



**The Hong Kong Society for Surgery
of The Hand 35th Annual Congress**
香港手外科醫學會第三十五屆學術會議



Technological Advancement in Hand Surgery

Congress date: 25-26 Mar 2023

Guest Society: Deutsche Gesellschaft für Handchirurgie
(German Society for Hand Surgery)

Venue: Hong Kong Football Club

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Message from the President



Jeffrey Justin Siu-cheong KOO

President
The Hong Kong Society for Surgery of the Hand

Dear friends from DGH, members and distinguished guests,

It is my pleasure to extend a warm welcome to all of you to The Hong Kong Society for Surgery of the Hand 35th Annual Congress 2023.

For the last three years, the world has been disrupted by the COVID pandemic. Wearing a mask becomes a routine in daily life. Traveling abroad is restricted with stringent infection control measures. Face-to-face meetings have to change into webinar meetings.

We face much uncertainty when organizing this year's annual congress. Are we going to make another web-based meeting? We are delighted to see the pandemic dwindle early this year, and now we are not required to wear masks at social events. For the first time, we can have a full-scale face-to-face congress after three years of pandemics.

To catch up with the advancement in surgical techniques and innovative technologies over the past three years, we have decided that the main theme of this year's annual congress to be "Technological Advancement in Hand Surgery".

We are especially delighted to welcome our esteemed colleagues from Germany, who will join us for this exciting event. With delegates from Germany in attendance, we hope to foster an even greater sense of global community within the field of hand surgery.

The event will feature a diverse range of presentations and discussions, all aimed at advancing our understanding of technological advancements in hand surgery. We will hear from renowned experts in the field who will share their experiences and insights on how technology is transforming hand surgery. Attendees will also have the opportunity to learn about cutting-edge technologies and techniques and to network with colleagues from different countries and backgrounds.

I want to express my sincere thanks to all organizing committee members, led by Dr. Mak Chu-Kay, Michael, and, Dr. Lee Syn-yuk, Michelle, for organizing a fantastic program. With the hard work of our organizing committee members, we have solved many hurdles in the logistics and uncertainties when we still have quarantine requirements in the early stages of congress organization.

Last but not least, congress cannot be possible without the unfailing support of our sponsoring companies. So please visit their booths during the congress and chat with them.

On behalf of the organizing committee, I invite you to join us for what promises to be an unforgettable event. We look forward to welcoming you and our German colleagues to Hong Kong in 2023.



Jeffrey Justin Siu-cheong KOO
President
HKSSH (2022-2024)

Message from the Co-Chairs of the Organizing Committee



Michael Chu-kay MAK

Co-chairperson
Organising Committee
35th Annual Congress



Michelle Syn-yuk LEE

Co-chairperson
Organising Committee
35th Annual Congress

Dear Seniors, Colleagues, Esteemed Guests and Friends,

On behalf of the Organizing Committee, it is our great honor and pleasure to welcome you all to the 35th Annual Congress of the Hong Kong Society for Surgery of the Hand.

The theme for this year is “Technological Advancement in Hand Surgery”. Technology has found its way into all aspects of hand surgery, from congenital conditions to trauma, nerve surgery, deformity correction, degenerative conditions, wrist surgery and rehabilitation, and we will look into each of these in the 7 sessions of our 2-day programme.

With the COVID pandemic behind us, we could finally meet face-to-face, interact in person and see the smile on everyone's face. Thanks to earlier COVID restrictions, we had to seek venues outside the hospital environment, so it is no ordinary occurrence that this year's Congress is held in such a nice and serene setting as the Hong Kong Football Club. The environment, food, and free flow of coffee are qualities that no online platform in the world can provide.

Technology has shaken things up in our daily lives and work in recent years. From commuting to communicating, walking to parking, technology has a part to play somewhere, whether we are aware of it or not. Often, these developments were adapted into the medical industry from ‘civilian’ use, and sometimes it went the other way, like how we had computer navigation in trauma and spine surgery before Wii Tennis became popular. Since our last face-to-face meeting in 2019, major events have shaken the world. In 2019, for the first time, a blackhole was directly visualized. Shortly after, pandemic-of-a-century COVID-19 struck. But it is when faced with tough challenges that human ingenuity arises. Vaccines and COVID drugs were made available from benchside to bedside in record speed. The mobile device or smartphone became an inseparable part of us, that not long ago was mandatory for dining-in at restaurants. It has also brought conveniences to healthcare, from managing clinic appointments in the app HA-Go, to electronic leave-taking at the tip of the finger, to remote clinical access. Tele-rehabilitation and tele-consultation are already taking hold even in the orthopaedic field, it may only be a matter of time before orthopaedic surgery can be performed remotely via high-speed networks.

This mobility and connectivity also allowed us to hold the last two hand congresses in online platforms amidst the pandemic, and allowed weekly Saturday meetings in the orthopaedic community to continue and with good attendance, too. Virtual platforms have gained huge popularity over the past years. The landscape of conferences may have

been permanently changed, and like an addictive substance, the online meeting format is a tempting one and may be difficult to wean off, even with the noise and distractions from our own living rooms. In fact, a lot of us are constantly online, whenever we're eating, shopping, or idling; we could even be in two online meetings at the same time. Hong Kong residents have been so fond of the virtual world that a study has found that globally, we spent the most amount of time online, at 6.5 hours each day in 2022. We may have forgotten the meaning of a true meeting and heartfelt dialogue. So this year, we hope that with a purely face-to-face meeting, professionals and enthusiasts of the hand and upper limb in different parts of the world can be brought together, engage in real exchange of ideas, and build lasting friendships.

Not so long ago, virtual/augmented reality was a gimmick in a crazily popular mobile gaming app that saw masses of people walking about mindlessly in the streets, phones in their hands. Now in the orthopaedic field, it may be the new technological holy grail that will soon come out of incubation in research centres all around, where virtual and augmented reality in the operation theater will soon be a reality. The more that we imagine something might happen, probably the more likely it eventually will.

Germany has a long history of fundamental contributions to hand surgery, with names like Sudeck, Volkmann, and Buck-Gramcko that have become regular terms in our daily usage. It is our privilege that 10 renowned experts from the German Hand Society, Deutsche Gesellschaft für Handchirurgie (DGH), will share with us today and open our eyes to the current state of the art.

Technology or not, the goals that hand surgeons past and present have endeavoured to attain will be here to stay: safe and effective treatments, minimal surgical trauma and access, maximal surgical precision, and finishing earlier on Fridays. But perhaps most of all: happy patients. So lastly, allow us to express our deepest gratitude to the organizing committee, covering all bases in the uncertainty of the COVID days, to make this day possible.

Handwritten signatures of Dr. Mak Chu Kay Michael and Dr. Lee Syn Yuk Michelle.

Dr Mak Chu Kay Michael & Dr Lee Syn Yuk Michelle
Congress Co-Chairs
HKSSH 35th Annual Congress

Council of the HKSSH (2022-2024)

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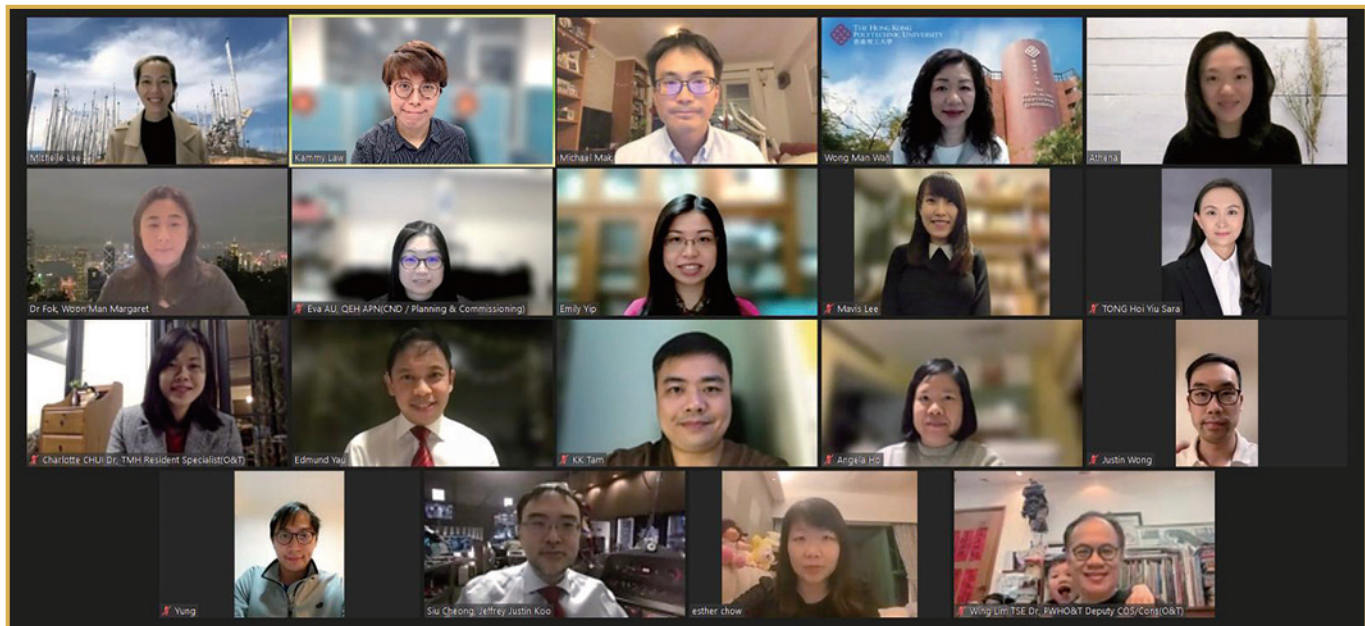
COUNCIL MEMBERS

Michelle Syn-yuk LEE

Ka-ki TAM

Wing-lim TSE

Organizing Committee of the 35th Annual Congress



CO-CHAIRPERSONS

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Michelle Syn-yuk LEE

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- President, German Society of Hand Surgery (DGH), 2020-2021
- European Board Member-- Treasurer, International Confederation of Plastic Surgery Societies (ICOPLAST), since 2023
- Past President in 2019, Head of Advisory Board, Head of Webinar Committee, International Wrist Arthroscopy Society (IWAS)



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- Dieter Buck-Gramcko Professorship, Hand and Functional Microsurgery, University Medicine Greifswald, Germany
- Former President of the German Society of Hand Surgery, 2018 – 2019
- Regional editor for Journal of Hand Surgery GO 2019
- Congress President of the IFSSH in Berlin 2019



Leila Harhaus-Wähler

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- Member of CHASG (Congenital Hand Surgery Study Group)
- Founding Member of PULPe (Pediatric Upper Limb Project Europe)

Overseas Speakers and Faculty



Simon Kim

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- Professorship at the Martin-Luther-University of Halle-Wittenberg, Germany



Gudrun Schlewitz

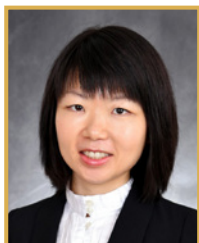
- Chief of Department of Hand surgery, Plastic and Microsurgery at Dr. Erler Klinik Nuremberg, Germany
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Heinrich - Geert Tünnerhoff

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- Founder of the service of Hand Surgery at Marbach Hospital Germany

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Associate Consultant
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Nethersole Hospital

HKSSH-JSSH Ambassadors



Takashi Noguchi MD PhD (2023 JSSH Ambassador)

Assistant Professor, Kyoto University Hospital, Japan

A novel nerve conduit using the Bio-3D printer development project

Takashi Noguchi MD PhD, Ryosuke Ikeguchi MD PhD, Shuichi Matsuda MD PhD

When it comes to peripheral nerve injury, direct suture is optimal treatment, however, in case of nerve gap, nerve grafting is required. Although auto-graft has some disadvantages, it is still the gold standard choice. While artificial conduit is alternative option, however it does not show sufficient regeneration ability. A Bio 3D printer is technology that creates three-dimensional tissue using only cells, and we focused on cells considered one of important factors for tissue engineering. Using the technology, a novel three-dimensional nerve conduit (Bio 3D nerve conduit) was created from several clusters of cells named spheroids.

We reported first application of the Bio3D conduit for peripheral nerve defect in rat. The Bio3D conduit demonstrated comparable regeneration with autograft in both functional and histological examinations. Additionally, we reported not only the long-term results but also the analysis of the characteristics of the novel conduit.

For a proof of concept, the conduit was tested in higher animals, canine. The conduit showed the acceptable nerve regeneration. Based on the studies, a first in human project is underway to treat peripheral nerve injury with gap in the Kyoto University Hospital.



Issei Nagura MD PhD (2020 JSSH Ambassador)

Department of Orthopedic Surgery, Ako City Hospital, Japan

Using deep learning for ultrasonographic images for evaluation of thenar muscle atrophy

Issei Nagura¹, Takako Kanatani², Issei Shinohara³, Atsuyuki Inui³, Yutaka Mifune³, Ryosuke Kuroda³

¹Department of Orthopedic Surgery, Ako City Hospital, Japan

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³Department of Orthopaedic Surgery, Kobe University of Medicine, Japan

Introduction: Deep learning (DL) algorithms have been utilized for the diagnosis of medical images. We previously reported thenar muscle atrophy evaluation by measuring the depth of the thenar muscles by ultrasonography (US). The purpose of this study was to detect imaging features using DL in US images of carpal tunnel syndrome (CTS) and calculate the diagnostic accuracy from the confusion matrix obtained.

Materials and Methods: US images of 27 hands with a diagnosis of CTS and 138 hands of healthy volunteers and were included in this study. Ultrasonographic examination was performed to evaluate the abductor pollicis brevis and opponens pollicis muscles. The transducer was applied onto the palmar surface of the hand perpendicularly to the longitudinal axis of the first metacarpal bone. The short-axis image of the thenar muscle was visualized. Transfer learning was performed using three pre-trained models. The confusion matrix and receiver operating characteristic curves were used to evaluate diagnostic accuracy. Furthermore, regions where DL was determined to be important were visualized.

Results: The highest score had an accuracy of 0.78, precision of 0.91 and recall of 0.77. AUC obtained ROC curve was 0.90. Visualization of the important features revealed that the DL models focused on the hypoechoic lesion lateral to the bony prominence of the thumb metacarpal bone.

Conclusion: We demonstrated the usefulness of the diagnostic method by DL for US images of the thenar muscle atrophy in CTS. DL could be a useful tool for evaluation of thenar muscle atrophy



Shiro Yoshida MD PhD (2022 JSSH Ambassador)

Department of Orthopaedic Surgery, Kurume University School of Medicine, Fukuoka, Japan

General and Venue Information

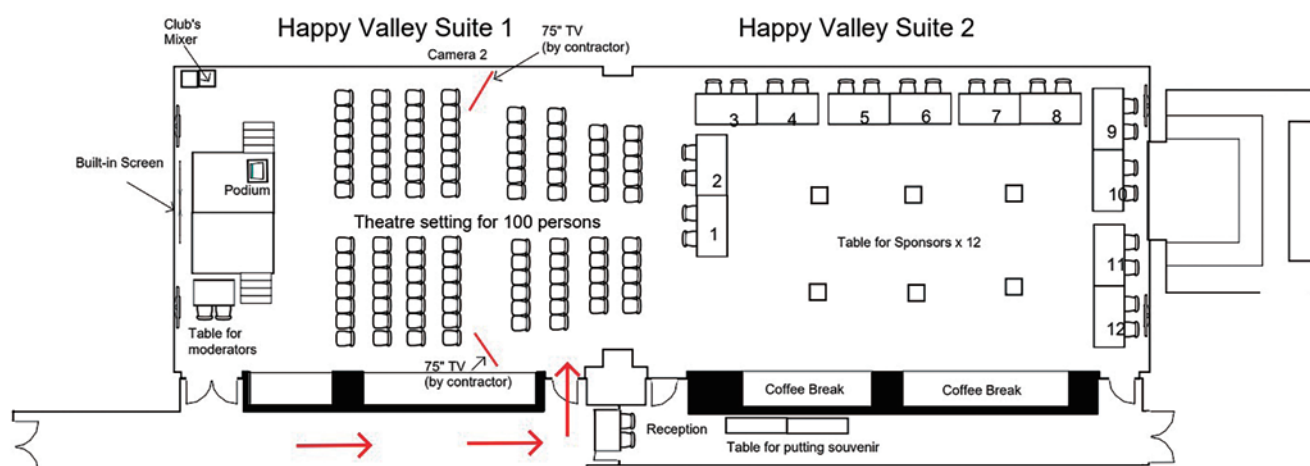
Venue

Hong Kong Football Club
3 Sports Road, Happy Valley, Hong Kong



Date	Time	Venue	Function	Setup
25 March 2023 (Saturday)	08:30-17:00	Happy Valley Suites, 2/F	Meeting	Theatre
	12:00-14:00	Meeting Room 2/F	Lunch Buffet	Round table
	12:00-14:00	Meeting Room 1/F	Lunch Buffet	Round table
26 March 2023 (Sunday)	08:30-13:00	Happy Valley Suites, 2/F	Meeting	Theatre

Happy Valley Suites



Annual Congress Program

Day I Program 25th March, 2023

Time		Topic	Speaker	Moderator
08:30		Opening Speech	Congress Co-Chairs, Presidents of HKSSH and Guest Society (DGH)	
08:50 - 09:50	1. Three Dimensional Considerations in Paediatric Deformities	3D Printing for Correcting Forearm Malunions in Children	Prof Leila Harhaus-Wähler	Dr Emily Ka-yan Yip, Dr Wing-lim Tse
		Three Dimensional Geometry of the Webspace in Syndactyly Surgery	Dr Esther Ching-san Chow	
		Use of Distraction in Complex Syndactyly	Dr Wiebke Hülsemann	
		Discussion		
09:50 - 10:05	BREAK			
10:05 - 11:25	2. Deformities from Shoulder to Digit	Customized Surgical Guides for the Hand and Wrist	Dr Esther Ching-san Chow	Dr Athena Cheuk-yiu Au, Dr Michael Chukay Mak
		Use of 3D Printing in Distal Radius and Forearm Malunions	Dr Christian Xinshuo Fang	
		3D Printing for Elbow Corrective Osteotomy in Children	Dr Evelyn Eugenie Kuong	
		Planning your Surgery: From Paper to Cloud	Dr Elvis Chun-sing Chui	
		Multiplanar Rotational Correction from Humerus to Scaphoid	Dr Michael Chukay Mak	
		Discussion		
11:30 - 12:20	3. Nerve Dysfunction: Reinnervation and Denervation	Targeted Muscle Reinnervation in Neuropathic Pain	Dr Margaret Woon-man Fok	Dr Edmund Leung-kai Yau, Dr Charlotte Shek-kwan Chui
		Distribution of Nerve Endings in the Wrist and the Role of Denervation	Prof Susanne Rein	
		Application of VR in Nerve and Functional Rehabilitation	Prof Kenneth Nai-kuen Fong	
		Discussion		
12:20 - 12:35		Vote of thanks to Guest Speakers and Sponsors	Co-Chairs	
12:35 - 13:35	BUFFET LUNCH + LUNCH SYMPOSIUM			
13:35 - 15:15		10 Free Papers (5 min + 3 min Q&A). 2 Ambassador Papers (7 min + 3 min Q&A)	Free Paper Presenters, JSSH Ambassadors Dr Issei Nagura, Dr Noguchi Takashi	Dr Edmund Leung-kai Yau, Dr Jeffrey Justin Siu-cheong Koo
15:15 - 15:35	TEA BREAK			
15:35 - 16:50	4. Micro-surgery, Macro-reconstructions	Reconstruction of Osteocutaneous Defects in Hand Surgery	Prof Susanne Rein	Dr Esther Ching-san Chow, Dr Michelle Syn-yuk Lee
		Long-term Results after Bridging Large Bone Defects with Free Vascularized Bone Transplants in Extremities	Prof Andreas Eisenschenk	
		Current Applications of Super-Microsurgery and New Vascular Imaging Techniques	Dr Emily Ka-yan Yip	
		The Pursuit of Normal Limb Size in Breast-cancer-related Lymphedema: A New Advancement in Lymphedema Surgery	Dr Lawrence Hin-lun Liu	
		Discussion		
16:50 - 17:50	AGM (ANNUAL GENERAL MEETING)			

Annual Congress Program

Day 2 Program 26th March, 2023

Time		Topic	Speaker	Moderator
08:30 - 10:15	5. Managing the diseased joint: Replace, Erase, and Reface	Arthroscopic Interposition Surgery for 1st CMC with Autologous Fat Graft	Dr Eva-Maria Baur	Dr Michelle Syn-yuk Lee, Dr Michael Chu-kay Mak
		Long-term Results after Thumb Carpometacarpal Joint Total	Dr Senat Krasnici	
		Salvage Procedures: Comparing Denervation, AMANDYS and Four Corner Fusion	Dr Gudrun Schlewitz	
		Resurfacing a Osteochondral Defect of the Wrist: From Stem Cell to Osteochondral Grafting	Dr Wing-lim Tse	
		The Evolution of Wrist Joint Replacement	Dr Pak-cheong Ho	
		Custom Prosthetic Scapular and Humeral Reconstructions of the Upper Limb in Orthopaedic Oncology	Dr Kwok-chuen Wong	
		Discussion		
10:15 - 10:30	BREAK			
10:30 - 11:00	6. Rehabilitation	Tele-Rehabilitation in the Hand and Wrist	Mr Charles Lam	Dr Douglas Yu-bun Yung, Ms Mavis Man-hei Lam
		Patient-Specific Design in Rehabilitation	Mr Joseph Cheng	
		Modular Task-Specific Prostheses and Augmentation for the Upper Limb	Prof Darwin Tat-ming Lau	
		Discussion		
11:15 - 12:25	7. The New 360 in Wrist Trauma	Arthroscopic Approach and Implant Innovations in Distal Radius Fracture	Dr Jeffrey Justin Siu-cheong Koo	Dr Margaret Woon-man Fok, Dr Rachel Yuk-yu Lam
		Restabilizing the DRUJ: Computer-Assisted Osteotomy, and a Novel Ligament Reconstruction	Dr Heinrich-Geert Tünnerhoff	
		Reconstruction of the SL Complex with 3LT and Henry Procedure	Dr Simon Kim	
		The Future of Wrist Arthroscopy: Pushing the Limit	Dr Pak-cheong Ho	
		Discussion		
12:30 - 12:45	CLOSING REMARKS			

Abstracts of Lectures

I. Three Dimensional Considerations in Paediatric Deformities



3D Printing for Correcting Forearm Malunions in Children

Prof. Leila Harhaus-Wähner

*Department for Hand Surgery, Peripheral Nerve Surgery and Rehabilitation
BG Trauma Center Ludwigshafen*

Partial fusion of the growth plate following K-wire osteosynthesis can be a severe problem of fractures in the childhood. Circumscribed growth arrest and consecutive painful joint deformities can result.

Different treatment options are existing depending on the age of the child, the expected length growth and the individual joint configuration. Epiphyseodeses and corrective osteotomies are frequently used.

In cases, where more than 6 cm lengths growth are still expected and the ossification zone is < 50%, a selective resection of the ossification zone can release the partial growth arrest and allow the bone to remodel during further growth.

The challenge is to identify the ossification zone of the physis intraoperatively in order to remove it completely, but leave the healthy parts intact.

With help of a CT-based, 3D printed guide, we present a reliable technique to solve this challenge.



Three Dimensional Geometry of the Webspace in Syndactyly Surgery

Dr. Esther Ching-san Chow

Department of Orthopaedics and Traumatology, United Christian Hospital, Hong Kong.

Syndactyly is the 2nd most common congenital hand abnormality. The use of the “graft less” technique vs. “skin grafting” technique has been debated among hand surgeons for an extended period. Using skin graft has the disadvantages of skin pigmentation, hair growth, and donor site morbidity. However, surgeons that prefer “skin grafting” criticized that the “graft less” techniques might alter the shape of the webspace.

The current post-operative assessments for syndactyly cases are only 2-dimensional. The technique of using a 3D model to assess the 3D geometry of the webspace is currently being introduced. This can objectively evaluate the 3D shape of the operated webspace.

Using a 3D model, the post-op webspace shape can be compared with the contralateral normal side. The volume symmetry index and the mean Hausdorff distance are the two parameters that can be used to calculate the level of symmetry between the right and left hand.



Use of Distraction in Complex Syndactyly

Dr. Wiebke Hülsemann

Department for Hand surgery, Children's Hospital Wilhelmstift Hamburg, Germany

In cases of very narrow complex syndactylies we facilitate the release with a prior soft tissue distraction. The idea for prior transverse soft tissue distraction is to make release possible or to get a better outcome.

We started in 1997 to use the Cube-fix in Apert hands, complex syndactylies of ulnar finger and special cases of central synpolydactyly. Over 24 years around 300 soft tissue distractions in malformation were done.

With some technical changes we used it in complex ulnar syndactylies of the ulnar fingers. Due to the tiny distal phalanges of different finger length we transfix the distal phalanges by longitudinal K-wires of 0.8 mm.

Conclusion: Transverse soft tissue distraction helps to get better results: better pulps, better nail folds, more own skin. Also in case of missing arteries we have had no problem with blood supply. With an axial K-wire the Cube-Fix can be installed in very small phalanges. This technique enables us to separate fingers we couldn't separate before.

Abstracts of Lectures

2. Deformities from Shoulder to Digit



Customized Surgical Guides for the Hand and Wrist

Dr. Esther Ching-san Chow

Department of Orthopaedics and Traumatology, United Christian Hospital, Hong Kong.

3D printing technology has become increasingly popular in the application of orthopaedic surgery. This has also been applied in improving efficiency and accuracy in performing hand and wrist surgery. The clinical outcome showed promising results in meeting the patients' growing demand.

The 5 steps in performing the 3D printing of customized surgical guides include: 1) Identifying a clinical problem, 2) Image Acquisition, 3) Pre-operative planning, 4) 3D printing of surgical guides, and 5) Surgical application.

The most common application in the hand and wrist region is the use of patient-specific surgical guides for deformity correction. This can be applied in cases with malunion in the wrist, carpus, metacarpals, and phalanges. Bone cutting can be more precise and accurate using these customized surgical guides. This new technology can simplify the complex surgical steps, hence, shortening the operative time, reducing intra-operative blood loss, and limiting radiation exposure with a decrease in the need of an intra-operative x-ray.

The limitations in applying this technique in the hand and wrist region include 1) smaller bones and limited surgical site exposure, 2) smaller bone contact area making the surgical guides less accurate, and 3) a narrow margin of error is allowed in the hand and wrist region.



Use of 3D Printing in Distal Radius and Forearm Malunions

Dr. Christian Xinshuo Fang

Department of Orthopaedics and Traumatology, University of Hong Kong, Hong Kong.

The aim of using 3D printed patient specific instrumentation in distal radius and forearm malunion correction is to enhance surgical accuracy and outcomes. Uptake of this technology is hindered by intensive pre-operative planning with specialized software, and uncertainty during execution. We discuss the application of such technology, and our experience through a series of cases in the past eight years.



3D Printing for Elbow Corrective Osteotomy in Children

Dr. Evelyn Eugenie Kuong

Department of Orthopaedics and Traumatology, Queen Mary Hospital, Hong Kong.

Upper limb sporting injuries in adolescents may lead to comminuted intra-articular fractures of the distal humerus. In the immature skeleton, fractures are often pinned with smooth pins which can occasionally lead to suboptimal reduction. The blood supply to the distal humerus is tenuous and careful consideration must be taken before embarking on revision surgery in cases of malunion. Here is an example of how 3D printing can be useful in the decision-making process on how to correct malunited distal humerus fractures in young patients.

Abstracts of Lectures



Planning your Surgery: From Paper to Cloud

Dr. Elvis Chun-sing Chui

Department of Orthopaedics and Traumatology, The Chinese University of Hong Kong, Hong Kong

The advent of 3D printing technology and computer assisted surgery techniques enable surgeons to plan surgeries with multi-planar corrections preoperatively, bringing the plan into intra-operative execution accurately. It has been proven that 3D planning and 3D printing technologies could improve the intraoperative time, recovery time and the accuracy of surgery. However, computer planning has not become a widely adopted approach in most hospitals due to 1) time-consuming planning; 2) lack of user-friendly 3D planning software in the market for surgeons; 3) extra investment needed for developing a technical team.

A web-based AI assisted surgical planning platform designed for surgeons' use could encourage the application of 3D computer planning in surgeries. The web-platform could be accessed and manipulated by surgeons easily for surgical planning, customized surgical instrument design, and implant design. The system incorporated an automatic segmentation program for medical images based on deep learning to speed up the image pre-processing time for surgery planning. Planning modules for common surgeries were also designed specifically. Upper limb module, lower limb module and spine module have been developed. A relatively gentle learning curve is needed as the system is designed for surgeons familiar with navigation systems with similar interface. No installation is needed due to the web-based feature.

In the long run, the program will accumulate a database of medical images for AI analysis to achieve an increasingly accurate surgery planning guidance. Not only surgery precision will be improved, such a pioneering program will also drive the regional development of customized 3D printing for medical applications.



Multiplanar Rotational Correction from Humerus to Scaphoid

Dr. Michael Chu-kay Mak

Department of Orthopaedics and Traumatology, Prince of Wales Hospital, The Chinese University of Hong Kong, Hong Kong

Deformities in the upper limb usually feature a significant rotational component, as bone growth and remodelling are heavily influenced by rotational motion which is present in all three major upper limb joints: shoulder, elbow, and wrist. Since direction of bone growth and fracture healing are influenced by rotational torque, disturbances of these processes in the upper limb result in deformities that usually involve a major rotational component, for example in radial club hand and humeral supracondylar and forearm malunions. These motion requirements generate particular structural adaptations most striking in the forearm and wrist. For example, curvature of both forearm bones is required to allow the radius to cross over the ulnar in pronation, and the scaphoid requires an upright posture to keep the carpal rows stably seated on each other. However, given their delicate arrangement, even modest alterations in bony configuration can cause deleterious effects on motion or stability. When articulating components are incongruent, either motion is impeded, or joint constraints need to give way.

These qualities pose unique challenges in performing realignment surgery in terms of 1. the assessment of combined rotational and angular alignment, and 2. configuring the osteotomy to achieve correction of both. However an opportunity is also presented when there is significant rotational deformity: using an oblique-cut rotational osteotomy (OSCRO), concomitant angular deformity can also be corrected at the same time. This type of osteotomy maintains length while not requiring bone graft, allows for smoother change of contour, and specifically changes the alignment in all 3 planes, in contrast with closing or open wedge and dome.

When faced with concomitant multiplanar deformity together with shortening, simultaneous deformity correction and asymmetric lengthening could be achieved by a single operation by using the Ilizarov external fixator or Taylor Spatial Frame. However, compared with purely longitudinal lengthening, accurate placement of pins and hinge in asymmetric lengthening can be challenging, rotational correction is difficult to incorporate into the planning and gradual distraction, and premature consolidation may occur at the side of slower distraction. Using a rotational osteotomy to achieve multiplanar correction, a one-stage operation can be performed to allow for simple longitudinal lengthening, and full bone contact can be maintained during the latency phase of distraction osteogenesis.

Deformities in different regions of the upper limb cause unique problems that need to be addressed. Using some case examples of deformities from the humerus to the wrist, the application of multi-planar realignment in tackling these issues will be illustrated. These include patients with proximal physeal arrest with varus deformity and shortening of the humerus, radius malunions with reverse bowing causing PRUJ and DRUJ instabilities, distal radius malunion with DRUJ and ulnar-sided wrist problems, radial club hand, and scaphoid malunion with carpal collapse. Execution of the planned osteotomy, realignment and fixation can be facilitated by the computer-assisted techniques of 3-D printing, navigation, and both in combination.

Abstracts of Lectures

3. Nerve Dysfunction: Reinnervation and Denervation



Targeted Muscle Reinnervation in Neuropathic Pain

Dr. Margaret Woon-man Fok

Department of Orthopaedics and Traumatology, Queen Mary Hospital, Hong Kong

Neuropathic pain is a painful condition which is a result of damage or injury to the peripheral nerves, especially pure sensory or mixed motor / sensory nerves. There are many different treatments for the management of neuropathic pain, which can be divided into therapies like desensitization, mirror box therapy and virtual reality therapy, medications like analgesic, antidepressants and antipsychotics and invasive procedures like injections, ablation, and nerve graft. Yet, even with multimodal therapies, the outcome varies.

Targeted muscle reinnervation (TMR) is a procedure which is initially developed for upper limb amputees. It is a surgical nerve – transfer procedure which provides a more intuitive control of upper limb while wearing the prosthesis. Yet it is noted that patients who previously experienced phantom pain and underwent TMR had a resolution of their symptoms. In addition, none of the patients who was free of postamputation neuropathic pain developed neuropathic pain after the TMR procedures.

Currently, routine performance of TMR is recommended for patients undergoing amputation in order to minimize the development of phantom pain and neuroma in the USA. In Asia Pacific region, TMR is a relatively new concept. There is no current literature describing the outcome of TMR on the Chinese ethnicity.

We report our local experience of using TMR in the management of neuropathic pain. We performed TMR in patients who experienced long term phantom pain, and neuropathic pain and patients who undergo acute TMR in limb amputation. Our early results correspond to the current literature and supports TMR as a promising modality in the management of neuropathic pain.



Distribution of Nerve Endings in the Wrist and the Role of Denervation

Prof. Susanne Rein^{1,2}

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The distribution of sensory nerve endings in the wrist is explained in regard to recent developments of imaging techniques. Afterwards, an overview of studies performed on proprioceptive qualities after wrist denervation is given.

Abstracts of Lectures



Application of VR in Nerve and Functional Rehabilitation

Prof. Kenneth Nai-kuen Fong

Department of Rehabilitation Sciences, The Hong Kong Polytechnic University

Virtual reality (VR) has been used in combination with conventional rehabilitation because its benefits are not limited to motivate patients to participate in treatments but also to promote their recovery through intense, repetitive, interaction with virtual task-specific (TS-VR) environment, and instant multi-sensory feedbacks through haptic devices, and prepare them to adapt to the real task environment. We have recently reviewed the use of markerless motion capture technology for both assessment and training in upper limb (UL) rehabilitation, we found most of the studies used Kinect (proximal) and Leap Motion Controller (LMC) (distal) for upper limb assessment and training in neurological populations. In our study, we designed a TS-VR game using LMC to 20 patients suffering from stroke with UL impairments over 2 weeks, 5 sessions per week, 30 min per session. Significant improvements were found after TS-VR training in UL impairments particularly in the higher-functioning group, but no significant effect on grip strength was found. In another study, we developed another TS-VR using LMC to facilitate patients with end-stage renal disease for understanding and learning of the peritoneal dialysis (PD) exchange procedure before carrying out real task practice on their own at home. The results showed that there were significant differences between the VR group and the educational group in performance of the overall PD exchange sequence, especially on the crucial steps. VR had a patient satisfaction rate of 89%, and all patients preferred to have the VR aid incorporated in PD training. Future studies regarding a user-friendly VR technology base system for hand measurement that can be accurately analysed by clinicians are warranted.

4. Micro-surgery, Macro-reconstructions



Reconstruction of Osteocutaneous Defects in Hand Surgery

Prof. Susanne Rein^{1,2}

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The principles of osteocutaneous reconstruction are explained, which include the differentiation into single stage and staged reconstruction. Clinical cases are presented for both reconstruction methods, before both procedures are compared in regard of indication, advantages and disadvantages.



Long-term Results after Bridging Large Bone Defects with Free Vascularized Bone Transplants in Extremities

Prof. Andreas Eisenschenk

Department for Hand, Replantation and Microsurgery, Trauma Hospital, Berlin

Aspects after bridging bone defects with free vascularized bone grafts and long-term courses

The presentation is divided into 3 parts:

In the first part, the development and importance of the postoperative vitality of free vascularized bone grafts is discussed.

The second section deals with bone healing under radiation and chemotherapy.

In the third section, long-term courses (12 to 34 years) are also demonstrated with minor complications.

Abstracts of Lectures



Current Applications of Super-Microsurgery and New Vascular Imaging Techniques

Dr. Emily Ka-yan Yip

Department of Orthopaedics and Traumatology, Tuen Mun Hospital, Hong Kong

Supermicrosurgery is defined as surgical procedures performed for anastomosis of neurovascular structures less than 0.8 mm in diameter. Knowing the principles and strategies of supermicrosurgery could provide us with another dimension of approach to reconstructive microsurgery.

Currently Applications of supermicrosurgery include fingertip replantation, digit reconstruction, thin and short pedicled perforator flaps, perforator-to-perforator flaps, lymphaticovenular anastomosis (LVA) and vascularized nerve grafts.

The evolvement of supermicrosurgery goes with the advancement of new technology, including finer micro-instruments, higher magnification microscopes and new vascular imaging tools for pre-operative planning and execution. These include ultra-high frequency ultrasound, ICG lymphography and infrared thermography.

With better microsurgery training and the application of new technologies, supermicrosurgery will continue to evolve to make reconstruction more customized, simpler, more successful with better outcome.



The Pursuit of Normal Limb Size in Breast-cancer-related Lymphedema: A New Advancement in Lymphedema Surgery

Dr. Lawrence Hin-lun Liu

Consultant Plastic Surgeon

Pedder Health

Founder, Hong Kong Lymphoedema Association

Abstracts of Lectures

5. Managing the diseased joint: Replace, Erase, and Reface



Arthroscopic interposition surgery for 1st CMC with autologous fat graft

Dr. Eva-Maria Baur

MD/Dr.

Practice for Plastic and Hand Surgery – Murnau (D)

Head of Department of Plastic and Hand Surgery - Penzberg (D)

University Clinic of Plastic, Reconstructive and Aesthetic Surgery - Innsbruck (AU),

Team leader of Hand and peripheral Nerve department

Osteoarthritis of the carpometacarpal joint of the thumb (CMC-I) is a common disease in clinical day of Hand surgery. A variety of conservative and surgical treatments have been developed during the last decades. Although resection arthroplasty with its many variations is a hallmark in surgical treatment of thumb osteoarthritis (OA) the search for less invasive or maybe preventive therapy is going on. This aim and the steady technical improvement are leading to the more and more common use of arthroscopy of the CMC-I joint. The increasing number of publication suggest that arthroscopic débridement with or without interposition leads to satisfactory outcomes, but there is still a lack of long term results, limitations of these procedures in term of patient selection and, if there is any, the optimal type of interposition material.

Since 2013 we have treated arthroscopically 52 patients, suffering from trapeziometacarpal joint arthrosis. Regarding the classification of Eaton and Littler they showed radiologically a 1st to 2nd grade of CMC-I OA. Arthroscopically all patients had at least second grade of cartilage lesions in terms of Outerbridge classification. In all cases we did a synovectomy/debridement and an autologous fat graft after arthroscopic débridement. The minimum follow up was 6 month up to 3 years after arthroscopic treatment. 11 patients could be reported with the minimum FU from 6 months to 24 months (published in J Wrist Surg 2018) Grip and pinch strength as well ROM and Kapandji score were examined during follow up. Apart from that the patients' satisfaction, VAS and DASH score were surveyed. One case suffered from light version of CRPS. There was no infection.

Arthroscopic synovectomy with interposition appears to prolong the painless interval. Besides there were mostly resection arthroplasty after débridement without interposition. So similar to the current literature we see a discret advantage in arthroscopic débridement with interposition.

Interposition with autologous fat graft is methodically easily done. No infection or complication according to the fat graft took place. So far since 2013 only 9 out of 52 patients need a (hemi)-trapezectomy arthroplasty or prosthesis. Radiologically the degenerative process of the CMC I arthrosis decelerates. There is almost no influence regarding the range of motion (ROM) after arthroscopic treatment and pain relief is achieved after short time. Grip strength stays diminished. None of the patients would refuse re-doing the arthroscopic treatment. So arthroscopic treatment in case of painful CMC-I arthrosis is a potential tool. Especially autologous fat graft interposition after arthroscopical débridement seems to be an efficient therapeutic option.

Abstracts of Lectures



Long-term Results after Thumb Carpometacarpal Joint Total Arthroplasty

Dr. Senat Krasnici

Head of Traumatology and Hand Surgery at Johanniter-Hospital Stendal, Stendal, Germany

Purpose: Rhizarthrosis is a disease with a high prevalence in middle and old age that severely affects the quality of life. Resection arthroplasty with and without tendon suspension is still considered the gold standard in the surgical treatment of rhizarthrosis. In recent years, alloarthroplastic joint replacement has increasingly emerged as a promising alternative. The aim of the present study was to investigate long-term patient satisfaction and the frequency of revision surgery after successful implantation of an endoprosthesis of the thumb saddle joint.

Methods: All patients operated on for rhizarthrosis or its complications in two hand surgery departments between January 2008 and December 2020 were included. During this period, 341 arthroplasties were implanted primarily, and 32 procedures were performed as revisions after TEP implantation. We contacted the patients in writing and asked them to answer a questionnaire with four free questions about complaints in the thumb/hand; we also collected a DASH score.

Results: We received responses for 219 procedures; 20 patients have since died. Regardless of the type of prosthesis implanted, long-term patient satisfaction was high (91%), and the vast majority of our patients would undergo this procedure again (95%). Patient satisfaction was also high after revision procedures (83%). DASH scores did not differ between patients with primary arthroplasty implantation and patients after required revision of a prosthesis.

Conclusion: Saddle joint TEP is a good alternative to resection arthroplasty for the surgical treatment of stage III rhizarthrosis with very high patient satisfaction, even in the long term. Thereby, there is no correlation between prosthesis model and long-term outcome in our patient population.



Salvage Procedures: Comparing Denervation, AMANDYS and Four Corner Fusion

Dr. Gudrun Schlewitz

Hand surgery, Plastic and Microsurgery at Dr. Erler Klinik Nuremberg, Germany

Salvage Procedures: Comparing Denervation, Amandys and Four Corner Fusion

Goal of Surgery: Elimination or reduction of pain of the wrist while maintaining motion of the wrist and ameliorate the strength.

Methods: 102 Patients, Average Age 56 years, 39 females and 63 males were included.

48 Patients received denervation, 42 patients received four corner fusion and 12 patients received Amandys.

Results: The preoperative range of motion mainly didn't change for patients with denervation. For patients with four corner fusion and Amandys the range of motion showed a loss of 19% (FCF) and for the Amandys 17%.

All groups showed a decrease of pain in comparison to preoperative state.

The grip strength ameliorated for patients with denervation, four corner fusion and Amandys.

Wrist fusion became necessary twice for patients with Amandys and three times for patients with four corner fusion. Three Patients with Denervation received proximal row carpectomy and two four corner fusion.



Resurfacing a Osteochondral Defect of the Wrist: From Stem Cell to Osteochondral Grafting

Dr. Wing-lim Tse

Department of Orthopaedics and Traumatology, Prince of Wales Hospital, The Chinese University of Hong Kong, Hong Kong

Currently there is no effective treatment for articulate cartilage injury. Conventional treatment include debridement, stimulation of chondrogenesis by subchondral bone drilling, MACI implantation osteochondral autograft have been performed extensively at knee and ankle but sparsely at wrist joint. One reason may be the complex capsule-ligamentous and articulating structure of wrist joint and limited space of access. A review of current understanding in cartilage regeneration and Experience on wrist joint autologous osteochondral transplantation and a clinical trial of stem cell transplantation conducted at our Center will be presented.

Abstracts of Lectures



The Evolution of Wrist Joint Replacement

Dr. Pak-cheong Ho

Department of Orthopaedics and Traumatology, Prince of Wales Hospital, The Chinese University of Hong Kong, Hong Kong

The first total wrist arthroplasty was believed to be performed by a German surgeon Themistocle Gluck (1853-1942) in Berlin, using ivory device. Modern implants started in 1960s, when the first generation of silicone implant was introduced by Alfred Swanson and John Niebauer. Long term follow up showed high complication rate of silicone synovitis, implant fracture, subsidence and bone resorption.

Second generation TWA implants adopted ball and socket design. Most representative design included Meuli implant with reverse anatomy (with convex, polyethylene radial side and concave, metal carpal side). Volz implant was another modified ball and socket insert, with articulated non-hinged prosthesis, polyethylene radial side and metal carpal side. It only allowed flexion, extension, ulnar and radial deviation, without pronation and supination. Second generation implants experienced problems of soft tissue balance, subsidence, loosening, with metacarpal erosion and penetration.

Third generation was represented by Bi-axial implant. It was developed between 1978 - 1982 in Mayo Clinic by Cooney, Beckenbaugh, and Linscheid. It has a convex ellipsoidal carpal side with concave, metal-backed UHMW polyethylene radial implant. Distal fixation consisted of a long stem cementing into the third metacarpal and a small derotational stem inserted into the trapezoid. It was intended for cementation fixation but cementless option was also available. Cobb and Beckenbaugh published promising result for 57 consecutive cases in 6 years for rheumatoid arthritis of wrist. Long term results showed improved range of movement and grip. 75% patients remained pain free. However it was complicated with loosening, subsidence, carpal erosion and penetration of dorsum of third metacarpal, polyethylene wear, dislocation. In 2004, the implant was withdrawn from market without explanation. Another notable implant design was the Universal Total Wrist implant featuring a toroidal carpal component articulation. The carpal component consisted of a central stem that was cemented into the third metacarpal, with 2 additional screws being inserted into adjacent carpal bones. However poor survival rate was reported due to loosening of carpal component and periprosthetic dislocation in long term.

The continued evolution of total wrist arthroplasty implants aimed toward (1) reducing complication rates, (2) improving the biomechanics, and (3) minimizing bone resection and reducing carpal component loosening. These newer designs mainly relied on an ellipsoidal articulation that could replicate the native wrist joint and improve on the imbalance and instability problems in the older designs. Potential solution for carpal component loosening involves the use of materials with enhanced osseous ingrowth.

Modern fourth generation TWA implant is represented by Remotion and Mastro as well as other modern implants. The implant is designed for cementless fixation for biological fixation. Remotion implant was developed around 2000s. It consists of a radial component, carpal ball and a carpal plate. The radial component is titanium coated to promote osteointegration. The bearing surface is made of cobalt-chromium alloy to resist erosion. The concave geometry of articulation provides stability and prevent excessive motion, while its anatomical volar tilt as well as ulna tilt allow more physiological range of flexion motion. It permits minimal bone resection and avoid fixation in the carpal. It can be combined with ulna head replacement. 4th generation implant has accumulated enough data to prove its safety and desirable outcomes, with good pain relief, functional improvement and improvement in some aspects of range of motion with good longevity.



Custom Prosthetic Scapular and Humeral Reconstructions of the Upper Limb in Orthopaedic Oncology

Dr. Kwok-chuen Wong

Department of Orthopaedics and Traumatology, Prince of Wales Hospital, The Chinese University of Hong Kong, Hong Kong

With advances in 3D digital surgical planning and 3D printing technology, patient-specific implants (PSIs) are more readily accessible for complex resection and reconstruction in orthopaedic bone sarcoma patients. Besides conforming to patients' bony anatomy, PSI matches individual surgical requirements and integrates into the biomechanical environment to restore limb function and enhance implant longevity. Patient-specific guides (PSGs) also enhance surgeons' capacity to replicate surgical planning precisely. Fifteen years of local experience using PSIs in the humerus and scapular sarcoma will be shared with case illustrations.

Abstracts of Lectures

6. Rehabilitation



Tele-Rehabilitation in the Hand and Wrist

Mr. Charles Cheuk-Sang Lam

Department of Occupational Therapy, Alice Ho Miu Ling Nethersole Hospital, Hong Kong

Tele-rehabilitation is a tool that enables clinicians to perform evaluation and treatment of the patient using communication technologies. It is increasingly evident that telehealth can improve access to rehabilitation services and specialists, prevent unnecessary delays in receiving care and facilitate coordinated care and inter-professional collaboration. Studies show that tele-rehabilitation is effective for recovery of motor function following stroke or traumatic brain injuries. Unfortunately, studies investigating the efficacy of tele-rehabilitation following orthopaedic injuries are scarce. Moreover, within the literature concerning tele-rehabilitation of orthopaedic injuries, most concern lower limb injuries.

A local hybrid program with tele-rehabilitation for patients with carpal tunnel syndrome was implemented by occupational therapist since 2021. The program composed of 4 sessions: 3 individual face-to-face consultations for assessment and splint fabrication and 1 online Zoom class composed of CTS pathology education, activity modification and home exercises. A retrospective cohort study was performed to compare the effect of hybrid program group with conventional program group. Pre- and post-program functional outcomes were measured. The mean changes of patient's clinical outcomes including visual analog scale numbness rating, Phalen's test result, grip strength and QuickDASH score were improved more in hybrid program group than that in conventional program group, but the changes were not statistically significant except QuickDASH score ($p=0.001$).

Telehealth service delivery is a rapidly growing force in the healthcare environment. There is increasing evidence that many occupational therapy services are amenable to a telehealth service delivery model. In foreign countries, wearable device or tablet with gaming system were available for patient rehabilitation at home. It is worth to explore the feasibility of incorporating tele-rehabilitation in usual practice for different orthopaedic conditions.



Patient-Specific Design in Rehabilitation

Mr. Joseph Chung-keung Cheng

Department of Occupational Therapy, Caritas Medical Centre, Hong Kong

Occupational therapy (OT) plays a vital role in the rehabilitation process of patients who are recovering from injuries or surgeries. However, the traditional methods of designing and creating OT customized assistive devices can be time-consuming and costly. This is where 3D printing technology comes in, providing a more efficient and cost-effective solution.

In this presentation, we will discuss the benefits of using 3D printing technology for patient-specific aids design in rehabilitation. By leveraging the capabilities of 3D printing, we can create custom equipment with greater precision and accuracy that is tailored to the unique needs and abilities of each patient, to facilitate returning to work or promote independence. This allows for a more personalized approach to rehabilitation, which can result in better fit and improved functionality.

In addition to discussing the practical applications of 3D printing in OT, we will also address some of the challenges and limitations of this technology. We will explore how to overcome these obstacles and provide insights into the future of 3D printing in rehabilitation.

Overall, this presentation will provide valuable insights into the benefits and applications of OT 3D printing in patient-specific design. Participants will gain a deeper understanding of how patient specific design can be used to improve the rehabilitation process and provide better outcomes for patients.

Abstracts of Lectures



Modular Task-Specific Prostheses and Augmentation for the Upper Limb

Prof. Darwin Tat-ming Lau

Department of Mechanical and Automation Engineering, The Chinese University of Hong Kong, Hong Kong

The loss or motor impairment of the upper limb, such as amputation or nerve palsy, respectively, significantly impedes into one's ability to perform activities of daily lives (ADLs) in the human-made world. The loss of upper limb may refer to the entire arm, lower arm, hand or complete/partial finger(s), while impairment may refer to either the loss of limb function or deformation of limb structure. Aside from rehabilitation therapy, orthotics/prosthetics are engineered devices that can allow those in-need to regain function to perform ADLs. Existing robotic devices, such as prosthetic arms/hands and exoskeletons, aim to address such issues by re-creating or provide function in an anthropomimetic manner. However, the complexity of the human upper limb results in a very complex robotic systems that are still in its infancy and has not entered the mainstream. In this presentation, two types of orthotic devices studied by our research group will be presented. First, a novel philosophy of modular task-specific prosthetic device system is presented, where interchangeable 3-D printed tools targeting specific tasks are designed, rather than attempting to be anthropomorphic. This results in a library of effective, low-cost, robust and simple prosthetic devices, that is practical for those in need in Hong Kong and beyond. Second, extending from static prosthetic devices, our recent work on supernumerary robotic limbs (SRLs), as additional limbs (such as a third hand or sixth finger) to assist and augment the wearer, will be presented. Important challenges relating to the design of SRL mechanisms and the human-SRL control interfaces will be discussed, which will lead towards to development of next generation wearable device for those with upper-limb impairment.

7. The New 360 in Wrist Trauma



Arthroscopic Approach and Implant Innovations in Distal Radius Fracture

Dr. Jeffrey Justin Siu-cheong Koo

Department of Orthopaedics & Traumatology, Alice Ho Miu Ling Nethersole Hospital, Hong Kong

Historically, innovations have always remained in managing distal radius fracture. The introduction of locking plate design and three-column theory in distal radius has caused drastic changes. Instead of relying on a plain x-ray, a CT scan can better assess the fracture configuration. The articular incongruity and extremely small volar rim fragments are now easier to spot. These conditions lead to early posttraumatic arthrosis and volar carpal subluxation, respectively.

To prevent these two conditions, wrist arthroscopy was introduced to restore and assess the articular surface intra-operatively since fluoroscopy alone failed to evaluate the articular surface reduction adequately. Additionally, intra-articular soft tissue injuries such as scapholunate interosseous ligament and triangular fibrocartilage complex tears can be detected during surveillance of the wrist joint and treated simultaneously without treatment delay. Based on our studies, the use of wrist arthroscopy in AO Type C distal radius fracture has a better radiological and functional outcome. A newer plate design that can stably fix the volar rim fragment has been launched to prevent fragment dislodgement and volar carpal subluxation. In our experience, using these specially designed plates in volar rim fragment length less than 10mm can better prevent complication development.

Abstracts of Lectures



Restabilizing the DRUJ: Computer-Assisted Osteotomy, and a Novel Ligament Reconstruction

Dr. Heinrich-Geert Tünnerhoff

Founder, Hand Surgery Service at Marbach Hospital, Germany

Restabilizing the DRUJ: computer-assisted osteotomy, and a novel ligament reconstruction painful instability of the DRUJ may be due to incongruency of the bone frequently after malunion of distal radius fracture. Especially in cases of slight malunion computer assisted 3-D planning and osteotomy are helpful. Two examples are presented.

Instability may be as well due to incompetence of the ulnoradial ligaments usually after failed reinsertion procedure. Ligament-reconstruction is done by various types of grafts using tendons. Loosening is a problem in some cases due to failed incorporation of the tendon into the bone. A technique using a bone ligament graft taken from the extensor retinaculum reconstructing the insertion of the ligaments into the fovea and the palmar ulnoradial ligament has been developed. Results in nine wrists, eight patients are presented. The bone was anchored press fit and healed to the bone of the distal ulna in all cases after 6 weeks. Stability of the DRUJ was restored in all cases. Clinical results and PROM have been good in five patients, two patients had various other problems affecting the result, in one patient a ulnar shortening procedure was necessary as a later secondary procedure.



Reconstruction of the SL Complex with 3LT and Henry Procedure

Dr. Simon Kim

Department of Hand surgery, Children's Hospital Wilhelmstift Hamburg, Germany

Injuries to the scapholunate ligament can result in carpal instability and osteoarthritis of the wrist. While acute injuries may benefit from direct repair, older injuries may need a staged treatment. In cases with reducible SL dissociation and intact radiocarpal cartilage (Garcia Elias stage III and IV), a ligament reconstruction may prevent further collapse. I present follow-up data of patients who received a reconstruction according to Garcia-Elias (3LT) and Henry.

We included 38 patients after 3LT and 43 patients after Henry procedure. Mean follow up-time was 713 days (3LT) and 785 days (Henry). After 3LT, wrist extension (37° vs 58°) and flexion (32 vs 47°) were significantly lower compared to Henry. Pain on stress was higher (3.8 vs 2.3) but not during resting. DASH and PRWE-score were not different. After both procedures, reduction of SL distance (3 and 2.4 mm) and angle (51 and 57°) were lost. Final SL distance was 4 mm (3LT) and 2.6 mm (Henry), SL angle 71 and 70° .

There was no correlation between timing of follow up and radiographic markers or pain intensity.

Our data suggests that the Henry procedure should be favoured regarding range of movement and pain.

Abstracts of Lectures



The Future of Wrist Arthroscopy: Pushing the Limit

Dr. Pak-cheong Ho

Department of Orthopaedics and Traumatology, Prince of Wales Hospital, The Chinese University of Hong Kong, Hong Kong

Wrist arthroscopy is a relative new technique. Although the clinical application could be traced back to 1979 when YC Chen first reported on the result of 90 arthroscopic examination of wrist and finger joints in 34 patients, the technique did not gain popularity until 1986 when a formal wrist arthroscopy workshop was organized in USA by pioneers such as Gary Poehling, Terry Whipple and James Roth. Throughout the past 4 decades, the technique and concept flourished among hand surgeons globally. Diagnostic wrist arthroscopy had become a golden standard in many clinical conditions. Parallel to this, many new and innovative procedures continued to evolve with predictable outcomes and low complications. The future of wrist arthroscopy is promising. However like every surgical technique or concept, there are bottle necks during the development that require much conjoined effort to be overcome before getting fruition. In author's opinion, these limits lie on 8 major aspects:

1. Knowledge: There was rising trend in the publication of research on wrist arthroscopy globally since 1986, and especially in the last 15 years. However quality of the research was in general in the low level with few level I or II evidence based studies

2. Anatomy: The wrist joint consists of multiple articulation with important osseo-ligamentous connections. Despite the mastering of many major articulation components of the joint, a couple of areas inside the wrist are still relatively inaccessible, such as the piso-triquetral joint, STT joint, ulno-disc joint, dorsal and volar capsular region. New portals are evolving however their usefulness need to be critically evaluated. Use of local anaesthesia without tourniquet potentially enables the realization of the concept of portal without boundaries.

3. Technology & Skill: The ultimate dream of wrist arthroscopy can be a truly nano-scope which can be administered by injection with automated function and resorbable. In reality, the practical wish can include a smaller & flexible scope, new flexible & powerful gadgets, minimally invasive peri-op assessment tools, computer assisted technology and synthetic healing adjuncts.

4. Surgical innovation: Currently reconstructive surgery development has embraced complex surgical solutions tackling on osseous, soft tissue and cartilage problems. Current trend in reconstruction focused on navigation / 3D printing aided fixation, tendon graft for ligament reconstruction, true ligament anatomical reconstruction, enhancing bone-tendon junction healing, bone and cartilage regeneration, biological or implant interposition and ligament enhancing scaffolding etc. Further development would stretch our imagination, however needs to base on a solid understanding of wrist biology & pathology. The complexity must be balanced with practicality & safety. A wider use of computer technology will be an irresistible trend and need.

5. Rehabilitation: Accelerated rehabilitation builds on principle of predictable healing. Further arthroscopic treatment aims at stronger repair/ reconstruction, healing enhancing adjunct, load/ stress sharing devices for early phase rehabilitation, minimally or non-invasive surgery, better pain control and biofeedback on integrity of repaired structures.

6. Practice Setting: With the development of portal site local anaesthesia (PSLA) to allow wrist arthroscopy to be performed under local anaesthetic setting without tourniquet and sedation, the risk and cost associated with arthroscopy has markedly diminished and the acceptance of the surgery both by the patients and the surgeons is escalated. Future practices anticipate wide-spread application as office procedures especially for diagnosis and simple therapeutic means using disposable arthroscopes.

7. Training and Promotion: Wrist arthroscopic skill is difficult to acquire through training in non-anatomical models. Cadaveric hands-on training course became the standard mode of training. Since the first workshop being held in USA in 1986, the enthusiasm had then spread to other continents. Hong Kong organized the first ever wrist arthroscopy workshop in Asia since 1997, followed by the first EWAS workshop in Strasbourg in 2005. These helped to propagate the knowledge, skill and concept and aroused a surge in global interest on wrist surgery. However training at resident level is still generally lacking in many countries even in advanced system such as USA and France. There is no proven model of simulator in wrist arthroscopy training. Future development of e-learning platform, simulators, evaluation feedback system and augmented reality training can help to popularize the training and promotion on this clinically essential technique.

8. Organization Limits: The wide application of wrist arthroscopy stimulated a strong professional interest in wrist disorders on the continuing development, research and advancement. This directly or indirectly led to the establishment of several international organizations with foci on wrist surgery, including the International Wrist Investigator Workshop, European Wrist Arthroscopy Society, Asia Pacific Wrist Association and International Wrist Arthroscopy Society. Future development aims at cross collaboration with major hand surgery communities and at local national level promotion. International academic interflow such as traveling fellowship program, educational activities, multi-centered research should be enhanced.

Abstract of Free Papers

1. Toe-sock dressing for the thumb polydactyly patients

Jeremiah Seeway Chan, Esther Ching-san Chow

Department of Orthopaedics and Traumatology, United Christian Hospital, Hong Kong

Introduction: Dressing can be challenging after surgical treatment for thumb polydactyly as these toddlers tend to remove their dressing after the operation. It is essential to keep a secure and comfortable dressing that can ease their anxiety whilst protecting the wound. The aim of this study is to develop and review the outcome of "toe-sock dressing" for these cases.

Materials and Methods: 9 cases of thumb polydactyly patients aged 11 to 26 months who received surgery from January 2021 to June 2022 were included in this review. A "toe-sock dressing" is applied as the outer layer over a boxing glove dressing in all cases. Dressing conditions were reviewed through a questionnaire marked with a total score of 40 - a lower score indicating better dressing conditions. Parent satisfaction score was also charted.

Results: There were a total of 9 patients and 13 thumbs operated (4 cases of bilateral involvement). The dressing provided adequate protection and achieved adequate immobilization without the need for casts or splints. The average dressing score was 5.4 out of 40, showing excellent dressing conditions. The parent satisfaction score was rated at an average of 8.9/10. There was no wound complications.

Discussion and conclusion: The "toe-sock dressing" is a cheap and readily available option, whilst providing adequate protection during the postoperative period. The colourful cartoon over the sock allows patients to treat the dressing as a companion without removing it. It improves wound condition and optimizes the clinical outcome, as well as reducing patients' and parents' anxiety.

2. Clinical review of total elbow replacement in complex elbow fractures

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Introduction: Complex elbow fractures have been posing difficulty to surgical fixation with suboptimal clinical outcomes and often required subsequent operation. Primary total elbow replacement has been proposed to be an alternative for complex fracture non-amenable for fixation, or elbows with pre-existing arthritis. However, its application in local clinical practice has been limited.

Methods: Data from patients who received total elbow replacement for trauma related conditions in Prince of Wales Hospital between 2012 to 2022 were retrospectively retrieved. Patient's demographics and past medical history were documented. Serial X-rays were retrieved for evaluation. Postoperative clinical function, range of movement and longevity of the implant were recorded.

Results: Data from six patients were retrieved. Four patients received primary total elbow replacement in acute setting and two received subsequent arthroplasty for fracture non-union. Three patients had rheumatoid arthritis, one patient had osteoarthritis of the elbow, and the remaining two patients had AO type C distal humerus fracture. Mean follow-up time was 2 years. No arthroplasties required revision. Mean range of movement was 113 degrees flexion and 19.1 degrees extension. We experienced one case of intraoperative shaft fracture requiring fixation, as well as one case of transient ulnar nerve palsy.

Discussion and Conclusion: Total elbow arthroplasty is a viable option for complex elbow fractures, or fracture elbows with pre-arthritis condition. Satisfactory short-term outcomes are demonstrated. Future studies may further conclude on the long-term survivorship of the implant.

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3. Holistic pathology-based treatment protocol significantly improves clinical results in complex elbow fracture-dislocation

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Introduction: The study aimed to evaluate the functional results in patients with elbow fracture-dislocations and compare between the three different injury patterns.

Methods: We performed retrospective study on 31 patients with unstable elbow fracture dislocations between 2015 and 2020. Elbow collateral ligaments laxity was assessed with intraoperative fluoroscopy under general anaesthesia. The repair and fracture fixation were based on the assessment, range of motion (ROM), elbow and grip strength, visual analog scale (VAS) pain score, Mayo elbow performance score (MEPS), quick disabilities of the arm, shoulder, and hand (Quick DASH) score and patient rated elbow evaluation (PREE) were evaluated by an independent assessor at the final follow-up. Any documented complications were identified from the clinical records.

Results: In all, 18 had a PLRV, 7 had a PMRV, and 6 had a TOFD pattern. The average follow-up was 3.7 years. The mean age was 50.2 years with 67.7% men. The average waiting time for operation was 22.5 days. Elbow ROM, grip strength, elbow flexion and extension strength can achieve more than 95% of contralateral side. VAS pain scores at rest, light duty, and heavy lifting were 0.65, 0.94 and 1.42 out of 10. At the final assessment, our patients had MEPS score of 93.6, Quick DASH score of 8.5, and a PREE score of 8.7.

Discussion and Conclusion: When using the standard assessment and treatment protocol we proposed, the outcome in three injury patterns does not have a statistically significant difference in ROM, grip strength, pain, and function score. In addition, the time lapse between injury and operation treatment does not affect the functional outcome.

4. Comparison of Kleinert vs. Saint John protocol in Zone I/II Flexor Tendon Injuries: A Pilot Study

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Introduction: Flexor tendon injuries remain one of the most difficult hand injuries to manage. Till this day, there are still controversies regarding the best rehabilitation protocol. The aim of our study is to compare the Kleinert protocol with the Saint John protocol.

Materials and Methods: Cases with Flexor zone I and II injuries admitted to our hospital from Aug 2016 to Feb 2020 (Group 1: Kleinert protocol) and from Nov 2021 to Sep 2022 (Group 2: Saint John protocol) were recruited. Exclusion criteria include defaulted follow-up, psychiatric illness, paediatric patients. Outcome measurements include range of motion, grip strength, pain score at 6 and 12 weeks. Complications were reviewed.

Results: There were 12 patients and 14 fingers in group 1, and 11 patients and 13 fingers in group 2. The average age was 44.9 (group 1) and 37.1 (group 2), $p=0.731$. The gender distribution and zone of involvement have no difference between the 2 groups. The proximal interphalangeal joint (PIP) active ROM at 6 weeks showed a better result (83.8 vs 64.6; $p=0.028$). Patients in group 2 have lower pain score at 6 weeks (0.00 vs 0.686; $p=0.020$). Patients in group 2 have less severe PIP fixed flexion contractures at 6 weeks (4.61 vs 15.0; $p=0.048$). The total active movement / Strickland score of group 1 patients showed superior results at both 6 and 12 weeks but the difference were not significant.

Conclusion: We propose that compared with Kleinert protocol, the Saint John protocol achieves a better outcome at an early post-operative period.

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5. Comparison of two dynamic external fixators for proximal interphalangeal joint (PIPJ) fracture-dislocation in a cadaveric model

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Introduction: Fingers PIPJ fracture-dislocation is challenging to treat. This study aims to compare the effectiveness of two external fixators: 1. Suzuki external fixator and 2. A novel homemade syringe-spring external fixator.

Materials and Methods: Sixteen cadaveric fingers were categorized into two groups: 1) Group 1 using a classic Suzuki fixator with K-wires and rubber bands; 2) Group 2 using a novel syringe-spring external fixator. An unstable PIPJ fracture-dislocation was simulated in each finger. An external fixator was applied to achieve adequate reduction. Using a motor-driven linear actuator, each finger underwent a 1400-cycle range of motion (ROM). C-arm images were captured, and dorsal displacement distances were measured at different stages: 1) baseline, 2) post-fracture dislocation, 3) post-reduction, and 4) post-ROM.

Results: There were eight fingers in group 1 and eight fingers in group 2. The mean dorsal displacement after fracture-dislocation was 2.7mm in group 1 and 3.1mm in group 2 ($p=0.279$). The mean dorsal displacement after initial reduction was 0.14mm in group 1 and 0.21mm in group 2 ($p=0.328$). None of the fingers have re-dislocation after the cyclic motion. The maintenance of reduction after cyclic ROM was 0.06mm in group 1 and 0.05mm in group 2 ($p=0.382$). All findings showed no significant differences.

Conclusion: The efficacy of the two different types of external fixators was comparable. The novel syringe-spring construct has the additional benefits of 1) allowing fine adjustments of tension, 2) resisting torsional deformity, and 3) time-efficiency in application.

6. Computer-assisted correctional osteotomy for distal radius fracture malunion: early results of a customised 3-D printed spacer reduction guide

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Introduction: Malunion following distal radius fracture alters the alignment and biomechanics of the radio-carpal and distal radio-ulnar joint, resulting in pain, reduced range of motion and grip strength, often due to ulnar impaction. Corrective osteotomy for malunion aims to restore normal anatomy for symptom relief. Conventional surgical planning based on biplanar radiographs is inadequate in analysing multiplanar deformities, while on-table assessment is time consuming and often inaccurate due to positional factors. The advent of three-dimensional (3D) computer-assisted surgical planning based on computed tomography (CT) scans improves precision, allowing 3D printing of customised, patient-specific surgical guides. We report our experience with a 3D printed spacer reduction guide, which facilitates stable deformity reduction. Complex deformity correction may then be performed in a similar fashion as simple extra-articular distal radius fracture fixation.

Methods: This is a single-centre retrospective review of patients with extra-articular opening wedge distal radius osteotomy for fracture malunion performed from February 2018 until December 2021, via computer assisted planning and customised 3D printed spacer reduction guides.

Results: Six patients underwent the procedure, with average follow-up of 26 months. Postoperative radiographical parameters were all corrected to within acceptable range. An average residual error of $2.2^\circ \pm 2.4^\circ$ in radial inclination, $2.0 \text{ mm} \pm 1.6 \text{ mm}$ in radial height, $1.2^\circ \pm 1.1^\circ$ in tilt and $2.0 \text{ mm} \pm 2.0 \text{ mm}$ in ulnar variance remained compared to the contralateral normal wrist.

Discussion and Conclusion: The use of patient-specific 3D printed spacer reduction guides in distal radius corrective osteotomy facilitates realignment and provides a high degree of precision.

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7. A Novel Three-Dimensional, Estimation-free Method for Single-Cut Rotational Osteotomy Planning for Long Bone Deformities

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Introduction: Bone deformities are usually a combination of rotational and angular deformities, particularly in the upper limbs. Conventional closing or opening wedge osteotomy planning does not account for rotational realignment, results in shortening, or produces inter-segmentary gap. Single-cut oblique rotational osteotomy addresses both angular and rotational deformities, avoids shortening, and maintains good bone contact. However, conventional planning methods were based on estimations on projected 2-D images, using protractor measurements or estimations from graphs. A novel 3-D based, estimation-free method for planning of osteotomy site, obliquity, and amount of rotation is proposed.

Materials and Methods: Osteotomy planning was done using CT data in DICOM format imported into 3-D image processing software. A distal target for correction was first established using the mirrored image of the normal contralateral side. The deformed bone was matched to the proximal normal side. A distal coronal plane was created, and a plane perpendicular to this plane and the axial plane was created (AP). The deformity side was duplicated. The duplicate (DBb) was matched to the distal mirrored normal bone. The osteotomy plane was defined as perpendicular to the two APs of the proximally-matched and distally-matched bones and going through the CORA. This method was applied to 4 patients with upper limb deformities (humerus, radius, and ulna).

Results: This method was able to be applied to all 4 deformities with good matching of the realigned bone to the target. Surgery was performed according to the osteotomy plane, with correction of alignment according to the plan.

Conclusion: Correction osteotomy using single-cut oblique rotational osteotomy can be readily and accurately planned using a target-based realignment method in 3-D planning software.

8. Treatment of proximal interphalangeal joint fracture-dislocation using dynamic external fixator: A retrospective review

Sik-lok To, Esther Ching-san Chow

United Christian Hospital, Hong Kong

Introduction: Treating fracture-dislocation of proximal interphalangeal joint (PIPJ) remains challenging with residual stiffness, pain, and deformities being common. This study aims to review the clinical outcomes of PIPJ fracture-dislocation cases treated with three types of dynamic external fixators: the Suzuki frame, the Arex® Ligamentotaxor and a novel syringe-spring construct from our center.

Methods: Cases of PIPJ fracture-dislocations treated with dynamic external fixators from July 2014 to July 2022 were included. The demographic data were retrieved. The clinical, radiological and functional outcomes were assessed.

Results: 9 patients with 12 fingers were included (5 little, 4 ring and 3 middle fingers), with 6 pilon, 5 dorsal and 1 volar type fracture-dislocations. The average age at injury was 44.2 (range, 28-67). The average period between injury and surgery was 5.1 days (range, 2-16). 7 fingers were treated with the Suzuki frame, 2 with Arex® Ligamentotaxor, and 3 with the syringe-spring construct. The external fixators were kept on average 31 days (range, 21-43). The average follow-up time was 23 months.

The average total active range-of-motion (AROM) of the involved finger and PIPJ was 220.8 (range, 165-270) and 83.8 degrees (range, 50-100) respectively. The average grip strength was 77.9% of the contralateral hand. The brief Michigan Hand Outcome questionnaire score was averaged 81/100. The syringe-spring construct yielded better PIPJ and total AROM compared to the other 2 devices.

Conclusion: Dynamic external fixation produces good functional outcome for PIPJ fracture-dislocation. The syringe-spring construct yields promising results. Further studies looking into the use of this construct are warranted.

Abstract of Free Papers

9. In Distal Radial Fractures with Concurrent Scapholunate Ligament Diastasis, does Primary Treatment of the Distal Radius Fracture affects the Scapholunate Distance in Middle-aged Patients?

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Introduction: Distal radius (DR) fractures are often accompanied by ligamentous injuries. With an associated scapholunate diastasis, the decision whether to proceed with scapholunate fixation remains controversial. Studies showed that scapholunate diastasis reflects secondary carpal stabilisers involvement. It is likely that if displaced bony attachments of secondary stabilisers in distal radius fractures are fixed, secondary stabilisers heal will after DR fixation. In DR fractures with associated scapholunate diastasis, we evaluated radiological progression of scapholunate diastasis after surgical fixation of DR fractures.

Methods: Radiographs of 471 patients with DR fractures within our centre in Hong Kong were evaluated. Patients were selected between the year 2018-21, within the age group of 50-69 years old. We identified 28 patients who had intra-articular DR fracture with a scapholunate distance of more than or equal to 2.5 mm on injury radiographs, who were also subsequently treated with open reduction and internal fixation of the DR. Four patients were excluded as they suffered primary scapholunate injuries from high energy injury mechanisms, and primary scapholunate fixation was performed. The radiographic progression of the scapholunate distance and angle were evaluated from radiographs taken upon injury, immediate post-fixation and upon the latest clinical follow-up after DR healing. The results were analysed with ANOVA test.

Results: The mean scapholunate distance upon injury was 3.04mm. The subsequent scapholunate distance measured during immediate postoperative period was 2.30mm, and the scapholunate distance measured in radiographs at the latest follow-up was 2.02 mm. The mean change in scapholunate distance resulting immediately from DR fixation was a reduction of 0.40mm. The mean change in scapholunate distance from injury to the latest clinical follow up radiograph was a reduction of 0.96 mm ($p=0.001$). Conclusions: With primary DR fixation, the associated scapholunate diastasis shows a reduction in distance immediately after operation. Upon latest clinical follow-up, reduction of scapholunate diastasis is maintained.

10. Factors affecting outcomes after arthroscopic repair of dorsal tears of triangular fibrocartilage complex (TFCC)

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Introduction: To investigate the clinical and functional outcomes of patients with dorsal tears of the triangular fibrocartilage complex (TFCC) lesions after arthroscopic repair and the factors which could influence the outcomes.

Methods: A retrospective review of 32 patients with arthroscopic repair of TFCC dorsal tears (Male: 16, Female: 16, mean age: 36 years old) was carried out. We classified our patients into isolated dorsal tear group and concomitant double lesion group. We evaluated their clinical and functional outcomes, including range of motion, grip strength, wrist performance score, Visual Analog Score (VAS) and Modified Mayo Wrist Score (MMWS), and also compared the two groups with demographics, injury mechanism and ulnar variances.

Results: In the isolated group, the wrist performance score was improved from 29 to 37 ($p=0.01$), the VAS score was improved from 6 to 3 ($p<0.01$), the MMWS was improved from 60 to 74 ($p=0.01$), the hand grip strength was improved from 18 to 28 kg ($p=0.05$) and the distal radioulnar joint achieved 100% stability after surgery ($p<0.01$). In the double lesion group, the VAS score was improved from 6 to 3 ($p=0.01$) and the MMWS was improved from 44 to 79 ($p=0.01$). No statistically difference nor correlation with regards to age, sex, injured side, hand dominance, mechanism of injury and ulnar variance were found between dorsal TFCC injury.

Discussion and Conclusion: Arthroscopic repair of dorsal TFCC tear provides excellent postoperative results. Our patients were benefited with significant pain relief and increased capacity in performing daily activities.

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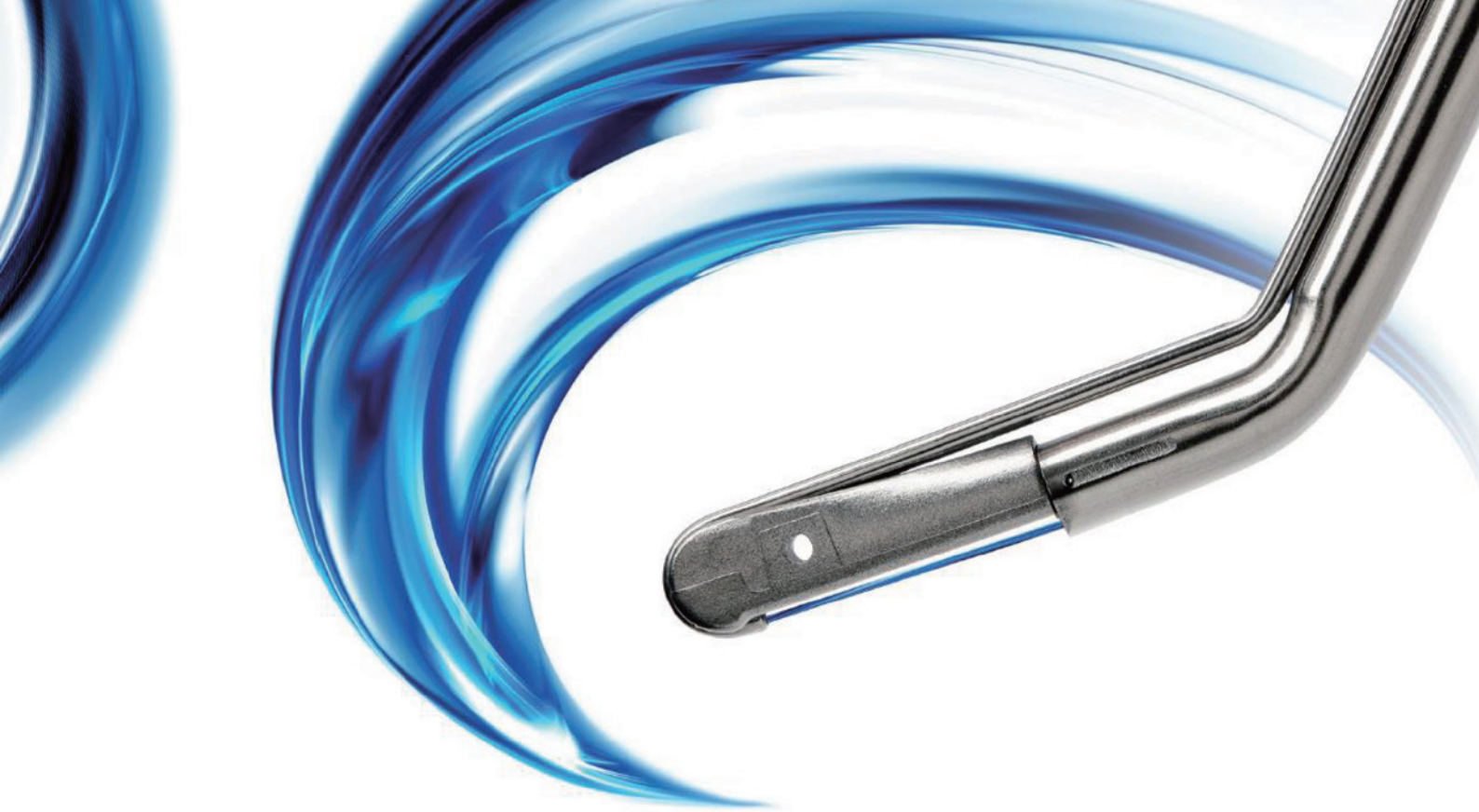
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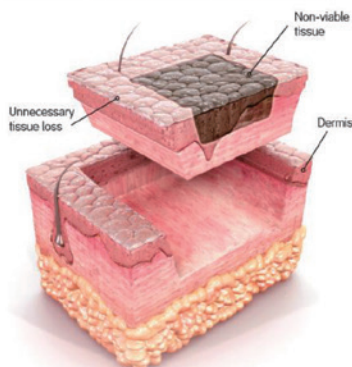
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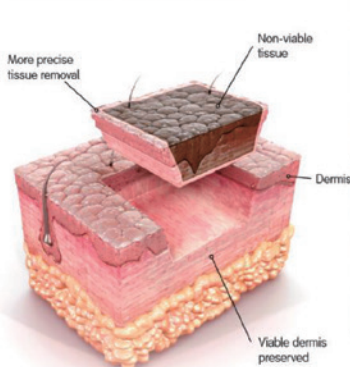
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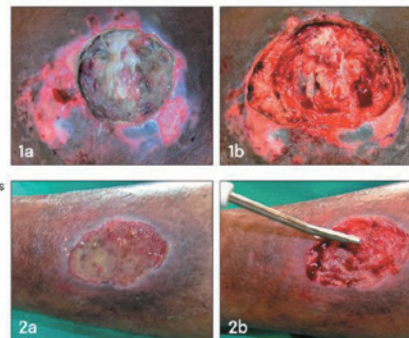


Adapted from Cubison TC, Pape SA, Jeffery SL. Burns. 2006;32:714-720.

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