www.ifssh.info VOLUME 5 ISSUE 1 FEBRUARY 2015

ifssh ezine

CONNECTING OUR GLOBAL HAND SURGERY FAMILY

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IFSSH Scientific Committee Reports on Tendon Transfers and Degenerative Arthritis

REHABILITATION AFTER ENZYMATIC INJECTION FOR DUPUYTREN'S CONTRACTURE

WIDE AWAKE HAND SURGERY

The cover photo is an example of the EPL opposition tendon transfer (Mennen, U. JHS(A) 1992)

Contents

Editorial

We invite you as members of this "Hand Family", to use this medium to share your knowledge and experience.

In the last Editorial (November 2014), President Michael Tonkin highlighted the IFSSH as a "Global Community"

The main function of the IFSSH ezine is for us, as this international Community, to communicate.

Again, we invite you as members of this "Hand Family", to use this medium to share your knowledge and experience.

As the Exco of IFSSH we have produced "Guidelines" and "Protocols" for the activities stipulated in the Charter of the Federation.

These "Guidelines" and "Protocols" are adapted and updated occasionally to keep up as our Federation grows and develops. In previous issues some relevant parts have been published to inform you as the members:

Issues 4 (November 2011) and 7 (August 2012) dealt with the aims and relevance of the IFSSH. Issue 5 (February 2012) explained the endorsement policy of hand meetings by the IFSSH. Issue 14 (May 2014) spelled out the duties and function of the Delegates who make up the IFSSH Council and issue 15 (August 2014) detailed the importance and strict requirements when nominating Pioneers.

This issue highlights the role of the Scientific Committees, which, as per our Charter, is one of the most important functions of the IFSSH.

Guidelines to regulate the IFSSH Scientific Committees:

1. The President and the President Elect shall work together to ensure a continuity in soliciting Reports from appointed Committees. (i.e. reports from committees should be an ongoing process and not restricted to the 3 year term of a president).
2. The Committee Chairpersons are identified for their expertise by the President (and assisted by the President-Elect) and requested to solicit additional committee members (max 4) to assist in producing a report on:
   a. a specific topic
   b. which can be published as an "oracle" of the IFSSH,
   c. which will not be controversial or be the view of an individual,
   d. but reflect the view of the current ethos of the Hand Surgery Fraternity,
   e. will present the report within a designated time (max 6-9months),
   f. which will be published in the IFSSH ezine and posted on the IFSSH website for the benefit of all the members of the IFSSH.
3. The reports should be concise, could be overview reports, but to the point, non-controversial, universally acceptable information, and include the latest available information on the topic. It will therefore be a formal document which will reflect the viewpoint of the IFSSH community. ***Committees are expected to be as inclusive as possible to reflect the international experience.***
4. The Committee shall serve for a period of 3 years, which may not necessary coincide with the term of office of the president, i.e. the Committee term may overlap presidential terms. Since these are official IFSSH committees, serving on them will be regarded as an honour and professional achievement.

With sincere regards

PROF ULRICH MENNEN

Editor

IFSSH ezine editorial team:
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Deputy Editor: Professor Michael Tonkin (President of the IFSSH)
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Letter to the editor

Dear Sir,

Re: Classification of congenital anomalies of the hand and upper limb

The OMT Classification has been approved by the IFSSH Scientific Committee for Congenital Conditions (Click here to see Ezine #14, May 2014) as a timely and appropriate replacement of the Swanson classification, previously approved by the ASSH in 1976, and subsequently by the IFSSH.

The OMT classification separates Malformations – abnormal formation/ differentiation of tissues; Deformations – alterations of tissue which is already formed; and Dysplasias – abnormal organisation of cells into tissue. Most of the anomalies surgeons encounter are malformations. The familiar surgical diagnoses, such as thumb duplication or thumb hypoplasia, retain their original terminology within the subsections of the classification.

The intent of the new system is:

1. To provide a classification of congenital hand and upper limb anomalies which relates to our increased understanding of the aetiology of anomalies and to relate this understanding to a determination as to which axis of development and differentiation is primarily involved, and whether the problem involves the whole of the upper limb or the hand plate primarily.
2. To allow documentation of all anomalies presenting in a single limb. For instance, if polydactyly, clefting and syndactyly occur together, then this is simply classified under "cleft hand complex". However, if a limb presents with apparently unassociated anomalies, such as syndactyly and clinodactyly, these are documented separately. Therefore, each limb may have multiple entries within the system.
3. To cross reference anomalies with syndromes. If an anomaly is part of a syndrome, the specific anomaly is documented as is the syndrome and the two are cross-referenced. For instance, Holt-Oram syndrome is documented and the limb anomaly - radial longitudinal deficiency (entire upper limb or hand plate alone) - is also documented. It is not intended that it be one or the other.

No classification system is perfect and some conditions defy a precise definition according to cause.

The IFSSH Scientific Committee for Congenital Conditions invites comments, advice and questions to be forwarded to the Chair of the Committee, Dr Marybeth Ezaki (Marybeth.Ezaki@tsrh.org). In this way, the classification, which is defined to be flexible, can be revised and/or modified. The detailed classification may also be found on the IFSSH website http://ifssh.info/2014_Congenital_conditions.pdf

Yours sincerely,

Michael Tonkin *Sydney, Australia*

Why Wide Awake Hand Surgery (WAHS)?

WAHS or Wide Awake under Local Anaesthesia with No Tourniquet (WALANT) is a rapidly developing area of hand surgery. The most common mixture is buffered 1% lignocaine and weak adrenaline, either 1:100 000 or 1:200 000. This is injected proximal to the area to be operated on to act as a "field block" and then, when numb, more is injected for the haemostatic effect of the adrenaline, into the areas where incisions are to be made. The myth about the danger of injecting hands or fingers with lignocaine and dilute adrenaline is no more than that; a myth.

Having adequate haemostasis from the adrenaline means that no tourniquet is required, as bleeding from the incisions and operative field

WATCH THE VIDEO HERE http://youtu.be/24dQfROMKp0

is drastically reduced or even stopped entirely. Tourniquets can be very painful and realistically can only be tolerated comfortably for a maximum of 10 minutes (at 250mmHg). Any operation lasting longer than this would require a regional or general anaesthetic for the tourniquet's sake. If no tourniquet is required, then the patient does not require any further anaesthetic and hence no anaesthetist is needed. This is one of the greatest factors to reduce costs and improve efficiency. I would urge any surgeon who uses an arm or forearm tourniquet to try it on themselves before inflicting it on patients.

WAHS is not new but its use and popularity is expanding, championed by Dr Don Lalonde from Saint John, Canada. He has lectured widely about the subject and has many publications in this field. It has been shown to be very safe. Patients do not need to starve pre-operatively; they can continue to take their medication, including anticoagulants and no monitoring is required intra-operatively.

Examples that we have shown in our instructional movie are: carpal and cubital tunnel decompression, trigger finger and De Quervain's release, SIMPLE block (digital ring block) and a trapeziectomy. Importantly we describe the reasons why using local anaesthetic with adrenaline should be considered, how to give an almost painless injection and some safety aspects such as who NOT to use WAHS on.

As a general rule inject VERY slowly, use the right amount (lots!) of the right mixture (1% lignocaine with adrenaline) in the right place and WAIT long enough for the adrenaline to work (minimum 30 minutes).

We hope that you will try using WAHS on your patients and any feedback on your experiences would be gratefully received.

Contact: alistairphillips1@mac.com

Your sincerely,

Alistair Phillips (Hand Fellow, University Hospital Southampton) and Nik Jagodzinski (Orthopaedic Specialist Registrar, South Devon Healthcare NHS Foundation Trust) with special thanks to Dr Don Lalonde.

Having adequate haemostasis from the adrenaline means that no tourniquet is required, as bleeding from the incisions and operative field is drastically reduced or even stopped entirely.

Connect with the global profession

The IFSSH ezine is created with the intention of engaging the global hand surgery community and to promote the profession through the sharing of knowledge. In order for the IFSSH ezine to remain relevant and topical, we rely on you, our readers, to:

- Subscribe to receive the ezine FREE OF CHARGE 4 times per year
- Submit letters to the editor
- Provide us with feedback about the ezine

member society updates

Member society updates

Italian Society for Surgery of the Hand (Società Italiana di Chirugia della Mano - SICM)

The Italian Society for Surgery of the Hand (Società Italiana di Chirugia della Mano - SICM) was founded in 1963 with Professor Auguso Bonola as the first president. This original group of hand surgeons has now grown to more than 500 members from all parts of Italy.

Beyond the organisation of the annual national congress, which was held in 2014 in Foggia, the society is encouraging the education of young members and residents through basic courses, the support of scholarships for visiting fellows in the main Italian hand surgery centers, and the organisation of cad-labs. This year, two practical courses on dissection and surgical techniques at hand and elbow level were organised by SICM with the participation of the most important Italian surgeons and high quality international faculty (Fig. 1) . Education and training has also improved thanks to collaborations with other national societies (Italian Society of Microsurgery), joint meetings with European and extra-European societies (future meetings with German Society and ASSH) and ongoing participation in the life of the European Federation (FESSH). In 2015 the FESSH congress will be organised in Milan with a high quality scientific program.

Communication is another important topic for the Society: the national journal and the website (with web-education and web-TV) are relevant for all the Council.

Finally, the Society believes in creating precise standards for hand surgery. A lot of work is undertaken by nominated committees to ensure the accreditation of centers, standardisation of the hand trauma centers and the creation of consensus and guidelines on the main subjects of hand surgery.

***Bruno Battiston**, MD, PhD*
IFSSH delegate

Fig. 1: Participants and faculty of Cad-lab on elbows with Riccardo Luchetti (President of the Italian Society) and Bruno Battiston (IFSSH delegate of the Italian Society)

The History of the Japanese Society for Surgery of the Hand

1) President's Greetings

It is my great pleasure to introduce our society in the IFSSH ezine Society News. JSSH is one of the oldest hand surgery societies in the world and one of the eight founding member societies of the IFSSH. Our society has contributed internationally to the development of hand surgery and intends to do yet more from now on.

Hiroshi Yajima M.D. & Ph.D., the 7th president of JSSH

The photo includes the members of the present board of directors.

2) Foundation and development of JSSH

In 1956, Dr Harry Miller from Pennsylvania visited Japan. He brought the film, "Tendon Repair", edited by Dr Mason, and a letter from Dr Bunnell which encouraged the launching of the Hand Society in Japan. In 1957, the Japanese Society for Surgery of the Hand (JSSH) was founded, and the secretariat was opened at Kyushu University. The 1st Annual Meeting was held on July 7, in Kobe City (president, Professor Amako). The participants numbered only fifty, and discussed hand contracture and tendon repair. The proceedings were published under the title 'Basics of Hand Surgery'.

With the effort of many senior hand pioneers, the JSSH has now grown to 3,492 regular members, approximately 13.8% of whom are plastic surgeons. The annual meeting is regularly held every year. The 57th Annual Meeting was held in Ginowan, Okinawa pref (Congress President Professor Kanaya), in April 2014. The participants totalled approximately 1,500, and 614 papers including poster presentations were discussed.

As the Society grows, a stronger system is needed to manage it. Professor Tamai was elected the first president of the JSSH in 1999. The JSSH organisation has 1 president, 2 vice presidents, 9 directors, 2 auditors, and 233 councillors. Now the congress president, elected every year, is engaged in the management of the annual meeting. In 2007, the Qualified Hand Surgeon system was started, and 450 surgeons were registered as QHS-certified.

Organising international meetings is also an important task for the JSSH. The 3rd International Federation of Societies for Surgery of the Hand (IFSSH) Congress in 1986 was the first big international meeting hosted by the JSSH (president, Professor Tajima). This international activity of the JSSH has been followed up with the 2nd International Symposium on the Wrist in 1991 (president, Professor Miura), the 5th International Symposium on Congenital Differences of the Upper Limb in 2000 (president, Professor Ogino), and the 4th Asian Pacific Federation of Societies for Surgery of the Hand (APFSSH) in 2005 (president, Professor Ikuta). Dr Yamauchi was elected as the President of the IFSSH in 1998. Dr. Tamai was also elected as the President of the APFSSH in 2000. Then Dr Beppu was also elected as the President of the APFSSH in 2012. Many senior Japanese hand surgeons were elected as "Pioneers of Hand Surgery" by the IFSSH.

We congratulate the hand societies on their evolution and hope for an even closer relationship between the IFSSH and the JSSH.

3) 58th Annual Meeting of the JSSH

Date and time: 16-17 April in 2015
Place: Tokyo
President: Professor. Koichi Nemoto, National Defence Medical College
URL: http://www.jssh2015.umin.jp/

4) Secretariat for Japanese Society for Surgery of the Hand
Address: c/o Congress Corporation, Kohsai-kaikan Building, 5-1 Kojimachi, Chiyoda-ku, Tokyo 102-8481, Japan
TEL: +81-3-5216-5569
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URL: http://www.jssh.or.jp/

Korean Society for Surgery of the Hand

The Korean Society for Surgery of the Hand (KSSH) was established in 1982 and recently celebrated its 30th anniversary in 2012. The KSSH has successfully held international hand society meetings, such as the 4th congress of the Asian Pacific Federation of Societies for Surgery of the Hand (APFSSH) in 2002 and the 11th congress of the International Federation of Societies for Surgery of the Hand (IFSSH) in 2010.

The KSSH started its hand surgery subspecialty board system in 2005, which is now in the right direction, producing the 11th subspecialty hand surgeons this year. Surgeons who have finished their orthopaedic, plastic or general surgery residency training for four years, plus at least one year of hand surgery fellowship training, can apply for the hand surgery subspecialty examination to become a board-certified hand surgeon. Hand surgeons have to maintain a specified level of requirements (education, meeting attendance, or research) to renew the certificate every five years. Now there are about 250 board-certified subspecialty hand surgeons in Korea.

The first Korean-language hand surgery textbook that covers the whole spectrum of hand surgery was written in 2005 by Professors Moon Sang Chung and Goo Hyun Baek. In addition to this textbook, in 2014 the KSSH has published a new Korean-language hand surgery textbook to which many leading Korean hand surgeons have contributed.

Members of the KSSH have also contributed a lot of research articles to international journals recently. During the last five years (from January 2010 to December 2014), more than 100 scientific articles from Korea have been published in the three major hand surgery journals (56 articles in J Hand Surg Am, 30 in J Hand Surg Eur, and 17 in Hand Surg). Professor Goo Hyun Baek of Seoul National University started to work as the editor-in-chief for the official journal of the APFSSH in January 2015. He changed the journal name from "Hand Surgery" to "Journal of Hand Surgery Asia Pacific Volume" (http://www.jhs-ap.org), and has begun to put all his efforts to make the journal for the better. He invites all members of the IFSSH to consider the new journal as a way to share their ideas and precious research results.

Korean hand surgeons sincerely wish that this New Year becomes a very special one with health, happiness, prosperity, and peace for all members of the IFSSH and their families.

Norwegian Society for Surgery of the Hand

The Norwegian Society for Surgery of the Hand was established in 1979. Hand surgery is not a speciality of its own; the surgeons performing hand surgery are either trained as orthopaedic or plastic surgeons.

Replantations, surgery on patients with Apert Syndrome and surgery on patients with brachial plexus injuries are national services localised to Oslo University Hospital, while surgery on patients with tetraplegia is a national service localised in Bergen.

There are four university hospitals in Norway (Oslo, Bergen, Trondheim and Tromsø) - the three last mentioned universities all have professors in Hand Surgery. Even outside the universities, hand surgery has developed as a sub-specialty. Arthroplasties (prosthetic replacements) in different finger joints, wrist joints as well as in the DRUJs are performed at many hospitals, and advanced arthroscopic assisted procedures (for instance for scaphoid non-unions and intercarpal bone fusions) are gaining popularity. Flexor tendon surgery, reconstructions and transfers, as well as surgery on peripheral nerves, is also surgery done outside the university hospitals.

We have trained hand therapists dedicated to postoperative treatment all over the country. The current President of the Norwegian Society is Yngvar Krukhaug, MD, PhD (Haukeland Sykehus, Bergen) and the Vice President is Jan-Ragnar Haugstvedt, MD, PhD (Østfold Hospital Trust, Moss). In 2015, the annual meeting will be held in October in Oslo.

The Norwegian Society has close relations with the societies of the other Scandinavian countries and to the Baltic countries, joining for biannual conferences.

Polish Society for Surgery of the Hand (Polskie Towarzystwo Chirurgii Ręki)

The past year was fruitful for Polish Hand Surgery. As usual, many meetings and symposia were organised to develop knowledge in hand surgery among orthopaedic, plastic and general surgeons focused on this area. Most of these programmes are ongoing events, such as the 7th International Poznań Course and the 11th Polish-German Hand Surgery Meeting in Szczecin. In addition to the scientific meetings, cadaveric and hands-on courses were organised to show new techniques and gold standards to both young and experienced surgeons.

In 2015 we will participate in more meetings and symposia including the VIII National Meeting in Gdansk, Hand Surgery Days in Szczecin and the 8th International Poznań Course in Upper Extremity Surgery.

Hands-on cadaver course in hand surgery, March 2014 Poznań.

Romanian Society for Surgery of the Hand

Hand Surgery in Romania is performed mainly by plastic surgeons, who have one year dedicated to hand surgery and one year to reconstructive microsurgery during their training program. One of the main goals of the Romanian Society for Surgery of the Hand (RSSH) is to increase hand surgery interest in students, young residents and specialists.

In this context, RSSH tried to enrich the contacts with all European and International hand societies by bringing together many well recognised personalities from all over the world. The organisation in Romania of a Post IFSSH Congress in 2004, of a FESSH Congress in 2010 and of an annual international course of hand surgery contributed a lot to this. Furthermore, we are organising annual practical courses of hand surgery dedicated to students and residents in plastic surgery and orthopaedic surgery. During these courses, using cadavers and pig skin and legs, the participants perform: hand dissection; useful flaps for hand surgery; bone, tendon, nerve and vessel repair. With the Romanian Society for Reconstructive Microsurgery, we have also developed flap dissection courses in living tissues in pigs.

The increasing number of members participating in courses and congresses all over the world proves the real interest of RSSH to be more involved in the community of European and International hand surgeons.

Professor Alexandru Georgescu, M.D., PhD
President, Romanian Society for Surgery of the Hand

IFSSH Scientific Committee on Tendon Transfers

Chair: Martin A. Posner (USA)

Committee: John Capo (USA), Ufuk Nalbantoglu (Turkey), Lyudmil Simeonov (Bulgaria), Hong-Kee Yoon (Korea)

Report submitted June 2014

Opposition Tendon Transfers Part I: Anatomy and History

Thumb opposition is maximal when the pulp of the distal segment of the thumb is directly opposite the pulp of the distal segment of the middle finger regardless of the distance between the two digits, whether grasping a marble or a baseball. (Fig. 1)

It is the most important component of thumb function and is a combination of three distinct motions: abduction, flexion and pronation. Abduction occurs primarily at the trapeziometacarpal (TM) joint. The contribution of the metacarpophalangeal (MP) joint, a condyloid joint, is less because unlike the MP joints of fingers that have a wide arc of abduction/adduction, the arc of MP motion in thumbs is more limited. The interphalangeal (IP) joint, a ginglymus or hinge joint, contributes nothing to abduction. The flexion component of opposition involves all three joints. Flexion at the TM joint positions the head of the thumb metacarpal in the same sagittal plane as the head of the middle finger metacarpal, flexion at the MP joint facilitates grasping objects of different sizes, and flexion at the IP joint is related to the type of pinch. For pulp-to-pulp pinch the IP joint is extended or is in slight flexion, and for tip-to-tip pinch it is in greater flexion. Pronation, the third component of opposition, occurs around a longitudinal axis through the center of the TM joint that has a concavoconvex anatomical configuration and is commonly referred to as a saddle joint. Based on this configuration, a saddle joint should permit motions in only two planes, flexion/extension and abduction/adduction; motions that a cowboys in the U.S. is able to do when seated in a saddle commonly referred to as a "western saddle". (Fig. 2) He can bend forward and back, and shift side to side, but he is unable to turn around because of the height of the rear part of the saddle, the cantle and the prominent horn in the front. In order to turn in the saddle the cowboy must lift himself from his seated position by

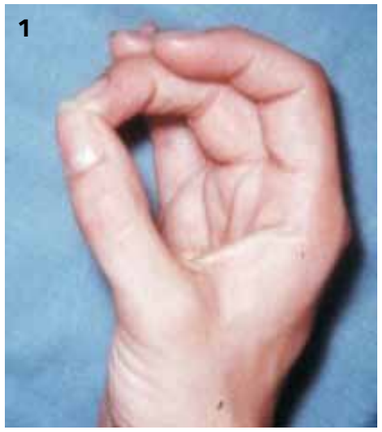

Figure 2 (left): The "western saddle". Figure 3 (right): the "English saddle"

pushing down with his boots against the stirrups. It is much easier for a rider to turn in what is referred to as an "English saddle" that has a much lower cantle in the rear and no horn in the front; the seat is not as deep as that in a western saddle. (Fig. 3)

The TM joint more closely resembles an English saddle than a western saddle because its articular surfaces are normally shallow. (Fig. 4A-B)

It is the combination of shallow articular surfaces and the laxity of the ligaments of the joint that permit pronation. (Fig. 5A-B)

Opposition is a function of the intrinsic muscles in the thenar eminence that comprise the abductor pollicis brevis (APB), the flexor pollicis brevis (FPB) and the opponens pollicis (OP). The adductor pollicis (AP) is also an intrinsic thumb muscle but it is not a "thenar muscle" because it is not in the thenar eminence. Its function, as its name indicates, is to adduct the thumb. Of the thenar intrinsic muscles, the APB is the most important for opposition; it abducts, flexes and rotates the metacarpal, abducts and flexes the proximal phalanx, and extends the IP joint. The direction of its force is toward the pisiform. Therefore, tendon transfers to restore opposition try to replicate the direction of the force of the APB. The FPB is not as important as the APB for opposition. In many patients the FPB has a dual innervation from both the median and ulnar nerves that is fortunate in those that sustain median nerve lacerations. Although these individuals lose the pronation component of opposition because the APB is paralyzed, they usually retain sufficient thumb abduction through the radial head of the FPB that remains innervated by the ulnar nerve, that they do not require opposition tendon transfers. The OP in spite of its name is the least important intrinsic muscle for opposition because it inserts solely on the first metacarpal and has no effect distal to the MP joint. Emanuel Kaplan who was an outstanding anatomist and first Chief of the Division of Hand Surgery at NYU Hospital for Joint Diseases, always referred to a tendon transfer for paralysis of the thenar muscles as an "opposition tendon transfer" rather than an "opponensplasty". His explanation was simply, "Why name an operation for the least important thenar muscle?"

The extrinsic abductor pollicis longus (APL), in spite of its name, contributes little to thumb opposition. Its primary function is to extend the thumb via its insertion into the base of the first metacarpal. Its contribution to thumb abduction is minimal and only when one of its tendon slips inserts volar to the TM joint. Rather than abducting the thumb, the APL extends the first metacarpal that is important for maintaining the longitudinal arch of the thumb. Without that arch, secondary hyperextension of the MP joint frequently develops and the IP joint flexes, resulting in a zigzag deformity. This is commonly seen in individuals, usually middle-aged females, with TM arthritis when the metacarpal base has subluxed radially due to attenuation of the ligaments, particularly the volar oblique ligament. The insertion of the APL also becomes attenuated and its normal extension force on the base of the thumb metacarpal is significantly weakened. The result is a flexed metacarpal that frequently leads to a hyperextended MP joint to compensate for the loss of extension at the TM joint. (Fig. 6) Since the APL is not an abductor but an extensor of the thumb metacarpal it is a misnamed muscle. A more appropriate name would be the "extensor metacarpus primus", the extensor of the first metacarpal.

Opposition is not actually grasp but is a preparatory position to grasp, whether it is power grasp or precision grasp. Thumb opposition and grasp are separate stages. Opposition does not require a strong muscle/tendon transfer. Any tendon capable of moving a passively mobile thumb has sufficient force to be an effective opposition tendon transfer. Only when the force of grasp is impaired is a strong tendon transfer required. Power grasp, that includes key pinch, is rarely significantly compromised in a low median nerve injury because the adductor pollicis (AP) innervated by the ulnar nerve, and the flexor pollicis longus (FPL) innervated by the median nerve in the forearm are not impaired.

Prior to any opposition tendon transfer, passive mobility of the thumb should be complete or almost complete, and passive abduction is more important than passive rotation. An adduction contracture of the first web space should be corrected and unless the contracture is rigid, non-operative therapy should be used that may involve the use of static and dynamic splints. It is important that when using an abduction force on the thumb, the force is applied to the ulnar side of the metacarpal head and not to the ulnar side of the proximal segment that could result in ulnar instability of the MP joint. When non-operative measures are unsuccessful, surgery is necessary to release the adduction contracture that almost always includes sectioning the fibrotic intrinsic muscles in the first web space, the first dorsal interosseous and adductor pollicis. In some cases, a skin contracture must also be corrected as well as a capsular contracture of the TM joint.

History of Opposition Tendon Transfers

The history of opposition transfers dates back to 1918 when Steindler re-routed one-half of the insertion of the FPL tendon to the radial side of the proximal phalanx.[1] The procedure was not effective since the portion of the tendon he re-routed was unable to move the thumb in a different direction from the intact portion of the tendon that flexed the IP joint. Several years later, Ney in 1921 cut the extensor pollicis brevis (EPB) at its musculotendinous junction and transferred the cut end of the tendon into the carpal tunnel where it was attached to either the palmaris longus (PL) or flexor carpi radialis (FCR).[2] Similar to Steindler's earlier procedure the transfer provided very limited thumb abduction and no pronation; it was not an effective opposition tendon transfer. Royle in 1938 recommended a procedure that was similar to Steindler's transfer but instead of transferring the radial one-half of the FPL to the radial side of the proximal phalanx of the thumb, he did the same using the FDS tendon of the ring finger that he re-routed through the FPL tendon sheath.[3] Unfortunately, it was as ineffective as Steindler's transfer. Thompson in 1942 modified Royle's operation by transferring the FDS around the ulnar border of the palmar aponeurosis that served as a pulley and then passed the tendon subcutaneously across the thenar eminence to the MP joint of the thumb.[4] He then split the distal end of the tendon and attached one end into the radial base of the proximal phalanx and the other end into the neck of the metacarpal. The procedure became known as the "Royle/Thompson procedure" named for the two surgeons who described it and for the sequence in which they published their articles. It has also been referred to as the "Thompson/Royle procedure" with Thompson's name first because he improved the procedure with his modification. The procedure is generally recommended for patients who have sustained both median and ulnar nerve injuries resulting in paralysis of all the intrinsic thumb muscles, both abductors and adductors. The procedure "splits the difference" between an opposition tendon transfer and an adductor transfer and attempts to restore both thumb functions. Unfortunately, in most cases neither function is restored to a satisfactory level. It is far preferable for the patient who has suffered a total loss of intrinsic thumb function and has significant disabilities due to the loss of both opposition and thumb adduction characterized by weak key pinch, to use separate tendon transfers for each function. The tendon transfer for the more severe functional deficit is usually performed first.

Many other techniques using a variety of donor muscles have been

described for opposition tendon transfers (see below). The most successful transfers are those in which the line of force of the donor motor extends from the area of the pisiform to the insertion of the APB. This is essentially the method described by Bunnell and Burkhalter (see Part II) that restores both abduction and pronation of the thumb. Variations in the manner in which the donor tendon is attached to the thumb have been described that will be discussed with those transfers.

Chronology of Procedures reported in the literature

1918 – Steindler:[1] radial half of FPL through tendon sheath to radial side of phalanx

1921 – Ney:[2] PL or FCR attached to EPB that is transposed into carpal tunnel

1921 – Taylor:[5] Extensor digiti quinti proprius (EDQP) around ulnar border of hand to radial side of thumb metacarpal

1921 – Huber,[6] (+ Nicolaysen 1922[7]): abductor digit quinti (ADQ) in hypothenar eminence to APB

1922 – Kruckenberg:[8] radial half of FDS (middle) re-routed as described by Steindler

1924 – Lyle:[9] FCR to EPB and radial half of FPL to radial side of proximal phalanx

1926 – Howell:[10] FPL transected at wrist, rerouted around the ulna to radial side of the thumb

1929 – Camitz:[11] PL + palmar aponeurosis to radial side of thumb MP joint

1938 – Bunnell:[12] FDS (ring) through pulley in FCU to ulnar base of proximal phalanx

1938 – Royle:[3] FDS (ring) through tendon sheath to radial side of proximal phalanx

1942 – Thompson:[4] FDS (ring) rerouted ulnar border of palmar aponeurosis to the thumb

1947 – Phalen and Miller:[13] Extensor carpi ulnaris (ECU) to rerouted extensor pollicis brevis

1956 – Zancolli:[14] EPL through carpal tunnel into APB

1959 – Riordan:[15] insertion of FDS; one half into APB and the other half into EPL 17

1962 – Henderson:[16] ECU, ECRL, ECRB or BR prolonged with a graft or to EPB

1967 – Makin:[17] translocation of intact FPL through an osteotomy in the proximal phalanx

1968 – Tubiana and Valentin:[18] EPL around FCR superficial to carpal tunnel into APB

1969 – Schneider:[19] described transfer of EDQP proposed by Taylor in 1921

1973 – Magnus:[20] FPL around FCU to APB, tenodesis of FPL at interphalangeal joint

1973 – Burkhalter:[21] Extensor indicis proprius (EIP) around ulnar border of hand to APB

The following commonly performed opposition transfers will be discussed in part II of this article:

1. Abductor Digiti Quinti (ADQ) - Huber/ Nicolaysen Transfer
2. Palmaris Longus (PL) - Camitz Transfer
3. Flexor Digitorum Superficialis (FDS) – Bunnell Transfer
4. Extensor Carpi Ulnaris (ECU) – Phalen-Miller Transfer
5. Extensor Indicis Proprius (EIP) Transfer – Burkhalter Transfer

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IFSSH Scientific Committee on Tendon Transfers

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Report submitted June 2014

Opposition Tendon Transfers
Part II: Commonly Performed Tendon Transfers

Part I of this article discussed the anatomy and physiology of thumb opposition. Part II will discuss tendon transfers to restore this important thumb function. Rather than discuss every opposition tendon transfer since many are only of historical interest, we will discuss those transfers that are currently being performed in the chronological order they were reported in the medical literature. Significant technical aspects of each procedure will also be discussed.

Figure 1: Paralysis of thenar muscles following median nerve laceration several years earlier with total loss of opposition

1. Abductor Digiti Quinti (ADQ) - Huber/Nicolaysen Transfer (1921 and 1922)

Huber in 1921 and Nicolaysen in 1922 independently proposed transfer of the abductor digiti quinti (ADQ), an ulnar nerve innervated intrinsic muscle in the hypothenar area of the palm, to restore thumb opposition.[1,2] In term of longevity, it is the longest performed opposition tendon transfer. The primary indication for the procedure is congenital absence of the thenar muscles because in addition to restoring opposition, it adds bulk to the thenar eminence, thereby improving the aesthetic appearance of the hand.[3] It is also useful for some irreparable post-traumatic injuries when other tendons are not available for transfer. (Fig. 1)

The operative approach exposes the entire length of the ADQ via an incision along the radial border of the hypothenar eminence that is curved distally and ulnarly into the distal palmar crease and then further distally along the ulnar side of the palm to the base of the little finger. The proximal end of the incision is also curved ulnarly into the wrist flexion crease. (Fig. 2) An incision on the ulnar border of the hand at the junction of the glabrous and dorsal skin, curving radially at the wrist crease is a reasonable alternative. The insertions of the ADQ into the ulnar base of the proximal phalanx and into the ulnar lateral band of the extensor mechanism are released, and the muscle is mobilized from the underlying flexor digiti quinti (FDQ) muscle. The neurovascular bundle that enters the ADQ on its dorsal surface just distal to the pisiform is identified and protected. (Fig. 3) A second incision is then made on the radial side of the thumb MP joint and is connected to the first incision by a subcutaneous tunnel of ample width to accommodate passage of the ADQ muscle. (Fig. 4) The ADQ muscle is rotated 180° on its longitudinal axis, akin to turning a page in a book, with the result that the original ulnar portion of the muscle is proximal and

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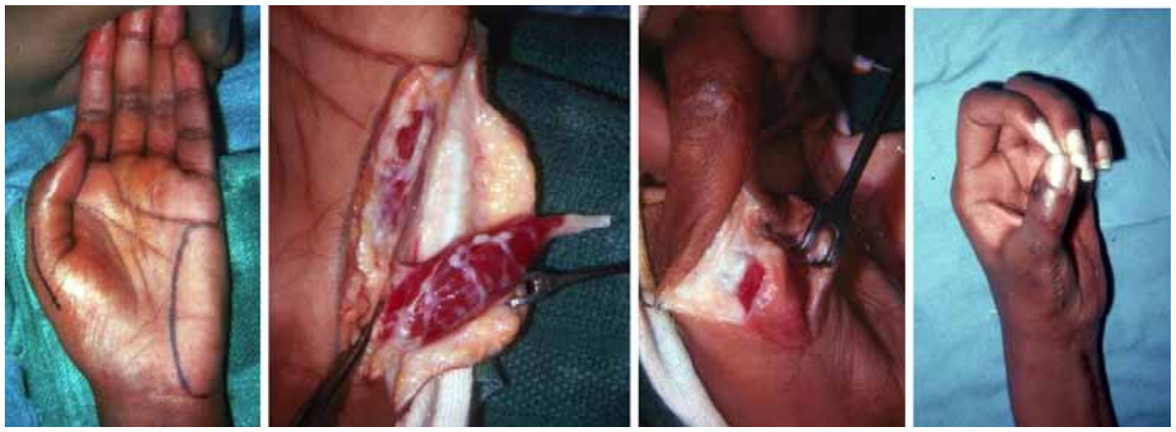
the original deep portion is superficial. If necessary, the origin of the ADQ is partially released from the pisiform in order to mobilize the muscle sufficiently to reach the thumb. The muscle origin can be completely released but its attachment to the FCU must be preserved in order to protect the neurovascular bundle from any undue tension being placed on it. The distal end of the ADQ is sutured into the conjoined tendon of the APB and FPB on the radial side of the thumb MP joint. (Fig. 5)

2. Palmaris Longus (PL) – Camitz Transfer (1929)

Described by Camitz in 1929, transfer of the PL has been recommended for elderly patients with longstanding Carpal Tunnel Syndrome who have complete thenar intrinsic muscle atrophy.[4] Usually, surgical decompression of the median nerve is all that is required in these patients to relieve their sensory complaints, particularly dysesthesias. However, in some cases when the loss of opposition is disabling, an opposition tendon transfer should be considered. Obviously, using the PL requires that its presence and approximately 20% of individuals do not have the tendon and are not aware of this since it provides no important hand function.[5] A Camitz transfer is an uncomplicated procedure and involves little more than extending distally the incision used to decompress the carpal tunnel. The PL is in effect lengthened with a strip of palmar fascia to which it is inserted, the pre-tendinous band to the middle finger that is then divided as distal as possible and sutured into the insertion site of the APB. (Fig. 6-7) Since the direction of force of the PL is to the radial side of the mid-line of the wrist, it neither flexes nor pronates the thumb. The transfer provides only abduction and the operation has appropriately been described as an "abductorplasty" rather than an opposition transfer.[5] (Fig. 8) If pronation is required, and for effective opposition it usually is, a different transfer such as the flexor digitorum superficialis opposition transfer that will be discussed in #3 should be used.

3. Flexor Digitorum Superficialis (FDS) – Bunnell Transfer (1938)

Bunnell recognized the important role of the APB in thumb opposition and its line of force toward the pisiform bone.[6] In order to replicate that force direction, he used a flexor digitorum superficialis (FDS) tendon, usually the FDS to the ring finger, that he routed through a pulley constructed in the flexor carpi ulnaris (FCU) tendon near its insertion into the pisiform. He then passed the FDS tendon subcutaneously across the palm to the thumb. At surgery, the FDS tendon is divided through a small window in the flexor tendon sheath between the A-1 and A-2 pulleys that leaves a distal stump of tendon that is approximately 1.5 cm in length. Cutting the FDS in this fashion is preferable to detaching the tendon at its insertion into the middle phalanx that can also result in a hyperextension or swan-neck deformity of the PIP joint in individuals with supple joints. The latter problem does not occur because the short distal tendon stump functions as a tenodesis of the PIP joint. A slight loss of 10-15° of PIP extension is not a functional impairment but a greater loss could be. It is therefore important to passively extend the PIP joint post-operatively to insure that there is not a more severe tenodesis effect from the distal tendon stump. Dividing the FDS proximal to the PIP joint also avoids damaging the vincula that when disrupted results in some bleeding within the sheath that can lead to scarring and a flexion contracture of the PIP joint. The possibility of scarring developing within the sheath resulting in a significant loss of motions of the donor finger, or any finger, is avoided by encouraging post-operative active exercises for the fingers and passive extension of the PIP joints, especially the PIP joint of the donor finger.[7]



From left to right: Figure 2: Operative incision; Figure 3: ADQ elevated from FDQ preserving neurovascular bundle (probe); Figure 4: Attachment of tendon of ADQ into insertion of APB whose muscle is pale due to chronic denervation; Figure 5: Post-operative opposition restored

From left to right: Figures 6 and 7: PL "lengthened" with a pre-tendinous band that is then tunneled under skin and attached to site of insertion of APB; Figure 8: Pre-operative and post-operative photos

The pulley in the FCU is constructed using the distal 4-5 cm of the tendon that is split longitudinally. The radial half of the split tendon is then cut proximally and passed through a slit in the intact distal portion of the FCU forming a tendon loop or pulley. The FDS tendon that was withdrawn through the incision in the wrist and distal forearm is passed around the FCU and then through the loop. (Fig. 9) This is an important sequence to follow because if the FDS tendon is simply passed around the FCU and not through any pulley, it can slide proximally along the FCU and away from the pisiform, and if the FDS tendon is passed only through the pulley and not around the FCU, as described in many texts, it can also pull away from the pisiform but in a radial direction. Rerouting the FDS around the intact portion of the FCU ensures that it remains on the ulnar side of the wrist and cannot shift radially, and passing it through the tendon loop insures that the direction of pull will be toward the pisiform and in line with the normal force of an APB.

There are several techniques used for attaching the FDS to the thumb. Probably the most common site for insertion is the APB tendon. A dual-insertion into the APB tendon and into the thumb extensor mechanism is sometimes used when there is an extension deficit in addition to the loss of opposition. Bunnell recommended that the FDS tendon be inserted into the ulnar side of the base of the proximal phalanx as a means to achieve not only maximum abduction but also maximum pronation. (Fig. 10 - 11)

The senior author and Dick Smith, who were in practice together in New York at the Hospital for Joint Diseases, frequently discussed the optimum attachment of the FDS tendon to achieve maximum thumb opposition. The senior author preferred the ulnar side of the base of the proximal phalanx. Dick preferred the APB tendon and in his classic textbook, "Tendon Transfers of the Hand and Forearm", he discussed the tendon insertion in terms of the "tangent" it formed with the thumb.[8] He stated that if the transfer passed dorsal to the MP joint to be inserted on the ulnar

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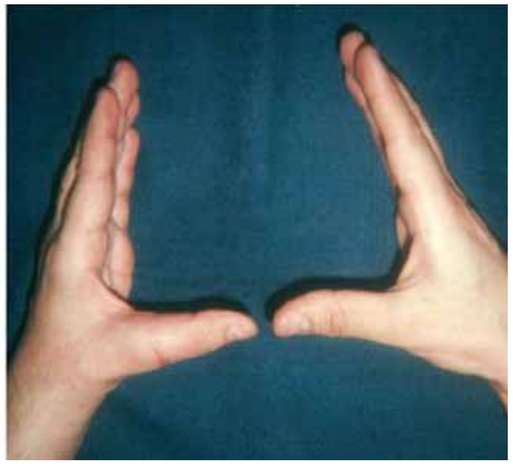
side of the proximal phalanx it would not improve pronation. The senior author's preference for inserting the tendon into the ulnar side of the proximal phalanx is not intended to produce a force that curves around the thumb. By positioning the tangent closer to the dorsum of the MP joint than is the location of the APB tendon, he believes the force is more likely to achieve better thumb rotation (pronation). This disagreement between the senior author and Dick was something they both enjoyed and they often joked about it. Dick also made it an "inside joke" because whenever they were together and Dick was giving a lecture on an entirely different subject, he would usually mention the insertion he preferred for opposition tendon transfers. The senior author was only person in the audience who understood his playful jab.

Regardless of the method of insertion, tension on the tendon transfer is adjusted with the wrist in approximately 30° of flexion and the thumb in complete opposition to the middle finger. Gauging the correct amount of tension is obviously important. An effective method that follows the principles of the Blix curve is to grasp the distal end of the donor FDS tendon with a straight mosquito clamp, exert maximum traction on the tendon and measure that distance. The FDS tendon is then attached to the thumb under sufficient tension to equal approximately one-half of that distance. Tension of the transfer is correct when with passive wrist extension the thumb moves into complete opposition. Following suturing the tendon at a proper tension, the wrist is immobilized in approximately 30° of flexion and the thumb in full opposition for 4 weeks. At the end of 4 weeks, the splint is removed several times daily for active range of motion exercises but is worn at all other times for an additional 1- 2 weeks.

Bunnell's FDS transfer is probably the most commonly performed operation for thumb opposition following median nerve injuries. It is obviously not an option in high median nerve injuries that result in paralysis of all the FDS muscles, and in high ulnar nerve injuries that results in paralysis of the FDP muscles to the ring and little fingers since the FDS is the only functioning flexor tendon in the ring finger and obviously must be retained. The FDS tendon to the middle finger can be substituted in such cases because the FDP to that finger is median nerve innervated.

4. Extensor Carpi Ulnaris (ECU) – Phalen-Miller Transfer (1947)

Phalen and Miller in 1947 proposed the ECU as a tendon transfer for thumb opposition.[9] Since the ECU is not of sufficient length to reach the thumb it is "lengthened" in a manner recommended approximately 25 years earlier by Ney who cut the extensor pollicis brevis (EPB) at its musculotendinous junction, leaving intact its insertion into the dorsal base of the proximal phalanx. He then transferred the distal end of the EPB tendon into the carpal tunnel and attached it to either the PL or flexor carpi radialis. [10] Ney's procedure restored some limited thumb abduction but it was not an effective opposition transfer. Phalen and Miller instead transferred the distal cut end of the EPB across the palm and attached it to the ECU that they detached from its insertion into the base of the fifth metacarpal. The tendon junction was on the ulnar side of the wrist and the direction of the transfer was in line with the APB, the most important intrinsic muscle for thumb opposition.



From left to right: Figure 9: The FDS tendon is first passed around the ulnar border of the FCU tendon and then through the pulley constructed using one-half of that tendon; Figure 10: Insertion of the FDS into the ulnar base of the proximal phalanx provides maximum pronation; Figure 11: Post-operative opposition of the left thumb equaled that of thumb in uninjured hand.

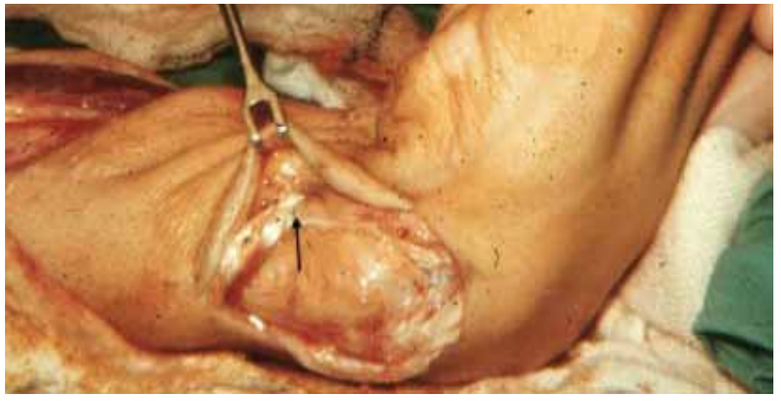


Figure 12. Attachment of ECU tendon to transposed distal end of EPB (arrow)

The operation requires three incisions and the sequence of the first two incisions is unimportant. One is over the dorsoradial aspect of the distal forearm proximal to the extensor retinaculum where the EPB is transected at its musculotendinous junction, and the other is over the dorsum of the thumb MP joint. At this second incision, the EPB tendon is mobilized up to the MP joint to avoid a hyperextension deformity but not distal to the joint that can result in an opposite flexion deformity when the tendon shifts volar to its axis of motion.[11] The latter problem can be avoided by looping the EPB tendon around the EPL tendon. It is also important to cut the fascial connections between the EPB and EPL because failure to do so can result in hyperextension of the interphalangeal joint. The third incision is on the ulnar side of the wrist where the ECU is cut at its insertion into the fifth metacarpal, taken out of its sheath and then attached to the EPB that had been passed subcutaneously across the palm from the dorsum of the thumb MP joint. The location of the tendon junction depends on the length of the EPB. When it has sufficient length, the junction is on the dorsoulnar side of the wrist but if its length is shorter, the junction is in the area of the pisiform. (Fig. 12) Although excursion of the transfer is limited, the ulnar border of the wrist functions as an effective pulley for opposition.

An important prerequisite for a Phalen-Miller opposition tendon transfer is intact function of the flexor carpi ulnaris (FCU) in order to preserve balance of the wrist post-operatively. [9] When the FCU is weak through injury or is paralyzed secondary to a high ulnar nerve injury or neuropathy, the wrist will deviate radially post-operatively. Although a Phalen-Miller opposition transfer should not be performed with a high ulnar nerve injury or neuropathy that has resulted in severe weakness or paralysis of the FCU, it can be performed with low ulnar nerve injury or neuropathy that is combined with a median nerve injury. It can also be performed in other situations when other potential donor tendons are unavailable or required for other transfers. It is not a commonly performed transfer and is indicated only when other options are not available.

5. Extensor Indicis Proprius (EIP) Transfer – Burkhalter Transfer (1973)

In the patient with total intrinsic muscle paralysis due to combined low median and ulnar nerve injuries, the extensor indicis proprius (EIP) described by Burkhalter in 1973 is often the procedure of choice to restore thumb opposition.[12] It has several advantages that include preserving the FDS tendons to correct clawing of the fingers, no loss of grip strength since an expendable extensor tendon is used, using a tendon that has sufficient length and does not have to be lengthened, and construction of a pulley is

unnecessary. The route of an EIP transfer is more direct than a FDS transfer whose path takes a more acute angle as it passes through a pulley in the FCU. By having a more direct line of pull, significantly less force is required for an EIP transfer than a FDS transfer.[13]

The EIP tendon is harvested at its insertion through a small transverse incision over the dorsum of the index MP joint. Some recommend it should be harvested with a contiguous strip of the extensor hood to insure that it is of sufficient length to reach its insertion. This is usually unnecessary and can cause a problem if the extensor hood is not properly repaired because the EDC can shift radially post-operatively and result in an extension lag.[14] The EIP is usually transected just proximal to the extensor hood and its distal stump is sutured to the EDC in order to preserve a balanced extensor pull on the proximal phalanx. A small transverse incision just proximal to the pisiform permits retrieval of the EIP tendon that is then passed subcutaneously to the radial side of the thumb MP joint where it is sutured to the APB tendon. Tensioning of the transfer and the post-operative care are the same as for a FDS transfer.

When discussing an EIP transfer for thumb opposition, mention should also be made of transfer of the other proprius tendon, the extensor digiti quinti proprius (EDQP) that was described many years earlier by Taylor in 1921 and later by Schneider in 1969. [15,16] Both the EIP and EDQP have similar advantages in that they are both available in patients with volar wrist injuries, in patients with combined low or high median and ulnar nerve injuries, do not require lengthening with a tendon graft, and have almost no deleterious effect on post-operative hand function. The disadvantage of using an EDQP is that it is often the dominant extensor tendon to the little finger and using it as a transfer could result in a loss of extension of the little finger that has only a rudimentary extensor digitorum communis. It is primarily for that reason that the EIP is preferred to an EDQP for an opposition transfer.

Conclusions

Opposition is not grasp but a pre-position for grasp that involves abduction, flexion and pronation. The most important thenar muscle is the APB whose direction of pull is toward the pisiform, and this is the muscle that opposition tendon transfers replicate. Numerous opposition transfers have been described that differ in the donor tendon (or muscle when the ADQ is used), the route of the transfer, and method of attachment to the thumb. No one transfer is applicable for every clinical condition, and each transfer has its advantages and disadvantages.

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IFSSH Scientific Committee on Degenerative Arthritis

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Report submitted May 2014

PIP Joint Replacement with a Pyrolytic Carbon Implant

Introduction

From the 1960s, finger joint prosthetic reconstruction has been mainly obtained using single-block silicone spacers, whose stems are free, with gliding into the medullary canal (piston effect) according to the biomechanical concepts and models expressed by Swanson over 30 years ago [(1)]. These prostheses represent one of the most frequently used medical devices in rheumatoid patients requiring metacarpophalangeal (MP) joint surgery. Clinical experience in the reconstruction of proximal interphalangeal (PIP) joints has been much less satisfactory. The silicone spacers do not offer lateral stability and therefore suffer from a frequent incidence of angular instability and secondary evolutionary deformity that may cause breakage of the stem at the junction with the central body. This brings about the risk of synovial inflammatory reactions, as a response to silicone debris.

In 2001 the EEC authorized the use of the PIP joint prosthesis, designed by J. Stanley (Wrightington Hospital, Wigam, U.K.) and R. Beckenbaugh (Mayo Clinic, Rochester, MN) made out of Pyrocarbon with a graphite core. This material has been used for some time now for medical implants, being biologically inert and having a low incidence of wear and tear.

It is a bicondylar implant made of graphite with an outer Pyrocarbon layer, which represents the 1mm transparent edge visible around the prosthetic components on X-rays.

The device is a semi-constrained press-fit; the components have been designed anatomically and the device requires a minimal articular resection, which is performed in respect of the anatomic center of rotation of the joint, preserves the collateral ligaments and reduces the axial torque force on the bone-implant interface.

The proximal element has a condylar shape and is implanted after having carried out 90° transverse and 60° volar osteotomies of the distal part of proximal phalanx (P1); the distal component has a matching bicupped condylar conformation.

Discussion

There is quite a small number of mid/long-term reports of PIP joint Pyrocarbon arthroplasty [(2,3,4,5,6,7,8,9,10,12,13)]. The opinions reported by the authors are somewhat controversial. Issues which are debated relate to: the surgical approaches, the rehabilitation regime, the evolutional X-ray findings, the assessment tools and, in brief, the overall appraisal.

Surgical approaches:
Dorsal, lateral and volar approaches are reported. Most frequently a dorsal surgical access is used. Some authors [(2, 3, 5,10)] prefer a lateral or volar approach and their rationale is because tendon continuity is preserved and a simpler and earlier rehabilitation can be performed.

With a dorsal approach either a longitudinal extensor tendon splitting or a V shaped tenotomy [(11)] is carried out preserving the central band insertion. The dorsal capsule is elevated whereas the collateral ligaments can be spared. The articular resection is then performed and the medullary canals are broached in order to implant the prosthetic components.

A lateral approach has the advantage of preserving extensor and flexor tendon integrity. The skin incision is longitudinal on the lateral aspect of the proximal phalanx and is then curved dorsally over the middle phalanx. The extensor apparatus is

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elevated after having severed the oblique and transverse fibers of the retinacular ligament; the tendon is then laterally dislocated preserving the bony insertion of its central band. The volar neurovascular structures are not seen and remain protected by the surrounding soft tissue. The ligament complex is elevated as a single triangular flap and proximally reflected, performing a V shaped incision whose longitudinal branch corresponds to the dorsal margin of the collateral ligament, whereas the anterior-oblique one separates the collateral and accessory collateral from the phalango-glenoidal ligament. The proximal insertion of the volar plate and the dorsal capsule are then partially released in order to laterally dislocate the joint, having the contra-lateral collateral ligament complex as a pivot point. Bone resection and medullary canal reaming are then performed and the Pyrocarbon components are implanted. The joint is reduced and the collateral ligaments are re-sutured to the phalango-glenoidal component. The retinacular ligament is sutured to the lateral band in order to complete the anatomic reconstruction of the extensor apparatus[3].

In a volar approach the palmar skin is incised in a zigzag fashion (Bruner incision). The flexor tendon sheath is exposed. A partial release of the flexor tendon sheath at the PIP joint level is performed to allow lateral retraction of the flexor tendons. The palmar plate is more commonly released from the volar rim of the middle phalanx and retracted. The accessory collateral ligaments are detached. The articular surfaces are removed in reverse order from the dorsal approach. The proximal phalangeal condyles are removed with a 60º-angled cut, and the remaining dorsal aspect of the articular surface with a vertical cut. The base of the middle phalanx is also removed with a vertical cut. This is done carefully so as to preserve the insertion of the central slip.

X-ray findings:

X-ray findings following a Pyrocarbon arthroplasty show some peculiar aspects that are the subject of discussion and can be used for classifying some predictable patterns of evolution. Pyrocarbon implant settlement happens by means of an appositional bony process that can usually be observed on a sequential series of x-rays and takes place in the first 2 years after surgery[2,3,5,10,12]. This is evidenced by the formation of a high-density bony line, which surrounds the implant stem and seals the medullary canal at the level of the tip of the stem (3,10). The adaptive bony process is a progressive phenomenon, initiated as soon as post-operative mobility is permitted, whose evolution has a finite time of development. Any physiological axial settlement – or any evidence of progressive pathological subsidence and/or loosening - is observed within such a time. No late activations of bone remodelling were reported after the dense bony peri-stem line had become evident on the X-rays.

Rehabilitation:

The rehabilitation regime is correlated to the surgical approach, as tendon and peri-articular soft tissue healing are dependent on this. A dorsal approach is the most commonly used and it requires a longitudinal or V-shaped extensor tenotomy. Mobilization is started not earlier than 4 days after surgery; a dynamic PIP joint extension splint is usually worn during the day and it is gradually adjusted to allow for 60° of PIP flexion by 4 weeks post operation. Splinting is maintained for 4 to 6 weeks. A lateral or volar approach permits an earlier and less restricted mobilization. Active joint mobility is allowed wearing a dorsal custom made static splint that limits PIP joint extension to 5° and prevents lateral deviation. Complete joint extension is to be avoided for the first two weeks, so as to favor healing of the articular ligament complex. A palmar resting splint is worn at night, keeping MP and PIP joints flexed in a resting position with the distal interphalangeal (DIP) joint extended. Four weeks after surgery activities of daily living are permitted, wearing a protective buddy-taping to the adjacent finger for 2 months; an oval eight splint can also be used to prevent PIP joint hyperextension. Hand therapist supervision is recommended for three months after the operation.

Assessment and results:

Concerning the results, some recent mid-term surveys are quite significant for the number of revised cases[2,5,9,13,15]. However, there is no uniformity in assessing the outcomes and therefore a comprehensive comparison of the single data cannot be done. The following parameters were evaluated: patient's overall satisfaction, pain relief, grip and key-pinch strength, ROM, quick-DASH and Michigan Hand Outcomes Questionnaire score. The data are summarized in Table 1.

Sex ratio was 2.5:1 female:male. Etiology was predominantly osteoarthritis and post-traumatic arthritis. Some authors include RA and psoriatic patients and they do not separately evaluate degenerative and inflammatory conditions. This should be considered as a drawback in the overall assessment as soft tissue conditions and a systemic disease substantially interact with the healing process; actually, the proportion of patients with complications was significantly greater in those with a

Table 1:

	Patient satisfaction	Pain Pre-op.	Pain Post-op	Grip Pre-op.	Grip Post-op	Pinch Post-op	ROM Pre-op.	ROM Post-op	DASH Pre-op.	DASH Post-op	MHQ
Bravo et al. (2007)	77% satisfied	6 (VAS)	1 (VAS)	19 kg (3 – 36)	24 kg (4 – 41)	4.4 kg (2 – 10)	40° (0°-60°)	47° (10° – 90°)			
Sweet et al. (2011)	3.4 (Likert scale)		3 (VAS)				57° (15°-95°)	31° (0°-100°)			53
McGuire et al. (2011)	4.2 (Likert scale)		Excellent Pain relief				30°	66°			
Ceruso et al. (2011)	9.2 (1-10 scale)	7.3 (VAS)	0.8 (VAS)		25 kg	6.9 kg	14.5° AROM	50° AROM	43	16	
Watts et al. (2012)	2 (PEMq)		0 (VAS)		96% of other side		25° (0°-85°))	30° (0°-90°)		22 (10-48)	
Ono et al. (2012)				11+7 kg	12.4+13.5 kg	4.8 kg	43°+6	51°+ 24			62
Heers et al. (2012)	All pat. satisfied		0-5 (VAS)				46°	58°			
Mashhadi et al. (2012)	All pat. satisfied		0.9 (VAS)		15 kg	7.7 kg	36° AROM / 37° PROM	46° AROM / 58° AROP			
Hutt et al. (2012)		4.2 rest / 8.6 act.	0 rest. / 0 act.				40°	45° (0°-90°)			
Tagil et al. (2013)	5.9 (COMP)	4 rest / 6 act.	0 rest / 1 act.	19 kg	25 kg		53°	54°	40	25	
Reissner et al. (2014)		7.6 (VAS)	0.7 (VAS)	21 kg	17 kg		36°	29°		21	

diagnosis of articular inflammatory disease [2,5]. The 3rd finger is the most often involved, followed by the 4th, 2nd and 5th. The majority of the series include multi-digital arthroplasties.

Patient's satisfaction and pain relief are mostly reported as good. As a final comment, a larger number of authors will continue to use a Pyrocarbon implant [2,3,5,6,7,9,12,13], a lesser number [4, 8,10] does not support its further use.

X-ray findings were evaluated according to different scoring systems: Herren System [14], Sweet and Stern Grading System [4], Nelson Hospital scoring System [7]. The implant settlement was analyzed yearly by comparing the X-rays of post-operative controls with sequential X-rays.

At the radiographic assessment radiolucent lines, subsidence and settling of the implant were evaluated. A certain number of patterns of evolution is described: no variations during time, early X-ray changes followed by unmodified X-ray findings on further controls as implants settle in a stable position [12,13], progression of implant tilting, subsidence and/or loosening [4]. It should be noted that ongoing X-ray modifications were all observed during the first 18-24 months post-op [3,5,9,10]. In none of the cases, did implant subsidence start later than this time when former controls had shown a stable implant condition. Implant settlement or tilting was not always related to a symptomatic condition [5,13].

As for reoperation rate, additional procedures and implant revisions are summarized in Table 2:
Total implant failures, requiring either conversion to a Swanson spacer or PIP joint fusion, ranged from 0 to16%. A single component substitution was rarely reported (av. 0.5 %) [3,13].

Table 2:

	N.	ADDITIONAL SURGERY	REVISION ARTHROPLASTY (total failures)
Sweet et al. (2011)	31 implants	1 excision of exostosis	4 arthrodeses 1 Silicone implant
McGuire et al. (2011)	57 implants	6 arthrolyses/tenolyses 7 FDS tenodeses	5 (9%) revision 4 Silicone implants 1 larger proximal component
Ceruso et al. (2011)	40 implants		1 arthrodesis
Pritch & Rizzo 2011	203 implants (203/294 from the article were pyrocarbon)	6 tenolyses	3 Silicone implants 1 larger proximal component
		50 (24.6%) 25 arthrolyses/tenolyses 9 ligament/joint stabilization 8 FDS hemitenodeses 4 bone spur removals 1 exposed implant 1 triggering 2 extensor tendon repair	29 Revisions (14.2%) 18 revision 12 larger 4 SRA (+/- cement) 2 silicone 7 arthrodeses 4 amputation
Watts et al.	97 implants	22 (23%)	13 (13%) revision

Conclusions

PIP joint reconstruction by prosthetic replacement has peculiar aspects in relation to replacement of other more proximal articulations. A clear appreciation of these can help in understanding the reasons for the inconveniences encountered in hand joint replacement surgery, whose outcomes are not yet comparable to the common standards currently obtained for other joints. Soft tissue handling and reconstruction is as relevant as the characteristics of the prosthetic device.

Potentially advantageous prosthetic features are the bicondylar semi-constrained anatomic design, which permits a limited bone resection, the press-fit non-cemented fixation, the biological compatibility and low wear proprieties of the material with a similar modulus of elasticity to cortical bone. As for soft tissue handling, the characteristics of the surgical approach should be focused, considering the maintenance of the extensor apparatus as a key factor. Accordingly, a tendon sparing approach is to be regarded as a first choice option in PIP joint arthroplasty as it permits an anatomical dissection of the peri-prosthetic soft tissues and a stable post-operative ligamentous reconstruction, which allows an earlier and more straightforward rehabilitation of the gliding mechanisms. Finally, a standardised rehabilitation protocol is an essential tool in order to obtain a satisfactory outcome in PIP joint arthroplasty; the patient should undergo surgery only after having been informed that an immediate post-operative mobilization program will be carried out under the supervision of the hand-therapist and with the support of appropriate custom-made orthoses.

As for implant failures, two main risk factors should be considered: the axial alignment of the stems, which is to be precisely obtained intra-operatively, and the adequate sizing of the implant components, whose articular prosthetic plates should be supported by the metaphyseal cortices [3,5].

Malalignment or inadequate cortical support of the components should not be disregarded, as they will be likely amplified by the peculiar reactive remodelling of the peri-prosthetic phalangeal bone

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IFSSH Scientific Committee on Degenerative Arthritis – CMC Joint

Chair: David Warwick (United Kingdom)
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Report submitted March 2014

Degenerative Arthritis – Thumb CMC Joint

KEY LEARNING POINTS
- **Thumb base arthritis is very common**
- **It is usually not symptomatic**
- **Always delay surgery because symptoms often settle**
- **Consider joint sparing operations**
- **Complex, expensive or experimental operations have not been shown to surpass simpler cheaper procedures**

TRAPEZIECTOMY
- **interposition or ligament suspension convey no benefit yet increase complications**
- **fusion and joint replacement are no better yet increase cost and complications**

ADVANTAGES OF JOINT REPLACEMENT
- **Quicker recovery**
- **Length and mobility retained**

DISADVANTAGES OF JOINT REPLACEMENT
- **Technical difficulty**
- **Expensive**
- **Early risk of dislocation**
- **Inevitable later loosening**
- **No proven advantage over trapeziectomy**

Introduction

Thumb base arthritis is a common affliction. It is particularly common in females, with 33% of post menopausal women affected (Armstrong et al 1994). It usually occurs spontaneously, probably with a genetic predisposition. Only occasionally are other causal factors such as trauma or infection identified. Joint laxity may be a factor in those with a younger onset.

The natural history is usually benign. An early painful phase often settles; reassurance is essential. Painkillers, steroid injections, functional aids and perhaps a splint can reduce symptom until the predicted resolution occurs. Precipitous surgical treatment is wrong.

Pain is localised to the saddle joint at the base of the thumb. The importance of this joint to hand function means that functional difficulties can be profound. Pain localised to the scaphoid tubercle indicates that the adjacent scapho-trapezo-trapezoid (STT) joint may be involved, either alone or in association with the carpometacarpal (CMC) joint.

Meticulous clinical examination should establish the diagnosis; the joint may be lax or stiff; squaring of the joint with fixed adduction at the base and secondary hyperextension of the metacarpophalangeal (MP) joint is typical in later stages. Radiographs, especially a specific antero-posterior "Robert's View" should show degenerative changes; MRI or even arthroscopy can identify earlier disease in a pre-radiological phase. There is a poor correlation between radiological degree and symptoms; the most advanced disease may be quiescent; severe symptoms can accompany the mildest of radiological change. This discrepancy underscores the need for calm observation rather than premature surgery. This approach is even further validated by the absence of any clearly superior surgical treatment as assessed by formal systematic review (Wajon et al 2009, Vermeulen et al 2011).

In this article we review the options for treatment, with an emphasis on avoiding or delaying surgery with simple non operative treatment, and a reminder that there are effective joint sparing procedures.

Non-Operative Treatment

Therapy and Splints: The most effective design or program of exercise is unclear but there is RCT evidence that custom made splints can impart durable pain relief and functional improvement (O'Brien et al 2013) s (Rannou et al 2009). (Boustedt et al 2009).

Steroid injections: Cortisone injection to the trapeziometacarpal joint is widely used (Wolf and Delaronde 2012). Injections are effective at least in the short term (Meenagh 2006) but have possible adverse effects and do not improve articular cartilage morphology; they are associated with elevations in blood sugars in diabetic patients.

Hyaluronidase injections: The role of hyaluronidase (HA) in the management of base of thumb arthritis, and whether or not it is equivalent, superior or additive to cortisone, has not yet been established despite randomised trials (Fuchs et al 2006, Stahl et al 2005, Hayworth et al 2008); further data are needed (Moran et al 2009) .

Complications after intra-articular HA viscosupplementation include acute local reactions, the development of acute gout and synovial granulomatous inflammation, especially with more than one course of treatment (Moran et al 2009, Hamburger et al 2003). The treatment is relatively expensive.

Joint preserving Surgery

If non-operative treatment fails, then the hand surgeon joint should first consider whether an operation which preserves the joint is suitable. This must be preferable to deletive surgery such as arthrodesis, trapeziectomy or replacement all of which have potentially irreversible disadvantages

Ligament reconstruction: Stabilisation of the painful, hypermobile trapezio-metacarpal by reproducing the palmar beak ligament with a portion of the flexor carpi radialis tendon can effectively reduce symptoms; (Lane and Eaton 1987, Takwale et al 2004) ; progression to arthritis is perhaps slowed (Freedman et al 2000). The technique can be very effective in reducing the

pain of early stage arthritis as well (Eaton et al 1984). More recently, attention has been drawn to the potential importance of stabilising the dorsal ligamentous structures as well as the palmar beak ligament (Coleman 2007, Lin et al 2013). Potential disadvantages are stiffness and quite a prolonged recovery (Tomaino 2001).

Osteotomy: Extension- or extension-abduction osteotomy shifts mechanical loading at the trapeziometacarpal joint more dorsally and redirects force vectors to increase base of thumb stability against dorsal translation. (Tomaino 2006, Koff et al 2006)

The procedure is straightforward; care must be taken to avoid the superficial radial nerves; the incision should be performed with a cooled saw to preserve the viability of the bone. A 20 to 30 degree wedge should be excised. The anterior cortex should be preserved and broken prior to compression of the dorsal cortex. The fixation should be rigid enough to prevent non-union. Wires, staples and plates can all be used, depending on preference and availability. Several studies show that the procedure is effective and durable (Parker et al 2008). (Gwynne Jones et al 2008).

An alternative theory, to be further validated, is an osteotomy of the trapezium (Cheema 2012).

Arthroscopy: There has been increased interest in base of thumb arthroscopy due to improved fine arthroscopic instruments and patient demand for less invasive treatment options. (Adams et al 2011, Cobb et al 2011). Options include arthroscopic synovectomy, capsular shrinkage, hemitrapeziectomy with or without tendon interposition (Cobb et al 2011) (Furia 2010) (Badia 2007) (Abzug 2011) (Edwards and Ramsey 2010) (Park et al 2012). The role of arthroscopic surgery is still to be defined with proper randomised studies and objective outcomes, to determine whether the glamour and technical challenge is justified by any advantage over simpler and cheaper treatments. Only 10% of hand surgeons completing a large survey of the American Society for Surgery of the Hand (ASSH) members would consider arthroscopic treatment of established, early base of thumb arthritis, when 13% would perform a ligament reconstruction and 11% an extension osteotomy (Wolfe and Delaronde 2012).

Trapeziectomy

The operation which has stood the test of time for advanced arthritis, when joint preserving procedures are not suitable, is trapeziectomy (Figure 1). It can be performed alone or with interposition of a spacer (autogenous or artificial) with suspension using tendon.

Vermeulen and colleagues (2011) concluded in a systematic review of literature up to 2009 that there is no evidence of superiority of trapeziectomy alone or with interposition over any of the other techniques.

Similarly, the meta-analysis of Li and colleagues (2011) of literature from 2002 up to 2008 which compared trapeziectomy and trapeziectomy with ligament reconstruction tendon interposition (LRTI), demonstrated no statistically significant differences in postoperative strength, pain, and DASH score. Another meta-analysis (Wajon et al. 2009) reviewing the literature up to 2008, similarly showed similar results for trapeziectomy alone and trapeziectomy with tendon interposition. They concluded that neither interposition nor ligament suspension conveyed any benefit in terms of pain and physical function, yet caused more complications 22% compared to 10% (p = 0.01)

Comparative studies performed since these meta-analyses confirm that trapeziectomy alone is as least as effective with fewer complications as pyrocarbon Pi2 interposition (Maru et al 2012) or tendon interposition or ligament reconstruction (Gangopadhyay et al 2012).

If interposition is performed, autologous tissue interposition is preferable, since several studies have shown that non-autologous tissue interposition (Gore-tex; Silastic implants; Permacol TM), Artelon, Pyrocarbon) are associated with increased complications; furthermore these devices are expensive and no advantage has been demonstrated to justify the cost.

Metacarpal collapse: Although it is clear from the literature that ligament suspension has no benefit, there may be circumstances in which there is a role for ligament reconstruction, in particular the patients with advanced arthritis with fixed adduction of the metacarpal and hyperextension of the MP joint (Fig 2). In these patients, trapeziectomy alone may not be adequate; correction of the adducted metacarpal base with a tendon reconstruction readily corrects the adduction once the trapezium is removed. The metacapophalangeal joint itself may correct automatically once the thumb base is extended; if not then options include temporary pinning in flexion, sesamoid arthrodesis or formal arthrodesis of the MP joint.

STT arthritis

Theories that STT arthritis always represent a late stage of CMC arthritis (Eaton and Glickel 1987) are not supported by radiological evidence, since the STT joint can become arthritic in isolation or in association with CMC arthritis (Armstrong et al 1994). The condition is sometimes associated with tendinopathy, even

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rupture, of the flexor carpi radialis (FCR) or flexor pollicis longus (FPL).

The arthritic STT joint should be treated non-operatively for as long as possible because symptoms may settle. Isolated STT arthritis can be treated by either fusion or excision of the distal pole of the scaphoid. The former (Wollstein and Watson 2005) has several disadvantages to include technical difficulty, metalwork problems, a risk of non-union, stiffness and pain from overload of other joints. The latter is technically more straightforward (Garcia Elias 2011) but even a judicious excision can lead to hyperextension of the scaphoid and capitate lunate subluxation (Corbin and Warwick 2009). The procedure is best avoided if there is pre-exsiting extension of the lunate on the lateral radiograph.

If the CMC joints are affected, then the proximal few millimetres of the trapezoid should be excised at the time of trapezium excision.

Trapeziometacarpal Arthrodesis

The three dimensional mobility imparted by the saddle joint is essential to hand function. Fusion carries potential disadvantages. Function is significantly altered as shown by a trial of splinting in the fused position in normal individuals (Thommen et al 2006) . The cosmetic effect of the thumb fixed in abduction, loss of opposition and an inability to place the hand flat on the table is of concern to many. There is the potential to provoke arthritis in the adjacent STT or MP joints (Rizzo et al 2009). It is contraindicated in STT and MP arthritis. Non union can occur in around 13% although not all are symptomatic (Rizzo et al 2009, Hartigan et al 2001).

Meticulous technique is, as ever, essential. Maintaining adequate trapezium bone stock is essential to allow good proximal fixation. Alteration of the bony surfaces to a cup and cone configuration increases bony contact and allows adjustment to best thumb position. Proper metacarpal positioning is crucial to maximise post-operative function with the thumb at 45˚ to the coronal and sagittal planes. Methods of fixation include single k-wires, multiple k-wires to avoid rotational instability, tension band, headless compression screws, staples and plates. K-wires need to be removed after union and before irritation or infection (occasionally a contradiction); plates may need late removal due to tendon irritation. (Forseth and Stern 2003).

Since there is no evidence to show that arthrodesis is superior to trapeziectomy (Wajon et al 2009, Vemeulen et al 2011) yet it carries a significant complication rate, it is probably wise to restrict the operation to specific indications such as the active patient younger than sixty years needing a more reliable pinch grip than that imparted by trapeziectomy (de Smet et al 2010, Goldfarb and Stern 2002, Hartigan et al 2001). Implant arthroplasty may be contraindicated in this group.

Joint Replacement

The aim of total prosthetic replacement of the trapeziometacarpal joint is to create a painfree joint, combining the basic advantages of other methods: the stability offered by arthrodesis with the mobility and pain relief offered by resection and/or interposition procedures. Joint replacement in the short term probably gives faster pain relief and a better early function compared to tendon interposition arthroplasty (Ulrich-Vinther et al 2008, Vandenberghe et al 2013). The expense, the paucity of good outcome studies and the inevitable risk of loosening are concerns.

There are reports of promising early function and long term survivorship with some implants in which the concept is not to reproduce the anatomy, but to replace the saddle joint with a ball-in-socket joint (de la Caffinière 1991, Johnston 2012, Martin-Ferrero 2013), Caution is recommended and correct patient selection is essential, restricting use to older low demand individuals. The experience of joint replacement is by no means universally favourable. The evidence is usually limited, with small retrospective short-term series without a comparator and perhaps sometimes from enthusiastic proponents with industry relations. More critical publications have found their way to the Journals which reveal failure and more specifically, high rates of radiographic loosening of 5 to 51%. (Kaszap et al 2012, Klahn et al 2012, Maru et al 2012).

The trend in joint replacement at other sites, and indeed in the thumb base, has been in favour of non-cemented techniques. However bony ingrowth depends on compression and sufficient trabecular bone; in basal joint arthritis the volume of trabecular bone in the metacarpal and trapezium is often very limited and fixation of the stem needs cortical reaming to obtain a firm fixation. Perhaps non-cemented prostheses are inferior in the thumb (Wachtl et 1998).

New Concepts

Several new implants and modifications have been recently developed in an effort to improve the outcomes of patients treated surgically for trapeziometacarpal arthritis of the thumb. As the use of these modalities becomes more commonplace, these alternatives have met with variable success.

Artelon spacers: The Artelon spacer is a T-shaped biodegradable insert composed of polycaprolactone based polyurethaneurea. The purpose is to resurface the distal part of the trapezium and proximal metacarpal thus preserving soft tissue and bone, and stabilising the joint capsule by augmentation. Early studies demonstrated excellent material biocompatibility and good early clinical results. Whilst a small early study was promising (Nilsson et al 2005), several subsequent studies have shown poorer clinical outcomes; there are also reports detailing foreign body reactions to the biomaterial and poor implant survival correlated with pain secondary to inflammation and osteolysis. Blount et al (2013) recently reported their experience with 32 patients treated with the Artelon implant of whom 37% required revision surgery with implant removal. Those treated with the implant had significantly diminished pain improvement and satisfaction compared with those receiving the more traditional LRTI procedure. As a result, the authors state that they have abandoned the clinical use of this implant, a trend which appears to be applicable to many practising hand surgeons.

Suture-Button Suspensionplasty: Systematic reviews of the literature suggest that trapeziectomy alone is as successful as trapeziectomy with soft tissue stabilization, with perhaps a lower incidence of postoperative complications. In spite of these findings, many surgeons prefer to augment the trapeziectomy with stabilization of the thumb metacarpal. Strategies for stabilization include the use of temporary pin fixation and various tendon weaves using FCR or abductor pollicis longus (APL).

Recently, the use of suture-button suspensionplasty has been introduced as an alternative for thumb metacarpal stabilization after trapeziectomy. The implant that has been popularized for use in this setting is the "Mini Tight-rope" device (Arthrex, Naples FL, USA). The device consists of two small metallic buttons joined together with several strands of fiberwire sutures. The buttons are introduced via drill holes in the thumb and index metacarpals, and oppose the ulnar surface of the index metacarpal and the radial surface of the thumb metacarpal, in effect tethering the two metacarpals together (Figure 3) .

Yao and Song (2013) recently described their experience with 21 patients evaluated retrospectively at two years minimum after partial or full trapeziectomy and suture-button suspensionplasty for stabilization. The implants yielded excellent stability of the metacarpal with low risk of complications. Given the stability of the implant, it was felt that rehabilitation can be started several days after surgery obviating the need for prolonged immobilization after surgery. While this appears to be a safe implant, at least one complication involving an index metacarpal fracture has been reported with the use of this device. More information is required about durability and complications.

Pyrolytic carbon: The advantages of pyrocarbon as a biomaterial include compatibility and low wear rates, which are related to the similarity between the modulus of elasticity between pyrocarbon and cortical bone. Additionally, phospholipids adhere to the surface of pyrolytic carbon, which are an important lubricating component in synovial fluid. While most of the experience with pyrocarbon arthroplasty in the hand has been concentrated on the metacarpophalangeal and proximal interphalangeal joints, there are several commercially available implants for use in the trapeziometacarpal joint eg .Pyrodisk, the Pyrocardan, NuGrip, Pi2.

Recent studies suggest that whilst the short term patient satisfaction is quite high, so is the complication rate and need for revision (Martinez de Aragon et al 2009, van Aaken et al 2011, Colegate-Stone et al 2011) The durability in the medium or long term has not been established for any of these. More information on outcomes is needed to establish safety and longevity with these devices.

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Rehabilitation after enzymatic injection for Dupuytren´s Contracture

Christina Flodmark

During the past few years there has been a dramatic change regarding the treatment options for Dupuytren's contracture (DC). Surgery has, in many clinics, been replaced by Clostridium Collagenase injections, using different techniques. Since surgery is now seldom used in our clinic, the hand rehabilitation team has been searching for methods that would ensure the best outcome after treatment by injection.

The Department of Hand Surgery, University Hospital in Uppsala, Sweden has six years of experience in the treatment of DC with Clostridium Collagenase injections using Xiapex® (Xiaflex® in USA). In a multi-centre clinical trial, which started in 2008, 36 patients were treated with Clostridium Collagenase injections and then followed up for 5 years. Treatment with Clostridium Collagenase was accepted for clinical use in Europe in April 2011, and since then more than 600 patients have been treated by injection in our clinic.

Multiple fingers, bilateral DC

At first the treatment protocols from the clinical trials were used, with injection of one joint at a time. During the last two years, two joints or fingers often have been treated with one injection, using several injection sites. This has reduced the number of procedures required. This is especially beneficial to Scandinavian patients, as a severe type of DC with early onset of the disease is common and often several joints or fingers are affected.

Treatment with enzymatic injections generally means fewer problems concerning long standing oedema, difficulties with wound healing, circulation, nerve function or stiffness. There has been no case of CRPS in our clinic so far.

In order to ensure optimal treatment outcomes, the following important considerations should be taken into account when rehabilitating patients after injections:

1. DC is an inflammatory disease.
(Editor: Clarification- DC does not start as an inflammatory condition, but can become inflammatory if excessive stretching causes injury ie tears)
Many patients suffer from poor circulation, and the risk for recurrence is always present. The tissues are sensitive to excessive stretching which might cause an inflammatory reaction with recurrence or progression of the disease.

2. Circulation is crucial.
Straightening of previous contracted joints will affect circulation, since nerves and blood vessels often are short before treatment. There is a risk for permanent nerve dysfunction, if the nerves or blood vessels are excessively stretched for a long period of time, in the attempt to straighten the fingers as much as possible in a splint or a cast.

3. Injection will rupture the cord causing the extension lag, but not treat joint stiffness.
Due to the anatomical construction of the joints and the ligaments, it is often easier to get a good result from affected MCP-joints. The PIP-joint shows the greatest tendency to rebound and for the contracture to recur. Long-

Splint for MCP-joints and/or PIP-joints, dorsal view (left) and volar view (right)

term treatment with night splints to gradually reduce secondary joint stiffness is often necessary, but the extension deficit due to short ligaments is not always possible to treat.

Rehabilitation protocol followed in the hand clinic at the University Hospital in Uppsala (Sweden)

Before injection: In order to make the skin more elastic and to reduce the risk of skin rupture, patients are asked to moisten the hand with hand lotion several times per day, for at least one week before injection.

Injection: The hand therapist evaluates and records extension of all the joints of all the fingers immediately before the injection. In many cases several joints or fingers are involved. Sometimes more than one joint/finger can be corrected with one Clostridium Collagenase dose.

In our clinic we therefore calculate the Total Extension Deficit (TED). In addition, difficulties with flexion, decreased sensibility, pain or other problems such as cold sensitivity, are noted before the injection is administered.

Since several injection sites are used, many patients prefer to have local anaesthesia before injection. After injection a soft bandage is applied. The hand should be kept in an elevated position, but may be used for light activities until the actual extension procedure. Driving a car directly after injection is not recommended since some patients may experience dizziness. Patients remain in the clinic for half an hour after the procedure, as a precaution so that possible allergic reactions can be monitored.

Extension procedure (one or two days after injection): Local anaesthesia is used. Extension of the finger joints is performed by the surgeon with the proximal joints (wrist or MCP-joint) slightly flexed, in order to protect the flexor tendon.

Rehabilitation starts immediately after the extension procedure. The hand is normally swollen due to the reaction from the enzyme. In cases of excessive oedema, an oedema glove or a finger sleeve is used. Blisters and haematoma may appear and should be covered. Sometimes there will be a skin rupture. In cases where there is a large skin deficit with extensive bleeding, the hand is bandaged for a few days and mobilisation is delayed.

"Treatment with enzymatic injections generally means less problems concerning long standing oedema, difficulties with wound healing, circulation, nerve function or stiffness."

Choice of splint: A custom-made hand based volar thermoplastic splint is made in a sub maximal position. As an alternative, a manufactured glove for extension may be used, which is sometimes easier to handle. In our experience however, it does not position the joints as well as a thermoplastic splint and it can be difficult to put on directly after the extension procedure, when the hand is swollen.

The splint pictured above is our splint of choice. This is because it is easy to position the PIP joints in an optimal position and it gives some compression on the volar surface of the hand. Perforated splinting material is recommended, as we believe that this promotes healing in cases where the skin has ruptured.

When the little finger or the index finger only is involved, the splint can be made smaller, as seen in the photographs below. Note the position of the volar bar to ensure that the splint fits snugly over the hand. This also makes it more stable so that it does not move too much. Soft straps, preferably made from velour fabric, are used to apply a gentle force over the PIP-joints.

When the PIP-joint of the middle or ring finger only is involved, it is usually sufficient to use a single volar gutter splint. An example is seen below.

In rare cases, if there is a large open wound and/or excessive rebound

of flexion in the PIP-joint, a dorsal splint is used during the first weeks. It applies a gentle force to assist in slowly increasing passive PIP -joint extension. See photographs below.

Posture in splint: To ensure good circulation it is important not to straighten the MCP-joints too much, rather to leave them in a slightly flexed position for the first week. During the first week, the splint is worn half the day (every second hour, or what is suitable for the patient) and the entire night. The splint is then worn for the full night only, until extension is stable.

"There is a risk for permanent nerve dysfunction, if the nerves or blood vessels are excessively stretched for a long period of time, in the attempt to straighten the fingers as much as possible in a splint or a cast."

A volar gutter splint is used for single PIP-joint for the middle or ring finger.

This usually takes several months. Numbness, tingling or increased pain are signs of reduced circulation. If any of these problems arise, the patient is instructed to remove the splint to ensure better circulation.

General advice: The hand should be kept warm. Wounds and blisters should be attended to. Skin lotion should be used to maintain skin elasticity. The hand may be used for all activities, but no load is allowed during the first week after the procedure.

Exercises: Gentle exercises, individually modified, are commenced immediately after the extension procedure. (See suggested exercises below). It is important to ensure that flexor digitorum profundus of the treated finger is activated right from the beginning. Full flexion of fingers is neither possible nor necessary during the first week, especially if the skin has ruptured. Exercises may slowly be increased once complete wound healing has been achieved.

The oedema reaction from the enzyme will usually disappear after one or two weeks.

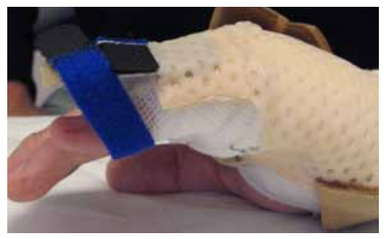
1-2 weeks after extension procedure: The patient visits the hand therapist once more for straightening of the splint and for monitoring the range of motion of the treated joints. The exercise programme may be adapted at this stage. Heavy (high resistance) activities are allowed once tenderness and oedema have significantly reduced.

Most patients require no more hand therapy visits. However, in case of skin rupture, joint stiffness or if more injections are planned, additional visits to the hand therapist are required. During these visits joint range and hand function are monitored and where necessary, the splint is gradually remodelled. The splint is then used at night until the next injection is performed, usually within a couple of months.

Of the examined patients 74 % were satisfied with the treatment. Reported gains were putting on gloves, shake hands, hold a tool, play an instrument, clap hands, caressing someone.

Splint for little finger with involvement of MCP-joint and/or PIP- joint and/or DIP-joint, with volar bar.

As the fingers are able to extend more, the splint is remodelled.



Outrigger for extension of PIP- joint of the little finger. Note that the MCP-joints are blocked in a slightly flexed position.

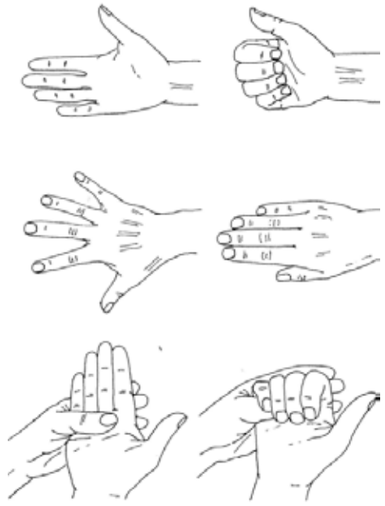
Patients not satisfied had early recurrence and/or thought the procedure was painful or bad. Two patients were very dissatisfied and had long lasting problems.

33 % of the patients had recurrence of 20 degrees or more in one of the treated joints, within one year. Some of them were treated in several joints and were still satisfied with the outcome. The most common joint for recurrence was the PIP V joint.

Example of a splint for the middle and ring fingers. Note the position of the little finger where the PIP-joint is still waiting for an additional injection.

Summary

Clostridium Collagenase injection treatment is a valuable alternative to surgery. It gives less long lasting problems concerning stiffness, reduced circulation and sensibility. The rehabilitation is normally faster and easier than after surgery. In our experience exercises and the use of individually adapted long term splints are valuable to achieve a good outcome. Since it is not always possible to regain full extension, it is essential for the patient to understand that the best outcome is not necessarily a perfectly straight hand. A hand with a satisfactory function, with no negative effects from the treatment such as stiffness or diminished sensation, can be considered a successful outcome, especially for the patient with a severe DC.



Exercises a few days after the extension procedure

About the author

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Results, 1 year follow up in 2013:

The results in the table below are based on 79 patients whom have been examined by a hand therapist, one year after their first injection.

Total number of patients treated		79
Male		78%
Female		22%
Age range		34 – 93 years
Mean number of injections		1.3 per patient
Mean TED (total passive extension of all joints in all fingers) before injection		157º
Mean TED (total passive extension of all joints in all fingers) after one year		76º
Mean gain of extension TED (total passive extension of all joints in all fingers) after one year		81º
Complications:	Reduced sensibility	4%
	Cold intolerance	5%

Pioneer profiles

HENRY BRUMMER

Dr Henry Brummer graduated from the University of Helsinki in 1952. He trained in general surgery at the Finnish Red Cross Hospital where his Professor of Neurosurgery, Arno Snellman, influenced him to become a hand surgeon. He studied hand surgery with Erik Moberg in Göteborg, Sweden and wrote his thesis on the factors of tendon adhesions. He also developed procedures for the treatment of Dupuytren's contracture and demonstrated his work to Harvey Allen at the Finnish Red Cross Hospital in the late 1950's.

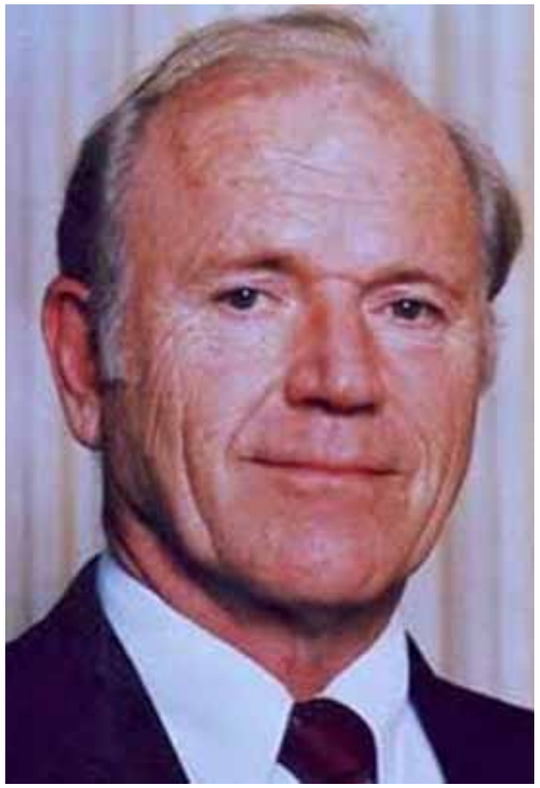
After the Helsinki University Clinic for Orthopaedics and Traumatology took over the Red Cross Hospital, Dr Brummer completed his specialty certificate in Orthopaedics in 1963. Starting in 1967, he worked in hand surgery with Professor Kauko Solonen at the Invalid Foundation Orthopaedic Hospital, where most Finnish Hand Surgeons were then trained.

Dr Brummer was a Founder Member of the Finnish Hand Society and Vice-President from 1976 to 1987, during which time hand surgery became recognised as a specialty in Finland. At the Hospital of the Invalid Foundation, Dr Brummer organized annual International Seminars which were attended by lecturers such as Raoul Tubiana, Alfred Swanson and Hanno Millesi.

Dr Brummer has been interested in tendon transpositions to restore hand function following nerve and spinal cord injuries. In 1978, Douglas Lamb invited him to attend a special conference in Edinburg, where the classification of tetraplegia was written. He worked with Dr Moberg on surgery to restore elbow extension and hand function in tetraplegics and designed a new procedure (winch operation). He presented his results at conferences in Hyères in 1984 and later with Yves Allieu in Montpellier. Dr Brummer introduced the use of orthoses in Finland where he extensively lectured to hand therapists.

Dr Brummer continued his clinical work and teaching at the Central Military Hospital in Helsinki despite a severe hearing loss, the result of exposure to loud gunfire during World War II. Dr Brummer enjoyed sailing his yacht, "Naviculare". He has won several first prizes in races in the Gulf of Finland and the Baltic which for a long time was the only sea in the world without an east coast! At the sixth congress of the IFSSH in July 1995, which was held in Helsinki, Finland, Henry Brummer was elected Pioneer of the IFSSH.

HARRY BUNCKE



Dr Harry J Buncke graduated from New York Medical College in 1951 where the spent three years in General Surgery. He trained in Plastic Surgery with Herbert Conway at the Cornell Medical Center and the Bronx Veterans Hospital from 1954-56. He was a Marks Fellow at Queen Victoria Hospital, East Grinstead, and Senior Registrar at the Glasgow Royal Infirmary. In 1957, he was inspired by Thomas Gibson to develop techniques for transplanting blocks of tissue on vessels of 1mm.

Seven years later he reported the first successful rabbit ear replantation to the Plastic Surgical Research Council. He helped develop microsurgical laboratories at the Universities of California-San Francisco and Stanford, Oak Knoll Naval Hospital, Davies Medical Center and Hospital Jeanne d'Arc in Nancy.

In 1969, at Oak Knoll, Donald MacLean and he performed the first successful microvascular transplant using omentum to fill a large skull defect. He helped do the first microvascular transplants at Davies Medical Center, San Francisco General Hospital, at the Universities of California-San Francisco, California-Irvine, Stanford, Johns Hopkins, and New York, and also in Puerto Alegre, Brazil, and the Royal Medical Center in Amman, Jordan. His team was first in the United States to perform a human toe-to-hand transplant, scalp replant, serratus-combined-latissimus microvascular transplant, four-digit replant and multiple microvascular simultaneous transplant. During his time, over 330 articles have been published from this service which was established in 1970, and 80 clinical and 37 research fellows and 47 residents have trained there during that time; 27 have become department chairmen or co-chairmen. Dr Buncke has performed unique pro bono transplants for a number of international organisations, and for hundreds of uninsured patients.

Dr Buncke is Past-President of the American Society for Surgery of the Hand (1980) and the American Association of Plastic Surgeons (1982). He is a Founding Member of the International Reconstructive Microsurgery Society, the American Society for Reconstructive Microsurgery and Honorary Member of the International Microsurgery Society. He has received honorary awards from the American Association of Plastic Surgeons, American Society of Plastic and Reconstructive Surgeons, New York Medical College, Chinese Medical Society, and University of Nancy, France. He was elected Pioneer of the IFSSH in July 1995 in Helsinki, Finland during the Sixth Congress of the Federation.

Journal Highlights

Below is a selection of contents pages from the latest issues of the following leading hand surgery journals. Hover your mouse over each article heading and click to go to the original abstract page of the article.

Journal of Hand Surgery (European Volume)

February 2015 J Hand Surg Eur Vol 40, Issue 2

- Collagenase clostridium histolyticum in patients with Dupuytren's contracture: results from POINT X, an open-label study of clinical and patient-reported outcomes
- Early outcomes of a sequential series of 144 patients with Dupuytren's contracture treated by collagenase injection using an increased dose, multi-cord technique
- Safety and tolerability of collagenase Clostridium histolyticum and fasciectomy for Dupuytren's contracture
- What patients want from the treatment of Dupuytren's disease — is the Unité Rhumatologique des Affections de la Main (URAM) scale relevant?
- A review of the classification of Dupuytren's disease
- Dynamism in Dupuytren's contractures
- Genetic and environmental influences in Dupuytren's disease: A study of 30,330 Danish twin pairs
- Commentary on Larson et al. Genetic and environmental influences in Dupuytren's disease: A study of 30,330 Danish twin pairs
- Single versus repetitive injection of lignocaine in the management of carpal tunnel syndrome – a randomized controlled trial
- Commentary on Akarsu et al. Single versus repetitive injection of lignocaine in the management of carpal tunnel syndrome – a randomized controlled trial
- Outcome of carpal tunnel release – Correlation with wrist and wrist–palm anthropomorphic measurements
- Supraretinacular endoscopic carpal tunnel release: surgical technique with prospective case series
- Commentary on Ecker et al. Supraretinacular endoscopic carpal tunnel release: surgical technique with prospective case series
- The Korean version of the Carpal Tunnel Questionnaire. Cross cultural adaptation, reliability, validity and responsiveness
- Stuck on me – Dupuytren's disease of the finger presenting as complete synechium of the finger to the palm
- The value of different inflammatory markers in distinguishing deep closed hand infections from non-infective causes
- Surgical rehabilitation for correction of severe flexion contracture of the proximal interphalangeal joint by modified Ilizarov method
- Anatomic course of the medial antebrachial cutaneous nerve: a cadaveric study with proposed clinical application in failed cubital tunnel release
- Multiple subungual glomus tumours associated with neurofibromatosis type 1
- Finger tourniquets: a review of National Patient Safety Agency recommendations, available devices and current practice
- Avoiding extensor tendon rupture after the use of palmar locking plates for distal radial fractures
- Objective results of median nerve decompression and tenosynovectomy for carpal tunnel syndrome in patients with mucopolysaccharidoses Types I and II
- Intraoperative migration of a foreign body within the tendon sheath of the flexor pollicis longus
- Involvement of hand surgeons in research on the genetics and pathogenesis of congenital upper limb anomalies

Hand **Volume 9 – Issue 4, December 2014**

- An open-label comparison of local anesthesia with or without sedation for minor hand surgery
- Distal humeral hemiarthroplasty: indications, results, and complications. A systematic review
- A quantitative study of vibration injury to peripheral nerves—introducing a new longitudinal section analysis
- Non-surgical treatment of lateral epicondylitis: a systematic review of randomized controlled trials
- Postapproval clinical experience in the treatment of Dupuytren's contracture with collagenase clostridium histolyticum (CCH): the first 1,000 days
- The incidence of postoperative flare reaction and tissue complications in Dupuytren's disease using tension-free immobilization
- Median nerve compression at the fibrous arch of the flexor digitorum superficialis: an anatomic study of the pronator syndrome
- Surgical management of the wrist in children with cerebral palsy and traumatic brain injury
- Long-term follow-up of first metacarpal extension osteotomy for early CMC arthritis
- Anomalous first thoracic rib as a cause of thoracic outlet syndrome with upper trunk symptoms: a case report
- Radiographic interpretation of distal radius fractures: visual estimations versus digital measuring techniques
- Evidence for safe tourniquet use in 500 consecutive upper extremity procedures
- The Meniscus Arrow® as a fixation device for the treatment of mallet fractures: results of 50 cases
- Differences in response rates between mail, e-mail, and telephone follow-up in hand surgery research
- Intraoperative evaluation of dorsal screw prominence after polyaxial volar plate fixation of distal radius fractures utilizing the Hoya view: a cadaveric study
- Volar locking plate fixation of distal radius fractures: use of an intra-operative 'carpal shoot through' view to identify dorsal compartment and distal radioulnar joint screw penetration
- Curvatures of the DIP joints of the hand
- Treatment preferences for trigger digit by members of the American Association for Hand Surgery
- The treatment of extensor lag of the middle finger following crushing–penetrating injuries of the metacarpophalangeal joint: case series
- Integra® dermal regenerative template application on exposed tendon
- Upper Extremity Orthoses Use in Amyotrophic Lateral Sclerosis/Motor Neuron Disease: Three Case Reports
- Anomalous muscles within the first dorsal extensor compartment of the wrist
- Carpal tunnel syndrome secondary to an accessory flexor digitorum superficialis muscle belly: case report and review of the literature

Journal of Wrist Surgery **Issue 03 Volume 04 · November 2014**

- Carpal Tunnel Syndrome Pathophysiology: Role of Subsynovial Connective Tissue
- Biomechanical Role of the Transverse Carpal Ligament in Carpal Tunnel Compliance
- The Transverse Carpal Ligament: Anatomy and Clinical Implications
- Carpal Tunnel Release: Do We Understand the Biomechanical Consequences?
- Routine Imaging after Operatively Repaired Distal Radius and Scaphoid Fractures: A Survey of Hand Surgeons
- The Utility of the Fluoroscopic Skyline View During Volar Locking Plate Fixation of Distal Radius Fractures
- Proximal Migration of Hardware in Patients Undergoing Midcarpal Fusion with Headless Compression Screws
- Intraneural Ganglion in Superficial Radial Nerve Mimics de Quervain Tenosynovitis
- Ligamentous Radiocarpal Fracture-Dislocation Treated with Wrist-Spanning Plate and Volar Ligament Repair
- Avascular Necrosis of the Hamate: Three Cases and Review of the Literature

Hand Surgery: Asia Pacific

Volume 20, Number 1

- Triangular Fibrocartilage Complex Tears
- A2 Pulley Integrity And The Strength Of Flexor Tendon Repair: A Biomechanical Study In A Chicken Model
- Influence Of Different Length Of Core Suture Purchase Among Suture Row On The Strength Of 6-Strand Tendon Repairs
- Cross-Cultural Adaptation, Validation, And Reliability Of The Michigan Hand Outcomes Questionnaire Among Persian Population
- The Greek Version Of The Hand20 Questionnaire: Crosscultural Translation, Reliability And Construct Validity
- Neuropathic Pain In Brachial Plexus Injury
- Impact Of Phrenic Nerve Paralysis On The Surgical Outcome Of Intercostal Nerve Transfer
- The Tricipital Aponeurosis — A Reliable Soft Tissue Landmark For Humeral Plating
- Clinical Radiographic Features Of The Wrist Without Osteoarthritis And Its Relations To Age And Sex In Japanese
- Radial Nerve Lacerations — The Outcome Of End-To-End Repairs In Penetrating Trauma
- Biphasic Motion Of The Median Nerve In The Normal Asian Population
- Patient Related Functional Outcome After Total Wrist Arthroplasty: A Single Center Study Of 206 Cases
- Hand And Wrist Injuries In Professional County Cricket
- Delineation Of Extensor Tendon Of The Hand By Mri: Usefulness Of "Soap-Bubble" Mip Processing Technique
- Surgical Outcomes Of Fifth Metacarpal Neck Fractures — A Comparative Analysis Of Dorsal Plating Versus Tension Band Wiring
- Factors Affecting The Functional Results Of Open Reduction And Internal Fixation For Fracture-Dislocations Of The Proximal Interphalangeal Joint
- Hemi-Hamate Arthroplasty Versus Transarticular Kirschner Wire Fixation For Unstable Dorsal Fracture-Dislocation Of The Proximal Interphalangeal Joint In The Hand
- Amniotic Constriction Bands: A Case Series And Proposed New Classification System
- A Retrospective Review Of Troubled Replantations
- Postoperative Voluminal Flap Reduction After Fingertip Reconstruction Using The Reverse Digital Artery Island Flap
- A Case Report Of Acute Cubital Tunnel Syndrome Caused By Venous Thrombosis
- Complete Closed Brachioradialis Tendon Rupture: A Case Report
- Closed Traumatic Rupture Of The Flexor Pollicis Longus Tendon In Zone T I: A Case Report
- Closed Traumatic Rupture Of The Flexor Pollicis Longus Tendon In Zone T I: A Case Report
- Irreducible Volar Subluxation Of The Proximal Interphalangeal Joint Due To Radial Collateral Ligament Interposition: Case Report And Review Of Literature
- A Rare Case Of Multiple Subungual Glomus Tumours In A Neurofibromatosis Type 1 Patient
- Surgical Correction Of Ulnar Deviation Deformity Of The Wrist In Patients With Birth Brachial Plexus Palsy Sequelae
- The Use Of Bmp-2 And Screw Exchange In The Treatment Of Scaphoid Fracture Non-Union
- New Technique "Graft Reposition On Flap" In Allen Type Iv Amputation: A Report Of Six Cases
- Total Proximal Interphalangeal Joint Arthroplasty For Osteoarthritis Versus Rheumatoid Arthritis — A Systematic Review
- Current Management Of Hand Enchondroma: A Review

Journal of Hand Surgery: American volume

Volume 40, Issue 2, (February 2015)

- Force Variations in the Distal Radius and Ulna: Effect of Ulnar Variance and Forearm Motion
- Load Transfer at the Distal Ulna Following Simulated Distal Radius Fracture Malalignment
- Long-Term Functional Outcomes After Bilateral Total Wrist Arthrodesis
- Biomechanical Evaluation of 4-Strand Flexor Tendon Repair Techniques, Including a Combined Kessler–Tsuge Approach
- Longitudinal Split Tear of the Extensor Pollicis Brevis Tendon: Report of 2 Cases
- Anatomy of the Flexor Digitorum Profundus Insertion
- Computed Tomography Arthrography Using a Radial Plane View for the Detection of Triangular Fibrocartilage Complex Foveal Tears
- Functionality After Arthroscopic Debridement of Central Triangular Fibrocartilage Tears With Central Perforations
- Temperature in and Around the Scapholunate Ligament During Radiofrequency Shrinkage: A Cadaver Study
- Functional Outcomes of Replantation Following Radiocarpal Amputation
- Incipient Malunion of an Isolated Humeral Trochlea Fracture Treated With an Elbow Hemiarthroplasty: Case Report
- The Effect of Using a Cement Gun With a Narrow Nozzle on Cement Penetration for Total Elbow Arthroplasty: A Cadaveric Study
- The Effect of Prosthetic Radial Head Geometry on the Distribution and Magnitude of Radiocapitellar Joint Contact Pressures
- In Vivo Kinematics of the Trapeziometacarpal Joint During Thumb Extension-Flexion and Abduction-Adduction
- Dual Mini TightRope Suspensionplasty for Thumb Basilar Joint Arthritis: A Case Series
- The Effect of Humerus Diaphyseal Shortening on Brachial Plexus Tension: A Cadaver Study
- A Systematic Review of Outcomes Reporting for Brachial Plexus Reconstruction
- Short-Term Electrical Stimulation to Promote Nerve Repair and Functional Recovery in a Rat Model
- Transfer of the Radial Nerve Branch to the Extensor Carpi Radialis Brevis to the Anterior Interosseous Nerve to Reconstruct Thumb and Finger Flexion
- Biomechanical Characteristics of Hemi-Hamate Reconstruction Versus Volar Plate Arthroplasty in the Treatment of Dorsal Fracture Dislocations of the Proximal Interphalangeal Joint
- A Modular Surface Gliding Implant (CapFlex-PIP) for Proximal Interphalangeal Joint Osteoarthritis: A Prospective Case Series
- The Effect of an Educational Program on Opioid Prescription Patterns in Hand Surgery: A Quality Improvement Program
- Dorsal Distraction Plating for Highly Comminuted Distal Radius Fractures
- Pullout Wire Fixation Together With Distal Interphalangeal Joint Kirschner Wire Stabilization for Acute Combined Tendon and Bone (Double Level) Mallet Finger Injury
- Nuts and Bolts: Dimensions of Commonly Utilized Screws in Upper Extremity Surgery

Upcoming events

The 6th Combined Meeting of ASSH and JSSH: Unsolved Problems in Hand Surgery

Maui, Hawaii, USA
March 29 - April 1, 2015
http://www.assh.org/Courses/ASSH-Courses/2015-ASSH-and-JSSH-Combined-Meeting

The American Society for Surgery of the Hand (ASSH) and the Japanese Society for Surgery of the Hand (JSSH) invite you to submit an abstract for consideration at our 2015 Combined Meeting in! The 6th Combined Meeting will bring hand care professionals from around the world together to share, discuss and learn about breakthrough techniques and procedures advancing the care and treatment of the hand and upper extremity.

Mark your calendar for and join us in beautiful Hawaii!

7th Instructional Course on Reconstructive Tetraplegia Hand Surgery

Tarcal, Hungary
8-10 April 2015
www.asszisztencia.hu/15tetra

The three day course is based on management and current concepts in the surgical rehabilitation of upper limbs in tetraplegic patients. Our aim is to provide you with a reliable toolbox of operations that can be applied in the majority of reconstructions necessary in tetraplegia hand surgery. Therefore, much time will be spent on practicing surgical procedures in cadavers. Besides the much demanding scientific work during the course, organisers try to provide participants with the opportunity to get to know each other and have a glimpse of the famous Tokaj region as well. Both previous courses owned a very friendly atmosphere, that you can see on the pictures taken.

Techniques in brachial plexus

Paris, France
17-18 April 2015
www.institutdelamain.com

As a Brachial Plexus surgeon, we realise that information is varied, sometimes crucial but very dependent on the precise technique described. It is very difficult to interpret the techniques described in the literature. This is the reason that has led us to organise the Symposium where the most inventive and experienced surgeons will present their technique in video and comment it. It will be interactive and the floor may discuss with these surgeons.

10th World Symposium on Congenital Malformations of the Hand and Upper Limb

7-9 May 2015
Rotterdam, The Netherlands
www.worldcongenitalhand2015.com

The 10th World Symposium on Congenital Malformations of the Hand and Upper Limb will be held on the 7th-9th May 2015, in Rotterdam, The Netherlands. A broad variation of congenital hand anomalies, genetics, embryology and classification will be presented, discussed and shared. Invited lectures, discussion, free paper sessions and panel sessions will inform you of the latest on congenital hand anomalies. Some of the keynote speakers are Michael Tonkin, Caroline Leclercq and Ann van Heest. The symposium will be preceded by a cerebral palsy pre course on Wednesday the 6th of May. For more information on the program and registration go to: www.worldcongenitalhand2015.com

2015 International Conference on Dupuytren Disease and Related Conditions

22-23 May 2015
Groningen, The Netherlands
www.Dup2015.com

This is a unique opportunity to present your Dupuytren related research to an international audience of experts. This conference will showcase progress made since the 2010 Miami International Dupuytren Symposium and the work of the international community of patients and physicians on the cause, course, treatment and future of Dupuytren disease.

We invite you to submit your research for this meeting. We encourage presentation of all aspects of Dupuytren disease: genomics, cell biology, pathogenesis, surgery, pharmacotherapy, radiotherapy, biomechanics, hand therapy and related conditions of Ledderhose, Peyronie and frozen shoulder. Abstract submission instructions are on the meeting website Dup2015.com. All abstracts must be submitted online. Abstracts must be in English and not exceed 500 words. Abstracts will be peer reviewed by an international panel. Accepted abstracts will be published on our website and will be available at the conference. Presentations will be videotaped and published online. Authors will be invited to submit a full paper of their presentation for book publication. Abstract submission deadline is 1 December 2014.

6th International Dissection Course on Reconstructive Microsurgery: Peripheral Nerve Surgery And Tendon Transfer

Alicante, Spain
8 - 10 June 2015
http://www.studioprogress.it/en/convegni/6th-international-dissection-course-reconstructive-microsurgery

This course is aimed at Plastic Surgeons, Neurosurgeons, Orthopaedic Surgeons and Hand Surgeons who want to improve their technical skills in peripheral nerve surgery and palliative tendon transfers on the upper and lower limb. The course consists in discussion time on clinical anatomy, dissection techniques and lectures delivered by experts in the field, followed by practical sessions with cadaver dissection performed directly by the participants. Participation to the dissection course is limited to 30 surgeons accepted on a "first registered, first served" basis.

Hand and Wrist Biomechanics International (HWBI) Symposium

16-17 June 2015
Milan, Italy
www.hwbi.org/2015.html

In conjunction with 20th Congress of Federation of European Societies for Surgery of the Hand (FESSH 2015) and the 2nd International Thumb Osteoarthritis Workshop (ITOW 2015), the Symposium Chairs are Marc Garcia-Elias, MD, Insitut Kaplan, Spain and Frederick W. Werner, MME, SUNY Upstate Medical University, USA.

The main topics are wrist, carpal tunnel, thumb, finger mechanics, DRUJ, distal radius, ligaments, tendons and biomaterials.

XX FESSH Congress

17-20 June 2015
Milan, Italy
fessh2015.org

In 2015, Federation of European Societies for Surgery of the Hand (FESSH) is organising the Annual FESSH Congress in the beautiful city of Milan in Italy. The congress will explore all aspects of hand surgery and its impacts. Surgical technology development, biomechanical tools, ethical, legal, social and financial topics, individualised medical aspects, diagnostic and therapeutic issues, advanced technologies, and many other related topics will be presented and discussed by professionals in their fields. We encourage delegates to use this congress as a meeting place to assemble their clinical and academic interest-groups. FESSH 2015 will be an intellectually broad and exciting event at which ideas and researchers from Europe and around the world interact.

IX International Symposium On Spinal Cord Injuries

3-5 December 2015
Brescia, Italy
www.midollospinale.com

Symposium Main Topics and Events include:

- Honorary Lecture by Nobel Laureate A. Yonath
- Basic and applied research in experimental Spinal Cord repair and regeneration
- Experimental studies and clinical use of stem cells and neurotrophic factors
- Robotics and Telemedicine
- Young Neuroscientist supported by Dompè Investigator Award
- The 4th "Brunelli Club Meeting" dedicated to the most advanced surgical and neuro- rehabilitation techniques in the treatment of the flaccid and spastic palsies of upper limbs, including case reports.

World Congress of Brachial Plexus and Peripheral Nerve Surgery

New Delhi, India
4-7 February 2016
www.wcns2016.com

The ISPNS is a 100 member strong young Indian Society of Brachial Plexus and Peripheral Nerve Surgeons, which is committed for the spread of education regarding the brachial plexus and peripheral nerves to young surgeons from the country and abroad.
The event will be the 5th Annual meeting of Indian Society of Peripheral Nerve Surgery (ISPNS) and will feature a one-day Pre-conference cadaveric Hands-On workshop on 4th February 2016, at Cadaveric Training and Research Facility, All India Institute of Medical Sciences, New Delhi; followed by 3 day long CME (5-7th February 2016) by expert faculty from all around the globe. The meeting is expected to be attended by numerous delegates from across the country, and abroad, including neurosurgeons, hand surgeons, orthopaedic surgeons and plastic surgeons. A number of national and international faculty are expected to attend this event.

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