

<b>Paper Reference</b>	<b>Last Name</b>	<b>First Name</b>	<b>Speakers Paper Title</b>	<b>Speakers Theme Description</b>	<b>Session Description</b>
<a href="#">IP01</a>	IP	Wing-Yuk	PHALANGEAL AND METACARPAL FRACTURES	Surgery - Hand Fractures (Phalangeal & Metacarpal)	Free Paper Session 1 - Phalangeal and Metacarpal Fractures 1
<a href="#">IP02</a>	Egloff	Daniel V.	Indications for Toe Transfer	Surgery - Free Tissue Transfer	Free Paper Session 2 - Microsurgery: Thumb Reconstruction
<a href="#">IP03</a>	Lees	Vivien	LOAD DISTRIBUTING FUNCTION OF THE DISTAL RADIOULNAR JOINT - BIOMECHANICS AND TOTAL REPLACEMENT ARTHROPLASTY	Surgery - Degenerative Joint Disease	Free Paper Session 3 - Degenerative Joint Disease/ Rheumatoid Arthritis
<a href="#">IP03</a>	Scheker	Luis R.	LOAD DISTRIBUTING FUNCTION OF THE DISTAL RADIOULNAR JOINT - BIOMECHANICS AND TOTAL REPLACEMENT ARTHROPLASTY	Surgery - Degenerative Joint Disease	Free Paper Session 3 - Degenerative Joint Disease/ Rheumatoid Arthritis
<a href="#">IP04</a>	Sennwald	Gontran Robert	WHY DOES A DORSAL MALUNION TO THE DISTAL RADIUS JEOPARDISE LIGAMENTOUS FUNCTION	Surgery - Fractures Of The Radius	Free Paper Session 4 - Distal Radial Fractures 1
<a href="#">IP06</a>	De Vecchi	Jorge	SURGICAL TREATMENT OF THE BASAL JOINT OF THE THUMB. AN EVOLVING CONCEPT	Surgery - Thumb Basal Joint OA	Free Paper Session 6 - Basal Thumb Joint OA 1
<a href="#">IP07</a>	Pho	Robert	Limb Salvage in Malignant Tumor of Hand	Surgery - Tumours	Free Paper Session 7 - Tumours
<a href="#">IP08</a>	Landi	Antonio	The Odyssey Of Mutilation Of The Hand Over The History Of Man	Surgery - Replantation	Free Paper Session 8 - Microsurgery: Replantation
<a href="#">IP09</a>	Baek	Goo Hyun	IDIOPATHIC ULNAR IMPACTION SYNDROME	Surgery - Distal Radioulnar Joint	Free Paper Session 9 - Distal Radio-Ulnar Joint
<a href="#">IP10</a>	Van Schoonhoven	Joerg	REVISION PROCEDURES FOLLOWING CARPAL TUNNEL RELEASE	Surgery - Nerve Compression Syndromes & Tissue Degeneration	Free Paper Session 10 - Nerve Compression: Median Nerve 1
<a href="#">IP11</a>	Lin	Chih-Hung	OSTEOPLASTIC THUMB RAY RESTORATION WITH OR WITHOUT SECONDARY TOE TRANSFER FOR RECONSTRUCTION OF OPPOSABLE BASIC HAND FUNCTION	Surgery - Soft Tissue Cover	Free Paper Session 11 - Microsurgery: Finger Reconstruction
<a href="#">IP12</a>	Sandow	Michael	Flexor tenorrhaphy strength and active mobilisation - are we getting to the core of the problem	Surgery - Tendon Injury / Repair	Free Paper Session 12 - Flexor Tendon Injury: Research & Repair 1
<a href="#">IP13</a>	Toh	Satoshi	INDICATIONS OF PERCUTANEOUS SCREW FIXATION FOR THE SCAPHOID FRACTURES	Surgery - Scaphoid & Other Carpal Fractures	Free Paper Session 13 - Scaphoid 1
<a href="#">IP14</a>	Zyluk	Andrzej	COMPLEX REGIONAL PAIN SYNDROME TYPE 1 DIAGNOSIS AND TREATMENT	Surgery - Chronic Regional Pain Syndrome	Free Paper Session 14 - Complex Regional Pain Syndrome/ Trigger Digits
<a href="#">IP15</a>	Nanchahal	Jagdeep	MYOFIBROBLAST: THE CULPRIT IN DUPUYTREN'S DISEASE	Surgery - Dupuytren's	Free Paper Session 15 - Dupuytren's Disease 1
<a href="#">IP16</a>	Belmahi	Amin	SURGERY FOR FINGER METACARPOPHALANGEAL JOINTS DEFORMITY IN ULNAR NERVE PALSY	Surgery - Nerve Compression Syndromes & Tissue Degeneration	Free Paper Session 16 - Nerve Compression: Ulnar Nerve
<a href="#">IP17</a>	Ryu	Jaiyoung	CURRENT DISTAL RADIUS FRACTURE MANAGEMENT	Surgery - Fractures Of The Radius	Free Paper Session 17 - Distal Radial Fractures 2
<a href="#">IP18</a>	Chen	Hung-Chi	Microsurgery: Free Flaps in the Hand and Upper Limb with Focus on Flaps of Musculocutaneous Perforators	Surgery - Free Tissue Transfer	Free Paper Session 18 - Microsurgery: Flaps in the Hand and Upper Limb 1
<a href="#">IP19</a>	Strickland	Jim	Flexor Tendon Surgery' Where Are We? Where Are We Going?	Surgery - Tendon Injury / Repair	Free Paper Session 19 - Flexor Tendon Injury: Research and Repair 2
<a href="#">IP20</a>	Nakamura	Ryogo	Clinical Features of Lunotriquetral Dissociation	Surgery - Wrist Instability	Free Paper Session 20 - Wrist Instability
<a href="#">IP21</a>	Millesi	Hanno	END-TO-SIDE COAPTATION IN PERIPHERAL NERVE SURGERY - INDICATIONS AND RESULTS	Surgery - Brachial Plexus Injuries And OBPP	Free Paper Session 21 - Brachial Plexus 1
<a href="#">IP22</a>	Ogino	Toshihiko	RESULTS AFTER POLLICIZATION FOR HYPOPLASTIC THUMB	Surgery - Congenital	Free Paper Session 22 - Congenital 2

IP23	Posner	Martin	SUBMUSCULAR TRANSPOSITIONS OF THE ULNAR NERVE AT THE ELBOW: A REVIEW OF 400 CASES	Surgery - Nerve Compression Syndromes & Tissue Degeneration	Free Paper Session 23 - Nerve Compression: General
IP24	Mudgal	Chaitanya	FRACTURES ABOUT THE ELBOW - LONG TERM OUTCOME	Surgery - Other Wrist Conditions	Free Paper Session 24 - Elbow Injury and Disease
IP25	Hastings	Hill	CRITICAL FACTORS INFLUENCING PIP JOINT STABILITY - THE ESSENTIAL VOLAR BUTTRESS	Surgery - Tendon Injury / Repair	Free Paper Session 25 - The PIP Joint
IP26	Ozkan	Turker	TENDON TRANSFERS IN SEQUELAE OF OBSTETRICAL PALSY	Surgery - Brachial Plexus Injuries And OBPP	Free Paper Session 26 - Brachial Plexus Birth Palsy
IP27	Lim	Beng Hai	CURRENT CONCEPTS ON FLEXOR TENDON REPAIR	Surgery - Tendon Injury / Repair	Free Paper Session 27 - Tendon Injury: Research and Repair
IP28	Mennen	Ulrich	EXCISION ARTHROPLASTY FOR TRAPEZIO-METACARPAL JOINT OSTEO-ARTHRITIS - SIMPLIFYING A CREATED PROBLEM	Surgery - Thumb Basal Joint OA	Free Paper Session 28 - Basal Thumb Joint OA 2
IP29	Fridén	Jan	COLLAGEN ORGANIZATION AND EXPRESSION IN SPASTIC MUSCLES FROM INDIVIDUALS WITH CEREBRAL PALSY	Surgery - Paralysis / Spasticity Tendon Transfers	Free Paper Session 29 - Spasticity
IP30	Dailiana	Zoe	DIGITAL COVERAGE WITH FLAPS FROM THE SAME OR NEIGHBORING DIGITS	Surgery - Soft Tissue Cover	Free Paper Session 30 - Microsurgery: Flaps in the Hand and Upper Limb 2
IP31	Teoh	Lam-Chuan	CERCLAGE-WIRING-ASSISTED FIXATION OF DIFFICULT HAND FRACTURES	Surgery - Hand Fractures (Phalangeal & Metacarpal)	Free Paper Session 31 - Phalangeal and Metacarpal Fractures 2
IP32	Tsai	Tsu-Min	VASCULARIZED BONE GRAFTING FOR SCAPHOID NONUNION	Surgery - Scaphoid & Other Carpal Fractures	Free Paper Session 32 - Scaphoid 2
IP33	Sotereanos	Dean	VEIN WRAPPING FOR MEDIAN NERVE COMPRESSION	Surgery - Nerve Compression Syndromes & Tissue Degeneration	Free Paper Session 33 - Nerve Compression: Median Nerve 2
IP34	Stanley	John	Options For Treatment Of The Rheumatoid Wrist	Surgery - Rheumatoid Hand	Free Paper Session 34 - Rheumatoid Arthritis
IP35	Barbier	Olivier	Skeletal Reconstruction in Severe Traumatic Lesions of the Upper Limb.	Surgery - Free Tissue Transfer	Free Paper Session 35 - Microsurgery: Mutilating Injuries and Bone Transfer
IP37	Dubert	Thierry	STRUCTURE AND ACTIVITY OF THE FESSH HAND TRAUMA CENTERS IN EUROPE. REPORT OF THE HAND TRAUMA COMMITTEE AUDIT	Surgery - Hand Fractures (Phalangeal & Metacarpal)	Free Paper Session 37 - Hand Surgery Services/ The Septic Hand
IP38	Lundborg	Goran	Enhancement of sensory relearning after nerve repair by using repeated cutaneous anesthesia of the forearm	Surgery - Tendon Injury / Repair	Free Paper Session 38 - Nerve Injury: Research and Repair 1
IP39	Fernandez	Diego	OSTEOTOMIES FOR DISTAL RADIUS MALUNION: CURRENT STATE OF THE ART	Surgery - Fractures Of The Radius	Free Paper Session 39 - Distal Radial Fractures 3
IP40	Herzberg	Guillaume	CLASSIFICATION AND CURRENT TREATMENT OF PERILUNATE DISLOCATIONS	Surgery - Scaphoid & Other Carpal Fractures	Free Paper Session 40 - Carpal Injuries
IP41	Siemionow	Maria	CHIMERIC THERAPEUTICS A SUPPORTIVE THERAPY IN COMPOSITE TISSUE ALLOGRAFT TRANSPLANTS	Surgery - Hand Transplantation	Free Paper Session 41 - Microsurgery : Transplantation
IP42	Rossello	Mario Igor	TWENTY YEARS OF EXPERIENCE WITH SWANSON TOTAL WRIST ARTHROPLASTIES: LONG TERM RESULTS IN A SERIES OF 128 PATIENTS	Surgery - Degenerative Joint Disease	Free Paper Session 42 - Degenerative Joint Disease
IP43	Downing	Nicholas David	SCAPHOID BLOOD SUPPLY - HOW CRITICAL IS IT FOR FRACTURE UNION?	Surgery - Scaphoid & Other Carpal Fractures	Free Paper Session 43 - Scaphoid 3
IP44	Brunelli	Giorgio	NERVE REGENERATION AND MOTOR END-PLATE PLASTICITY (CHANGE OF RECEPTORS FROM CHOLINERGIC TO GLUTAMATERGIC)	Surgery - Nerve Injuries / Repair	Free Paper Session 44 - Nerve Injury: Research and Repair 2
IP45	Allieu	Yves	CUSTOM MADE KEY GRIP CONSTRUCTION IN HIGH LEVEL TETRAPLEGIA	Surgery - Paralysis / Spasticity Tendon Transfers	Free Paper Session 45 - Tetraplegia, Paralysis and Tendon Transfer
IP47	Shibata	Minoru	Reconstruction of Cleft Hand with Severely Narrowed or Syndactylised First Web	Surgery - Congenital	Free Paper Session 47 - Congenital 3



## **IP01**

### **Phalangeal & metacarpal fractures**

#### **Wing-Yuk IP**

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Hand fractures are difficult fractures because of their small size, special compact anatomy and special functional requirements. Why hand fractures are so problematic? Considerations to be taken include anatomy, biomechanics and bone healing biology, physiological loads and energy transfer during fractures. The key issue to good functional outcome is to restore a stable bony construct for early active mobilization. Stability of a fracture is conferred by the fracture geometry, periosteum and soft tissue cuff. A treatment protocol is suggested based on the functional stability of a fracture. A hierarchy of treatment from conservative to operative can be determined. Stable fracture after reduction can be mobilized without protection. For proximal phalangeal fractures, the extensor mechanism is taut when the metacarpal phalangeal joint is flexed and it serves as a good stabilizer. Metacarpal-phalangeal block splint is a good option to avoid the complication of open reduction and internal fixation. Unstable fractures require fixation to achieve a stable bony construct. Open reduction and internal fixation invites complications which include delayed union, wound infection, implant impingement, soft tissue adhesion etc to minimize soft tissue trauma, minimal invasive technique is desirable. Intramedullary fixation is concept worthwhile to explore. PIPJ fracture dislocation requires constant traction force for treatment. Minimal invasive traction device also has good potential for further development. Even with the best implant and best technique, there are fractures which are not doing well. These include open fractures with multiples soft tissue injuries, fractures that are too small or too extensive to fix, fractures with segmental loss and comminuted fractures at basal or condylar region. The solution will lie on new implant design and manipulation of biology to hasten bone healing by using activated cells, factors and new biomaterials as carrier.



## **IP02**

### **Indications for toe transfer**

#### **Daniel Egloff**

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Indications for toe transfers are mainly traumatic, since they represent close to 90 percent of indications as a whole, whereas congenital malformations represent only the remaining 10 percent. It is relatively easy to delineate indications for toe transfers in post-traumatic situations, where reconstruction of the thumb represents 50 percent, reconstruction of long fingers, 35 percent and reconstruction of a bi- or tri-digital pinch, 15 percent. In congenital malformations, indications are highly heterogeneous. A polemic has existed for a long time about the toe to be chosen for the reconstruction of the thumb: First or second toe? Presently, it is generally admitted that the second toe should be preferred or else the first toe if reconstruction can be achieved with the last phalanx only, which enables to leave the MP joint of the first ray untouched and hence not to alter the gait.



## IP03

### **Load distributing function of the distal radioulnar joint – Biomechanics and total replacement arthroplasty**

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2 *Kleinert Institute for Hand & Microsurgery, Louisville, Kentucky, USA*

Surgical ablation of the ulna head is associated with pain secondary to radioulnar impingement 1, impaired grip and load-bearing function. Our hypothesis is that the DRUJ, and associated structures form a linked system distributing force, facilitating function and preventing injury. The integrity of this osseo-ligamentous system is vital to normal function. Biomechanical studies have been performed on a human cadaver model collating Tekscan™ data from force transmission / pressure profiles across the DRUJ, strain gauge data from bending forces of the radius and ulna, and Microstrain™ data indicating tension in the DRUL. Consistent and characteristic profiles (force, pressure, tension, bending moments) were demonstrated in the intact and surgically modified (excision of ulna head) arms. The DRUJ is shown to be important in the transmission of load and its anatomical integrity should be respected in surgical procedures if normal function is to be preserved.

The Scheker DRUJ total replacement arthroplasty adopts these principles in restoring the functional relationship of radius and ulna throughout the range of forearm rotation. A series of 31 patients with minimum 5-year follow up is presented in which patient regain mean of 89% of forearm rotation and 67% of grip strength. There has been one broken stem needing replacement after car accident. No cases of loosening have occurred. The prosthesis has demonstrated its efficacy and utility in the cases used to date.

1. V.C. Lees & L.R. Scheker

The radiological demonstration of dynamic ulnar impingement.

*Journal of Hand Surgery* 1997: 22B(4): 448-450.

2. H. Shabaan, G. Giakis, M. Bolton, R. Williams, L.R. Scheker & V.C. Lees

The distal radioulnar joint as a load-bearing mechanism – a biomechanical study.

*Journal of Hand Surgery* 2004 : 29A: 1: 85-90.



## IP04

### Why does a dorsal malunion to the distal radius jeopardise ligamentous function

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**Introduction:** On subjecting the wrist to axial load the lunate tends to rotate in extension while the scaphoid rotates in flexion. It has been demonstrated that a unidirectional coupling exists through the SL ligaments which constrain this counteracting, relative movement. The more the hand is flexed, and the scaphoid with it, the greater is the tension in the SL ligaments. We therefore hypothesise that a dorsal tilt of the radius might possibly induce abnormal constraint in the SL ligaments that could finally lead to instability of the wrist. Malunion after distal radius fracture is frequent and the consequences of malunion still controversial. The validity of the hypothesis raised, has now been tested with respect to instability.

**Material and Method:** Three fresh human cadaver forearm specimens, including the elbow and the distal third of the humerus, were used. Final dissection proved that they were free of any wrist pathology. Distal radial malunion was simulated with dorsal tilts of 0°, 20° and 50°. Stability was compared in these three different positions of dorsal tilt and also without tilt, but in 0°, 20° and 50° of wrist flexion.

**Results:** With increasing wrist flexion, or dorsal tilt of the radius, the torque/angle graphs showed less intracarpal movement for a given torque, indicating increased restriction (higher stiffness).

**Conclusion:** Permanent overload of the ligaments occurs with wrist flexion or dorsal tilt. Thus, it might be expected that progressive deterioration (creep) of the involved ligaments could possibly occur, a potential cause of progressive instability and/or rupture.



## **IP06**

### **Surgical treatment of the basal joint of the thumb. An evolving concept**

**Jorge De Vecchi**

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Pain at the trapezometacarpal joint can be a seriously disabling ailment. For more than 50 years different surgical solutions have been proposed

All these techniques yield excellent results concerning the problem:- the pain-. and, at the same time, keep an adequate range of movement at the joint. To improve these results the technique should be simplified, the costs diminished and the morbidity decreased.

After having used the Swanson arthroplasty and the Eaton LRTI with good results the author is currently using a simpler version of the LRTI concept.

When conservative treatment does not relieve the pain surgery is indicated. The same technique is applied in all the stages of the disease.

Under local anesthesia with vasoconstrictors and without ischemia the trapezium is totally resected. The volar-most of the Abductor Accessories is detached proximally, diminishing the luxating forces over the metacarpal. It is introduced in the defect of the trapezium excision and sutured to the distal end of the flexor carpi radialis. The remaining tendon is rolled and used to fill the cavity. In this way a simple ligament that fixes the lateral side of the base of the metacarpal to the ulnar side of the joint is constructed. The thumb is held in functional position for 4 weeks and afterwards full range of movement is encouraged progressively

The author has been using this technique for 5 years with excellent results in 24 patients.



## **IP07**

### **Limb salvage in malignant tumor of hand**

#### **Robert Pho**

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*Emeritus Consultant, National University Hospital, Singapore*

Primary malignant bone and soft tissue tumors of the hand are rare, comprising less than 2.5% of all tumors seen in the hand. In the fingers, most tumors present early as a small lesion. In the palm and wrist, the presentation can be late and the tumor size can be relatively large in relation to the surrounding structures.

Assessment of tumor biology and staging based on imaging technology in defining tumor margins is difficult because of close proximity of many tiny and important structures tightly packed and surrounding the tumor. The limitation of current imaging technology in clearly defining tumor margins, demonstrating small satellite lesions and micro metastasis are still evolved.

In management of malignant tumors of the hand, amputation as the choice of treatment still offer the best option in complete eradication of local tumor tissues. Technically it is a simpler operation and in many instances it may be in the best interest of the patients and the family.

Limb salvage, although always preferred by patients and the family, is a very complex and technically very demanding. It requires detailed assessment of tumor biology, surgical margins and complicated reconstructive options. The technique may have to be individualized. Evaluation of the institutional expertise and resources that can deliver the favorable outcome that is affordable economically and time to the patient and the family are equally important.

The principles of limb salvage in musculoskeletal malignancy affecting the hand:

- Saving life is more important than saving limbs.
- Complete excision of tumor tissue to achieve local control
- Salvaged digits or hand should not compromise adjacent normal digits and hand functions.
- Salvaged digits or hand should provide useful hand functions.





## **IPO8**

### **The odyssey of mutilation of the hand over the history of man**

#### **Antonio Landi**

Mutilation of the hand has been cited throughout the history of man, with evidence dating back nearly two million years ago when man assumed the erect position and began to use the hand for new purposes.

The first known evidence of mutilation can be observed in graffiti of prehistoric caves at Gargas and Maltravieso in Estremadura, Spain, where mutilation of the 5<sup>o</sup> finger {ray} is depicted. In the caves of Gargas, mutilations involve the long fingers but never the thumb. The ethnologist and historian André Leroi Gourham believes that these may represent a simple cinegetic code that associates mutilation with the frequency of the five most common animals found in the territory: bison, horse, deer, etc.

**Legal and primitive amputations.** These were already described in the old testament and regard the Cahanan King Adoni Bezeck defeated by Giosuè, whose thumb and toes are amputated and who subsequently dies in misery.

**Self-amputations.** These can be traced back to the Roman Empire, when the Murci of Southern Italy amputated their thumbs to avoid military service; from here the verb "murcare," which in Latin means "to be coward"

**In the XX century, with the introduction of microsurgical techniques** re-implant of the severed hand became possible. On July 27, 1965 Komatzu and Tamai at Nara in Japan were the first to attach an amputated thumb. On September 1998, the first cadaver transplant of a hand was performed, in a context however of new ethical rules for communication and science, perhaps too readily adopted by a silent consensus.



## **IP09**

### **Idiopathic ulnar impaction syndrome**

**Goo Hyun Baek**

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Ulnar impaction syndrome, which is frequently seen in patients with positive ulnar variance, can be defined as a degenerative condition characterized by ulnar wrist pain, swelling and limitation of motion related to excessive load bearing across the ulnar aspect of the wrist. The common acquired predisposing conditions for this syndrome include malunion of the distal radius fracture, premature physal arrest of the distal radius, and previous radial head resection or an Essex-Lopresti injury. Some patients, however, have congenital or dynamic positive ulnar variance without any history of fracture or premature physal arrest; this can be called 'idiopathic' ulnar impaction syndrome.

The most common symptoms are ulnar wrist pain , decreased range of motion, weakness of grip, and swelling. The symptoms have a gradual onset and are related to occupation and sports.

The inclusion criteria for the diagnosis is 1) no history of trauma of the forearm and wrist, 2) history of ulnar wrist pain that was worsened by pronation and ulnar deviation of the wrist with such activities as opening a jar, squeezing a wet towel, typing, or changing the gearshift , 3) a positive provocation test (ulnocarpal stress test), and 4) positive ulnar variance with or without cystic changes of the carpus on plain X-rays.

Nonoperative treatment including nonsteroidal anti-inflammatory medications and splinting, can be tried for more than three months. When nonoperative treatment modalities are not helpful, the ulnar shortening osteotomy is recommended for the surgical treatment.

This ulnar shortening osteotomy performed in patients with idiopathic ulnar impaction syndrome results in improvement in the wrist scores, and reduce the subluxation of the distal radioulnar joint when present.



## **IP10**

### **Revision procedures following carpal tunnel release**

**Joerg van Schoonhoven**

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Carpal tunnel syndrome (CTS) affects a great number of patients. Decompression of the median nerve by carpal tunnel release (CTR) was first performed in 1930 and has become one of the most common and rewarding operations in hand surgery. Despite its success operative revision due to various causes has been described in up to 12%. In recent years we have noticed an increasing number of patients referred to our clinic for complications associated with previous carpal tunnel release. During a period of 25 months we treated 2350 patients primarily for CTS. In the same period of time we had to perform 204 revision operations on patients with persisting or recurrent symptoms following CTR. In 34 patients primary CTR had been performed endoscopically, in 170 patients an open technique had been performed. Analysis of the origin for the revision procedures revealed five groups: incomplete primary carpal tunnel release (108 patients, 15 endoscopic, 93 open approach), constriction and nerve position in the scar (46 patients, 8 endoscopic, 38 open approach), true recurrence of CTS (21 patients, all open approach), fibrous proliferation (17 patients, 4 endoscopic, 12 open approach), iatrogenic median nerve damage (12 patients, 7 endoscopic, 5 open approach). Analysis of the origin of persisting or recurrent symptoms following CRT revealed in 166 of the 204 patients avoidable technical errors to be the cause of treatment failure. This applies for an incomplete CRT, a too radial division of the transverse carpal ligament with a nerve position directly in the scar and secondary traction neuropathy and iatrogenic median nerve damage. The overall rate of complications appears to be similar for endoscopic and open CTR but complications in the endoscopic group seem to be more severe. The study clearly demonstrates that CTR is widely underestimated and belongs into the hands of experienced surgeons.



## IP11

### **Osteoplastic thumb ray restoration with or without secondary toe transfer for reconstruction of opposable basic hand function**

**Chih-Hung Lin** , Yu-Te Lin, Cheng-Hung Lin, Chien-Tzung Chen, Fu-Chan Wei

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**Purpose:** Mutilating hand injuries result in bone and soft tissue defects. Osteocutaneous flaps can be used for osteoplastic thumb ray reconstruction (OTRR) as a definitive procedure or followed by toe transfer.

**Materials and Methods:** Twenty-four hands with thumbs amputated proximal to the metacarpophalangeal joint underwent osteoplastic surgeries for first ray bone and soft tissue reconstruction. Kapandji classification was used for the evaluation after osteoplastic surgery and after toe transfer.

**Results:** 13/ 24 osteoplastic neo-thumbs (54%) achieved opposition; 2 more after corrective osteotomies of the crest (62.5%). 13/15 that had thumb amputations only (86.7%), accomplished opposition after OTRR. ten patients received 12 toe flaps, two received sensate flaps and 1 an opponensplasty. After toe transfers, opposable basic hand function was 75.0% (18/24). 9/10 patients undergoing toe transfers had an average improvement of 4.1. 75% in total achieved opposable hand function. 8/8 that received toe transfers for thumb reconstruction achieved significant improvement (average 4.1)

**Conclusion:** OTRR followed by osteotomies or sensate flap transfers can yield satisfactory results for some patients. Optimal functional outcomes are achieved when OTRR is followed by toe transfer.



## IP12

### **Flexor tenorrhaphy strength and active mobilisation – are we getting to the core of the problem**

**Michael Sandow**

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To safely allow active mobilisation following flexor tenorrhaphy, the suture technique must have sufficient strength and low gapping potential to overcome the anticipated loads during the rehabilitation phase. Irrespective of the repair technique, the competency of the tenorrhaphy relies on the suture itself for at least the first three weeks. The priorities for a satisfactory flexor tenorrhaphy are that the repair is: 1. Biomechanically sound, 2. Biologically inert, and 3. User friendly. The repair should be shown on ex-vivo testing to have sufficient tensile strength to cope with the post repair stresses and have low gapping potential (LGP). Where a multiple strand technique is used, all strands should be loaded concurrently to ensure cumulative strength. A modification of the Savage technique (single cross grasp 6-strand repair) has been shown on biomechanical testing to satisfy most of these requirements and has been used to repair 23 zone II FDP tendon lacerations. With complete follow-up, good / excellent outcome was achieved in 78% with no ruptures. The technique however requires accurate coaptation of the tendon ends during repair and increased tendon handling. An approximating device (Pactan repair device) has been developed that aids the repair. There was a disproportionately poorer outcome in those patients that were difficult to locate for final review, highlighting the importance of complete follow-up to obtain an accurate rupture rate. Further biomechanical testing has shown that a 4-strand single cross grasp repair using 3-0 BPS (eg. Ethibond) has increased strength, low gapping potential and only a slight increase (5%) in total suture cross sectional area. The method is more user friendly than the originally used 6 strand technique, and is now the predominant tenorrhaphy used in our Plastics and Orthopaedic hand service. This is combined with an immediate active mobilisation protocol in a splint that maintains the wrist extended 30°, MCP joints at 90° and IP joints straight. To assess the efficacy, and robustness of this approach to flexor tendon laceration, between June 1996 and June 2000, the variably experienced members of the trauma service at a large general hospital performed a four-strand single cross grasp flexor tenorrhaphy on 68 (zone 1/2) FDP tendon lacerations in 48 patients. 3-0 braided polyester was the recommended suture, but the actual material used was at the surgeon's discretion. Post-operatively, all patients were placed in a dorsal splint with the wrist in slight extension, the MCP joints flexed to 70°, and the IP joints straight, and maintained for 6 weeks. All commenced an active mobilisation programme within 12 hours of repair. Fifty-nine of the 68 tendons (87% follow-up) were reviewed at a minimum 3 months postoperatively and 71% of fingers achieved a good or excellent outcome on (original) Strickland and Glogovac score. There were 3 (5.1%) ruptures. Rupture was associated with the use of 4-0 suture (nylon or braided polyester), technical error with core suture damage and premature splint removal due to poor patient compliance. No ruptures occurred in tendons repaired with 3-0 sutures. A four-strand single-cross-grasp repair using 3-0 braided-polyester sutures is a strong user-friendly technique, and with active post repair mobilisation can achieve satisfactory outcomes in the general trauma service setting.



## IP13

### Indications of percutaneous screw fixation for the scaphoid fractures

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The purpose of this study is to introduce our technique of percutaneous screw fixation for scaphoid fractures and clarify the indications of this procedure.

[Material] The 120 cases, all with follow-up times over 6 months, were reviewed. There were 36 cases of acute stable type, 58 of acute unstable and 26 of delayed fibrous union. Screws used were original Herbert screws in 50, and other cannulated type screws in 70.

[Recent Operative Methods] Recently we prefer to use a dorsal approach. Following Dr. Slade's approach, after flexion and ulnar deviation followed by forearm rotation, the image intensifier is used to obtain a good perpendicular view of the long axis of the scaphoid. The scaphoid is visualized as two rings; distal and proximal. The guide wire is then inserted perpendicularly through the centers of the two rings. This technique results in the wire being automatically inserted along the central axis of the scaphoid. Then the screw is inserted free-hand.

[Results] In 114 of 120 cases, good bony fusion and good clinical results were achieved.

In one of the remaining 6 cases, bony fusion was achieved but revealed symptomatic malunion. In other one case, bony fusion was delayed but using low-intensity ultrasound, solid bony fusion was achieved. In 4 cases, bony fusion was not achieved. Two of these 4 cases were combined with perilunate dislocation. The factors leading to poor results are poor reduction, improper screw position.

[Conclusion] The best indication for this method is an acute unstable fracture. For acute stable fractures, we recommend this method for the patients who cannot accept long term immobilization. It can also be used in cases of delayed fibrous union when good alignment can be achieved and a bone graft is unnecessary.



## IP14

### Complex regional pain syndrome type 1 diagnosis and treatment

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**Diagnosis.** Complex Regional Pain Syndrome Type 1 (CRPS Type 1, formerly reflex sympathetic dystrophy, algodystrophy) is a descriptive term for the complex of symptoms and signs consisting of pain, swelling, vasomotor instability which is associated with severe functional impairment of the affected limb. The diagnosis of the condition is largely based on clinical grounds, although a range of diagnostic tools have been used including bone scintigraphy, X-ray, CT and MRI scans. Typically CRPS 1 presents with very varied symptoms and signs which occur in different numbers, intensity and combinations. Only some patients will exhibit all of the classic features. This variation of symptomatology creates a spectrum of presentations from those who hardly fulfill the minimal diagnostic criteria to those with florid disease.

**Treatment.** Various treatment methods have been used for CRPS Type 1. The most commonly treatment modalities reported in the literature include sympathectomy, calcitonin, steroids, free radical scavengers, anticonvulsant and antidepressive drugs as well as various form of physiotherapy. The effectiveness of these treatments is not definitively proven and they are used in different stages of the syndrome. Early forms of CRPS Type 1, lasting shorter than 4 months, are commonly treated with physiotherapy, calcitonin and free radical scavengers. At this stage, one may expect the rate of recovery up to 90%, although, complete restoration of hand function is rarely achieved earlier than after 1 year from the onset of the disease. In chronic form of the CRPS Type 1 (former stages II and III) the treatment is much more difficult and recovery rate does not exceed 20%.

**Staging.** A new staging of the CRPS Type 1 is proposed, in which classical staging (I - acute, II - dystrophic, III- atrophic) is replaced by early (acute) and late (chronic) forms of the disease.



## **IP15**

### **Myofibroblast: The culprit in Dupuytren's disease**

#### **Jagdeep Nanchahal**

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The cells that primarily contribute to the pathogenesis of Dupuytren's disease are myofibroblasts. These cells are characterised by the presence of actin and myosin, in particular a smooth muscle actin. Development of the myofibroblast phenotype is also associated with decreasing matrix metalloproteinase activity, high collagen I and fibronectin production, high proliferation rate and cell immobilisation due to maturation of focal adhesions.

The myofibroblast evolves via the protomyofibroblast and is influenced by cytokines, growth factors, adhesion molecules and extracellular matrix components. The complexity of the interactions between these factors is illustrated by the fact that transforming growth factor  $\beta$  1 (TGF  $\beta$  1) activates resident fibroblasts to produce ED-A (wound) fibronectin (ED-A FN). The latter is necessary for TGF  $\beta$  1 to lead to the production of the myofibroblast phenotype from fibroblasts.

Myofibroblast differentiation requires a mechanically restrained microenvironment. Myofibroblasts are connected to the ECM by specialised adhesion sites called fibronexi. High extracellular tension is necessary to maintain the superfocal adhesions of myofibroblasts.

A possible mechanism for generation of myofibroblasts is as follows (Hinz 2006):

In the majority of normal connective tissues, the fibroblasts are stress shielded by the ECM. Stimuli such as tissue damage may lead to changes in the organization and mechanical properties of the ECM and release of local growth factors. The tractional forces generated by protomyofibroblasts lead to increasing matrix compaction and rigidity that surpasses the critical threshold to permit progression to the differentiated myofibroblast.





## IP16

### Surgery for finger metacarpophalangeal joints deformity in ulnar nerve palsy

**Amin Belmahi**

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**Introduction:** In a prospective study of 63 ulnar nerve palsies collected between 1995 and 2006, the most bothering symptoms in a decreasing order were: - the decrease of grip (F 1) and pinch (F 2) strengths - The amyotrophy - The claw deformities - The Wartenberg's sign. It seems logical to treat these palsies on the basis of these symptoms.

**Methods:** To choose the best protocol to improve F 1 and F 2 and to correct the claw deformities, these patients were distributed in 3 groups of 21 patients: - Group A: only static techniques were used on the metacarpophalangeal joints (MP) of the fourth and fifth digits and the thumb - Group B: only dynamic techniques among the most popular were used on these ulnar digits and on the flexor pollicis brevis and the first dorsal interosseous muscle - Group C: • on the thumb's MP: static and dynamic techniques of Group A and B • on the ulnar digit's MP: static technique. The only static technique used is an original transosseous capsuloplasty with anteroposterior drilling. F 1 and F 2 were measured at preoperative and at sixth post-operative month. The Wartenberg's sign was treated in 28 patients by the neck tie lasso which is an original technique using one strip of the flexor sublimis of the ring finger. The amyotrophy was treated by a lipostructure. Results: - the protocol C gives the best results for F 1 and F 2 - The lasso technique decreases F 1 by 24% in Group B - The claw deformities were corrected without recurrence in all cases - The Wartenberg's sign was actively corrected in all the cases treated - The lipostructure improves the hand's aesthetic.

**Conclusions:** For an effective reconstruction of an ulnar nerve palsy, the protocol C seems the best - The two original techniques reported seems very efficient in the correction of claw deformities and Wartenberg's sign - The lasso technique has to be avoided - The lipostructure has to be encouraged.



**IP17**

**Current distal radius fracture management**

**Jaiyoung Ryu**

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Treatment of distal radius fractures has been advanced a great deal during the last decade and continues to evolve. Volar locking plates and release of brachioradialis improved the final results.

While the author believes the volar approach has many advantages over other surgical options, he also encountered some issues to overcome, such as troubles dealing with dorsal comminution, less than ideal screw placement, less than ideal fixation to allow early motion, problems with radial translation of the distal fragment, and less than ideal reduction of the fracture especially when there are many small fragments.

The author also struggled to find the right volar plate system among the ever so increasing number of products.

This presentation is to show these difficulties and how the author tried to solve them.



## **IP19**

### **“Flexor tendon surgery” Where are we? Where are we going?**

**James Strickland**

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An enormous amount of basic laboratory research has improved the hand surgeon’s knowledge of the anatomy, morphology, and nutrition of flexor tendons, their kinesiology, the biomechanics of their action, their biologic response to injury and repair, the mechanical characteristics of various tendon suture methods, and the effect of post-repair motion stress on tendon strength, healing and gliding. These investigative efforts have led to improved methods of tendon repair, an emphasis on tendon sheath preservation and restoration, and practical protocols for the early application of passive and active wrist and digital motion as a means of more rapidly increasing the strength and gliding of repaired tendons. The clinical application of the information derived from this research has significantly improved the results of flexor tendon repairs but it can be argued that without the ability to alter the biologic events necessary for tendon healing and gliding, future progress will be much less impressive. We are now witnessing an impressive proliferation of meaningful investigation of molecular and genetic processes existing at the tendon repair site and the potential to favorably alter the rate of tendon healing and lessen the development of adhesions. Laboratory studies exploring the use of growth factors, mesenchymal stem cells, and biologic scaffoldings have been carried out with promising results. The molecular modulation of adhesion formation using various cytokines such as TGF-*B* have also yielded some encouraging early findings. Gene therapy also appears to be well suited for flexor tendon repair because of the ability to deliver genes to specific sites and regulate their temporal and quantitative expression. It seems probable that these biologic factors will emerge from the laboratory to enhance tendon healing and gliding and the next major steps forward in improving the clinical results following flexor tendon repair may well be biologically mitigated.



## **IP20**

### **Clinical Features of Lunotriquetral Dissociation**

**Ryogo Nakamura**, Hideyuki Mitukuchi, Kaori Shionoya

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Early description of lunotriquetral dissociation pointed out VISI deformity with step-off of the lunotriquetral joint. However, we could not find VISI deformity in an isolated injuries. We present here current clinical features of symptomatic traumatic lunotriquetral ligament injuries based on our experience.

Patients with VISI deformity following lunotriquetral ligament injuries usually sustained prilunate or lunate dislocation, or axial dislocation of the carpus. Diagnosis of isolated lunotriquetral ligament injuries is not easy because of negative radiographic findings. But provocative tests are helpful for diagnosis. Ulnocarpal stress test has satisfactory sensitivity but is not specific for lunotriquetral ligament injuries. Lunotriquetral ballottement test, lunotriquetral compression test, shear, and shuck are specific but sensitivity is not satisfactory.

Arthroscopy is essential for establishing diagnosis and showed ligament injuries with gross instability( Geissler grade III or IV) in most patients.

Few patients without instability developed intraarticular impingement due to flap tear. Results after debridement, repair and ligament reconstruction were satisfactory in most patients.



## IP21

### End-to-side coaptation in peripheral nerve surgery- Indications and results

**Hanno Millesi**, Robert Schmidhammer

*Millesi Center for Surgery of Peripheral Nerves and Brachial Plexus Lesions, Austria*

**Introduction** : An explanation is offered for the contradicting results of the clinical application of end-to-side coaptation.

**Methods** : We used small monofascicular nerves as donors and small monofascicular nerves as recipients. In 17 patients end-to-side coaptation was performed using a nerve graft. In one case a direct end-to-side coaptation was performed. 9 out of 18 patients suffered from 4-5 root avulsions and 9 patients showed multiple root avulsions. The phrenic nerve served as a donor nerve in 14 patients. In 2 cases the accessory nerve, and in 2 cases the dorsalis scapulae nerve were donor nerves. The lateral and medial pectoral nerve, the suprascapular nerve, the axillary nerve, and the long thoracic nerve served as recipient nerves.

**Results** : In the 4-5 root avulsion group M4 or better was achieved in 4 patients and M3 (+) in 4 patients (average follow up 54 months and 48 months) in the re-innervated muscles. One patient achieved M2 after 16 months.

In the multiple root avulsions group 8 out of 9 patients showed functional useful regeneration after end-to-side coaptation. In one patient end-to-side nerve repair was a complete failure.

**Conclusion** : End-to-side coaptation under the given premises may serve as a useful tool in brachial plexus surgery.

**Key words** : end-to-side, nerve regeneration, brachial plexus



## **IP22**

### **Results after pollicization for hypoplastic thumb**

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Purpose: The purpose of this study is to report results of pollicization for congenital hypoplastic thumb.

Method: Twenty patients' 25 hands with congenital hypoplastic thumb have been treated with pollicization and followed up for more than 2 years. According to Blauth's classification, one hand was grade 3, 12 hands were grade 4, 9 hands were grade 5, two digits were missing in 1 hand and 2 hands were five fingered hands. Surgery was performed according to Buck-Gramcko's method. The age at pollicization ranged from 1.2 year to 5.8 years (average 2.5 years). Centralization or radialization was performed in 8 hands before pollicization. Additional surgery was performed in 7 hands. The follow-up period ranged from 2 years to 19 years (average 8.1 years).

Results: At follow-up, all patients could use the pollicized digit for pinch. Excellent pinch function has been achieved in 18 hands, good in 4 hands, and fair in 3 hands. The percent pinch strength compared to the opposite hand ranged from 28 to 93% with an average of 51%. Average active extension of the IP joint was -5 degrees and average flexion was 45 degrees. Average active extension of the MP joint was -3 degrees and average flexion was 39 degrees. In 20 cases out of 25 cases, patients always used pollicized digit well in usual manner. Satisfactory result was not always achieved in the cases with defect of the radius and/or preoperative contracture of the digits. All patients were satisfied with the results.

Conclusions: Pollicization provided pinch function in all case and it was satisfactory in 88%. Association of a radial club hand and contracture of digits seemed to influence the postoperative pinch function. The age of surgery did not seem to influence the results after surgery.



## **IP23**

### **Submuscular transpositions of the ulnar nerve at the elbow: A review of 400 cases**

**Martin Posner** , Steven Green

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The surgical treatment for ulnar nerve compressions at the elbow usually involves transposition of the nerve. In many centers, submuscular transpositions are reserved for failed prior procedures. However, they are the preferred technique for most cases at NYU – Hospital for Joint Diseases. The authors present the results of 400 submuscular transpositions they performed over a 20 year period. Several key points in the surgical technique and post-operative care will be highlighted.

Ulnar nerve function was graded pre- and post-operatively. Muscle function ranged from no weakness (M-0) to severe weakness with atrophy (M-3). The three most common symptoms of ulnar nerve compression were also evaluated: local tenderness over the nerve, numbness and paresthesias. When one symptom was present the grade was S-1; two symptoms, S-2; and three symptoms, S-3. Post-operatively, if the patient noted a significant improvement in a symptom(s) it would be graded zero. For example, a patient with a pre-operative grade of S-3 who noted post-operatively that tenderness and paresthesias had improved but numbness persisted would be graded S-1. Results: More than 90 % of patients with a pre-operative rating of M-2 improved. As anticipated, muscle recovery correlated with the duration of the nerve compression; compressions of year's duration did not recover as well as compressions of month's duration. Regarding symptoms, every patient graded S-3 pre-operatively, noted improvement in at least one symptom.

Submuscular transposition is an effective operation with little morbidity for chronic ulnar nerve compression at the elbow.



## IP24

### Fractures about the elbow – Long term outcome

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The purpose of this study was to evaluate the late outcome of open reduction and internal fixation (ORIF) of complex olecranon fractures or fracture-dislocations (n = 10) and stable displaced fractures of the radial head (n = 16), and to compare ORIF vs. excision for unstable displaced radial head fractures (n = 28). Patients were treated between 1974 and 1994.

The average long-term follow-up varied from 16 to 22 years, depending on fracture type. Clinical and radiographic outcome was evaluated with use of standardized evaluation instruments .

Fractures of the olecranon had a flexion arc of 104 degrees at one-year and 131 degrees at final follow-up. Five patients had compression of the ulnar nerve and eight patients had arthrosis. Patients with stable radial head fractures exhibited an elbow flexion arc of 129 degrees and forearm rotation of 166 degrees at final follow-up. Patients with unstable radial head fractures treated with excision had better early elbow flexion than patients treated with ORIF (136 vs. 119 degrees) but comparable rotation. After 17 years, both arcs of motion were similar. 8 patients with excision and 2 who underwent ORIF had radiographic arthrosis. Adequate restoration of the ulnotrochlear notch in patients with olecranon fractures leads to durable functional results, in spite of arthrosis. Results of ORIF for stable displaced radial head fractures demonstrate no appreciable advantage over published long-term results of non-operative treatment of these fractures. The appeal of ORIF is further diminished by potential complications.

Although ORIF of unstable radial head fractures is associated with less elbow motion one year after injury and occasionally fails, it seems to reduce the risk of subsequent elbow instability and to protect against long-term arthrosis.





## **IP25**

### **Critical factors influencing PIP joint stability – The essential volar buttress**

#### **Hill Hastings**

*The Indiana Hand Center, Indianapolis, IN*

Palmar fracture/dorsal dislocations of the Proximal Interphalangeal (PIP) Joint are classified as "stable" when involving < 30% of the palmar middle phalangeal articular surface, "tenuous" when involving 30-50% and joint reduction occurs with < than 30° of flexion, and "unstable" when involving > 50% or requiring > 60° of flexion to maintain reduction. Critical assessment of PIP stability after palmar lip fracture/dislocations was studied by sequential resection of the palmar articular rim of middle phalanx, dislocation of the joint, and fluoroscopic assessment of the amount of flexion required to reduce the joint. Joints were studied with collaterals present and collaterals excised. Mean bony resection before subluxation occurred was 42% of the articular surface. Progressive resection required increasing amount of joint flexion to secure joint reduction. Beyond 65% articular resection all PIP joints were unstable in all positions of flexion. Joint stability/instability was independent of the integrity of the collateral ligaments. Based upon anatomical studies, an osteochondral reconstructive procedure was designed to replace unreconstructable palmar defects using the dorsal ipsilateral hamate. Surgical technique of hemi-hamate resurfacing (HHRA) will be covered in details and long-term clinical outcomes shown. 12 patients with average articular involvement of 72% (65-80%) HHRA. One case failed secondary to graft contamination. A second patient required reoperation for Swan neck deformity. All grafts united. PIP range of motion averaged extension 26.5°/flexion 90.5° (+15-60°/70-105°). Grip strength averaged 81% of the opposite side. The patient with longest term follow-up (8-1/2 years) shows no degenerative joint changes, PIP extension 5°/flexion 105°; DIP extension 0°/flexion 90°.



## **IP26**

### **Tendon transfers in sequelae of obstetrical palsy**

**Turker Ozkan**

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**Aim:** We present our experience on palliative surgical procedures for surgical restoration of sequelae of obstetrical palsy in late stages; specifically about restoration of shoulder abduction, external rotation and forearm pronosupination.

**Patients and methods:** Between years 1997 and 2006, 110 patients were operated for restoration of shoulder abduction and external rotation by transfer of conjoint tendon of latissimus dorsi and teres major to the rotator cuff. Consequently 78 patients with obstetrical palsy underwent different types of surgical correction of forearm and hand deformities, 13 of which were brachioradialis pronatoplasty.

**Results:** For patients operated on shoulder restoration the median degree of shoulder abduction went from a preoperative value of 77° (20°- 170°) to 132° (60°- 180°) with a median gain of 55° (71% gain). The median degree of shoulder external rotation went from a preoperative value of 23° [(-10°) – 90°] to 79° (25°- 100°) with a median gain of 56° (gain rate 243%).

Following surgery for restoration of pronation the patients gained an 184% increase in active pronation and 276% increase in total active motion on average.

**Conclusion:** The results of techniques we employed in shoulder function restoration show satisfactory increases in shoulder abduction and external rotation in patients at any age. Brachioradialis rerouting and interosseous membrane release may be a viable option for restoration of pronosupination in obstetrical palsy patients.



## **IP27**

### **Current concepts on flexor tendon repair**

#### **Beng-Hai Lim**

*Centre for Hand and Reconstructive Microsurgery (CHARMS), Mount Elizabeth Medical Centre and Department of Orthopaedic Surgery, Yong Loo Lin School of Medicine, National University of Singapore, Singapore*

Restoration of normal hand function following flexor tendon laceration requires reestablishment of flexor tendon continuity, preservation of the gliding mechanism between the tendon and its surrounding structures, preserved integrity of the pulleys, a supple joint and a functioning muscle.

While current efforts had resulted in a stronger repair and improved rehabilitation technique, the results of surgical repair following flexor tendon injury remains unpredictable.

Strategic areas for improvement include strength of tendon repair, improvement in rehabilitation, improving the tendon surrounding tissue gliding interphase and increase the rate of tendon healing.

Improving repair strength and increasing tendon healing rate has great advantages as it allows early active mobilization resulting in less muscle atrophy, supple joints and good gliding tendon soft surface interphase.

Research into intra tendinous anchoring devices and increase in core sutures to increase repair pull-out strength had reached a plateau. Increasing suture strength had resulted in the suture pulling out of the tendon rather than rupturing of the suture material.

Current efforts looked at anchoring points in the flexor tendon to minimize suture pull-out and failure of repair from tendon softening.

Strategies in improving tendon healing include application of mesenchymal stem cells during repair of flexor tendon maybe a possible options in future.

All these strategies are aimed at improving the repair strength and healing of flexor tendons to the extent that the patient can have a splint free rehabilitation and early functional use of the hand.



## **IP28**

### **Excision arthroplasty for trapezio-metacarpal joint osteo-arthritis - simplifying a created problem**

**Ulrich Mennen**

*International Federation of Societies for Surgery of the Hand, Pretoria, South Africa*

The surgical options for the management of the osteo-arthritic trapezio-metacarpal joint are numerous, ranging from osteotomies to suspension plasties and sophisticated prosthesis.

Of the 1086 affected hands seen, 817 were operated by the same surgeon. The trapezium is totally removed and the first metacarpal engaged snugly between the trapezoid and scaphoid head, creating a "ball-and-socket" type joint.

The results of 83 % of patients who were retrieved showed pain relieve in 96 % of patients, improved stability of the thumb in 99 %, full opposition in 98 %, reduction of the MP joint hyperextension by 30°, increased widening of the 1 st web space by 27°, increase of the pinch power by 1,5 kg, thumb length shortening by an average of 3mm and an over-all patient satisfaction (i.e. better than before surgery) of 95,8 %.

This study indicates that the results of simple excision arthroplasty without any interposition or ligamentous reconstruction gives excellent results. It is based on the principle of creating an inherent stable but mobile joint (ball-and-socket). All interposition arthroplasties are biomechanically unstable and therefore need additional procedures to increase stability. We believe this is unnecessary. Long term, satisfactory results are achieved by keeping it simple!



## IP29

### **Collagen organization and expression in spastic muscles from individuals with cerebral palsy**

**Jan Fridén** , Eva Runesson, Nenad Stankovic

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Collagens are the most abundant structures in skeletal muscle ECM. Collagen type I and III are the dominant isoforms in the peri- and endomysial parts of muscle whereas the most common collagen in the basement membrane is collagen IV. Mechanical studies of spastic muscle bundles have demonstrated a poor quality of the ECM, indicating a lesser contribution of the ECM components to passive muscle tension than those of the healthy muscle. The primary objective of this study was to define the possible role of collagen involvement in spastic muscle of cerebral palsy patients and to determine whether there is any up-regulation of collagen synthesis.

Methods: Expression of different collagen types was analyzed in biopsy samples from spastic muscles in nine children with cerebral palsy (4 – 17 years of age).

Results: Significantly higher expressions of type I, III and IV collagens were found in spastic muscles compared to controls (12-, 4- and 2.5-fold increase, respectively). No expression difference between spastic and normal muscle was observed in the cross-linking collagen type VI. The ratio of type I/type III RNA was significantly higher in spastic muscle, primarily due to increased type I collagen. In addition, relative ratio between collagen type I + type III and collagen type VI demonstrated a 5-fold increase in spastic muscle tissue.

Conclusions: These findings indicate an abnormal increase of several collagen types in spastic muscle. The increased collagen amount may become structurally unorganized and mechanically weaker, due to insufficient amounts of cross-linkers such as collagen type VI.



## **IP30**

### **Digital coverage with flaps from the same or neighboring digits**

**Zoe Dailiana**

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Several flaps can be used from the same or neighboring digits for the reconstruction of extensive digital defects with exposure of tendons and/or phalanges.

Depending on the location of the defect (dorsal, volar, pulp) alternative flaps may be dissected: cross-finger flaps and homodigital/heterodigital flaps. For distal phalange reconstruction homodigital or heterodigital neurovascular island flaps provide coverage of the exposed phalange with skin possessing similar properties to the pulp; thus additional shortening and painful stumps are avoided. For more proximal reconstruction (proximal/middle phalanges and PIP/DIP joints) the cross-finger flaps are useful alternatives. Flaps from the dorsal side of the donor adjacent digit can either cover a palmar (classic flap) or dorsal defect (de-epithelialized cross finger flap) of the recipient digit. Apart of the superior aesthetic result, these flaps also offer a gliding layer of tissue over the tendons, minimizing formation of adhesions. The dissection of the homodigital/heterodigital neurovascular island flap although technically more demanding, can be concluded in a single procedure, whereas cross-finger flaps must be separated in a secondary stage.

In a 5-year period, 89 digital defects were reconstructed with the use of cross-finger and homodigital/heterodigital flaps in 81 patients. Neurovascular island flaps were used for 63 defects of the distal phalange: 45 homodigital and 18 heterodigital, whereas cross-finger flaps were used for the reconstruction of 26 dorsal and palmar defects (16 de-epithelialized and 10 classic respectively) of the proximal and middle phalanges to the DIP joint. All flaps survived. Functional and aesthetic results were good or excellent in 80 cases.

Knowledge of the special anatomic considerations and functional requirements of each recipient site permits the use of the most appropriate flap from a neighboring site/digit.



## **IP31**

### **Cerclage-Wiring-assisted fixation of difficult hand fractures**

**Lam Chaun Teoh** , P. L. Tan, S. H. Tan, E. C. Cheong

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Many hand fractures have multiple butterfly fragments or multiple cortical splits and/or with intraarticular extension. In these fractures, it can be impossible to obtain fracture reduction and temporary stability to allow a stable implant fixation to be completed. We report the result of 17 such fractures successfully treated with cerclage-wiring-assisted stable internal fixation.

We have 17 difficult hand fractures over a period of 4 years included in this study. Ten were metacarpal and seven were phalangeal fractures. After initial preliminary reduction, 1 to 3 gauge 28 to 28 stainless-steel wires were used to temporarily fix the multiple fracture fragments together. In addition definitive stable fixations were achieved using the AO principle of bridging, or neutralizing plating. Postoperatively, patients were started on active mobilization on the first postoperative day.

All the 17 fractures united within 6 months without any loss of reduction. With a follow up of 44.5 months, The phalangeal fractures recovered an average TAM of 229 0 and metacarpal fractures 259 0. The result were grading as excellent in all cases.

Cerclage-wiring-assisted fixation technique is a reliable option of internal fixation for difficult hand fractures.



**IP32**

**Compound flap from great toe and vascularized joint of second toe for post-traumatic thumb reconstruction at the level of proximal metacarpal bone**

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**Introduction:** The purpose of this study is to describe the harvesting skills, anatomic variations and clinical applications for thumb reconstruction using a compound flap from the great toe and vascularized joint of the second toe. **Method:** Five fresh cadaver dissections were studied for clinically relevant points, including dorsal and plantar dominance, position of the communicating branch between the dorsal and plantar system, the Gilbert classification, and the size of first dorsal metatarsal artery (FDMA) or first plantar metatarsal artery (FPMA) to the great toe and second toe. In addition, 3 compound flaps were performed between 1988 and 2003 on 3 patients with traumatic thumb amputation at the level of proximal metacarpal bone. The age of the patients ranged from 14 to 41 years. Follow-up period was eleven to twenty months. **Results:** The anatomic study showed that FPMA had larger caliber in 40 % of dissections, FDMA had larger caliber in 40%, and the FDMA and FPMA had the same caliber in 20% respectively. The Gilbert classification of FDMA was 40% class I and 60% class III. The branch of FDMA or FPMA to the great toe was generally larger than to the second toe. In the clinical applications, all three patients required a secondary procedure to improve function following reconstruction. All patients eventually had good opposition and motion of transferred joints with good pinch and grip power. Donor-site morbidity was minimal. **Conclusion:** The advantages of this compound flap over traditional toe transfer include: 1) provides better cosmesis and two functional joints 2) can be used for amputation of thumb at carpometacarpal joint level 3) significantly improves functional results 4) has minimal donor-site morbidity. 5) maintains growth potential in children through transfer of vascularized epiphyses. The disadvantages of this compound flap include: 1) technically challenging harvest 2) long operative time.





### **IP33**

#### **Vein wrapping for median nerve compression**

**Dean Sotereanos**

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Carpal tunnel release may lead to scar tissue formation and symptom recurrence in up to 20% of patients, even following adequate decompression.

Several techniques, such as the hypothenar fat pad flap, local muscle flaps, and free flaps have been used as an adjunct to revision decompression with variable success. Based on experimental studies on rat sciatic nerves, we have used autogenous venous wrapping on selected patients with recurrent clinical and electrodiagnostic findings combined with severe pain. Revision decompression and neurolysis of the median nerve is followed by harvesting of a greater saphenous vein graft four to five times the length of the involved nerve segment. The graft is then split longitudinally and meticulously wrapped around the median nerve with the endothelial surface adjacent to the epineurium. This technique has been shown to be relatively simple and effective in preventing recurrent scarring, improving nerve gliding and function, with minimal donor site morbidity.



## **IP35**

### **Skeletal reconstruction in severe traumatic lesions of the upper limb**

**Olivier Barbier**

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At the upper limb, reconstruction of severe lesions is often better than amputation but the decision rely, more than on any score, on the experience of a surgical team. The reconstruction of the different tissues is performed with a functional perspective and social reintegration is the ultimate goal. A precise planning of treatment is necessary in order to reach this objective. Microsurgical techniques are now parts of each step of treatment: revascularization, soft tissue coverage, reinnervation, bone graft and joint transfer. Revascularization and debridement of all dead tissues are the initial and most important steps. An early coverage of the wound by well vascularized tissues by means of local or free flaps helps to transform an open fracture into a closed one, giving the opportunity to use the most appropriate fixation devices for the particular fracture with a limited septic risk. In our functional perspective of treatment, rigid skeletal stabilization and reconstruction is an important and early step. Improved fracture fixation and early mobilisation after tendon repair avoid prolonged immobilization with the expected results of severe stiffness and tendon adhesions. In addition to soft tissue defects, severe open fractures show frequently bone defects. The choices done for the treatment of both defects are not independent: -Multitissular reconstructions are performed at the initial procedure by replantation or the use of spare parts. -In a revascularized environment, we have come to favor cancellous or cortical allograft as osteoconductive material, sometimes in combination with a joint prosthesis. -But, in case of larger defects with compromised adjacent tissue vascularity, vascularized bone grafting is indicated. Vascularized grafts have also the possibility to include a growth plate and reconstruct composite tissue loss in one procedure.-Shortening and distraction are other means to close a gap in bone (and soft tissues). For joints reconstruction we perform arthrodesis, arthroplasty or vascularized joint transfer.



**IP37**

**Structure and activity of the FESSH hand trauma centers in Europe. Report of the hand trauma committee audit**

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The "Hand Trauma Committee" (HTC) is a committee of the "Federation of the European Societies for Surgery of the Hand" (FESSH) dedicated to hand trauma in Europe. Created in 2004, this committee aims to federate Hand Trauma Centers in Europe, to collect data allowing to evaluate the importance of the trauma of the hand in the whole of the system of health and to analyze the differences and the similarities between the various European countries. This committee does not have the ambition to impose accreditation guidelines. Two representatives of the HTC for each country were nominated by their national boards in 20 of the 21 full members of the FESSH. These representatives - young surgeons strongly involved in trauma - were charged to collect the data using a questionnaire in all the Hand Trauma Centers in their country. The data could be collected in 18 of the 21 countries. These national data were then analyzed on a European scale. We report the results of this audit with regard to the characteristics of the centers (number, location, criteria of accreditation), of the surgeons (number, age, qualification, implication in the surgery at night, observance of the working hours according to European legislation), the educational missions, the composition of the teams (nurses, therapists, psychologists) and the usual methods of evaluation. A counting of the hand trauma treated during January 2006 was recorded (true replantations, other microsurgical surgeries, complex trauma and benign lesions). In collecting these data, the HTC points out the provision of Hand Trauma as a major part of the global Health System in Europe.



## IP38

### **Enhancement of sensory relearning after nerve repair by using repeated cutaneous anesthesia of the forearm**

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The result from nerve repair in adults is generally poor. We hypothesized that repeated cutaneous anesthesia of the forearm would allow expansion of the cortical hand representation, hereby facilitating and enhancing sensory recovery after nerve repair.

**Patients and Methods:** A prospective, randomized, double-blind study was performed in order to investigate the effects of cutaneous forearm anesthesia combined with intensive sensory re-education on recovery of functional sensibility after median or ulnar nerve repair. During a two-week period local anesthetic crème (EMLA®; n=7) or placebo (n=6) was applied at repeated occasions onto the volar aspect of the forearm of the injured arm combined with a standardized sensory re-education home program. *The Model Instrument for Outcome after Nerve Repair* (Rosén and Lundborg 2003) was used for evaluation of the sensory function at regular intervals and four weeks after the last EMLA®/placebo session, and group comparison was used to analyze the difference in outcome.

**Results:** The EMLA® group showed significant improvement compared to placebo in perception of touch/pressure ( $p=0.04$ ), tactile gnosis ( $p=0.03$ ) and in the summarized outcome "total score" ( $p=0.02$ ) after six weeks.

**Conclusion:** These results implicate that repeated cutaneous forearm anesthesia of the injured side in combination with sensory re-education can enhance the sensory recovery after nerve repair. The reason is hypothetically an expansion of the cortical hand representation in somatosensory cortex secondary to cutaneous anesthesia of the forearm. This increased "brain space" allocated to the hand may enhance the effect of sensory re-education



**IP39**

**Osteotomies for distal radius malunion: Current state of the art**

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Corrective osteotomy for malunited fractures of the distal radius has become a standardized surgical procedure, but refinements of the technique continue to evolve. Recognition of associated carpal malalignment and DRUJ derangement is mandatory to decide whether or not additional procedures together with radial osteotomy are necessary to guarantee a good result. The osteotomy should be performed as soon as the soft tissues show no trophic disturbances. Early correction provides easier radial and distal radioulnar joint realignment due to the absence of soft tissue and capsular contractures, and results in a considerable decrease of total disability. Dorsally angulated malunions require correction of the "multiplanar" angular deformity as well as restoration of radial length. *Opening wedge osteotomies* with graft interposition may be performed through a dorsal or a volar approach. In both instances locking plates and morcellized iliac grafts are recommended. Since most distal radius plates are pre-contoured to the volar anatomy of the distal radius, the distal fragment is automatically reduced following osteotomy, when the plate is applied to the shaft fragment. This implies angular and rotational correction. Length can be adjusted in laminar spreaders introduced in the osteotomy space if needed. *Closing wedge osteotomies* are easier to perform. They do not require bone grafting, but a leveling procedure at the distal radio-ulnar joint is necessary. If degenerative changes of the DRUJ are present, a *closing wedge palmar osteotomy* and *primary prosthesis* ulnar head replacement with restoration of 0 mm ulnar variance is preferred. The role of osteotomy of an *intra-articular malunion* following distal radius fracture is limited by the chronology, the fracture pattern, and the degree of cartilage damage as well as the condition of the soft tissues. We recommend to treat simple intra-articular malunions with minimal cartilage damage as soon as possible, otherwise a limited carpal fusion is preferable.



## **IP40**

### **Classification and current treatment of perilunate dislocation**

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Perilunate dislocations (PLD) and fractures-dislocations (PLFD) are severe, uncommon and challenging wrist injuries. They are characterized by an almost endless array of injury patterns and a need for surgical treatment. Despite the severity of this injury some PLD and PLFD are still missed at the initial stage which makes surgical treatment even more difficult. Classifying PLD and PLFD in terms of delay from injury and expected pathology is mandatory. PLD and PLFD may be classified as acute when diagnosed within the first week post-injury, delayed between the first and sixth weeks, and chronic after the sixth week. Some missed PLD-PLFD may be diagnosed several years after the injury when carpal tunnel syndrome and/or flexor tendon ruptures occur. Classifying the injury pattern helps choosing the appropriate treatment and providing a reliable prognosis because there is variability in the severity of PLD-PLFD. This classification should be established from initial and traction radiographs. Trans-scaphoid PLFD should be separated from pure ligamentous PLD and from PLFD with intact scaphoid. The direction (dorsal or palmar) and degree of displacement of carpal bones (i.e. lunate dislocated from radius or not) implies different surgical approaches and strategies. The existence of associated chip fractures of radius, ulna or carpal bones may indicate a more severe prognosis and should be considered. The most reliable current treatment of acute dorsal PLD-PLFD is open reduction and internal fixation of the carpal bones in order to make the ligaments and carpal fractures heal in order to minimize post-traumatic arthritis. Advances in screw technology has improved scaphoid fixation and lessened the immobilization period but comminution may still need the use of K-wires. Whatever the type of PLD-PLFD, carpal ligamentous ruptures are constant and the minimal period of immobilization is 6 weeks. In terms of approach, the dorsal approach has gained widespread acceptance, either alone or combined with a palmar carpal tunnel approach. Arthroscopic reduction and internal fixation may be considered in the future in selected PLD-PLFD. Late treatment may allow an anatomical repair of carpal bones and ligaments but often requires salvage procedure that sacrifices wrist motion. Early diagnosis and appropriate surgery of these severe carpal injuries are necessary to prevent carpal bone non-union, secondary carpal instability and post-traumatic arthritis.



## IP41

### Chimeric therapeutics a supportive therapy in composite tissue allograft transplants

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Hand transplants hold great potential in a clinical practice of reconstructive surgery. The bone component of the hand may contribute to tolerance induction. We assessed migration of immature (CD90) bone marrow cells (BMC) and role of osteopontin (OPN) in hematopoiesis following vascularized bone marrow transplantation (VBMT) across MHC barrier.

We found that VBMT across a MHC barrier under 7-day of a  $\beta$ -TCR/CsA protocol facilitated chimerism via migratory potential of and engraftment of immature BMC cells between donor and recipient compartments as early as day 7 post-transplant. Active donor bone hematopoiesis correlated with high chimerism in peripheral blood. Two-way trafficking between donor and recipient BM compartments was confirmed by the presence of recipient cells CD90(RT1 l) within the allografted bone with peak level at day 21 post-transplant (16.2%-25.7%). At day 63 upregulation of OPN correlated with allografted bone fibrosis. Donor CD90(RT1 n) cells (3.5%-4.0%) were present in recipient bone and correlated with chimerism maintenance. Donor-derived cells were detected within recipients' lymphoid organs.

The results achieved after VBMT suggest that the presence of donor cells within recipient BM contributed to chimerism maintenance. To further test the role of chimeric cells in tolerance induction we have created chimeric animals as a source of the chimeric cells for adoptive immunotherapy. This was achieved via intraosseous transplantation of donor-origin BMC cells LBN (RT1 n+l) or ACI(RT1 a) into naïve LEW(RT1 l) animals, followed by purification of chimeric cells from the BM compartment of LEW recipient by MACS-sorting technique. Adoptive transfer of purified chimeric cells into naïve LEW rats was applied as a supportive therapy during vascularized skin allograft transplantation under 7-day protocol of  $\alpha\beta$ -TCR/CsA therapy. This resulted in 150 days survival of skin allografts without chronic immunosuppression.

In summary, immunotherapy with donor-origin chimeric cells support allograft acceptance in CTA transplants. This approach may serve as a new therapeutic modality for tolerance induction in CTAs.



## **IP42**

### **Twenty years of experience with Swanson total wrist arthroplasties: Long term results in a series of 128 patients**

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**Introduction:** The long term results with Swanson total wrist arthroplasties were examined in a series of 128 patients operated by the author in the last 20 years; 94% of them were affected by rheumatoid polyarthritis, 6% by different types of degenerative arthropaties; all the cases underwent the same criteria of preop evaluation, surgical technique, postop treatment and result evaluation protocol, representing an omogeneous and conspicuous series: we think these results should be considered a concrete assessment of the technique.

**Methods:** the crucial points and skills of the technique used in all cases are described, and are reported the results of 55 of the cases with a follow-up from 20 to 10 years (av. 12,5 years), evaluated with a protocol including ROM, Carpal height and offset, pain suppression and subjective appraisal; a comparison between preop Larsen stage and results is also forwarded.

**Results:** 18 cases (34,5%) were classified excellent or good, with implant survival and a satisfying functional and subjective result, even with an X-ray poor appearance; 23 case (40,2%) were classified fair, with significant loss of ROM and unconstant pain recurrence; 14 cases (25,3%) were classified poor, with wrist collapse, poor ROM and pain recurrence: in 6 cases was found a spontaneous implant destruction and in 4 a post-traumatic breaking; 12 patients of this group underwent secondary surgery with a new implant, and only 2 were operated with an arthrodesis. The comparison between preop Larsen stage and results revealed that the best results were achieved in stages 2 or 3, the worst in stage 5.

**Conclusion:** the technique in our opinion is still an excellent, safe and durable answer to the problems of these low-demanding patients. A proper surgery is fundamental to get good results, as a correct postop treatment and ergonomic teaching of the patients.





## **IP43**

### **Scaphoid blood supply – How critical is it for fracture union?**

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There is currently much debate regarding the benefit of acute scaphoid fracture fixation. Approximately 85% of fresh fractures will unite if treated non-operatively. Is it possible to predict which scaphoid fractures will not unite? It is a widely held belief that the blood supply to the scaphoid is a critical determinant of fracture union and that poor proximal fragment blood supply predicts failure of union of acute fractures and failure of non-union surgery. The appearance of increased density of the scaphoid proximal pole is believed to reflect poor bone vascularity and be a poor prognostic sign for union. Recent focus has turned to developing vascularised bone grafting techniques to enhance union rates of scaphoid non-unions. How critical is scaphoid blood supply for union? Is it possible to assess scaphoid blood supply non-invasively and predict which fractures and non-unions will not unite? What does the appearance of changes in radiographic scaphoid bone density mean? Non-invasive measurement of bone blood supply is possible using Gadolinium enhanced dynamic MRI scanning. In Nottingham, UK, we have investigated the usefulness of this tool as a determinant of scaphoid blood supply and predictor of union of both acute fractures and non-unions. The relevance of apparent changes in bone density of the scaphoid as seen in plain radiographs has also been investigated. Scaphoid blood supply measured non-invasively is a poor predictor of the outcome of scaphoid fracture management and cannot be used to guide our management. The reasons for failure of scaphoid union are complex and multifactorial.



## IP45

### Custom made key grip construction in high level tetraplegia

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Erik Möberg laid the foundations of functional surgery of the upper limb in high level tetraplegia. He described the "Key Grip". The simplicity of the surgical technique as he described it does not however permit it to be adapted to all situations. Thanks to our 30 year old experience in functional surgery of the upper limb in tetraplegia, we modify this basic concept in each case. Restoration of this termino-lateral pollicis-digital pinch must take into account:

- not only the level of the neurological injury (Groups GI and GII of the international classification), but also the extent of the lesional medullary segment (presence or absence of an active sub lesional segment) and the thenar muscle tone
- not only its closing but also opening.

In order to perform a "Key Grip" we must consider:

- Its activation depending on the level of tetraplegia

By wrist extension: (and FPL tenodesis): "Passive key grip":

- Active wrist extension in group II
- Brachioradialis transfer to the ECRB (Group I)

By brachioradialis to FPL transfer: "Active key grip"

- Thumb column positioning depending on the extent of the lesional segment.
- IP, MP, CM, Thumb stabilisation (tenodesis or arthrodesis)
- The Key grip is custom made following these parameters and the patient's wishes



## **IP47**

### **Reconstruction of cleft hand with severely narrowed or syndactylised first web**

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Cleft closure and creation of the supple first web are crucial combining procedures for the reconstruction of the cleft hand deformity both to attain better appearance and to maintain good hand function. Manske and Hallikis proposed five degree classification with the attention focusing on the first web condition to decide surgical procedures.

Type II-B has severely narrowed first web space and actually no space for type III( Syndactylized web) , type IV (Merged web) and type V(Absent web). Reconstruction of the adequate first web space for the cases with the first web space narrowing severer than that of type II-B is technically demanding. Type III contains more difficult problems as it requires simultaneous separation and widening of the severely syndactylized web space and closure of the cleft. Reconstruction for the type IV and V is usually directed for the better function and not for the appearance. Snow-Littler's procedure is an elegant method applicable also to the reconstruction of type II-B or III cleft. The pedicled flap in this procedure utilizes redundant tissues for the coverage of the widened first web without discarding the soft tissue created by the closure the cleft.

We reconstructed type II-B combined with merged duplicated thumb or with ulnar side cleft, and type III. Although these reconstructions required touch-up surgeries, the created first web provided prehension using thumb and improved appearance. Even in these types with severe deformity, the thumb is usually equipped with well functioning thenar muscles. This basic anatomy encourages us to create the first web and soft tissue coverage using pedicled flap from the cleft.

We believe these procedures can convert prehension using digits oppos able with the cleft to that with well mobile slimmed thumb opposable to fingers with cleft closure. The detailed procedures and the results will be presented.