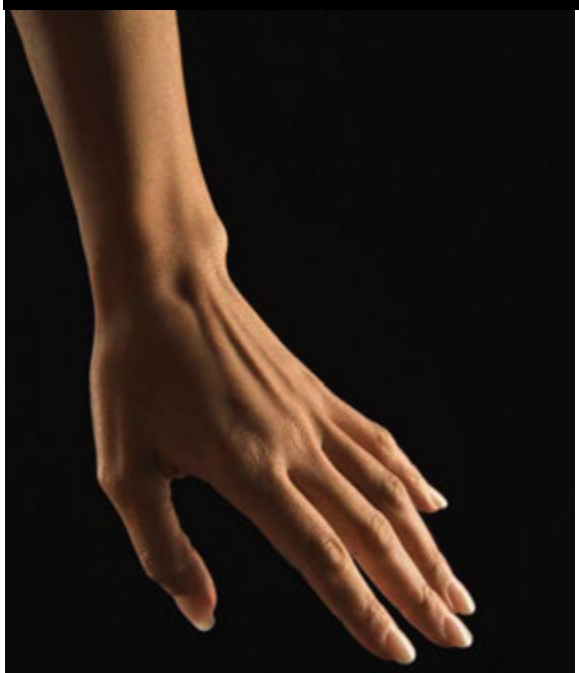
BRUSSELS HAND/UPPER LIMB INTERNATIONAL SYMPOSIUM

24th year

Genval
Brussels, Belgium
January 29-30, 2016

ULB

PAIN AND FUNCTIONAL IMPAIRMENT AFTER HAND/UPPER EXTREMITY SURGERY – CAUSES, PREVENTION, MANAGEMENT, AND REHABILITATION



PROGRAM

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24th BRUSSELS HAND/UPPER LIMB INTERNATIONAL SYMPOSIUM

PAIN AND FUNCTIONAL IMPAIRMENT AFTER HAND / UPPER EXTREMITY SURGERY- CAUSES, PREVENTION, MANAGEMENT, AND REHABILITATION

January 29-30, 2016

CHÂTEAU DU LAC GENVAL-BRUSSELS

DIRECTOR:

F. SCHUIND

DEPARTMENT OF ORTHOPAEDICS & TRAUMATOLOGY,
HÔPITAL ERASME, CLINIQUES UNIVERSITAIRES DE BRUXELLES,
UNIVERSITÉ LIBRE DE BRUXELLES, BRUSSELS, BELGIUM

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INTRODUCTION TO THE SYMPOSIUM

The 24th edition of the annual Brussels/Genval Symposium will take place on Friday, January 29 and Saturday, January 30, 2016. The Symposium is as always dedicated to a specific interdisciplinary topic involving the upper limb. The 2016 edition will evaluate pain and functional impairment after hand and upper extremity surgery. The Château du Lac at Genval will again be the beautiful venue for this symposium. The previous meetings have truly been international with up to 150 participants from 25 different countries.

Thirty years ago, pain was considered as a normal, unavoidable postoperative phenomenon following most upper extremity operations. Some surgical procedures were known as particularly painful. Pain remained unpredictable from one patient to another, despite similar procedures. The existence of a particular medical and psychological profile of patients presenting more pain than others has been suggested. Many progresses have now been made in the control of postoperative pain, not only for the "comfort" of the patient, but also to prevent the complications related to pain. However, despite advances in pain prevention and management (minimal invasive surgical procedures, organization of Acute Pain Services, multimodal strategy including the use of sonography-guided regional blocks well adapted to postoperative mobilization, etc.), a significant proportion of patients still suffer of postoperative pain. It has been even suggested that too good pain control in the first days could increase the postoperative pain after one week. The pain sometimes becomes chronic, evolving in what is known as CRPS type I (previously known as algodystrophy). The aetiology of this affection is not very clear and could be multifactorial (although prolonged inflammation is now admitted as a plausible hypothesis), there is no good animal model, the diagnosis rests essentially on clinical criteria, the symptoms are quite different at various locations (shoulder vs hand), the evolution is unpredictable, and the multidisciplinary treatment remains empirical and not very efficient – the affection is so poorly understood that some authors have challenged that CRPS might not really exist. The term CRPS could cover several different clinical entities.

The prevalence is relatively low but when CRPS occurs, it is catastrophic to the patient. Chronic pain becomes associated to cerebral dysfunction, anxiety and depression. Prevention measures have been recommended, but their efficiency has not been well established. Treatment remains difficult and some patients present kinesiophobia. After healing, CRPS patients still suffer to various extents of weakness and stiffness.

The aetiology of CRPS type II, previously known as causalgia, is somehow better understood. Peripheral nerve lesions related to trauma, amputation, fibrosis, tumor infiltration etc. induce chronic central "deafferentation" pain. Associated factors like diabetes mellitus or central conditions are known to increase the risks of neuropathic pain. Despite the efforts of the surgeons to treat the peripheral neuroma, such pain is frequently poorly controlled by surgery. Various new treatment modalities have been proposed, like cortical illusions.

There are many other causes of chronic pain at the upper extremity, like nerve compression, for example at the thoracic outlet, tumor infiltration, peculiar tumors as glomic lesions, degenerative or inflammatory osteoarticular conditions, implant loosening, arterial insufficiency/ischemia, tendinosis, etc. Sometimes the cause of pain is not so clear like in osteonecrosis or early osteo-arthrosis. Surgical procedures primarily aimed at pain treatment like neurolysis, neurectomy (posterior interosseous nerve) or total denervation frequently lead to incomplete results ; other treatment modalities including physiotherapy have an important place.

Better understanding the causes of hand/upper extremity pain, for better prevention and management, deserves joined efforts by committed surgeons, anesthesiologists, pain specialists, physiotherapists and others for the best care of our patients. The primary goals of the Brussels/Genval annual upper limb Symposium are indeed to promote the exchange of ideas, to establish guidelines on a consensual basis, and to foster collaborative investigations among various specialists in all fields related to patient care. Much time will be set aside for the discussions.

SPECIFIC AIMS

- To summarize the current progresses and new ideas in pain control after hand/upper extremity surgery ; to evaluate new techniques, new concepts, and results ;
- To more specifically discuss the aetiology, pathophysiology and treatment of the various forms of CRPS ;
- To assess the techniques of rehabilitation in chronic pain conditions ;
- To formulate, on these bases, recommendations to the medical community ;
- To discuss unsolved problems and possible solutions ;
- To explore future directions of research.

F. Schuind
Erasme University Hospital, Brussels, Belgium

ORGANIZING COMMITTEE

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R. van Riet (Deurne and Brussels, Belgium)
A. Zyluk (Szczecin, Poland)

INFORMATION FOR PARTICIPANTS

Welcome to Belgium. We hope that you had a pleasant journey and that your stay in Genval will be enjoyable. Please, read this important information.

BADGES
Your badge should be worn at all times.

OPENING HOURS OF THE REGISTRATION DESK
Friday, January 29, 2015: 07.30 - 17.00
Saturday, January 30, 2015: 07.30 - 17.00

MEETING ROOM
The scientific presentations will be held in the room Geneviève.

LUNCHES
On Friday and on Saturday, lunch will be served at the Argentina A Room. The price is included in the registration fee.

CONTINUING MEDICAL EDUCATION CREDIT
A certificate will be provided to interested participants. We will send the certificate to the participants who wish to receive this document, when available.

INFORMATION FOR PRESENTERS

We would like to draw your attention to the following points:

- The allocated time of presentation should be strictly respected.
- The standard presentation format is by computer. The audiovisual projection system in the meeting room will include a Personal Computer (PC) along with PowerPoint for Windows and USB port. Request to use any equipment other than this must be arranged at the presenter's expense.

Each presenter should check with the technician 20 min before the session, and introduce himself to the moderators of the session. The technician will be available in the meeting room from 07h45 on both congress days. There will be a laser pointer at your disposal.

SOCIAL PROGRAM

Friday, 29 January 2016
Visit to the Atomium - 18h30-23h00

Built for the World Fair in Brussels in 1958, the Atomium is nowadays the most popular touristic attraction and the symbol of Europe's Capital. We will visit the eight levels spread over 5 spheres. The panorama (92 m) in the upper sphere offers spectacular views of the city of Brussels.
Dinner will be served in the Panoramic restaurant, situated at the top too. At night, the nine spheres are lit up with 2970 LED lights that offer a very special show.

ACKNOWLEDGEMENTS

Frédéric Schuind, Director of the Symposium, and the Members of the Organizing Committee, gratefully acknowledge the following Authorities, companies and individuals for their precious support :

- the **FNRS** ("Fonds National Recherche Scientifique")

- **Companies**

Gold Partners

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SYMPOSIUM SECRETARIAT

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SCIENTIFIC PROGRAM

FRIDAY, JANUARY 29, 2016

07.30 – 17.00 Registration

08.10 – 10.40 SESSION 1: AN INTRODUCTION TO THE SYMPOSIUM (1)

Moderators: *J. Bahm, R. Perez*

08.10 **Opening Address**
F. Schuind (Brussels, Belgium)

08.15 001 **What is Chronic Pain?**
L. Plaghki (Brussels, Belgium)

08.30 002 **Interaction and Interdependance of Painful and Chronic Painful Process Occurrence and Pre, Per and PostOperative Pain Management**
P. Pandin (Brussels, Belgium)

08.45 003 **What is True in CRPS? Value of Scientific Evidence in a Vague Clinical Entity**
A. Zyluk (Szczecin, Poland)

09.00 004 **Evaluation of Touch-Evoked and/or Spontaneous Neuropathic Pain after Hand Surgery**
Cl. Spicher, E. Létourneau (Fribourg, Switzerland)

09.15 005 **Thoracic Outlet Syndrome Secondary to Clavicle Fracture**
J. Rois, W. Girsch (Vienna, Austria)

09.25 **Discussion**

09.40 006 **A Global Approach to the Management of Chronic Pain in the Upper Limb**
P. Amadio (Rochester, MN, USA)

09.55 007 **3D Augmented Reality Mirror Visual Feedback Therapy Applied to the Treatment of Persistent, Unilateral Upper Extremity Neuropathic Pain. A Preliminary Study**
D. Mouraux, T. Tuna, B. Penelle (Brussels, Belgium)

10.10 008 **Evaluation Tools for Hand Disorders. Responsiveness to Changes**
O. Barbier (Brussels, Belgium)

10.25 **Discussion**

10.40 **Coffee-Break and Visit of the Commercial Exhibition**

11.10 – 12.45 SESSION 2: WHAT IS CRPS TYPE I?

Moderators: *F. Schuind, A. Mouraux*

11.10 009 **Neuropsychology of Body Perception: Insights form the Study of Hemispatial Neglect and Extinction**
V. Legrain, C. Vanderclausen, S. Blandiaux, L. Filbrich (Brussels, Belgium)

11.25 010 **Pain, Neglect and the Central Representation of the Body in CRPS**
A. Mouraux, D. Torta, V. Legrain (Brussels, Belgium)

11.40 011 **Complex Regional Pain Syndrome : Clinical Research in Rehabilitation**
S. Hatem (Brussels, Belgium)

11.55 **Discussion**

12.05 012 **Pathophysiological Mechanisms of CRPS**
R. Perez (Amsterdam, The Netherlands)

12.20 **Discussion**

12.25 013 **Diagnosis and Prognosis of CRPS**
R. Perez (Amsterdam, The Netherlands)

12.35 **Discussion**

12.40 Lunch and Visit of the Commercial Exhibition

14.00 – 15.10 SESSION 3: PREVENTION AND TREATMENT OF CRPS TYPE I (1)

Moderators: *T. Tuna, S. Hatem*

14.00 014 **Can CRPS be Prevented in Hand Surgery ?**
F. Schuind (Brussels, Belgium)

14.15 015 **Prevention of CRPS**
A. Zyluk (Szczecin, Poland)

14.25 **Discussion**

14.35 016 **Evidence-Based Perspectives for Treatment of CRPS**
R. Perez (Amsterdam, The Netherlands)

14.45 **Discussion**

14.50 017 **Complex Regional Pain Syndrome Type 1 in Hand Surgery. Efficacy of Sympathic Ganglion Block**
V. Brouillard, L. Van Overstraeten, E. Camus (Tournai, Brussels, Belgium and Maubeuge, France)

15.05 **Discussion**

15.10 Coffee-Break and Visit of the Commercial Exhibition

15.40 – 17.15 SESSION 4: PREVENTION AND TREATMENT OF CRPS TYPE I (2)

Moderators: *D. Mouraux, E. Létourneau*

15.40 018 **Results of the Treatment of Chronic, Refractory CRPS with Ketamine Infusions. A Preliminary Report**
A. Zyluk, P. Puchalski (Szczecin, Poland)

15.50 019 **Anti-Inflammatory Treatment of CRPS**
R. Perez (Amsterdam, The Netherlands)

16.00 **Discussion**

16.10 020 **Brain-Related Rehabilitation Approaches to CRPS**
R. Perez (Amsterdam, The Netherlands)

16.20 021 **Management of CRPS with Somatosensory Rehabilitation of Pain**
Cl. Spicher, E. Létourneau (Fribourg, Switzerland)

16.30 **Discussion**

16.40 022 **Hand Surgery in CRPS**
S. Vossen, J. Bahm (Brussels, Belgium and Aachen, Germany)

16.55 023 **Functional Impairment of the Upper Limb after Treatment of CRPS**
A. Zyluk (Szczecin, Poland)

17.05 **Discussion**

17.15 – 17.45 SESSION 5: CRPS TYPE I - CASE PRESENTATIONS

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SATURDAY, JANUARY 30, 2016

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Moderators: *A. Aly, P. Pandin*

09.00 024 **Do More Proximal Regional Blocks Last Longer for Elective Hand Surgery ?**
L. Al-Mouazzen, H. Nagata, J. Field (Bristol, Gloucestershire, UK)

09.10 025 **Distal Nerve Blocks at the Wrist and Hand. A Superior Anesthetic Technique for Short Procedures**
A. Aly (Cairo, Egypt)

09.25 026 **'Wide Awake' Surgery to Reduce Pain and Improve Function in Hand Surgery**
P. Amadio (Rochester, MN, USA)

09.35 027 **Intra-Articular Infiltration of Liposome Bupivacaine for Analgesia after Trapeziectomy and Ligament Reconstruction with Tendon Interposition for Basal Joint OsteoArthritis of the Thumb**
J. Boons, J. Duerinckx, E. Peeters, S. Van Boxtael, C. Vandepitte, N. Knezevic (Genk, Belgium)

09.45 **Discussion**

10.00 028 **Keep it Simple and Safe in Hand Surgery**
W. El Kazzi (Brussels, Belgium)

10.10 **Discussion**

10.15 Coffee-Break and Visit of the Commercial Exhibition

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Moderators: *F. Moungondo, P. Amadio*

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J. Bahm (Aachen, Germany and Brussels, Belgium)

10.55 030 **Sensibility, Neglect and Pain in Obstetrical Brachial Plexus Children**
R. Bargain, F. Adam, J. Bahm, F. Schuind (Brussels, Belgium)

11.05 **Discussion**

11.15 031 **SomatoSensory Rehabilitation of Neuropathic Pain : from Theory to Clinical application**
Cl. Spicher, E. Létourneau (Fribourg, Switzerland)

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11.30 032 **The Management of Chronic Pain Caused by Peripheral Nerve Lesions. A Novel Application of Human Cadaveric Allografts**
J.I. Leckenby, B. Juon Personeni, C. Furrer, E. Vögelin (Bern, Switzerland)

11.40 033 **Surgery of Neuropathic Pain in the Upper Limb**
J. Bahm (Aachen, Germany and Brussels, Belgium)

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12.10 **Discussion**

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Moderators: *R. van Riet, M. Jayankura*

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S. Grijseels, F. Handelberg (Brussels, Belgium)

13.40 **Discussion**

13.45 036 **How to Optimize Prosthesis Positioning and Prevent Scapular Notching in Reverse Total Shoulder Arthroplasty ?**
M. Gonzalvez, P. Martz, H. Charles, P. Trouilloud, F. Handelberg, E. Baulot (Chenôve, Dijon, Lille, France and Brussels, Belgium)

13.55 **Discussion**

14.00 037 **Pain and Stiff Elbow**
R. van Riet (Antwerp, Belgium)

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F. Moungondo (Brussels, Belgium)

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H. van Schroeder, R. Gandhi (Toronto, Canada)

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14.55 040 **The Use of Proprioception and Sensorimotor Input in Rehabilitation of Distal Radius Fractures**
H. Harel, D. Michael, R. Wollstein (Haifa, Israel and Pittsburgh, PA, USA)

15.05 **Discussion**

15.10 041 **Joint Denervation. A Simple Option for Painful Upper Limb Problems**
A. Aly (Cairo, Egypt)

15.20 042 **Selective Trapezio-Metacarpal Denervation**
L. Van Overstraeten, E. Camus (Tournai, Brussels, Belgium and Maubeuge, France)

15.30 **Discussion**

15.35 Coffee-Break and Visit of the Commercial Exhibition

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Moderators: *P. Amadio, W. El Kazzi*

16.00 043 **Management of Suspected Clinical Scaphoid Fracture in Wigan, Wrightington and Leigh**
K.V. Sigamoney, A. Gabr, H. Lewkowicz, C. Jeyarajah, A. Watts (Wrightington, Wigan and Leigh, Stoke-on-Trent, UK)

16.10 **Discussion**

16.15 044 **Complications after Trapeziectomy : Role of Radiography and Ultrasonography**
V. Créteur, A. Madani (Brussels, Belgium)

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16.35 045 **Digital Pain in Neurofibromatose due to Glomus Tumors**
L. De Smet (Leuven, Belgium)

16.50 **Discussion**

16.55 046 **Middle Phalanx Resection in Treatment of Irreparable Flexion Contracture of the Long Fingers. Technique and results**
W. Beel, J. Goubau, B. Berghs, D. Kerckhove, P. Van Hoonacker, B. Vanmierlo, CK. Goorens (Bruges, Brussels, Belgium)

17.05 047 **A Cause of Progressive Upper Limb Loss in Patients with Severe Renal Failure : Calciphylaxis**
C. Melikoğlu (Izmir, Turkey)

17.15 **Discussion**

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17.40 **Summary and Conclusions**
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17.50 **End of Symposium**

ABSTRACTS

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008 **Evaluation Tools for Hand Disorders. Responsiveness to Changes**
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001 What is Chronic Pain?

L. Plaghki
Institute of Neuroscience, Université catholique de Louvain, Brussels, Belgium

The American Chronic Pain Association describes chronic or persistent pain as a condition, which can be continuous or recurrent and of sufficient duration and intensity to adversely affect a person's well-being, level of function, and quality of life (ACPC Resource Guide, 2012). Depending on the definition used, epidemiological studies have found that 10% to 55 % of people in various countries have chronic pain. The Taxonomy Working Group of the International Association for the Study of Pain (IASP) offers a publication entitled "Classification of Chronic Pain". It is free of charge to IASP members and the general public and includes detailed pain definitions, descriptions of pain syndromes, and codes for chronic pain diagnosis. However, it doesn't propose a precise definition of chronic pain. It is frequently described as pain that persists for an arbitrary interval of time (more than 12 months, 6 months, 3 months or that lasts a long time since onset) or pain that extends beyond the expected period of healing.
As alternative to this vagueness, Loeser & Melzack (1999) offered the following definition: *" It is not the duration of pain that distinguishes acute from chronic pain but, more importantly, the inability of the body to restore its physiological functions to normal homeostatic levels".* That inability can have many causes and is usually associated with a myriad of functional and structural neuronal and non-neuronal transformations in spinal and supraspinal structures. The vulnerability to these processes is determined by genetic and acquired factors (conditioning, opiates, …).
Despite the enormous increase in studies over the last decades, scientometric assessment did not reveal signs of really successful drugs in the field of pharmacotherapy for chronic pain (Kissin I. J Pain Res 2014). Therefore, whenever possible, prevention is better than trying to cure.

002 Interaction and Interdependance of Painful and Chronic Painful Process Occurrence and Pre, Per and PostOperative Pain Management

P. Pandin
Department of Anesthesiology, Erasmus Hospital, Free University of Brussels, Brussels, Belgium

For instance, approximately 40 million surgical procedures take place across North America each year, and by most conservative estimates 10% to 15% of those patients will go on to suffer chronic pain 1 year after surgery.1 This is a silent epidemic of devastating proportions for those who suffer the pain and the associated emotional costs related to distress and for society as a whole who bear the financial cost of lost productivity and treatment of pain-related problems. Investigations in recent years have given better definitions of the extent of the problem, some of the factors that may predict the onset of chronic pain after surgery and methods of preventing chronic pain. In addition, the future will bring us better definitions of the genetic basis of development of chronic pain allowing us to better counsel patients prior to different types of surgery regarding risk of chronic pain in relation to surgery and possibly allowing us to better aim the most intensive treatments at those patients in order to reduce morbidity. This rapid review of the state of the art in this matter would like to discuss the extent of the problem of chronic postsurgical pain, the factors associated with development, the typical presentation of this, eventually the underlying genetics, and possible methods of preventing it.

Finally, why some patients, and not others, experience chronic postsurgical pain is the question. For instance, any surgical incision will result in tissue damage, and activation of pain pathways. The problem is that in patients who experience this sort of complex painful process, these pathways, once activated, remain activated, and do not deactivate as they should, with time and normal healing. The next years would give us a first solution to this problem…

003 What is True in CRPS? Value of Scientific Evidence in a Vague Clinical Entity

A. Zyluk
Department of General and Hand Surgery, Pomeranian Medical University, Szczecin, Poland

Complex regional pain syndrome (CRPS) is a complex of symptoms typically occurring following trauma of the extremity. It presents initially with severe pain at rest or with the slightest movement, swelling, vasomotor instability (changes of color, temperature and sweating) and is accompanied by functional impairment of the affected limb (reduction of movements and strength). There are many inconsistent opinions in the literature concerning clinical forms of the disease (i.e. CRPS type 1 and type 2), pathophysiology (i.e. inflammatory, sympathetic, neurogenic) and effectiveness of the treatment (i.e. sympathetic blocks, antioxidants, vitamin C). In the presentation we discuss these issues and show that scientific evidence, although meeting all criteria of evidence based medicine, may lead researchers astray.

004 Evaluation of Touch-Evoked and/or Spontaneous Neuropathic Pain after Hand Surgery

Cl. Spicher, E. Létourneau
Somatosensory Rehab Center, Fribourg, Switzerland

Considering complex regional pain syndrome (CRPS) as a syndrome with somatosensory signs and symptoms, somatosensory rehabilitation of pain can be used to treat that specific condition. With all the symptoms typically related to CRPS, according to the Budapest criteria (Harden et al., 2010), CRPS patients present somatosensory disorders and neuropathic pain complaints can often be observed in clinical observations. To make a diagnosis of CRPS, three conditions must be present at the time of examination. First, the patient must experience continuing pain that is disproportionate to any inciting event. Second, there should be at least one symptom from each define category. And third, clinical signs should be present in at least two categories. The four categories are: Sensory, Vasomotor, Sudomotor / Edema and Motor / Trophic. Using the Somatosensory rehabilitation of Pain method, it is primal to consider the symptoms observed like the visible effect of CRPS. By this mean, treating only the symptom, like only treating the Decrease range of motion or the Edema, is not consider as a complete treatment of the CRPS. If we think of CRPS as a neuropathic condition that could have been triggered by an axonal lesion of a specific cutaneous branch, visible or not, then treating that syndrome with somatosensory rehabilitation will improve symptoms and somatosensory disorders like static mechanical allodynia and hypoaesthesia.

A large part of patients with CRPS observed in clinical practice over the years at the Centre de reeducation sensitive de la douleur presents static mechanical allodynia, a neuropathic condition that can be effectively treated with somatosensory rehabilitation of pain method (Spicher et al., 2006, 2008, 2009). First, the health professional must properly assess the portion of skin touched by static mechanical allodynia with an allodynography. Then it is possible to determine the severity of static mechanical allodynia using a scale of seven levels expressing the amount of non-painful pressure stimulation needed to triggers a reaction of pain: the rainbow pain scale. In the presence of an allodynic territory, a tactile device (used at home) and a vibratory device (used in therapy) are employed to provide comfortable somatosensory stimulations in a zone that is proximal to the territory of static mechanical allodynia but that is distant enough to ensure that the patient's experience is described as comfortable. The variable parameter of distant vibrotactile counter-stimulation is the localization of the stimulus application. The tactile device is made of any material providing a comfortable stimulus to the each patient (for example, fur, silk, microfiber fleece) and the vibratory device generated mechanical vibrations with frequency at 100 Hz and an amplitude of 0.06 mm (Spicher et al., 2008). As a result, clinical observations on neuropathic pain patients have shown that there is always and underlying hypoaesthesia when mechanical allodynia disappears (Spicher et al., 2007). Therefore, static mechanical allodynia is consider as a paradoxical painful hypoaesthesia, and this underlying hypoaesthesia needs to be treated as well.

Some patients with CRPS, however, did not suffer from paradoxically painful to touch condition. These patient presents another somatosensory disorder: hypoaesthesia, characterised by a loss of perception in a specific portion of their skin. That hypoaesthesia will be mapped with an aesthesiography (Létiévant, 1869; Tinel, 1916 ; Inbal et al., 1987; Spicher, 2013). The severity of hypoaesthesia can be assess with the two point discrimination test (Weber, 1835; Moberg, 1962; Dellon, 1978; Comtet, 1987) and the pressure perception threshold (von Frey, 1896). Rehabilitation of hypoaesthesia requires a daily home program of tactile stimulation for the patient with CRPS, repeated four times a day for five minutes in order to recover. “Look for hypoaesthesia, because, by decreasing hypoaesthesia neuropathic pain decreases” (Spicher and Clément-Favre, 2008): this paradigm of the SRM explains the search for hypoaesthesia. The technique (Spicher, 2006; Spicher and Quintal, 2013) is based on the neuroplasticity of the somatosensory system, involving direct stimulation of the hypoaesthetic skin mapped by aesthesiography.

During the treatment of the somatosensory disorders occurring during CRPS it is possible to treat others symptoms as well, but always with a non-painful strict restriction. This involves a prescription to avoid the stimulation of the skin with tactile mechanical allodynia and the realization of the home program mostly during the day before 4 P.M., because of the frequent increasing of pain at night with CRPS. With these recommendations, it is possible to effectively treat CRPS.

005 Thoracic Outlet Syndrome Secondary to Clavicle Fracture

J. Rois[1], W. Girsch[2]
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The common treatment of the clavicle fracture in the middle third is conservative, by the use of a figure-of-eight harness. Most of them heal uneventfully. In rare cases malunion or nonunion can lead to thoracic outlet syndrome (TOS), due to narrowing of the costoclavicular space.

In our retrospective study we report on 4 cases (3 women, 1 man) who developed a TOS secondary to a middle third clavicle fracture. In 3 patients (2 women, 1 man) the diagnosis of neurogenic TOS, with a delay of several months after the onset of symptoms, was made based on the patients history, physical examination, imaging studies and neurophysiological tests. In one case (woman) a neurovascular TOS was diagnosed secondary to reconstruction of a deficiency pseudarthrosis (nonunion resection, vascularized myo-osteo flap and plating). The three patients with the neurogenic TOS were treated surgically by nonunion resection, scalenotomy, neurolysis and plating of the clavicle. In one of these cases a first rib resection was performed. The fourth patient, neurovascular TOS, was treated surgically by decompression of the neurovascular structures,scalenotomy and first rib resection.

The surgically treated patients obtained solid bony union of the clavicle and relief from their symptoms without complications. In all our cases a good result could be achieved.

TOS secondary to clavicle fracture is rare, and often will not be recognized as such. Our patients developed symptoms of aTOS at varying intervals following trauma to the clavicle. The delayed onset of symptoms may lead to diagnostic confusion and delay in the beginning of appropriate treatment. There is no reliable method for diagnosis of a TOS, it is only the synopsis of the findings that results in diagnosis.

006 A Global Approach to the Management of Chronic Pain in the Upper Limb

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General Principles

- EARLY RECOGNITION
- Multidisciplinary Pain TEAM approach
- Parallel tracks (PAIN: Psyche, Anatomy, Illnesses, Nerve pathways)
- Address anatomic focus. Acute injuries first(fractures, lacerations)
- Therapy modalities, especially active
  - Biofeedback, acupuncture
- Pharmacologic management, preferably non-narcotic, of abnormal nerve responses
  - Antidepressants-tricyclics(amitriptylene), serotonin blockers(trazodone, Prozac, Paxil, Zoloft)
  - Anticonvulsants(Dilantin, Tegretol, Neurontin)
  - Pharmacologic Management of SMP, if present
    - Local anesthetics
    - Adrenergics-Alpha blockers(phenoxybenzamine, prazocin; alpha$_2$ agonists(clonidine)
    - Calcium Channel blockers(nifedipine)
    - Steroids
- Personality assessment/treatment, including work/medicolegal factors
  - The symbolic hand
  - Cultural factors
  - Substance abuse
  - Post traumatic stress disorder
- Address any systemic factors
- Consider chronic anatomic problems
- If nerve injury: desensitization vs reconstruction(graft, vein wrap, transposition, intraosseous transplantation, flap coverage, etc)
- Pain management; 'honorable exit' approaches
- I don't know/primum non nocere vs leave no stone unturned
- For longstanding SMP: consider sympathectomy(selective, chemical, or surgical)
- For longstanding CRPS
  - Implantable stimulators
- When NOT to Operate
  - The diagnosis is not clear
  - The surgical goal is not clear
  - The patient is not ready to get better
  - Postoperative support is not in place

CRPS 1

- Definition: pain, loss of function, autonomic disturbance
- Diagnosis: pain and loss of function by patient report/questionnaire quantification/VAS/observation. Autonomic dysfunction by 3PBS, QSART, thermography, vascular studies, physical examination(hair growth, skin atrophy, etc) etc. Symptoms may or may not be improved with sympathetic blockade. If symptoms improve with sympathetic blockade(i.e., IV phentolamine, an a blocker), it's SMP (sympathetically maintained pain) if not, SIP(sympathetic independent pain)
- Treatment: often non surgical

CRPS 2

- Definition: as in type 1 but with major mixed nerve injury(Weir Mitchell causalgia)
- Diagnosis as with Type 1 plus evidence(EMG, NCS) of injury to major mixed nerve

- Treatment: more likely to include surgery to address nerve injury, unless very proximal(root avulsion)

CRPS 3

- Definition: disproportionate pain and loss of function without autonomic dysfunction.
- Diagnosis: pain and loss of function by patient report/questionnaire quantification/VAS/observation. Common aliases: myofascial pain, fibromyalgia
- Treatment: almost always non surgical and often less pharmacologic. Avoid adding iatrogenic component.

Somatoform Pain Disorder

- Definition: multisystem complains over at least 6 months; minimal physical basis
- Diagnosis: history, lack of findings. More common in women
- Treatment: Recognition. Minimize tests, drugs. NO surgery!!!!

Conversion Disorder

- Definition: UNINTENTIONAL signs without physical basis
- Diagnosis: lack of physical basis, identification of underlying psychological conflict. Need close cause-effect relationship. Classic example: clenched fist syndrome
- Treatment: Recognition. Minimize tests, drugs. NO surgery!!!!

Munchhausen's

- Definition: SIMULATION of disease to gain attention. Variant: parent simulates disease in a child.
- Diagnosis: history(if available); suspicion; lack of confirmatory findings. Patient often very sophisticated medically
- Treatment: psychiatric(patient usually refuses). Avoid adding iatrogenic component

Malingering

- Definition: DELIBERATE misrepresentation of signs, symptoms in order to escape a duty or obligation. Is PROPORTIONATE to some secondary gain
- Diagnosis: suspicion
- Treatment: Recognition. May use 'honorable exit' strategy

Factitial syndromes

- Definition: Deliberate creation of disease, not proportionate to goals. Variant: SHAFT syndrome: patient tries to get doctor to operate on basis of feigned illness.
- Diagnosis: suspicion, especially in patient with a medical background. Overlap with malingering: when is secondary gain proportionate to induced illness/injury?
- Treatment: confrontation may help MD more than patient. Avoid adding iatrogenic component. Prognosis poor

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007 3D Augmented Reality Mirror Visual Feedback Therapy Applied to the Treatment of Persistent, Unilateral Upper Extremity Neuropathic Pain. A Preliminary Study

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Objective: We assessed if pain relief could be present with a new system that combines 3D augmented reality system (3DARS) and the principles of mirror visual feedback.

Methods: twenty two patients between 18 to 75 years of age who suffered of chronic neuropathic pain. Each patient performed 5 treatments 3DARS sessions of 20 minutes spread over a period of 1 week. The following pain parameters were assessed: (1) Visual Analogic scale after each treatment session (2) McGill pain scale and DN4 questionnaire were completed before the first session and 24 hours after the last session.

Results: The mean improvement of VAS per session was 29% ($p<0.001$). There was an immediate session effect demonstrating a systematic improvement in pain between the beginning and the end of each session. We noted that this pain reduction was partially preserved until the next session. If we compare the pain level at baseline and 24 hours after the last session, there was a significant decrease ($p<0.001$) of pain of 37%. There was a significant decrease ($p<0.001$) of the McGill's Pain Questionnaire and DN4 questionnaire ($p<0.01$).

Conclusion: Our results indicate that 3DARS induced a significant pain improvement for patients who presented chronic neuropathic pathology in an upper unilateral extremity. The 3DARS could be a new adjunct for manual therapist and all medical services who manage chronic neuropathic pain.

Keywords: Augmented reality; Mirror visual feedback; Physical Therapy; Neuropathic pain; Phantom limb pain; CRPS

"Level of Evidence": 4

008 Evaluation Tools for Hand Disorders. Responsiveness to Changes

Abstract not received in due time.

SESSION 2: WHAT IS CRPS TYPE I?

009 Neuropsychology of Body Perception: Insights form the Study of Hemispatial Neglect and Extinction
V. Legrain, C. Vanderclausen, S. Blandiaux, L. Filbrich (Brussels, Belgium)

010 Pain, Neglect and the Central Representation of the Body in CRPS
A. Mouraux, D. Torta, V. Legrain (Brussels, Belgium)

011 Complex Regional Pain Syndrome : Clinical Research in Rehabilitation
S. Hatem (Brussels, Belgium)

012 Pathophysiological Mechanisms of CRPS
R. Perez (Amsterdam, The Netherlands)

013 Diagnosis and Prognosis of CRPS
R. Perez (Amsterdam, The Netherlands)

009 Neuropsychology of Body Perception: Insights form the Study of Hemispatial Neglect and Extinction

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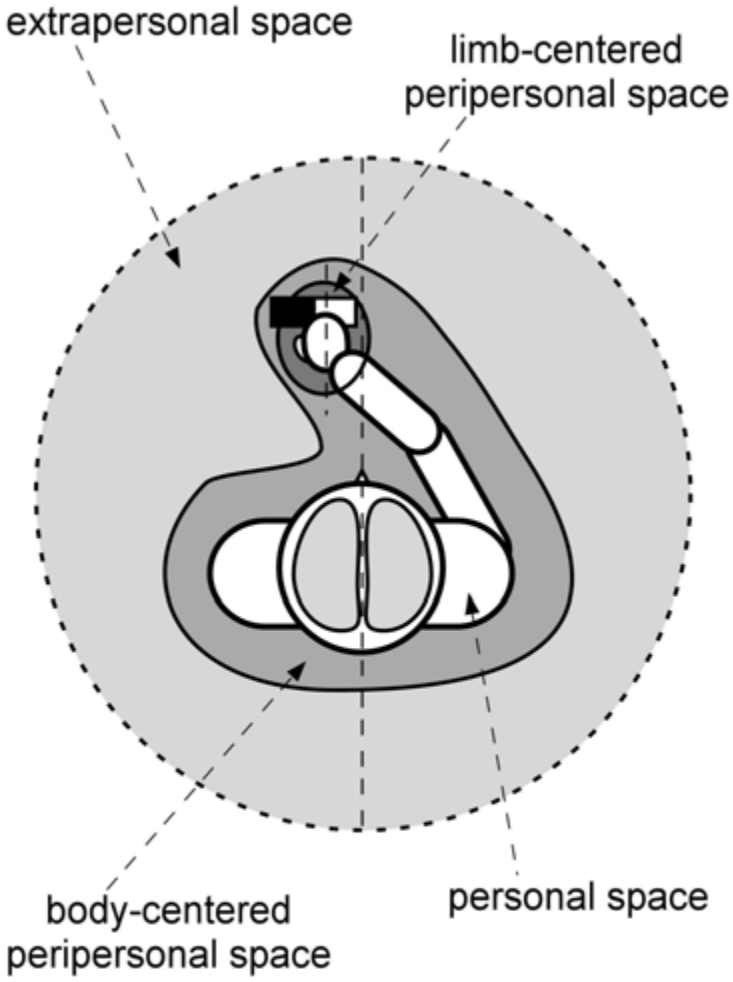
The ability to locate a stimulus applied to our body is an important function in order to adapt our behavior, especially when this stimulus can be noxious. This ability is partially supported by the anatomical representation of the skin surface in the primary somatosensory cortex. However, a large amount of studies has demonstrated that the brain is able to remap this body representation according to various coordinate systems that are using external space as reference (Figure 1). This allows taking into account the posture of the body and the position of the object in contact with the body in external space. Somatosensory inputs are therefore integrated with inputs from the different sensory modalities (e.g. proprioception, vision) to build global multisensory representations of the body and the proximal space. The existence of these complex spatial representations was partly evidenced by the study of the phenomena of hemispatial neglect and extinction occurring consecutive to cortical lesions. Hemispatial neglect is defined as the inability to explore and report stimuli on the side of space contralateral to the damaged hemisphere. Conversely, patients with extinction are able to report a stimulus presented on the side contralateral to the lesion when it is presented alone. Extinction is indeed characterized by an inability to report the stimulus on the side contralateral to the lesion, but only when it is presented simultaneously with a stimulus on the ipsilateral side. Here we will present an overview of the symptomatology of these two neuropsychological impairments, and the methods used to investigate them. We will also discuss how the study of hemispatial neglect and extinction contributed to the understanding of the cortical mechanisms underlying the perception of the body space.



from Legrain V., Torta D.M. (2015), in Pickering G., Gibson S. (Eds). Pain, Emotion and Cognition: a Complex Nexus.

010 Pain, Neglect and the Central Representation of the Body in CRPS

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Studies have suggested that, alongside sensory, motor and vegetative symptoms, patients with CRPS also present unilateral cognitive deficits leading to impaired perception and utilization of the affected limb. This has led some authors to propose that CRPS patients present a neglect-like symptomatology similar to the left hemineglect that is classically observed in patients suffering from a lesion of the right hemisphere. In this presentation, we will review the data supporting the existence of neglect-like symptoms in CRPS. We will show that, even though it is clear that CRPS-related changes in cortical function do not only affect sensorimotor processes but also higher-order multisensory processing of spatial information, there is still no agreement as to whether patients with CRPS really present neglect symptoms and, if they do, what it is that they really neglect. Furthermore, we will discuss whether these neglect-like symptoms are specific for CRPS, or whether they can also be observed in other types of lateralized pain syndromes.

011 Complex Regional Pain Syndrome : Clinical Research in Rehabilitation

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CRPS remains a challenging condition to treat. Intensive rehabilitation aims at improving the functional outcome of patients. At present, few rehabilitation strategies are evidenced-based. This topic will discuss the rationale of different types of rehabilitation treatment for CRPS with regards to known underlying pathophysiological mechanisms and available scientific evidence.

012 Pathophysiological Mechanisms of CRPS

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Multiple peripheral and central mechanisms have been proposed to be involved in the pathogenesis of CRPS, whereby different mechanisms may prevail between different patients and in the course of the disease. Peripheral and central sensitization, autonomic changes and sympatho-afferent coupling, inflammatory alterations, cortical changes, and genetic and psychological factors are likely to contribute to the pathophysiology and heterogeneity between patients. Central in the cascade, NF-KB is involved in general pathologic mechanisms such as inflammation, oxidative stress, and sensitization. Furthermore, Recent work has led to the suggestion that in some patients autoimmune processes may play a role in the pathophysiology of CRPS. A substantial body of evidence suggests that a derailed inflammatory response is plays a key role in the pathogenesis of CRPS. The resulting release of large concentrations of inflammatory mediators leads in the second place to the vasomotor dysfunction and maladaptive neuroplasticity. Peripheral and central sensitisation, together with the disinhibitory descending pathways and/or facilitating ascending pathways, play a large role in maladaptive neuroplasticity. Why neurological symptoms such as dystonia and body schema disorders occur is as yet unclear.

013 Diagnosis and Prognosis of CRPS

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CRPS-I is characterized by sensory, vasomotor and autonomic disorders of a limb, usually following a trauma or operation. The lack of a unique pathophysiological mechanism, as well as the absence of a good benchmark test, let alone a gold standard, necessitates the use of clinical diagnostic criteria. Clinical evaluation and diagnosis of CRPS-I is based on evaluation of observable phenomena and symptoms reported by the patient based on defined sets of diagnostic criteria. Establishing a clinical diagnosis of a case of CRPS-I that is typical and acute in all its facets is often quite straightforward. However, in most cases CRPS-I does not present itself in the classic form with all the symptoms.
During an IASP-sponsored symposium that was held in Budapest in 2005, the so-called “Budapest” criteria were proposed, whereby a distinction was made between diagnostic criteria for clinical use and diagnostic criteria for research. The criteria were then revalidated in an international study, which also involved Dutch centers (Harden et al. 2010). This study found the clinical criteria to have a diagnostic sensitivity of 0.99 and a specificity of 0.68 in 113 CRPS-I patients when compared with a control group of non-CRPS neuropathic pain patients (n=47). The Budapest research criteria resulted in a higher specificity (0.79), though this was accompanied by a lower sensitivity (0.78).
The Budapest criteria were formally approved by the taxonomy committee of the IASP as diagnosis criteria for CRPS-I (Merskey and Bogduk 2012). Additional diagnostic (including x-ray, bone scans, blood tests, etc.) can only be used to rule out other pathologies and should not be used to confirm the diagnosis of CRPS. However, some of these diagnostic procedures, such as temperature measurement, edema measurement and QST, can be used to quantify clinical symptomatology in CRPS-I.
It should also be taken into consideration that a definitive diagnosis of CRPS-I can only be made once the usual recovery period for the original trauma is assumed to have passed.

SESSION 3: PREVENTION AND TREATMENT OF CRPS TYPE I (1)

014 Can CRPS be Prevented in Hand Surgery ?
F. Schuind (Brussels, Belgium)

015 Prevention of CRPS
A. Zyluk (Szczecin, Poland)

016 Evidence-Based Perspectives for Treatment of CRPS
R. Perez (Amsterdam, The Netherlands)

017 Complex Regional Pain Syndrome Type 1 in Hand Surgery. Efficacy of Sympathic Ganglion Block
V. Brouillard, L. Van Overstraeten, E. Camus (Tournai, Brussels, Belgium and Maubeuge, France)

014 Can CRPS be Prevented in Hand Surgery ?

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Thirty years ago, postoperative pain was considered as a normal, unavoidable postoperative phenomenon. This has fortunately changed and the current multimodal strategy allows better control of postoperative pain, not only for the “comfort” of the patient, but also to prevent the complications related to pain, including chronicization of pain as seen in CRPS type I.

The pathophysiology of CRPS remains uncertain. The present hypothesis (as originally suggested by Sudeck) is that CRPS is an exaggeration of the normal posttraumatic inflammatory response, with vasodilatation and increased capillary permeability. Potential factors maintaining this aberrant, persistent state of inflammation include individual hypersensitization to vaso-active mediators, oversecretion of mediators, local release of free radicals, failure of inhibitors and increased venous pressure. The surgical team can act on several factors : (1) control of the surgical aggression at the origin of the postoperative inflammation ; (2) limitation of the peri-operative initial pain ; (3) decrease of the venous pressure and control of the subsequent edema ; (4) scavenging free radicals (vitamin C). A strategy based on these principles is efficient to decrease the risk of postoperative CRPS.

015 Prevention of CRPS

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There are no specific measures which are known to prevent CRPS after trauma of surgery. It was suggested that careful operative technique, knowledge of anatomy, avoidance of nerve traction and proper postoperative care can reduce of CRPS after operations. It is also common belief that early mobilization and prompt physiotherapy prevent the development of CRPS after fractures. Therefore, operative treatment of fractures would result in reduction of the risk of CRPS. However, although these factors are (in general) important determinants of the effectiveness of the treatment, their relationship to CRPS has not been scientifically confirmed. Reduction of CRPS incidence has been shown in patients after fracture of the distal radius by a two-months administration of oral vitamin C, but this beneficial effect has not been confirmed by other studies and has been recently questioned (Zollinger et al., 1998; Ekrol et al., 2014). In patients with a history of CRPS, a new injury or operation to that (or contralateral) extremity is known to increase risk of a recurrence. Therefore, specific measures are recommended such as avoiding of a tourniquet at the operation, pharmacological prevention by mannitol, calcitonin, steroids or vitamin C. However, the necessity of use of these measures has been questioned in some studies, showing that risk of a new episode of the condition in patients who recovered from CRPS is minimal (Zyluk and Puchalski, 2013). Based on our clinical experience we postulate that proper treatment of distal radial fractures (the most common cause of CRPS) is fundamental for preventing development of the disease.

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016 Evidence-Based Perspectives for Treatment of CRPS

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Recent years, a lot of new knowledge has become available regarding the epidemiology and pathophysiology of CRPS-I as well as on medical and paramedical treatment for CRPS. At the initiative of the Netherlands Society of Rehabilitation Specialists (VRA) and the Netherlands Society of Anesthesiologists it was found it desirable to update existing guidelines from 2006. In this update, the patient perspective was once again a key focus. The guidelines were developed based on the Evidence-Based Guideline Development method. A core group prepared the draft of this update, while an advisory group provided input on the problem-area analysis during the preparatory phase and feedback on the draft at a later stage. Nearly all core group members and advisory group members had also participated in the project group responsible for the CRPS-I guidelines from 2006, once again representing all their professional associations. A tentative treatment algorithm was proposed based on available evidence.

● General	Physical or Occupational Therapy
● Inflammatory profile	DMSO 50% (Vitamin C for prevention)
● Pain	WHO pain ladder up to step 2
Severe refractory pain	Ketamine IV
● Movement disorders	Oral Baclofen/oral benzodiazepines
Refractory MD > 1 extr.	Baclofen IT
● Vasomotor disorders	Calcium influx blockers Ketanserine IV
For selected patients: Interventional therapy	Spinal Cord Stimulation

017 Complex Regional Pain Syndrome Type 1 in Hand Surgery. Efficacy of Sympathic Ganglion Block

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Introduction: The efficacy of the pharmacological sympathectomy with Intravenous regional block of buflomedil or guanethidine for the management of the complex regional pain syndrome of type I (CRPS I) is controversial. The authorization of distribution of these substances were removed since 2011.
This study reports the preliminary results of the sympathetic ganglion block to treat the CRPS type I following a trauma in hand surgery.

Materials and methods: Between 2012 and 2014, fifteen patients (4 males and 11 females) with a mean age of 51 years old (35 – 75 yo) received a ultrasound-guided stellate ganglion block (SGB) with combined solution of ropivacain 0,75% (7 ml), dexametheson 10 mg (2ml), clonidine 150 µ (1 m),

after clinical and scintigraphic diagnose of a CRPS type I. The causes were 4 work accidents and 11 surgical procedures. The mean delay between the aggression and the diagnostic was 56 days (36 – 93 d). The mean symptom-onset-to-treatment interval was 92.8 day (40 – 221d). An associated treatment was given (Calcitonin 8/15, rehabilitation 12/15, psychologic 2/15, dynamic orthosis 2/15, other medication 6/1)
Pain, ROM of the wrist and the fingers, Grasp, disability were recorded.

Results: All patients received one SGB and 6 patients received 2 blocks. The pains decreased 13/15 and disappears 4/15. The stiffness of finger was found 8/15. This finger mobility was normalised 4/8 and improved 1/8. The mobility of the wrist was improved in all cases and above all for the flexion and for a short symptom-onset-to-treatment interval (31.6°). The grasp was improved in the same way (14.6 Kg ; 56% of improvement). The mean period of disability was 194 days and 2 patients didn't return to work and present a definitive invalidity.

Limitations: The interpretation of the present results is partly limited due to the small number included patients and the missing control group.

Conclusion: The SBG seems to improve pain and clinical function of the CRPS I, particularly when the time interval between the cause and the injection is short.

No conflict of interest

SESSION 4: PREVENTION AND TREATMENT OF CRPS TYPE I (2)

018 Results of the Treatment of Chronic, Refractory CRPS with Ketamine Infusions. A Preliminary Report
A. Zyluk, P. Puchalski (Szczecin, Poland)

019 Anti-Inflammatory Treatment of CRPS
R. Perez (Amsterdam, The Netherlands)

020 Brain-Related Rehabilitation Approaches to CRPS
R. Perez (Amsterdam, The Netherlands)

021 Management of CRPS with Somatosensory Rehabilitation of Pain
Cl. Spicher, E. Létourneau (Fribourg, Switzerland)

022 Hand Surgery in CRPS
S. Vossen, J. Bahm (Brussels, Belgium and Aachen, Germany)

023 Functional Impairment of the Upper Limb after Treatment of CRPS
A. Zyluk (Szczecin, Poland)

018 Results of the Treatment of Chronic, Refractory CRPS with Ketamine Infusions. A Preliminary Report

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Chronic, refractory complex regional pain syndrome remains very difficult to treat (Żyluk and Puchalski, 2013). A sub-anesthetic low-dose ketamine has shown promise in advanced CRPS (Azari et al., 2012). We investigated the efficacy of ketamine in anesthetic dosage in chronic, refractory CRPS patients that had failed available standard therapies. Five female patients, aged a mean of 34 years with long-standing, a mean of 8 years', CRPS received ketamine in anesthetic dosage over 10 days. The patients received 1-5 ketamine courses. The effect of gradual pain reduction was observed beginning on the 4th-5th day of treatment, associated with a decrease in the intensity of the allodynia (pain at light touch). No improvement in function (finger range of motion, grip strength) of the affected hands was noted in any patient. This beneficial analgesic effect was confined to 1.5-2.5 months after treatment and then pain relapsed to the baseline level. The results of this study show a short-term analgesic effect for this therapy, with no effect on movement and function of the affected limbs. Nevertheless, this method brings hope to the most severely ill patients who cannot be offered any other reasonable treatment option.

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019 Anti-Inflammatory Treatment of CRPS

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An exaggerated inflammatory response is generally proposed to contribute to pathophysiologic mechanisms of CRPS-1. Systematic evaluation of literature has been performed on the effect of anti-inflammatory therapy on pain, range of motion, clinical improvement and prevention of CRPS-1. Based on a best evidence synthesis of 22 articles, positive but limited effects of treatment of CRPS-1 with corticosteroids and free radical scavengers are found. For corticosteroids positive effects were observed on pain reduction and range of motion (Grade 3), but not on clinical severity scores (Grade 2). It is likely that free radical scavengers improve general clinical outcome, but have no effects on pain reduction (Grade 2). There are indications that free radical scavengers improve range of motion (Grade 3). Vitamin C is effective in reducing the occurrence of CRPS-1 after wrist fractures (Grade 1). Efficacy of both scavengers and corticosteroids may be less efficacious at longer disease durations. Future research should focus on establishing effects of anti-inflammatory therapy on distinct subtypes of well-diagnosed CRPS-1 patients. Novel findings related to the role of OPG in regulating NF-KB inhibition, may lend further support to treatments such as free radical scavengers corticosteroids and bisphosphonates. For the latter, emerging evidence suggest efficacy for treatment of CRPS. Furthermore, based on the assumption that autoimmune responses may play a role in the pathophysiology of CRPS, CRPS patients have been treated with intravenous immunoglobulin treatment (IVIG) with positive response in some patients. Elaborating on an autoimmune etiology for CRPS, plasma exchange therapy was offered to CRPS patients with a clinical presentation suggestive of a small fiber neuropathy, with positive outcome in an uncontrolled study. These findings and consequences for treatment will be discussed.

020 Brain-Related Rehabilitation Approaches to CRPS

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A variety of brain related approaches has been used successfully in the tratement of CRPS and chronic pain in general. These include congitive behavioural approaches, among which graded exposure treatment for patients with pain related fear, for which there is emerging evidence in CRPS. In effect, these approaches target the ability of patients to change their perspective on pain and to learn the mto approach pain in a different manner. This also includes renewed attention for pain education approaches, in this respect the book of Butler &Moseley “Explain Pain” is worth reading for both patient and health care professional. A number of treatment approaches which can be summerized under the term “brain-training”, focus on visual and congitive tricks in an attempt to uncouple sensory information and perception of pain. These include, a.o. mirror visual feedback and graded motor imagery. In systematic evaluation of literature these interventions appear to be more efficacious than more traditionally oriented exercise approaches. However, also here there is no one-size-fits-all: medical audits reveal that the efficacy of these approaches in practice may not yield the same effect size as found in contolled clinical studies.

021 Management of CRPS with Somatosensory Rehabilitation of Pain

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Considering complex regional pain syndrome (CRPS) as a syndrome with somatosensory signs and symptoms, somatosensory rehabilitation of pain can be used to treat that specific condition. With all the symptoms typically related to CRPS, according to the Budapest criteria (Harden et al., 2010), **CRPS patients present somatosensory disorders and neuropathic pain** complaints can often be observed in clinical observations. To make a diagnosis of CRPS, three conditions must be present at the time of examination. First, the patient must experience continuing pain that is disproportionate to any inciting event. Second, there should be at least one symptom from each define category. And third, clinical signs should be present in at least two categories. The four categories are: Sensory, Vasomotor, Sudomotor / Edema and Motor / Trophic. Using the Somatosensory rehabilitation of Pain method, it is primal to consider the symptoms observed like the visible effect of CRPS. By this mean, treating only the symptom, like only treating the Decrease range of motion or the Edema, is not consider as a complete treatment of the CRPS. If we think of CRPS as a neuropathic condition that could have been triggered by an axonal lesion of a specific cutaneous branch, *visible or not*, then treating that syndrome with somatosensory rehabilitation will improve symptoms and somatosensory disorders like static mechanical allodynia and hypoaesthesia.

A large part of patients with CRPS observed in clinical practice over the years at the *Centre de reeducation sensitive de la douleur* presents **static mechanical allodynia**, a neuropathic condition that can be effectively treated with somatosensory rehabilitation of pain method (Spicher et al., 2006, 2008, 2009). First, the health professional must properly assess the portion of skin touched by static mechanical allodynia with an allodynography. Then it is possible to determine the severity of static mechanical allodynia using a scale of seven levels expressing the amount of non-painful pressure stimulation needed to triggers a reaction of pain: the rainbow pain scale. In the presence of an allodynic territory, a tactile device (used at home) and a vibratory device (used in therapy) are employed to provide comfortable somatosensory stimulations in a zone that is proximal to the territory of static mechanical allodynia but that is *distant* enough to ensure that the patient’s experience is described as comfortable. The variable parameter of distant vibrotactile counter-stimulation is the localization of the stimulus application. The tactile device is made of any material providing a comfortable stimulus to the each patient (for example, fur, silk, microfiber fleece) and the vibratory device generated mechanical vibrations with frequency at 100 Hz and an amplitude of 0.06 mm (Spicher et al., 2008). As a result, clinical observations on neuropathic pain patients have shown that

there is always and underlying hypoaesthesia when mechanical allodynia disappears (Spicher et al., 2007). Therefore, static mechanical allodynia is consider as a paradoxical painful hypoaesthesia, and this underlying hypoaesthesia needs to be treated as well.

Some patients with CRPS, however, did not suffer from paradoxically painful to touch condition. These patient presents another somatosensory disorder: **hypoaesthesia,** characterised by a loss of perception in a specific portion of their skin. That hypoaesthesia will be mapped with an aesthesiography (Létiévant, 1869; Tinel, 1916 ; Inbal et al., 1987; Spicher, 2013). The severity of hypoaesthesia can be assess with the two point discrimination test (Weber, 1835; Moberg, 1962; Dellon, 1978; Comtet, 1987) and the pressure perception threshold (von Frey, 1896). Rehabilitation of hypoaesthesia requires a daily home program of tactile stimulation for the patient with CRPS, repeated four times a day for five minutes in order to recover. “Look for hypoaesthesia, because, by decreasing hypoaesthesia neuropathic pain decreases” (Spicher and Clément-Favre, 2008): this paradigm of the SRM explains the search for hypoaesthesia. The technique (Spicher, 2006; Spicher and Quintal, 2013) is based on the neuroplasticity of the somatosensory system, involving direct stimulation of the hypoaesthetic skin mapped by aesthesiography.

During the treatment of the somatosensory disorders occurring during CRPS it is possible to treat others symptoms as well, but always with a **non-painful strict restriction**. This involves a prescription to avoid the stimulation of the skin with tactile mechanical allodynia and the realization of the home program mostly during the day before 4 P.M., because of the frequent increasing of pain at night with CRPS. With these recommendations, it is possible to effectively treat CRPS.

022 Hand Surgery in CRPS

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Introduction: CRPS is unfortunately a companion of every handsurgeon. While being in the disease course surgical treatment of CRPS patients rests very debatable. The surgical paradigm was: the surgical procedure should be delayed until CRPS symptoms are well controlled.
Although by looking closely to the patients we often find a triggering concomitant disease, which would need a surgical treatment.

Patients and Methods: We will present a series of CRPS patients with concomitant disease. Those were triggering the CRPS. Examples for concomitant disease were trigger fingers, de Quervain’s disease, tenosynovitis, carpal tunnel syndrome, nerve irritation by a long K-wire, foreign bodies and laceration of the palmar branch of the median nerve. We treated the patients surgically early. We took reasonable precautions as an axillary plexus catheter for 48h hours perioperatively, an adapted pain treatment and a hand therapy attendance.
All patients better their CRPS symptoms rapidly and faster as one would expect during a normal course of the CRPS.
In our series we did not have patients who worsened under this surgical treatment.

Conclusion: Clinically we find triggering concomitant diseases in CRPS patients. By treating those early we could clearly improve the course of the disease. So we debate the former surgical paradigm, which delayed the surgical procedure.

023 Functional Impairment of the Upper Limb after Treatment of CRPS

Abstract not received in due time.

SESSION 6: ANESTHESIA AND PREVENTION OF POSTOPERATIVE PAIN IN HAND SURGERY

024 **Do More Proximal Regional Blocks Last Longer for Elective Hand Surgery ?**
L. Al-Mouazzen, H. Nagata, J. Field (Bristol, Gloucestershire, UK)

025 **Distal Nerve Blocks at the Wrist and Hand. A Superior Anesthetic Technique for Short Procedures**
A. Aly (Cairo, Egypt)

026 **'Wide Awake' Surgery to Reduce Pain and Improve Function in Hand Surgery**
P. Amadio (Rochester, MN, USA)

027 **Intra-Articular Infiltration of Liposome Bupivacaine for Analgesia after Trapeziectomy and Ligament Reconstruction with Tendon Interposition for Basal Joint OsteoArthritis of the Thumb**
J. Boons, J. Duerinckx, E. Peeters, S. Van Boxtael, C. Vandepitte, N. Knezevic (Genk, Belgium)

028 **Keep it Simple and Safe in Hand Surgery**
W. El Kazzi (Brussels, Belgium)

024 Do More Proximal Regional Blocks Last Longer for Elective Hand Surgery ?

L. Al-Mouazzen[1], H. Nagata[2], J. Field[2]
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Introduction: In elective hand surgery, axillary and mid-humeral brachial plexus blocks represent more than 50% of all regional anaesthetic techniques performed. The choice between the two approaches remains controversial. In this prospective study, we compared the longevity of the mid-humeral block compared to the axillary brachial plexus block following elective hand surgery.

Methods: An initial pilot study was performed comparing the 2 anaesthetic techniques. Having determined a difference in longevity between the groups an additional group was tested using exactly the same anaesthetic cocktail. A prospective review of 39 consecutive patients undergoing elective hand procedures over a 12 month period, with 13 patients in each group.

Group A: Had Axillary block with a 40mls of Chirocaine 0.375% with adrenaline 1:400.000.

Group B: Had Mid-Humeral block with a 40 mls of Chirocaine 0.375%

Group C: Had Mid-Humeral block with a 40 mls of Chirocaine 0.375% with adrenaline 1:400.000

Patients were phoned the day after the procedure and asked:

1- What time the block wore off

2- What time the patient first took painkillers

Groups were compared with the un-paired t-test.

Results: No difference between the groups was found with regard to demographic data or surgical site and procedure. Patients in group A reported experiencing pain after an average of 22 hours, with the need to take painkillers at an average of 26 hours post-operatively.
Patients in group B reported experiencing pain after an average of 14 hours, with the need to take painkillers at an average of 16 hours post-operatively. The difference was significant using the un-paired student t-test ($p<0.001$). Patients in group C reported experiencing pain at an average of 11.6 hours, with the need to take painkillers at an average of 12 hours post-operative. No difference was found when comparing the group B & C results. When group A and C were compared the difference was found to be significant at ($p<0.001$)

Conclusions: The axillary block appears to last longer than the mid-humeral block. Changing the mixture of the mid-humeral block did not change its longevity. We concluded that proximal blocks last longer.

025 Distal Nerve Blocks at the Wrist and Hand. A Superior Anesthetic Technique for Short Procedures

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Short procedures constitute a large proportion in hand surgery. Most of them are done as one day surgery. Regional anaesthesia is considered to be the best option for these types of operations. Compared with general anaesthesia, regional anaesthesia improves early outcome after wrist and hand surgery. These outcome benefits include improved analgesia, reduced nausea/vomiting, and reduced length of recovery room and hospital stay.

'Regional anesthesia always works, provided you put the right dose of the right drug in the right place'. The problem with regional anesthesia, and more specifically peripheral nerve blockade, has been getting the drug to the right place. This has traditionally involved a 'blind' approach to the nerve, relying on surface anatomical landmarks to estimate nerve location. The advent of ultrasonography has made performing upper extremity nerve blocks relatively easy with a high degree of reliability.

The proximal approaches to brachial plexus block such as supra-clavicular plexus block, infra-clavicular plexus block, or the axillary block are favored for most of distal upper extremity surgeries, but the delay in the onset time and the proximity to central structures as the pleura, subclavian or axillary artery and phrenic nerve, remain a barrier to their use for short procedures.

Distal nerve blocks have the benefits of lying away from critical structures and the preservation of proximal muscle function of the upper limb. Thus this type of nerve block is the ideal for short procedures where the patient can tolerate the tourniquet.

In this outgoing study we are comparing wrist block technique through either anatomical landmark based or ultrasound guided distal nerve block in regard block failure, onset duration, inadvertent vascular puncture, infection and nerve damage.

026 'Wide Awake' Surgery to Reduce Pain and Improve Function in Hand Surgery

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Lloyd and Barbara Amundson Professor of Orthopedic Surgery, Mayo Clinic, Rochester, MN, USA

I have been using the wide awake approach for the past several years, on more and more patients. In my own practice, in a large institution with many referred patients, I have found the following significant advantages related to the use of local anesthetic with epinephrine as an alternative to blocks or general anesthesia, or even to local anesthesia without epinephrine

- No tourniquet=no tourniquet pain intraop, no risk of tourniquet palsy, no risk of skin problems under the tourniquet, no post deflation flush, no need to get hemostasis after deflation
- No risk of complications related to general anesthesia, axillary or Bier block
- Less postop hematoma, less total bleeding, less time cauterizing
- No/less sedation= faster recovery and discharge from ASC
- Block in holding area=less OR time
- If truly 'wide awake', no need for anesthetist (cost savings); no risk of complications related to sedation
- The patient knows everything that is going on, especially if they watch (which I always encourage). A better informed patient is a happier patient and a better partner in postop recovery
- Most important, patient cooperation is key to setting tension and checking motion after any kind of tendon surgery, and in confirming active motion after contracture releases.

Roughly half my patients chose the local without sedation, and are truly 'wide awake'. I leave this to the patient's choice. I have not found that this choice relates to patient age, gender or whether they are local or referred. There are some cultural differences of course, but aside from that it seems to be a matter of patient preference

This is the only anesthetic method I have used where patients will often say, as they are being wheeled from surgery, "Thank you, doctor. It was fun, and I learned a lot".

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027 Intra-Articular Infiltration of Liposome Bupivacaine for Analgesia after Trapeziectomy and Ligament Reconstruction with Tendon Interposition for Basal Joint OsteoArthritis of the Thumb

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Background: Trapeziectomy and ligament reconstruction with tendon interposition (LRTI) is a common surgery for painful arthritis of the basal joint of the thumb. LRTI is associated with significant postoperative pain, for which patients typically require hospitalization for pain management using systemically administered opioid treatment. We report a novel approach to postoperative pain management with a new sustained-release preparation of bupivacaine HCl (liposome bupivacaine; Exparel®, Pacira Pharmaceuticals) for compassionate care in two patients having trapeziectomy and LRTI.

Methods: Two patients (50 and 56 year old women) underwent trapeziectomy and LRTI, consisting of resection of the trapezium bone, followed by harvesting of half of the flexor carpi radialis tendon, to reconstruct the volar beak ligament and for interposition arthroplasty. One patient (#1) received 2 ml of Exparel® 1.33% into the joint space and 3 ml subcutaneously at the surgical site. The other patient (#2) received similar injection of 10 ml mixture of Exparel® 1.33% and 0.5% bupivacaine HCl. Both patients received general anesthetic intraoperatively and multimodal postoperative pain management consisting of oral paracetamol (1g Q6 hours) and ibuprofen (0.4g Q8 hours). Both patients were given a prescription for opioids as a rescue pain therapy (Tramadol SL 50mg Q6 hours).

Results: Both patients had excellent postoperative analgesia, allowing discharge home the day of surgery, without the need for hospitalization. The analgesia was adequate throughout 48h postoperatively to allow discharge home short after the surgery. Neither patient required opioid rescue analgesia. Neither patient showed an evidence of local inflammatory reaction or systemic adverse events.

Discussion
Local anaesthetic infiltration is commonly used after trapeziectomy and LRTI. However, the short duration of currently available local anaesthetics often requires hospitalization for pain management [1] The recent pharmacological advances and introduction of sustained release formulation of bupivacaine (Exparel®) hold promise to improve postoperative pain management and allow some procedures to be performed as a day case surgery. We report our preliminary experience with different injection mixtures of Exparel® in 2 patients having trapeziectomy and LRTI, as no information is currently available on its use, dosing or effects of mixing Exparel® with bupivacaine HCl. Randomized controlled trials are indicated to more objectively determine the analgesic benefit of Exparel® in trapeziectomy and LRTI which we observed in our patients.

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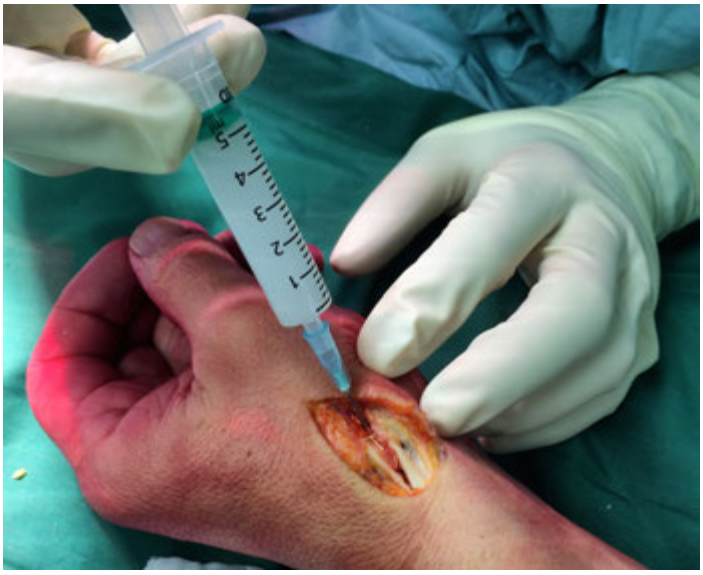

028 Keep it Simple and Safe in Hand Surgery

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Keeping hand elevated is the simple most important step patient can take in getting his hand working again. Because hands require sensation and movement to accomplish all tasks of daily living, hand surgeons try to restore hand function by avoiding complications. The best insurance against hand treatment's complications is an adequate safe surgery following simple objectives: operating the correct side on the correct patient, recognize and know the methods to minimize tourniquet related complications, use standard hand's approaches and prepare surgical procedure, use methods known to minimize the risk for surgical site infection and the risk for adhesions,…. Proper surgery, using bloodless surgical field, should be precise and atraumatic for best possible results offering for the patient. Dressing and Bandaging must be applied with care to avoid progressive swelling and stiffness.

SESSION 7: NERVE COMPRESSION AND NEUROPATHIC PAIN (CRPS TYPEII)

029 Mindfullness in Chronic Neuropathic Pain after Severest Brachial Plexus Injuries
J. Bahm (Aachen, Germany and Brussels, Belgium)

030 Sensibility, Neglect and Pain in Obstetrical Brachial Plexus Children
R. Bargain, F. Adam, J. Bahm, F. Schuind (Brussels, Belgium)

031 SomatoSensory Rehabilitation of Neuropathic Pain : from Theory to Clinical application
Cl. Spicher, E. Létourneau (Fribourg, Switzerland)

032 The Management of Chronic Pain Caused by Peripheral Nerve Lesions. A Novel Application of Human Cadaveric Allografts
J.I. Leckenby, B. Juon Personeni, C. Furrer, E. Vögelin (Bern, Switzerland)

033 Surgery of Neuropathic Pain in the Upper Limb
J. Bahm (Aachen, Germany and Brussels, Belgium)

034 The Impact of Wearing a MyoElectric Partial Hand Prosthesis on Function and Pain Outcomes. A Case Study
S. Breier, L. Mackay (Touch Bionics, UK)

029 Mindfullness in Chronic Neuropathic Pain after Severest Brachial Plexus Injuries

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In severe brachial plexus injuries [BPI] with multiple nerve root avulsions, neuropathic pain is the most important complaint, ranging in severity even before functional deficits.
Most patients rely on medical pain treatment, ie drugs, peripheral nerve blocks or stimulation devices.
Mindfulness spiritual exercices developed by Kabat-Zinn since 1979 are available to deal differently with chronic or subacute neuropathic pain, but when we proposed that approach to patients, none of them took the challenge so far.
It is nevertheless known that these patients improve allievation of pain once concentrated on motivating tasks or in a stress- reducing setting ; and there are ongoing studies in that field dealing with severe spinal cord injuries.

We present the main contents of this therapy, hints to motivate patients and a strategic pathway for treating severe neuropathic pain in BPI.

030 Sensibility, Neglect and Pain in Obstetrical Brachial Plexus Children

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There are few studies in the literature about sensation and chronic pain in children suffering from obstetrical brachial plexus palsy (OBPP).
We tested 11 OBPP children (mean age : 8.3 years). Sensibility was assessed using three methods : pressure Semmes-Weinstein monofilaments, ; thermoception (thermode), and tactile discrimination (Johnson-Van Boven and Philips domes). Various skin areas were tested : thenar and hypothenar regions for thermoception, side of the fingertips with monofilaments and index for tactile discrimination. Pain was evaluated with an EVA pain scale, a drawing representing the circuit of pain and self-portrait.
We noticed a highly significant difference ($p = 0.009$) between the two hands for tactile discrimination. However, half of the subjects had a totally normal sensibility of the fingers' pulps. For the cold test, the two regions had not a significant difference, compared to the healthy hand. The difference was highly significant ($p = 0.002$) for the thenar region with the heat, but not significant for the hypothenar. Pain was present in a majority of children, especially located on the scars. Pain was especially present when the child suffered a general infection, however without the characteristics of neuropathic pain.
This preliminary study reveals in OBPP children significant problems of sensibility, particularly of thermoception and tactile discrimination, and pain, which are underestimated in the current medical literature. However, our small and non-homogenous group of patients is probably insufficiently representative of the general population of OBPP children. Further studies are surely needed but already we can conclude that the prevention and the screening of these disorders are of paramount importance.

031 SomatoSensory Rehabilitation of Neuropathic Pain : from Theory to Clinical application

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Neuropathic pain syndromes have a severe impact on patients' quality of life and is hard to treat using only a classical pharmacological approaches (Baron et al., 2010). Therefore, a **multidisciplinary approach** is recommended, including rehabilitation, in order to get better results. Somatosensory rehabilitation of pain is a method that seems promising in terms of pain reduction. On the other hand, patients and health professionals have to discuss about the expected results and be realistic about the therapeutic goals, in order to maintain adhesion to the treatment.

Just as any other specific method in rehabilitation, somatosensory rehabilitation of pain requires to be discussed in terms of **efficacy in decreasing pain** and the expected duration of treatment. A series of clinical observations on 81 chronic neuropathic pain patients with upper extremity pain, treated with somatosensory rehabilitation of pain method shows interesting results. Patients with neuropathic pain localised in the upper extremity have neuropathic pain complaints for a mean of 56 +/- 22.6 months (range 7-523 months). At the first session, the pain was evaluated with the McGill Pain Questionnaire (Melzack, 1975), in order to monitor the expected modulation of pain. Results were a mean of 43.8 +/- 26.9 points (range 11 – 88 points). The questionnaire was done again at the last session. The results of these observations shown a final result at the McGill Pain Questionnaire of 8.4 +/- 6.4 points (0 – 27 points) for a duration of treatment of 94.5 +/- 65.6 days (range 9 – 405 days).

Considering that somatosensory rehabilitation of pain can have interesting results with patients suffering from neuropathic pain, it is essential to know the realism of clinical application in daily practice for health professionals. A few things need to be taken in consideration, before planning to integrate somatosensory rehabilitation of pain as a regular method used in health care facilities. First, learning somatosensory testing and rehabilitation takes **time and energy** to the willing professional. The somatosensory rehabilitation of pain network, responsible to promote the method, recommends 56 hours of courses and personal work to learn the method for professionals. Second, a specific space where sessions of treatment can occur with patients need to be available. Assessments require a calm environment, in order for the patient to provide the needed concentration from the various tests. Also, the complete assessment describe in the somatosensory rehabilitation of pain method takes a lot of time, considering the amount of evaluations recommends. Third, the patient adhesion to treatment is crucial with the somatosensory rehabilitation of pain method. In order to obtain positive results in rehabilitation, the patient will be asked to do daily exercises at home, sometimes up to eight times a day. It is a method that requires a full engagement from the patient in order to complete the rehabilitation.

Somatosensory rehabilitation of pain is a method that implies a lot of engagement from both the patients and the team of health professionals working with them. It is also important to consider the **therapeutic adhesion** to such a treatment, in terms of energy and on a period of time that can vary a lot depending of the initial severity of cutaneous disorders.

032 The Management of Chronic Pain Caused by Peripheral Nerve Lesions. A Novel Application of Human Cadaveric Allografts

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Introduction: Chronic pain resulting from peripheral nerve lesions represents a difficult patient group to manage. After traditional conservative treatments have been exhausted, surgical intervention may be indicated. Surgical exploration and excision of the lesion can necessitate the use of grafts to ensure a tension free repair is achieved. Even though autologous grafts are the gold standard, their use may not be applicable due to the donor site morbidity and the risk of creating a secondary local or regional neurogenic pain problem. We present our 6 year experience of using Avance¨ allografts to manage this patient group.

Methods: Data was collected prospectively for all patients who received an allograft repair of a peripheral nerve. The inclusion criteria for this study were as follows: to have surgical repair more than 21 days following injury, failed conservative treatment except in iatrogenic nerve lesions, have pre-operative pain and have a minimum follow-up of six months. Pre- and postoperative data was collected using the Numeric Rating Scale (NRS) for pain and both the modified Medical Research Council Classification (MRCC) and Semmes-Weinstein Monofilament (SWM) mapping. In all cases an ultrasound guided local anesthetic infiltration was performed on at least two occasions to verify that there was a neurogenic cause and where indicated were investigated with allodynography. Results: A total of 77 allografts were used of which 33 fulfilled the inclusion criteria. 18 grafts were used to reconstruct digital nerve defects, 8 for upper limb defects and 7 for lower limb defects. The mean time interval between injury and reconstruction was 825 days (21-5968) with an average follow-up of 373 days (180-610). The mean pre-operative pain score was 5.6 (3-10) and the mean post-operative score was 2.2 (0-8); this was a significant improvement ($p < 0.001$). 67% of patients had a meaningful recovery and there was a significant improvement in two-point discrimination post-operatively ($p = 0.003$).

Conclusions: This study supports the use of allografts in chronic pain caused by peripheral nerve injuries. Both post-operative pain scores and improvement in sensibility were significantly better. The results suggest that early surgical intervention yields more favourable outcomes however this was not statistically significant ($p = 0.12$). Overall, allografts achieve excellent post-operative results and careful selection of patients is crucial in order for them to benefit from what is essentially elective surgery.

033 Surgery of Neuropathic Pain in the Upper Limb

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Neuropathic pain develops when nerves are traumatized [total or partial disruption] or entrapped by scar tissue and send disturbing information to central pain centers ; a persistant stimulus than will mark the pain memory.
Situations where the nerve lesion cannot heal or was not treated by a reestablishement of continuity, thus avoiding proper reinnervation, and those where nerve cables or endings end up in scar tissue are the often unknown bases for neuropathic pain.

Diagnostic steps

Identification of superficial vs deep triggers within a clearly defined skin area.
Test of local xylocain infiltration and its effect.

Hypothesis of former nerve lesion and/or entrapment.

Surgery

Identification of the triggering nerve segment or nerve end by open exploration.
Reestablishment of distal continuity [suture or conduit], distal targeting of the trigger organ [nerve transfer or coverage of a stump], excision of neuroma or glomus tumors; mandatory sensitive reeducation and long term follow-up.

Sensitive reeducation protocol

Desensibilisation, modulation of pain perception, active limb motion.

We present our strategy in analyzing the pathophysiology of neuropathic pain and when applying different microneurosurgical operation techniques in clinical settings [painful skin scar area after former deep surgery, superficial neuroma surgery, recreation of proper gliding tissue in recurrent nerve entrapment surgery].

034 The Impact of Wearing a MyoElectric Partial Hand Prosthesis on Function and Pain Outcomes. A Case Study

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Introduction: An upper-limb amputation is a devastating experience and will have a life-changing impact. Beside psychological and emotional effects, mobility and dexterity will be affected.
An amputee may also suffer from pain, phantom pain, or phantom sensation. Phantom limb pain (PLP) is common for most people after amputation and affects up to 80% of all amputees (1). During recent years the question has been asked, if the use of a myoelectric prostheses may influence the experience of phantom pain (2). Therefore the impact on pain experience when using a myoelectric partial hand prosthesis will be explored.

i-limb digits as a new intervention: i-limb™ digits is a powered prostheses for individuals with partial hand absence. This technology has only been available worldwide for several years and offers a functional myoelectric solution for individuals with one to five digit absence and can work in conjunction with any residual fingers

Methods: An individual case study was adopted to show the effects of using a partial hand prosthesis on overall functional outcomes. The Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire (3) was used to measure overall function, and particular focus was paid to the questions relating to pain experience. A pre/post study design with longitudinal follow up was utilized.

Results: The case study demonstrated overall functional change as shown in the table below
DASH outcomes

DASH Outcome	Pre-fitting – 12/9/11	Post-fitting – 26/10/11	Post-fitting – 31/1/12	Post-fitting – 6/5/14	Total change
General	22.13	28.44	23.28	12.93	9.19

Analysis of the five questions within the DASH specifically related to pain indicated a significant reduction in the pain reported by the patient.

DASH Pain outcomes

DASH Outcome – pain question	Pre-fitting – 12/9/11	Post-fitting – 26/10/11	Post-fitting – 21/1/12	Post-fitting – 6/5/14	Total change in DASH score
Arm, shoulder or hand pain	4	3	3	2	50
Arm, shoulder or hand pain when you performed any specific activity	3	3	2	2	25
Tingling (pins and needles) in your arm, shoulder or hand	4	3	2	2	50
Weakness in your arm shoulder or hand	4	3	3	2	50
Stiffness in your arm shoulder or hand	4	3	2	2	50

For four out of five of the questions, the DASH score reduced by 50%, with the remaining question (Arm, Shoulder or Hand pain when you performed a certain activity) indicating a 25% reduction. This is a significantly higher value that the MCID reported by Kennedy et al (4)

Conclusion: The results from this case study appear to show a reduction in pain with prosthetic use. In addition to this study, Touch Bionics continues to measure the outcomes of individuals using both their partial and full hand prosthetic options, and this trend of reduction in pain appears to be representative of the wider cohort. The authors plan to report on the findings for the wider cohort at a later date.

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SESSION 8: MANAGEMENT OF CHRONIC PAINFUL CONDITIONS OF THE SHOULDER AND THE ELBOW

035 A New Technique for Therapeutic Arthrography for Frozen Shoulder. A Review of 20 cases
S. Grijseels, F. Handelberg (Brussels, Belgium)

036 How to Optimize Prosthesis Positioning and Prevent Scapular Notching in Reverse Total Shoulder Arthroplasty ?
M. Gonzalvez, P. Martz, H. Charles, P. Trouilloud, F. Handelberg, E. Baulot (Chenôve, Dijon, Lille, France and Brussels, Belgium)

037 Pain and Stiff Elbow
R. van Riet (Antwerp, Belgium)

038 Pain in the Lateral Compartment of the Elbow
F. Moungondo (Brussels, Belgium)

035 A New Technique for Therapeutic Arthrography for Frozen Shoulder. A Review of 20 cases

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Objective: The treatment of FS consists of pain medication in the first, painful phase. There might be a place for calcitonines also. In the second or frozen phase physiotherapy is done. If no improvement is noticed after 4 to 6 weeks, therapeutic arthrography (TA) is indicated.

We describe a new technique for performing TA in patients with FS and evaluate the outcome.
20 patients with FS underwent this new technique.

The conventional technique punctures anterior between the joint capsule and the anterior humeral head or posterior between the labrum and the humeral head. These are peripheral recesses which do not allow neither efficient spread of the medication nor equal or efficient distribution of the pressure induced by hydrodilatation. In the modified technique a microcatheter is positioned more central in the joint space and therefore according to hydrodynamics allows an improved dispersion of the medication and the pressure.

The purpose of this study was to assess the improvement of this technique in pain and mobility.

Material and Methods: After application of local anesthetic**,** the joint space was punctured with the help of a micropunture system (Cook Medical, Bloomingtin, IN,USA) and a microcatheter was positioned central in the joint space (subscapular recess or glenohumeral joint). First 8 cc of contrast Omnipaque 180 (GE Healthcare Inc, Princeton, NJ, USA) to confirm the diagnosis of FS. Subsequently 4cc linisol 2%, 4cc marcaine 0, 5% and I ml containing 40 mg of depomedrol where injected centrally in the joint space. This was followed by hydrodistention of the shoulder joint with saline up to a total of 40cc. The positioning of a microcatheter in the middle of the joint space allows a more equal and efficient distribution of the medication. There is also an equal distribution of the pressure with hydrodilatation allowing the pressure wave to reach each surface within the joint, this according to the physics of hydrodynamics.

All patients had physiotherapy as soon as possible after the procedure.
All patients received follow up at 2 days, 1 month, 3 months, 6 months and 12 months after the procedure. At each contact, the patients were asked to separately rate the improvement in pain and mobility on a percentage scale from 0 to 100%, where 100% was defined as being totally no pain and complete mobility. We report the obtained feedback from 4 patients over the period of 12 months, from 11 patients over 6 months, from 15 patients over 3 months, and all of them (20) after two days.

Results: The average age of the patients was 54, 4 years (range 39 to 67). There were 13 man and 7 women.

We obtained following data in pain relief and improvement of mobility (one patient was lost after 3 months and a second one was lost after 6 months). Data are expressed as mean values with their 95% confidence intervals (CI). We report respectively improvement in pain and mobility: after two days 57.7% (CI 37.6 – 65.9) and 46.8% (CI 33.3 – 60.1); after 3 months 77.7% (CI 64.7 – 90.6) and 75.0% (CI 60.9 – 89.0); after 6 months 82.9% (CI 71.9 – 93.9) and 82.9% (CI 72.3 – 93.5); after 12 months 95.0% (CI 79.1 – 100) and 98.8% (CI 94.8 – 100).

Conclusion: The obtained results from our technique with puncture centrally in the joint space are encouraging and at least comparable with typically reported data of pain relief and mobility in other studies where the puncture was done in the peripheral recesses. This seems logic according to the physics and the law of hydrodynamics.

036 How to Optimize Prosthesis Positioning and Prevent Scapular Notching in Reverse Total Shoulder Arthroplasty ?

M. Gonzalvez[1], P. Martz[2], H. Charles[3], P. Trouilloud[2], F. Handelberg[4], E. Baulot[2]
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Introduction: Surgical experience has shown that glenoid positioning remains challenging due to difficult access, reduced intraoperative visibility and variable anatomy. Moreover, glenoid component malposition remains one of the causes of glenoid loosening. In order to adjust the position of the glenoid baseplate and its fixation elements, and also the position of the humerus relative to the glenoid, we developed in 2011 the first custom template system available in shoulder surgery. This system used in combination with a third-generation reversed prosthesis bearing an inferior overhang onto the glenoid baseplate should enhance prevention of scapular notching.

Aim: The main goal of this study was to assess the reliability and precision of this planning system for RTSA. Our second objective was to determine the notching rate and the clinical outcomes.

Methods: This innovative planning system is based on reconstructing the shoulder joint bones in three dimensions using CT-scan data, placing landmarks on the glenoid and humerus. That will be used as a reference when the user positions the prosthesis components with the Personal Fit software by changing the size of the glenoid baseplate, the length of the central peg, its inclination, retroversion along with its depth and height, to find the best position for the inferior overhang and to simulate screw positioning and angulation.
39 RTSA were planned with mostly osteoarthritis indication. The glenoid and humeral prostheses were virtually placed and the Patient Specific Instrument (PSI) created. Surgery was performed *via* superior approach using standard instrumentation. After exposition, osteophytes were not removed. The glenoid and humeral PSI were placed in the lone position allowing, respectively, the reproduction of glenoid baseplate axis and the cutting level planned preoperatively. before placing the glenoid template in the lone possible position. A drill bit is passed through this template to reproduce the center of rotation. Postoperative CT scan was performed only for 5 patients due to special image processing required to remove the artefacts induces by the metal prosthesis. Radiographic data were evaluated for the remaining population. Constant score were measured pre and post-operatively. Incidence of scapular notching according to Sirveaux grading system and bone spur were recorded.

Results: The size of the actual glenoid baseplate and length of its peg corresponds to the ones planned, in all cases. The center of implanted glenoid baseplate is horizontally and vertically positioned within 1 mm of the predetermined position. The retroversion between implanted and planned baseplate differed by an average of 2.5° (0.5-3.5°), either by increasing or decreasing the native retroversion. The inclination differed by 4° on average (2.5-5.5°).
Mean Constant score increased from 36.5 (27-50) pre-operatively to 62.4 (36-77) at 11.3 months mean follow-up. There were neither notching nor complications or technical difficulties related to the use of the patient-specific template. Surgical time was not increased.

Conclusion: This system provided good repeatability of the implant size, especially of the position of the joint center between the planning stage and actual implantation. Although the current study was performed on a small cohort of patients due to the specific postoperative requirements, this strategy improved the active range of motion, limited the risks of dislocation and glenoid loosening and clearly reduced the notching effect attributed to Grammont-style prosthesis.
This innovative tool will be even more useful in cases of severe shoulder deformity or significant glenoid bone defects.

037 Pain and Stiff Elbow

Abstract not received in due time.

038 Pain in the Lateral Compartment of the Elbow

Abstract not received in due time.

SESSION 9: MANAGEMENT OF CHRONIC PAINFUL CONDITIONS OF THE HAND AND WRIST (1)

039 Pain is a Major Predictor of Return-to-Work following Work-Related Hand Injuries
H. van Schroeder, R. Gandhi (Toronto, Canada)

040 The Use of Proprioception and Sensorimotor Input in Rehabilitation of Distal Radius Fractures
H. Harel, D. Michael, R. Wollstein (Haifa, Israel and Pittsburgh, PA, USA)

041 Joint Denervation. A Simple Option for Painful Upper Limb Problems
A. Aly (Cairo, Egypt)

042 Selective Trapezio-Metacarpal Denervation
L. Van Overstraeten, E. Camus (Tournai, Brussels, Belgium and Maubeuge, France)

039 Pain is a Major Predictor of Return-to-Work following Work-Related Hand Injuries

H. van Schroeder, R. Gandhi
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Purpose: Sick leave following workplace upper extremity injury is a major challenge as it is costly, negatively impacts workplace productivity and can lead to loss of self-esteem and stress in family relationships. The purpose of this study was to find patient level predictors that are associated with return-to-work (RTW) in a hand and wrist work injury population.
Methods: Relevant covariates, including functional pain scores and demographic data and were recorded for injured workers discharged between January 2010 and April 2014 from a multidisciplinary hand and wrist treatment program. Our primary outcome, RTW, was assessed at 3 months follow-up. Bivariate analyses and logistic regression were used to identify those factors associated with a successful RTW outcome.
Results: Of the injured workers who participated in the upper extremity treatment program, 465 patients met our inclusion criteria for the study with 59% male at a mean age of 47.5 years. For the 241 patients who were not working at initial assessment, 148 (61.4%) were able to RTW at 3 months post-treatment. Bivariate analyses revealed that lower initial assessment scores on the numeric pain scale (NPRS), Pain catastrophizing scale (PCS), and *Quick*DASH as well as the absence of depression and a higher education were significantly associated with a successful RTW outcome at 3 months post-treatment. Logistic regression revealed that lower baseline NPRS scores, lower baseline *Quick*DASH scores and absence of depression were significant predictors of successful RTW.
Discussion: Greater pain and presence of depression were the major factors associated with poorer RTW following a workplace hand injury. An interdisciplinary approach to address pain and depression could be of benefit when treating this population.

040 The Use of Proprioception and Sensorimotor Input in Rehabilitation of Distal Radius Fractures

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Objective: Proprioception has been used in rehabilitation to treat neurological and joint injuries. These feedback loops are still not well understood in the wrist. Our clinical impression is that in distal radius fractures (DRF) there is a temporary loss of proprioception that should be addressed following surgical treatment. The purpose of this study was to compare the outcomes of patients following surgery for DRF treated using a specific sensorimotor treatment protocol with patients treated after surgery according to standard of care.

Methods: Since sensorimotor response loops are complex and it is difficult to isolate the effect of the different types of input, both the evaluation and the treatment protocols included a comprehensive sensorimotor panel. Patients were evaluated a few days following surgery, at 6 weeks and three months post surgery. The protocols will be presented.

Results: All patients demonstrated significant sensorimotor deficits following surgery for DRF. There was documented sensorimotor and functional improvement in both groups with treatment. The clinical results were superior in the group treated with the sensorimotor-proprioception protocol despite only one therapy session a week.

Conclusions: Patients after surgery for DRF demonstrate significant sensorimotor deficits, which seem to improve faster when utilizing a comprehensive proprioceptive and sensorimotor treatment protocol. Further study is necessary to provide sensorimotor therapeutic guidelines following surgery for DRF.

041 Joint Denervation. A Simple Option for Painful Upper Limb Problems

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The upper limb is a common site for traumatic and degenerative disorders. Chronic pain still represents a challenge for upper limb surgeons, especially that it affects young individuals. Such pain causes a huge impact on strength, motion, and ability to work and perform daily activities. When symptoms are severe and the damage is irreversible, choices could be joint fusion or replacement arthroplasty.

Joint denervation is a possibility when the main complaint is pain with available functional range of motion. The purpose of the operation is to achieve pain relief by selective neurotomy without impairment of function and with preservation of mobility.

Denervation shows particular promise in the upper limb where the joints are non-weight bearing and easily exposed. It may be indicated in a wide variety of pathologies. Its effectiveness is predictable, and we can mimic denervation by local anesthetic injection. It can be used for chronic pain, either alone or combined with bony surgeries.

The successful surgical treatment of pain requires that there is useful movement at the joint, no obvious inflammation or oedema, positive blockade tests and accurate knowledge of peripheral neuroanatomy.

Denervation offers an outpatient, ambulatory operative approach that is joint sparing and rehabilitation free.

042 Selective Trapezio-Metacarpal Denervation

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Introduction: The authors analyzed a retrospective series of 15 single-operator selective denervation trapeziometacarpal conducted between 2004 and 2010.

The technique is recalled; changes in approach are specified.

Method: Patients were reviewed, examined and x-rayed by an independent surgeon. The analysis report the functional and pain evolution (VAS, PRWE, DASH), clinical and X-Ray evolutions (mobility, grasp, pinch, sensitivity).
The indications are explained

Results: The average follow-up of 40 months. The average age is 52 years. The indication is laid mainly because of young age, occupation and manual hobbies.
The pain is much improved or eliminated in 60% (VAS: 8-2) but often late. The function is always being improved (the PRWE from 90 to 17.5, the DASH from 107 to 50). The mobility is normal. The force is much improved in more GRASP than PINCH. Sensitivity is exceptionally impaired.
Radiologically, the joint is stable but a bit more grip without osteophytes increased. The return to job is quick (63 days)

Conclusion: The selective denervation CMC is a reliable enough solution to treat CMC arthritis of young manual worker. The failures come often from associated lesions. The results can deteriorate by reinnervation collateral

SESSION 10: MANAGEMENT OF CHRONIC PAINFUL CONDITIONS OF THE HAND AND WRIST (2)

043 Management of Suspected Clinical Scaphoid Fracture in Wigan, Wrightington and Leigh
K.V. Sigamoney, A. Gabr, H. Lewkowicz, C. Jeyarajah, A. Watts (Wrightington, Wigan and Leigh, Stoke-on-Trent, UK)

044 Complications after Trapeziectomy : Role of Radiography and Ultrasonography
V. Créteur, A. Madani (Brussels, Belgium)

045 Digital Pain in Neurofibromatose due to Glomus Tumors
L. De Smet (Leuven, Belgium)

046 Middle Phalanx Resection in Treatment of Irreparable Flexion Contracture of the Long Fingers. Technique and results
W. Beel, J. Goubau, B. Berghs, D. Kerckhove, P. Van Hoonacker, B. Vanmierlo, CK. Goorens (Bruges, Brussels, Belgium)

047 A Cause of Progressive Upper Limb Loss in Patients with Severe Renal Failure : Calciphylaxis
C. Melikoğlu (Izmir, Turkey)

043 Management of Suspected Clinical Scaphoid Fracture in Wigan, Wrightington and Leigh

K.V. Sigamoney, A. Gabr, H. Lewkowicz, C. Jeyarajah, A. Watts

Introduction: Suspected scaphoid fractures are defined as the presence of clinical signs of scaphoid fracture with a normal plain radiograph. In the suspected fractures, studies reported 5-10 % prevalence of scaphoid fracture. We had a protocol to manage these suspected scaphoid fractures within the trust started in 2009. This was audited and our compliance was low. Equally the whole pathway took an average of 4 weeks before patients are cleared of any fractures and they also had multiple hospital visits.

In May 2013, a new protocol was introduced. All patients are seen in A & E with combined clinical tests & scaphoid series X-rays. If a scaphoid fracture is suspected, the patient is referred to hand clinic within 1 week. At that point if a fracture is still suspected, the patient is referred for limited sequence scaphoid MRI scan. This is then treated accordingly.

Objectives: To check our compliance to the new protocol and to evaluate if the protocol is to continue or changed and to share our treatment method.

Methods: All patients with a suspected scaphoid fracture from August 2013 to March 2014 were reviewed retrospectively.

Results: There were 55 patients. Age range was 12 to 79 (average 34) years old. 34 were seen within a week in fracture clinic from being seen in A&E (61.8%). The average time seen from A&E to clinic was 8.7 days. All were seen by a Consultant, fellow or SPR. 9 patients were seen initially in clinic and discharged to hand physiotherapy as they had improved/ no suspected scaphoid fractures. 46 patients had MRIs (83.6%) and 35 within 1 week (76.1%). 38 had only one XR prior to MRI (82.6%). After being seen in clinic, 2 patients were seen back later than 1 week (95.7%). A total of 9 patients had pathways longer than 2 weeks mainly due to initial presentation (83.6%). However, the average total pathway was 1.9 weeks. 6 had scaphoid fractures (10.9%) and there was no reported missed scaphoid fractures. 2 patients (No MRI initially) had persistent symptoms and had repeat MRI scans showing no fractures. Total compliance to the whole pathway was 60% as compared to 20% in the previous audit. There was also a significant reduction in cost compared to that seen in the previous audit.

Conclusions: There was a significant reduction in treatment time for patients with no fractures as compared to the previous audit in 2010. We recommend this protocol for the management of suspected scaphoid fractures. It is beneficial to the patient, clinician and also cost effective.

044 Complications after Trapeziectomy : Role of Radiography and Ultrasonography

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The purpose of this paper is to review the potential complications of Trapeziectomy and how to detect them using Radiography and Ultrasonography.
Surgery may be required, when medical treatment of the Trapeziometacarpal joint (TMC) fails. Various surgical procedures are available, including Trapeziectomy alone, Trapeziectomy with ligamentoplasty, Trapeziectomy with tendon interposition, or Trapeziectomy with Arthroplasty [1].
Few studies provide imaging after Trapeziectomy. For example, in case of Trapeziectomy alone, only the scaphometacarpal distance is measured on Radiography, often without specifying on which view they have been made (anteroposterior or lateral), or without specifying if they have been realized at

rest and/or during pinch. Nevertheless, this measure is anyway of little interest since it has been shown that shortening of the scaphometacarpal space, *-resulting in shortening of the thumb-*, does not have a significant impact on pinch strength [2]. In case of Arthroplasty, Radiography may not always be able to demonstrate neither bone loosening nor the integrity of a radiolucent implant. Fluid collection represents often the first sign of an inflammatory response to such orthopedic material, but is easily overlooked by Radiography. Ultrasonography is an accurate technique to analyze soft tissues, especially in the hand and the wrist [3]. However, few studies provide the use of Ultrasonography in the exploration of the native TMC or after Trapeziectomy [4-7].
In a recent review of the Cochrane Musculoskeletal Group, analyzing 11 studies with a total of 670 participants, the authors were unable to demonstrate any benefit between different surgical techniques in term of pain management or thumb functionality. Nevertheless, complications do occur after Trapeziectomy, ranging from 13 % to 33 % [2]. These complications may consist in scar, instability, infection, foreign body reaction, synovitis, implant fracture or migration, subcutaneous tendon interposition herniation, tendinopathy or tendon rupture, muscular atrophy, cystic formation and nerve compression, section or nevroma [2, 8, 9].
If Ultrasonography is useful for soft tissue analysis and Radiography for osseous tissue evaluation, both techniques do have limitations [10, 11]. Their combination may allow better diagnosis in case of pain, mass or dysfunction of the thumb after Trapeziectomy [7]

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045 Digital Pain in Neurofibromatose due to Glomus Tumors

Abstract not received in due time.

046 Middle Phalanx Resection in Treatment of Irreparable Flexion Contracture of the Long Fingers. Technique and results

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Long fingers in flexion contracture do not only have repercussions on the finger function, they also impair the function of the whole hand. Patients are unable to wear gloves, to move their hand into small spaces and are often hindered by unintendedly hitting objects. We reviewed ten (10) patients with persistent flexum of the third, fourth or fifth finger following recurrent Dupuytren's contracture or a contracture following failed flexor tendon laceration repair. We performed a resection of the middle phalanx (P2) and fused the third phalanx (P3) to the proximal phalanx (P1). Indications for this procedure were primarily driven by the precarity of vascularisation in multiple surgeries for Dupuytren's disease, or failed repair of flexor tendon where rapid recovery of function was essential. This technique was first described by Dr. Guy Raimbeau, French hand surgeon (Angers – F). The benefits of this procedure area preserved pulp integrity and hence its sensibility, an esthetical good result after regression of the bulk of the folded palmar skin and an absence of painful neurinomas, a complication often present following amputation. Moreover, cold intolerance is not increased following this procedure. We propose the surgical technique and results with an average follow up of 2 years. This technique is reliable, gives a good functional result and is esthetically very acceptable in the ring and small finger.

047 A Cause of Progressive Upper Limb Loss in Patients with Severe Renal Failure : Calciphylaxis

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Aim: Calciphylaxis, or uremic calcific arteriolopathy, is a systemic pathology also associated with cutaneous involvement, and which may occur in patients with severe renal failure. Selye first used the term *calciphylaxis* in 1961, while evaluating the results of an animal study. Patients are generally referred because of skin ulcers in the distal regions of their extremities that may be associated with local infections coexisting with progressive necrosis. It is characterized by the calcification of dermal and subdermal arteriolar structures, as a result of mural calcification. A pathognomonic lesion is the vascular calcification associated with arterial hypertrophy, and thrombus in the overriding small vessels. We present here the treatment and management of two cases who came to our clinic, and were diagnosed with calciphylaxis during their follow-ups.

Materials and methods:

Case report 1: A 85-year old female patient applied to our clinic with an open wound surrounded by necrotic tissue, and existing in the third finger of the right hand. The wound was repaired by local flap after debridement. The patient's pathology progressed, also affecting the fourth finger. Both fingers were amputated. In the ensuing period, the patient passed away due to her internal pathologies.

Case report 2: A 75-year old male patient with a 20 year history of DM, and insulin use. He also had chronic renal failure for the previous 10 years, and had been receiving hemodialysis treatment for eight years. The patient visited our clinic because of necrotic tissue on the second, third and fourth fingers of his right hand. In his follow-ups, all three fingers were amputated at high levels, and the level of amputation was stopped. The patient's follow-ups still continue.

Findings: The follow-ups of the two patients, who were diagnosed pathologically as calciphylaxis, were maintained together with the nephrology and endocrinology clinics (Pictures 1-2).

Conclusion: A multidisciplinary approach is important in the treatment and follow-up of calciphylaxis. In patients undergoing dialysis for a long period, and particularly for more than five years, materials should be referred for pathological investigation following debridement if DM also exists, and if the necrotic tissue is atypically located. Calciphylaxis is a condition with high resistance, and it has no treatment other than a surgical approach of progressive amputation. Early diagnosis is important for the prognosis, rather than the treatment. Following the appearance of ulceration the prognosis worsens, and mortality rates can reach 80%.

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