2, L Yalçın2, J Koebe3
(1) Manus Hand Group, Istanbul, Turkey
(2) Department of Anatomy, Cerrahpasa Medical Faculty, Istanbul University, Istanbul, Turkey
(3) Institute II for Anatomy, University of Cologne, Cologne, Germany

Purpose: The aim of our study was to observe the macroscopic anatomical features of the oblique retinacular ligament (ORL) which provides tenodesis function to the dorsal aponeurosis of the digit.

Materials and Methods: The study included 23 digits of six hands of fresh cadavers (four females, two males; mean age: 71.3 years, range: 65 to 78 years) were used to examine the extension and termination of ORL. The study was carried out on fresh cadaver hands (an average one month old) at the Institute of Anatomy of the University of Cologne, Germany. The dissections were performed under magnification x2.5. A longitudinal incision was made along the dorsal aspect of the medial four digits. At the level of the interphalangeal joint the incision was converted to the ‘H’ incision to expose the whole dorsal aponeurosis.

Results: The oblique retinacular ligament originated in all cases bilaterally from the A2 pulley and proximal phalanx shaft. In 19 digits the radial sided ORL was thicker than the ulnar sided. In one of the female hands the digits had swan-neck deformity which made us suspect rheumatoid arthritis. At the digits of this case the radial sided ORL was displaced to the dorsal aspect and the ulnar sided to the palmar aspect of the digit. The ligament extended in 16 digits symmetrically and in seven digits asymmetrically. On eight sides of 23 digits ORL approached the lateral conjoint ligament at the 1/3 proximal and on four sides at the 1/3 middle of the middle phalanx the terminal tendon (TT). In both cases it appeared as an indistinct thin band. In these cases ORL became apparent when the DIP joint was forced to flexion during the PIP joint flexion. On 34 sides ORL approached TT at the level of the distal interphalangeal joint as an apparent band. The ligament terminated in all digits at the distal phalanx near the TT.

Conclusion: Although ORL gives sometimes the feeling of a membranous structure it always appears gross anatomically in variable thicknesses. It should be noted that ORL become especially apparent during flexion of both DIP and PIP joints.
A-0579 Comparison of torque against resistance between proximal row carpectomy and four corner fusion

A Lluch1,2, M Garcia-Elias1, A Lluch1, S Balan1, S Barrera2, N Vidal2
(1) Institut Kaplan, Barcelona, Spain
(2) Hospital Vall d’Hebron, Barcelona, Spain

Purpose: Scaphoidectomy and luno-capito-triquetromate arthroplasty are two surgical techniques commonly used for the treatment of carpometacarpal and midcarpal disease, respectively. The techniques are two different surgical procedures, but they are frequently compared. When a PRC is performed, radiocapitate ligament is the only extrinsic ligament preserved, thus allowing full intraoperative pronation and supination of the remaining carpus from the forearm without any restriction. This fact raises the hypothesis that individuals having a PRC would have problems in performing activities that require pronation or supination against resistance.

Methods: Fifteen patients with a PRC and 15 patients with a FCF, with similar epidemiologic features, have been included in this study. Procedures were performed by three different surgeons. Mean follow-up after both surgeries was 69 months (minimum follow-up 14 months). Pronation and supination against resistance was measured, together with the functional outcome after the procedure (VAS, QuickDASH and satisfaction), grip strength, motion and return to work. Pronation and supination against resistance was measured with a specially designed torquemeter to assess maximal isometric prosupination strength.

Results: No statistical difference was found between PCR and FCF in any of the variables measured except from radial inclination, significantly diminished in PCR patients. Most reasonable explanation for the fact that PCR individuals, barely with one ligament linking the carpus and forearm, still have the same torque against resistance lies in the dynamic control provided by the muscles crossing the wrist.

Conclusion: PCR individuals don’t have less torque against resistance compared to those having a FCF. Lack of strength difference between PRC and FCF cannot be attributed to ligaments. If strength was related to the amount of ligaments left intact, patients with FCF should be stronger than patients with a PRC. The fact that both groups of patients had similar strength indicates that muscles, and not ligaments, are the key elements in the recovery of rotational strength after these types of surgeries. Indirectly, these findings demonstrate that muscles are the ultimate stabilizers of the radiocarpal and midcarpal joints against axial rotational stresses.

A-0583 The versatility of reverse dorsal digital artery island flap for closure of large defects of the finger

A-G Türkmen, E Ayla, MN Koç, H Kütükoğlu
Gaziantep University Faculty of Medicine, Department of Plastic, Reconstructive and Aesthetic Surgery, Gaziantep, Turkey

Purpose: The reconstruction of full-thickness defects of the finger still remains a challenge. The complex anatomical structure of this region, the defect closure options being limited and even primary closure of small defects being hard due to the stretched skin structure all contribute to this fact. So far there are a number of techniques described for closure of defects in this region. Though, most of these techniques are insufficient for closure, particularly for large defects. In this study we present the use and results of reverse dorsal digital artery flap for closure of large finger defects.

Methods: During the last two years, the reverse dorsal digital artery flap was used in eight patients (six male, two female). The defects resulted from trauma in three patients and from snake bite in the remaining five patients. The patients’ ages were between 20 to 36 (average 27). Defect dimensions ranged from 2.3 x 3 to 3 x 5 cm. In all patients, flaps were elevated above the paratenon via the subcutaneous pedicle based on the dorsal digital artery and transferred to the defect area as an island flap. In two patients, pip joint ligament reconstruction was performed. The donor site was closed primarily in all patients.

Results: In the early post-operative period no complications were encountered and all the flaps healed uneventfully. During the six–twelve month follow-up, none of the patients suffered from limited range of motion or contractures. In all patients acceptable functional and aesthetically pleasing results with color and texture match were achieved.

Conclusions: Reconstruction of full-thickness, distal finger defects is an issue with few alternatives due to the limited soft tissue in the region. For defects in which bone or tendon is not exposed, secondary healing or graft closure can be used as a treatment. However, for full-thickness defects of this region, the gold standard is local or distal flap closure. Groin flap, cross-arm, cross-thenar or cross-finger flaps which necessitate division of the pedicle, coerces the patient to a minimum of three-week immobilization therefore patient’s comfort and daily life is seriously disturbed. In addition, excluding cross-finger flap, distant flaps are difficult to adapt because of significant color and tissue mismatch. Reverse dorsal digital artery island flap is a useful option for closure of large finger defects.
defects as it is a homodigital, single-staged operation with perfect color and texture match and minimal donor site deformity. In addition, compared with other homodigital island flaps the reverse dorsal digital artery flap has a longer pedicle and distal pivot point allowing the flap to be used for the closure of distal and wide defects of the fingers. Although useful as local flaps, homodigital island flaps have their own disadvantages such as: 1) one-side of the digital package participating to the flap, 2) dissection of the flap is difficult, and 3) advancement of the flap is limited.

A-0584 Dorsal hand coverage: aesthetic and functional outcome

R Adani1, –M Corain1, –L Tarallo2
(1) Department of Hand Surgery and Microsurgery, University Hospital of Verona, Italy
(2) Department of Orthopaedic Surgery, University of Modena and Reggio Emilia, Modena, Italy

Purpose: The dorsum of the hand has thin, fragile skin and poor subcutaneous tissue covering tendons, bones and muscles. The connection between the skin and subcutaneous tissue is very loose and unstable. These characteristics affect the possibilities for reconstruction of defects occurring in this area. The purpose of this study is to review the patients with extensive dorsal soft tissue defects treated with different pedicle flaps or free tissue transfer and to determine the best flap for dorsal hand coverage in terms of aesthetic appearance and donor site morbidity and to define an algorithm of treatment of this type of injury.

Materials: A retrospective study of all flaps used for dorsal hand coverage was done. Between 1990–2010 44 patients (mean age, 36 years; range 16 to 79 years) were treated for large soft tissue defects located on the dorsum of the hand. Twenty-one patients with composite tissue loss of tendon and skin on the dorsum of the hand were treated employing a completely vascularized single-stage reconstruction (the cutaneous tendinous dorsalis pedis and the radial tendinous island flap were used). The management of pure cutaneous defects (23 cases) includes different type of pedicle fasciocutaneous flaps (radial forearm flap, posterior interosseous flap, groin flap), or using a free tissue transfer (LAF, ALTF). No muscle flaps were employed for dorsal hand reconstruction.

Results: All flaps survived completely. Tendon-cutaneous flap required tenolysis in two cases. Fasciocutaneous flap required debulking procedures in six cases. Fascio-cutaneous flaps had the highest need for skin grafting at the donor site.

Conclusions: The approach to the patient with a dorsal hand injury requires the surgeon to be aware of a variety of treatment options. Techniques that most closely replace that which has been injured are the most successful. Flap selection must be individualized to the specific patient and defect. Cutaneous and fascial flap showed good functional and aesthetic results, donor site was better in fascial flaps. The replacement of combined loss of skin and tendons in only one stage gives the best opportunity for functional recovery, and allows patients a relatively rapid return to a productive life. The dorsalis pedis flap and radial forearm flap are less often used now because of the donor site morbidity.

A-0589 Results of endoscopically assisted ulnar nerve decompression at the elbow – prospective study, 101 patients

I Humhej, T Radovnický, M Sameš
Department of Neurosurgery, J.E.Purkinje University, Masaryk Hospital, Ústí nad Labem, Czech Republic

Purpose: To evaluate the efficiency of ulnar nerve decompression for entrapment at the elbow by using a miniinvasive endoscopically assisted method. This technique enables deliberating the ulnar nerve in a wide range requiring only a short skin incision (2-3 cm). In such a manner we can protect the anatomically important structures (e.g. vascularization of the ulnar nerve, medial antebrachial cutaneous nerve) while releasing the ulnar nerve in all points of potential compression. Moreover, endoscopically assisted procedure provides continual visual control of the ulnar nerve at all times of decompression and it avoids any additional compression of the nerve, because the retractor with integrated endoscope remains in subcutaneous space.

Methods: Between May 2007 and December 2012 we operated 101 patients [males 47; females 54; mean age 47 years; range 18-88 years] with the ulnar nerve entrapment syndrome at the elbow using endoscopically assisted simple decompression technique. According to McGowan’s scale, 24 patients were grade I [mild lesions], 67 grade II [moderate lesions] and 10 grade III [severe lesions] regarding clinical symptoms severity. Tinel’s sign was positive in 92 cases and negative in 9 cases. We used the Karl Storz Peripheral Nerve Set for endoscopic decompression in peripheral nerve entrapment syndromes in all procedures. 75 procedures was performed on the left side, 26 on the right side. We had to convert the simple decompression to anterior subcutaneous transposition of the ulnar nerve due to nerve luxation during...
elbow flexion in 2 cases. All patients were followed prospectively. **Results:** We had a 3 months follow-up available in 68 patients (74%). In 94% of cases we observed improvement in clinical complaints, in 6% there was no change in the clinical status, no patient was worse. Elbow pain had 20% of the patients 3 months after surgery. The EMG studies showed improvement in 95% of cases, while in 3 patients (5%) it stayed unchanged [2 pts were McGowan gr. III preoperatively, 1 pt had preop. EMG study with no pathology]. No EMG worsening was recorded. We encountered 3 wound hematomas (all managed conservatively), 1 superficial inflammation (treated with antibiotics), 1 wound dehiscence (requiring resuturing), 1 seroma (managed by aspiration), 1 medial antebrachial nerve hypeaesthesia and 1 medial antebrachial nerve hyperesthesia. All responding patients completed a detailed questionnaire regarding the outcome of surgery in a one year follow-up. In long-term follow-up we operated 4 patients for persisting ulnar nerve irritation [2 of them because of ulnar nerve friction over the medial epicondyle by the nerve luxation], although there was motor and EMG improvement in all of them. In all of these cases we performed extensive exoneurolysis with anterior subcutaneous transposition of the ulnar nerve resulting in clinical improvement in all patients. **Conclusions:** Endoscopically assisted decompression of the ulnar nerve is a simple, fast, delicate and effective procedure in the management of the ulnar nerve entrapment at the elbow. It enables extensive nerve decompression with excellent visualisation and maximal preservation of all important anatomical structures. Moreover, this method enables early physiotherapy, fast recovery and return to professional activities.

A-0594 Flexor-tendon tissue engineering: results of an extensive literature survey focusing on hand-flexor-tendon tissue engineering

E Ntouvali1, Z Dailiana2
[1] Diagnostic & Therapeutic Center HYGEIA SA, Athens, Greece
[2] Department of Orthopaedic Surgery, Faculty of Medicine, School of Health Sciences, University of Thessalia, Biopolis 41110 Larissa, Greece

**Introduction:** Tissue engineering using scaffolds, stem cells and growth factors is the most recently added option in our arsenal for the treatment of severe flexor-tendon injuries. Compared to the available alternatives (including tendon grafting; two-stage flexor-tendon reconstruction using silicon rods; and "FDS-finger"), flexor-tendon tissue engineering (FTTE) aims to the achievement of a significant therapeutic benefit at acceptable cost while simultaneously obviating the shortcomings of the aforementioned operative-treatment methods which adversely affect the functional outcome of flexor-tendon repairs, especially following complex hand injuries. **Purpose:** Our objective was to perform a systematic literature survey on FTTE, focusing on its applications in terms of hand-flexor-tendon reconstruction. **Material and Methods:** Our extensive MEDLINE® search yielded interesting reports on a variety of FTTE - approaches. **Results:** Acellularized tendon grafts; extracellular matrix (including bioengineered porcine small-intestinal sub mucosa [SIS]; human amnion extracellular matrix [HA–ECM]; etc.); and (bio)material scaffolds in the form of microscaffolds or, more recently, electrospun nanoscaffolds (including polyglycolic acid [PGA] unwoven fibers, mesh or bundles oriented in parallel; calcium polyphosphate fiber [CPPF], preferably with organic coating [e.g. Type-I collagen]; etc.) are listed amongst the various scaffolds that have been tested in terms of FTTE in the experimental setting to date. The cellular component, which may be seeded on the scaffolds either ex vivo or in vivo, may consist of autologous or allogeneic, differentiated cells (namely, epitenon – or endotenon – tenocytes; synovial cells; sheath fibroblasts; skin fibroblasts) or undifferentiated cells (e.g. adipose – derived stem cells; bone-marrow-derived stem cells; and, potentially, muscle–derived stem cells [i.e. ASCs; BMSCs; and MSCs, respectively]). Based on a direct comparison of autologous tenocytes, skin fibroblasts, ASCs and BMSCs, ASCs proliferated faster in cell culture, but the four cell types mentioned above were similar in other respects; thus, all four cell types could be successfully used in terms of FTTE. On the other hand, BMSCs are also being investigated as an injectable-cell treatment for equine tendon injuries including flexor-tendon injuries. Furthermore, several growth factors (including IGF-I; bFGF; PDGF–BB; IL–3; IL–14; etc.) have the potential to promote FTTE. IGF-I, bFGF and PDGF–BB have all been shown to enhance the results of FTTE using autologous tenocytes, fibroblasts or ASCs, with PDGF–BB being the most effective amongst them. Finally, a synergistic effect of combinations of the aforementioned growth factors has been recorded. **Conclusions:** Improving understanding of tendon healing has enabled hand surgeons to successfully modulate the normal repair process. Future perspectives include the development of biomaterial scaffolds with more favorable characteristics with respect to the rate and products of their biodegradation, as well as optimization of the number of cells and doses of growth factors used in terms of FTTE.
A-0595 A comparison of the effect of platelet-rich plasma and erythropoietin on sciatic nerve regeneration in an experimental rat model

RG Goncu1, MN Karalezli2, S Tuncer2, N Dalkilic2, H Esen2, E Koktekir3
(1) Konya Education And Research Hospital, Konya, Turkey
(2) Necmettin Erbakan University, Meram Medical Faculty, Konya, Turkey
(3) Selcuk University, Selcuklu Medical Faculty, Konya, Turkey

Aim: To compare the effects on nerve healing of Platelet-rich plasma (PRP) and Erythropoietin (EPO) (EPO compared to PRP, but as it is an expensive product, a careful and attentive surgical approach is thought to be the best treatment method.

Material and Methods: This experimental study was conducted on 60 adult female Wistar Albino rats, separated into four groups of 20. The first group was divided into two with the right sides as control and the left sides as incision group. The other two groups were formed as PRP and EPO groups. In the second group, nothing was done to the right thigh and in the left thigh the sciatic nerve was fully cut then primary repair was made. In the third group, after cutting and primary repair of the left sciatic nerve, autologous PRP was administered to the repair area. In the fourth group, after cutting and repair, 5000 IU/kg recombinant EPO was administered. All the subjects were sacrificed at the 2nd and 4th months. The sciatic nerve was removed by isolating it from the lumbar plexus to the ankle. The results were compared by electrophysiological and histopathological evaluation.

Results: Nerve conduction was able to be recorded at the 2nd and 4th month for each of the four groups. In the 2nd month, significantly better conduction was recorded in the EPO group but no statistically significant difference was determined between the groups. In the measurements taken at the 4th month, there was no difference in conduction between the PRP and EPO groups. While recordings were obtained from all the subjects in the EPO group, there were subjects in the incision and PRP groups from which conduction could be taken. The conduction at the 2nd and 4th month did not reach healthy nerve conduction parameters in any of the groups. The repaired distal fibres with and without myelin were numerically calculated histopathologically. In the EPO group, more fibres with myelin were enumerated at both the 2nd and 4th month than in the incision and PRP groups.

Conclusion: In the short-term EPO was found have the effect of significant faster healing of the nerve, although in the long-term no difference was found in the effect of EPO and PRP compared to the incision group. Despite the morphological and functional healing of all the EPO group, the quality of the nerve conduction in all the injured groups was seen to be poor. A relatively positive effect was determined in EPO compared to PRP, but as it is an expensive product, a careful and attentive surgical approach is thought to be the best treatment method.

A-0601 Distal radius fracture: complications of palmar plate osteosynthesis and strategies to avoid them

C Kindler, B Lukas
Schön Klinik München-Harlaching, Munich, Germany

Purpose: From 2011 to 2012 we had 21 complications in palmar osteosynthesis which needed revision surgery. In a retrospective study we tried to reveal reasons for failure of palmar plate osteosynthesis.

Methods: All 21 cases were reviewed. Preoperative x-rays and CT Scan, surgery report, post-operative X-rays, post-operative outcome were analyzed. The special complication in each case was discussed in the complete hand surgery department, searching for reasons of failure.

Results: In eight cases we registered individual mistakes. Too long screws in five cases lead to tendon ruptures and in three cases revision of median nerve was necessary. In 13 cases we observed insufficient osteosynthesis or missed concomitant lesions.

Conclusions: The accurate interpretation of the fracture is important to avoid complications and to choose the correct technique of osteosynthesis. There are several types of fractures in which a single palmar plate is inadequate. After osteosynthesis is finished investigation of DRUJ stability and scapholunate dissociation is required. In detailed surgical approach, plate design and position, technique of osteosynthesis and limitation of palmar procedure will be addressed.

A-0605 The UNESCO initiative: OER – an approach to knowledge and science without barriers

R Boettcher, A Eppelin
Handchirurgie Weltweit e.v., Panketal, Germany

Although the development of digital media and electronic publishing really advanced in the last decade, access to knowledge and science is mostly limited by economic and copyright related barriers. Hand surgery is based on very specialized surgical education, research and current discussion. Commercial textbooks and journals are expensive and limited in distribution. Contents have to be revised in short time intervals and cause recent editions. Operative treatment and microsurgical techniques cannot be displayed adequately in printed media.
The beginning of this millennium is characterized by increasing information and communication technologies which allow the transfer of information through global communication systems. This opens up opportunities to create and share a wider array of educational resources. Social networking and collaborative learning becomes common. Copyright regimes and business models for publication are under scrutiny. The idea of OER (open educational resources) has now led to guidelines for open educational resources in higher education, developed by the UNESCO and the C.O.L. (Commonwealth of Learning). The purpose of these guidelines, published 2011 and specified for governments, higher education institutions, academic staff and student bodies is to support freely accessed, reused, modified and shared knowledge. One important tool in this concept is open licensing with a structured legal framework for well defined rules concerning copying, reusing, changing and commercial use of contents under preserving the authors rights. Creative Commons licences offer different licence packages adapted to national laws. Open access publishing with worldwide electronic distribution of peer-reviewed journal literature and monographs in order to give free and unrestricted access to knowledge according to the Budapest Open Access Initiative is the key. The term “OER” is not synonymous with online learning, eLearning or mobile learning. Many OER – while shareable in a digital format – are also printable. In the presentation the concepts and guidelines for OER, Open Access publishing and the use of Creative Common licences are explained. Using the concept for an Open Access Textbook the advantages and possibilities of OER are explained. The conclusions will include a suggestion for OER institutional policies and practices of FESSH and the national societies.

A-0616 Reconstruction of malignant bone tumor in forearm

Y Tomita, Y Nagahama, R Muller Nakajima, K Kusunose, A Hara, T Torigoe, K Noike  
[1] Institute of SASAKI Foundation  
[2] Kyoundo Hospital, Department of Orthopaedic Surgery Tokyo  
[3] Rosai Hospital, Department of Orthopaedic Surgery  
[4] Juntendo Urayasu Hospital, Department of Orthopaedic Surgery  
[5] Mejiro University, Department of Orthopaedic Surgery  
[6] Juntendo University, Department of Orthopaedic Surgery

Background: Several procedures for malignant bone tumor in forearm have been described. Since 2006, eleven cases of the malignant tumor in the upper extremity were operated on in our department and the associated institution. We discussed three malignant bone tumors in forearm, about each method of the reconstruction and the hand and wrist function. Case: We treated a case of Ewing osteosarcoma in the ulnar and two cases of malignant giant cell tumor in distal radius:  
Case 1. Forty-three-year-old man who had giant cell tumor in distal radius in 1998 was treated by the curettage and recurrence at several times. After the recurrence as malignant giant cell tumor, the resection of the tumor and the around tissue and the partial wrist arthrodesis with the vascularized fibular graft was performed in 2006.  
Case 2. Twelve-year-old girl who had Ewing osteosarcoma in ulnar in 2007 was treated by the wide marginal resection of the tumor and the reconstruction with the vascularized fibular graft. Three months after the operation she had the finger and wrist reconstruction with the tendon transfer.  
Case 3. Nineteen-year-old woman who had giant cell tumor in distal radius in 2009 was treated by the curettage. After the recurrence as malignant giant cell tumor, the curettage of the tumor, the resection of soft tissue including the extensor mechanism and the reconstruction with the tendon transfer and graft after the pedicle frozen autograft, which was treated by liquid nitrogen, were performed. Results: Case 1. He has a limitation of wrist motion and a good hand function. He died by pulmonary metastasis in 2010 without the local recurrence. Case 2. she has a slight limitation of the wrist flexion and the supination, and a good hand function without the recurrence for four years. Case 3. She has a slight limitation of wrist flexion and a good hand function without the recurrence for twenty months. Discussion: The reconstruction of malignant bone tumor in forearm used to apply the vascularized fibular graft for the anatomical configuration. In particular, the reconstruction of the wrist indicated the vascularized fibular head. But the problems of reconstruction using the vascularized fibula graft were the instability of the wrist joint including the distal radius-ulnar joint and the vascularity of the fibula head. Reconstruction with the pedicle frozen autograft, which was treated by liquid nitrogen, have maintained the wrist stability and motion. We were able to freeze the distal radius without radius osteotomy, to invert the hand with osteotomy of the middle part of the ulnar. Conclusion: Three kinds of the reconstruction for malignant bone tumor in forearm were reported. The pedicle frozen autograft was the most successful reconstruction for the wrist.
A-0617 Surgical management of avascular necrosis of the capitate bone

M Mahmoud
Kasr Al Ainy University Hospital, Cairo, Egypt

Avascular necrosis of the capitate is a rare. Many reasons were thought to be the result of this condition including repetitive trauma, hypercoagulability, metabolic abnormality, rheumatic diseases, gout and steroid use. We present the results of the surgical management of seven patients with avascular necrosis of the capitate after evaluation of the complete history taking, examination and laboratory work-up for any possible risk. Four patients underwent vascularized pedicled grafts, two patients underwent arthroscopically assisted surgery (capitohamate fusion and percutaneous pinning) and one patient underwent open capitohamate fusion. Functional evaluation scores were improved in six patients. No improvement in the one patient with nonunion of the capitohamate articulation. In spite of being rare and not well understood, avascular necrosis of the capitate can be managed by variable surgical options with satisfactory results.

A-0619 Radiologically-assessed outcomes and complications of volar plate fixation at a district general hospital: are we providing a good fix?

SA Ross, D Smith, S Chatterji, KA Buch
Pennine Acute Hospitals NHS Trust, Oldham, UK

Purpose: Distal radius fractures are the most common fracture presentation to emergency departments in the United Kingdom. For unstable distal radius fractures, a trend to fix them using volar locking plates has overtaken any other type of treatment. Currently at our hospital, two different types of plate designs are in use. The aim of this study was two-fold: to review radiographs for a set of parameters that have been suggested best estimate functional outcome and to identify our most frequent complications.

Methods: This is a hospital-approved retrospective audit with patients identified from the trauma theatre logbooks. We hand searched these for all volar plate fixations of distal radius fractures. Any revision cases were excluded. Demographic details recorded included grade of surgeon and for consultants, if they were general or upper limb specialised surgeons. For each patient we examined radiographs from pre-op through to the latest follow-up for certain parameters of fracture reduction (Radial length, intra-articular displacement and carpal alignment). Radiographs were looked at by two blinded observers. We also recorded any implant-related abnormalities with the potential for complication (i.e. plate placement). We initially collected data on 50 cases, but to try and clarify some results of our statistical analysis we have expanded the study to review cases over a 12 month period.

Results: We identified 150 cases in total with a demographic distribution as expected, mostly female, mostly elderly and mostly left wrists. The initial 50 patients were 93% female with a mean age of 62 and 52% left wrist injuries. The main findings are that in the majority of cases we have provided adequate reductions that have persisted to the latest follow up. The most common complication found was the malplacement of screws, either long screws dorsally or the screw tips in the radiocarpal joint.

Conclusions: As the majority of fractures have had improved radiological parameters, our patients are being given the potential for a good functional outcome. Since screw placement has been shown to be a problem, we suggest that a third standard intra-operative view (25° lateral or “lift off” view) is performed regularly to demonstrate that any apparently “long” screws are unlikely to be in the joint. Our results also suggested that upper limb consultants provided better reductions with fewer complications. This result did not reach statistical significance though so we will recheck this, with the rest of our results of the expanded data set. These will be available for presentation at the conference.

A-0624 Suprascapular nerve entrapment syndrome

I Humhej, M Sameš
Department of Neurosurgery, J.E. Purkinje University, Masaryk Hospital, Ústí nad Labem, Czech Republic

Purpose: Suprascapular nerve entrapment (SNE) is a rare entity, but it must be considered in the differential diagnosis of shoulder pain and weakness. Suprascapular nerve (SN) contains motor fibres for the supraspinatus and infraspinatus muscle and proprioceptive fibres from the acromioclavicular and gleno-humeral joints. It carries no important skin sensory innervation. The suprascapular nerve can be compressed in two different locations along its course - in the suprascapular notch (under the superior transverse scapular ligament) and distally in the spinoglenoid notch (compression under the inferior transverse scapular ligament). Entrapment of the SN in the
suprascapular notch causes shoulder pain, weakness and atrophy of both the supra and infraspinatus muscles, while the compression of the SN in the spinoglenoid notch results in selective infraspinatus affection. Sometimes ganglion cyst originating from the shoulder joint can compress the SN and cause clinical problems. There is a wide scale of differential diagnoses when we manage the patients with shoulder pain and weakness including C5 radiculopathy, rotator cuff disease, adhesive capsulitis, degenerative shoulder disease, TOS, Pancoast tumor etc. The diagnostic nerve block with the local anesthetics can often help in doubtful cases. If conservative management (rest, splints, physiotherapy, NSAID, local injections with corticosteroids) of the SNE is ineffective or in the cases with advanced nerve deficit (heavier weakness, muscle atrophy), surgical treatment should be considered. We can use different approaches according to experiences of the surgeon and location of the SN entrapment.

Methods: We present our experiences with 6 patients (males 4; females 2; mean age 46 years; range 30-58 years) operated between the years 2001 - 2009 for the SNE. We illustrate the operative procedure step by step on a cadaver specimen and also on images from the operating theatre.

Results: In 2 cases we found local pathology (1 ganglion cyst and 1 fibrolipoma) on the preoperative MRI which was successfully surgically removed. In other four cases there was a real entrapment syndrome of the SN in the suprascapular notch, which we solved by transecting the superior transverse scapular ligament. All 6 patients improves clinical symptoms within the 1 year follow-up.

Conclusions: SNE is a rare cause of shoulder pain and paresis, but it should be definitely taken into account in the differential diagnoses of shoulder affections. With appropriate instrumentation technique and experiences of the surgeon, SNE can be managed with a high success rate.