INTERNATIONAL FACULTY

Graham King (Canada)
Denise Eygendaal (Netherlands)
Michael McKee (Canada)
Cynthia Cooper (USA)

TOPICS
Arthroplasty
Instability
Stiffness
Trauma
Pain

Advances in Elbow Surgery

21 - 22 March 2015

PROGRAMME & ABSTRACTS

www.hkssh.org
COMPREHENSIVE SHOULDER & ELBOW SOLUTIONS

DePuy Synthes is proud to support the Hong Kong Society for Surgery of The Hand 28th Annual Congress, 21-22 March, 2015.

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Message from The President

Dear Friends,

I take great pleasure to welcome all of you attending the 28th Annual Congress of the Hong Kong Society for Surgery of the Hand on March 21-22, 2015.

15 years ago, the theme of our congress was “Elbow 2000” and we had a great success. This year, we have “Advances in Elbow Surgery” as our theme. We have invited four renowned overseas speakers, together with the experienced local surgeons to lead us through this challenging topic.

We successfully went through the computer virus in 2000, but have to face the recent threat of influenza virus infection this year. Certainly, we will not be threatened and we are strong to prepare this compact informative congress for you to attend.

With increasing knowledge on elbow anatomy and pathology, as well as rapidly developing technology, we are better equipped to tackle the difficult and challenging elbow problems. With the vast knowledge and experience of our speakers, the congress will definitely be successful and fruitful.

2000 was a good vintage, but 2015 may be even better after our diligent cultivation.

Dr LO Che Yuen
Message from the Chair of the Organising Committee

Dear colleagues and guests,

It is my great pleasure and honour to be the Chair of the 28th Annual Congress of the Hong Kong Society for Surgery of the Hand 2015.

This year, the main theme of the congress is “Advances in Elbow Surgery”. Looking at the past, we have the topic “Elbow 2000” 15 years ago in the new millennium. During these years there are a lot advances in this field, from trauma to degenerative, inflammatory condition to sport injury, and open surgery to arthroscopic surgery.

We are privileged to have invited two eminent surgeons for the congress - Dr Denise Eygendaal from the Netherlands and Prof Graham King from Canada. Dr Eygendaal is the consultant orthopaedic surgeon in Breda, the Netherlands. She has many researches in the field of elbow surgery including elbow replacements, arthroscopy techniques and fractures around the elbow. Professor King is Professor of Surgery at Western University and the Chief of Orthopaedics at St. Joseph’s Health Centre, Ontario, Canada. His research interests are wrist and elbow biomechanics, computer and image assisted orthopaedic surgery. Ms Cynthia Cooper, Adjunct Faculty, Occupational Therapy Department, A.T. Still University, Arizona, USA, will deliver lectures on therapists’ role in management of elbow disorder. Together with Professor Michael McKee from University of Toronto, Ontario, and our local experts Dr Y.F. Leung, Dr Y.Y. Chow, Dr H.K. Wong, Dr N. Tang, Dr C.Y. Lo and Dr S.T. Ho, I hope you will find this programme enjoyable.

I would like to extend my sincere gratitude to the Council of the Hong Kong Society for Surgery of the Hand for their tremendous support in running this Congress, the Organising Committee and supporting staff for their great efforts in making this Congress a success, the international and local experts for their scientific contribution, and our industry partners for their generous sponsorship. On behalf of the Organising Committee, we wish you all a fruitful and insightful Congress and an enjoyable stay in Hong Kong for all our overseas guests.

Dr Angela HO
The Council

PRESIDENT
Dr LO Che Yuen

PRESIDENT-ELECT
Dr CHAN Ping Tak

HONORARY TREASURER
Dr WAN Siu Ho

VICE-PRESIDENT
Dr LAU Yan Kit

HONORARY SECRETARY
Dr WONG Hin Keung

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Dr YIU Hon Wah
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Dr CHEUNG Kim Wai
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Dr HAU Vincent
Professor IP Wing Yuk Josephine
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Dr LAM Man Yan Marianne
Dr LAU Yan Kit
Mr LAU Chan Fai Lewis
Dr LEUNG Yuen Fai
Dr LO Che Yuen

Ms MA Wai Ling Eva
Dr SIN Cheuk Hang Vincent
Dr TONG Hoi Yiu Sara
Dr TSE Wing Lim
Dr WAN Siu Ho
Dr WONG Hin Keung
Dr WONG Tak Chuen
Dr WONG Wing Yee Clara
Dr YAU Leung Kai Edmund
Dr YIP Ka Yan Emily
Overseas Faculty

Professor Graham KING, MD MSc FRCSC
Division of Orthopaedic Surgery
Department of Surgery
University of Western Ontario
Ontario
Canada

Dr Denise EYGENDAAL, MD PhD
Consultant Orthopaedic Surgeon
Upper Limb Unit
Amphia Hospital
Breda
Netherlands

Professor Michael MCKEE, MD FRCSC
Division of Orthopaedic Surgery
Department of Surgery
University of Toronto
Ontario
Canada

Ms Cynthia COOPER, MFA MA OTR/L CHT
Adjunct Faculty
Department of Occupational Therapy
A.T. Still University
Mesa, Arizona
USA
Local Faculty

Dr CHOW Yuk Yin
Cluster Chief of Service and Consultant
Department of Orthopaedics and Traumatology
New Territories West Cluster

Dr HO Sheung Tung
Chief of Service and Consultant
Department of Orthopaedics and Traumatology
Caritas Medical Centre

Dr LEUNG Yuen Fai
Consultant
Department of Orthopaedics and Traumatology
Tseung Kwan O Hospital

Dr LO Che Yuen
Consultant
Department of Orthopaedics and Traumatology
Queen Elizabeth Hospital
Local Faculty (cont’)

Dr TANG Ning
Consultant
Head of Trauma Team
Department of Orthopaedics and Traumatology
Prince of Wales Hospital

Dr WONG Hin Keung
Associate Consultant
Department of Orthopaedics and Traumatology
Princess Margaret Hospital
HKSSH Visiting Scholars 2015 (China)

Dr LIU Bo
Associate Consultant
Department of Hand Surgery
Beijing Jishuitan Hospital
The Fourth Clinical College of Peking University
Beijing
China

Professor ZHAN Haihua
Department of Hand Surgery
Tianjin Hospital
Tianjin
China

Professor ZHAO Xin
Department of Hand Surgery
Huashan Hospital
Fudan University
Shanghai
China

HKSSH – JSSH Ambassador 2015

Dr Yoshitaka TANAKA
Department of Orthopaedic Trauma & Microsurgery Centre
Seikeikai Hospital
Osaka
Japan
General and Venue Information

Venue: Block H, 7/F Lecture Theatre, Princess Margaret Hospital, 2-10 Princess Margaret Hospital Road, Lai Chi Kok, Kowloon, Hong Kong.
Locations of Programme

- Registration desk - next to the entrances of lecture theatre
- Scientific exhibition booths - Foyer, 7th Floor of Block H
- Coffee and Tea - Foyer, 7th Floor of Block H
- Luncheon symposium - Lecture theatre

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## Programme at a Glance

### 21 March 2015 (Saturday)

<table>
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<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>08:00 - 08:30</td>
<td>Registration</td>
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<tr>
<td>08:30 - 09:45</td>
<td>Symposium I: Elbow arthroplasty</td>
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<tr>
<td>09:45 - 10:15</td>
<td>Tea break</td>
</tr>
<tr>
<td>10:15 - 11:45</td>
<td>Symposium II: Elbow dislocation &amp; elbow instability</td>
</tr>
<tr>
<td>11:45 - 13:15</td>
<td>Luncheon symposium</td>
</tr>
<tr>
<td>13:15 - 13:30</td>
<td>Opening ceremony and presentation of souvenirs</td>
</tr>
<tr>
<td>13:30 - 15:00</td>
<td>Local Free Paper</td>
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<tr>
<td>15:00 - 15:30</td>
<td>Tea break</td>
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<tr>
<td>15:30 - 17:00</td>
<td>Symposium III: Elbow trauma: new advances</td>
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<tr>
<td>19:00</td>
<td>Congress dinner</td>
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### 22 March 2015 (Sunday)

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<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>08:30 - 09:15</td>
<td>Symposium IV: Elbow pain</td>
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<tr>
<td>09:15 - 10:30</td>
<td>Symposium V: Elbow stiffness</td>
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<tr>
<td>10:30 - 10:45</td>
<td>Tea break</td>
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<tr>
<td>10:45 - 11:45</td>
<td>Symposium VI: Elbow fracture in the elderly</td>
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<tr>
<td>11:45 - 13:00</td>
<td>Dr LAM Cho Yee Memorial Scholarship report</td>
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<td>HKSSH-JSSH ambassador paper and report</td>
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<td>HKSSH-JSSH ambassador paper and report</td>
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<td>Ambassador free papers</td>
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<tr>
<td>13:00 - 13:05</td>
<td>Closing remarks</td>
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# Detailed Programme

## 21 March 2015 (Saturday)

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Speaker</th>
<th>Moderator</th>
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<tr>
<td>08:00-08:30</td>
<td>REGISTRATION</td>
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<tr>
<td>08:30-09:00</td>
<td>Symposium I: Elbow Arthroplasty</td>
<td>D Eygendaal</td>
<td>WY Ip</td>
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<tr>
<td></td>
<td>Plenary Lecture</td>
<td></td>
<td>J Chan</td>
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<td></td>
<td>Total elbow arthroplasty: Indication, patient selection</td>
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<tr>
<td>09:00-09:15</td>
<td>Revision total elbow arthroplasty: Tips and pearls</td>
<td>G King</td>
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<tr>
<td>09:15-09:30</td>
<td>Total elbow replacement for distal humeral fractures</td>
<td>M McKee</td>
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<tr>
<td>09:30-09:45</td>
<td>Discussion</td>
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<td>09:45-10:15</td>
<td>TEA BREAK</td>
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<tr>
<td>10:15-10:30</td>
<td>Symposium II: Elbow dislocation and elbow instability</td>
<td>YF Leung</td>
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<td></td>
<td>‘Simple’ elbow dislocation: Is it really that simple?</td>
<td>M McKee</td>
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<tr>
<td>10:30-10:45</td>
<td>Management of terrible triad</td>
<td>G King</td>
<td>HK Wong</td>
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<td>Emily Yip</td>
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<tr>
<td>10:45-11:00</td>
<td>Late presentation of elbow dislocation</td>
<td>YY Chow</td>
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<tr>
<td>11:00-11:15</td>
<td>Posterolateral rotatory instability</td>
<td>G King</td>
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<tr>
<td>11:15-11:30</td>
<td>Valgus extension overload syndrome (Thrower’s elbow): Diagnosis and treatment</td>
<td>D Eygendaal</td>
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<tr>
<td>11:30-11:45</td>
<td>Discussion</td>
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<tr>
<td>11:45-13:15</td>
<td>Luncheon Symposium</td>
<td>M McKee</td>
<td>E Yau</td>
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<td>WY Shen</td>
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<td></td>
<td>Emily Yip</td>
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<tr>
<td>13:15-13:30</td>
<td>Opening ceremony and presentation of souvenirs</td>
<td>CY Lo</td>
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<td></td>
<td>A Ho</td>
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<td>M Lam</td>
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<td>Vincent Hau</td>
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<tr>
<td>13:30-15:00</td>
<td>Local free paper session</td>
<td>PT Chan</td>
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<td>S Tong</td>
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<td>15:00-15:30</td>
<td>TEA BREAK</td>
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<tr>
<td>15:30-15:45</td>
<td>Symposium III: Elbow Trauma: New advances</td>
<td>D Eygendaal</td>
<td>YF Leung</td>
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<td></td>
<td>Radial head fracture: Fix it or replace it</td>
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<td>E Yau</td>
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<tr>
<td>15:45-16:00</td>
<td>Coronoid fracture: my preferred approach and fixation method</td>
<td>G King</td>
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<tr>
<td>16:00-16:15</td>
<td>Olecranon fracture: How to fix it?</td>
<td>HK Wong</td>
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<tr>
<td>16:15-16:30</td>
<td>Distal humerus fracture: Tips and pearls</td>
<td>N Tang</td>
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<tr>
<td>16:30-16:45</td>
<td>Capitellum fracture: How I treat it</td>
<td>CY Lo</td>
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<td>16:45-17:00</td>
<td>Discussion</td>
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## Detailed Programme (cont’)

**22 March 2015 (Sunday)**

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<tr>
<th>Time</th>
<th>Event</th>
<th>Speaker</th>
<th>Moderator</th>
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<tbody>
<tr>
<td><strong>Symposium IV: Elbow pain</strong></td>
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<tr>
<td>08:30-08:45</td>
<td>Lateral epicondylitis: Role of conservative treatment</td>
<td>C Cooper</td>
<td>C Wong Eva Ma</td>
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<tr>
<td>08:45-09:00</td>
<td>Lateral epicondylitis: Should we use arthroscopic or open release?</td>
<td>D Eygendaal</td>
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<tr>
<td>09:00-09:15</td>
<td>Elbow arthritis: Role of elbow arthroscopy</td>
<td>G King</td>
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<tr>
<td><strong>Symposium V: Elbow stiffness</strong></td>
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<tr>
<td>9:15-9:30</td>
<td>Treatment of elbow stiffness: My approach</td>
<td>D Eygendaal</td>
<td>YK Lau Lewis Lau</td>
</tr>
<tr>
<td>9:30-9:45</td>
<td>Heterotopic ossification: Prevention and treatment</td>
<td>G King</td>
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</tbody>
</table>
| 9:45-10:15 | **Plenary Lecture**
*Therapists’ role in management of elbow stiffness*                          | C Cooper         |                 |
| 10:15-10:30| Discussion                                                            |                  |                 |
| 10:30-10:45| **TEA BREAK**                                                        |                  |                 |
| **Symposium VI: Elbow fracture in the elderly**                                                                                   |
| 10:45-11:15| **Plenary Lecture**
*My approach to distal humerus fracture in the elderly*                       | G King           | CY Lo E Chow    |
| 11:15-11:30| Evidence-based-medicine: treatment on elbow fracture in elderly       | ST Ho            |                 |
| 11:30-11:45| Discussion                                                            |                  |                 |
| 11:45-13:00| Dr Lam Cho Yee Memorial Scholarship report                           | Emily Yip Angela Ho | HK Wong         |
| 11:45-13:00| HKSSH-JSSH ambassador paper and report                                | Y Tanaka WL Chan |                 |
| 13:00-13:05| Closing Remarks                                                       | CY Lo            |                 |

Visiting scholars free paper session

- B Liu
- H Zhan
- X Zhao

Visiting scholars free paper session

- Angela Ho
- WL Tse

<table>
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<tr>
<th>Time</th>
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<tbody>
<tr>
<td>13:00-13:05</td>
<td>Closing Remarks</td>
<td>CY Lo</td>
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## Detailed Programme (cont')

### Local free paper

<table>
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<th>Title</th>
<th>Presenter</th>
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<tbody>
<tr>
<td>1</td>
<td>Local review of treatment of hand enchondroma (artificial bone substitute vs autologous bone graft) in tertiary referral centre: 8 year experiences</td>
<td>YW Hung</td>
<td>Prince of Wales Hospital</td>
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<tr>
<td>2</td>
<td>Hemi-hamate osteochondral autograft arthroplasty for treatment of acute and chronic fracture-dislocation of the proximal interphalangeal joint of finger in a local regional centre</td>
<td>YY Lam</td>
<td>Tuen Mun Hospital</td>
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<tr>
<td>3</td>
<td>Distribution of sesamoid bones in the hand - a study in the Chinese population</td>
<td>GYT Lam</td>
<td>United Christian Hospital</td>
</tr>
<tr>
<td>4</td>
<td>Review of functional outcome of metacarpophalangeal joint arthroplasty using self locking small joint implant - an alternative option than silicon interposition arthroplasty</td>
<td>YC Siu</td>
<td>Prince of Wales Hospital</td>
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<tr>
<td>5</td>
<td>Arthroscopic debridement of thumb CMCJ</td>
<td>Clara Wong</td>
<td>Prince of Wales Hospital</td>
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<tr>
<td>6</td>
<td>Arthroscopic management of elbow ganglion, 8 years follow-up</td>
<td>Clara Wong</td>
<td>Prince of Wales Hospital</td>
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<tr>
<td>7</td>
<td>Elbow osteoarthritis: Results of arthroscopic osteocapsular arthroplasty</td>
<td>Clara Wong</td>
<td>Prince of Wales Hospital</td>
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<tr>
<td>8</td>
<td>Anatomical precontoured locking compression plates for the treatment of distal third humeral fractures: a retrospective analysis</td>
<td>KK Liu</td>
<td>Princess Margaret Hospital</td>
</tr>
<tr>
<td>9</td>
<td>A study on the measurement of wrist motion range using the smartphone gyroscope application</td>
<td>YY Kwok</td>
<td>Prince of Wales Hospital</td>
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### Visiting scholars free paper

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<th>Affiliated Institute</th>
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<tbody>
<tr>
<td>1</td>
<td>Arthroscopic assisted minimally invasive management of perilunate dislocations and fracture-dislocations</td>
<td>B Liu</td>
<td>Beijing Jishuitan Hospital</td>
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<tr>
<td>2</td>
<td>Treatment of the non-united scaphoid waist fracture</td>
<td>H Zhan</td>
<td>Tianjin Hospital</td>
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<tr>
<td>3</td>
<td>Reconstruction of shoulder function for brachial plexus injuries by combination of nerve transfer and arthroscopic release: cases report</td>
<td>X Zhao</td>
<td>Huashan Hospital</td>
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</tbody>
</table>
Abstracts of Lectures

Plenary Lecture
Total elbow arthroplasty: Indication, patient selection

Dr Denise EYGENDAAL
Consultant Orthopaedic Surgeon
Upper Limb Unit, Amphia Hospital, Breda, Netherlands

Introduction:
Elbow joint replacement has lagged behind that of hip, knee and shoulder. Modular elbow arthroplasty can be inserted with either type of linkage mechanism; each type of prosthesis has its specific surgical technique and complications.

Surgical technique for elbow arthroplasty:
A posterior approach is advised in most cases; handling of the triceps is surgeon based and can be a triceps on technique, a triceps split or a triceps flap technique.

Summary:
The results of total elbow replacement are inferior to the results of total hip and knee arthroplasty. Complications are relatively frequently encountered. Different type of implants are related to different type of complications. In general the surgical approach is via posterior and all components are fixed with cement.

Reference:
Revision total elbow arthroplasty: Tips and pearls

Professor Graham KING
Department of Surgery, University of Western Ontario, Canada

This lecture will review the common causes of failed total elbow arthroplasty and tips and tricks for successful management. The role and technique of staged revision for infected arthroplasty will also be outlined.

‘Simple’ elbow dislocation: Is it really that simple?

Dr LEUNG Yuen Fai
Consultant, Department of Orthopaedics and Traumatology, Tseung Kwan O Hospital

Classically, it is defined as dislocation of ulnohumeral and radiocapitellar articulations without fractures and the radioulnar articulations are intact. In fact, 80-90 percent of ‘simple’ elbow dislocation cases have been confirmed to have minor fractures such as avulsion fracture, chips fracture of coronoid process, tiny osteochondral or chondral fracture intra-articularly (detected by CT scan, MRI or open surgery); almost always posterior/posterolateral dislocation except rare case reports; classically treated with closed reduction and short immobilization(1-2 weeks) followed by active elbow motion; in the past, no surgery was advised but increase in elbow flexion to 120 degrees and longer immobilization in case of unstable or incongruent reduction; the prognosis was said to be excellent.

Mechanism of traumatic posterior elbow dislocation: fall on outstretched hand; body weight as an axial force; valgus stress on radial column +/- tensile force on ulnar column; supination forearm with stress on ligamentous complex (from lateral to medial)

Pathoanatomical stages of elbow dislocation: 3 stages of elbow dislocation (O’Driscoll)
3A: All ligamentous structures are disrupted except the anterior band of MCL (with medial hinge stability)
3B: All ligamentous structures are disrupted, elbow will be stable with 30-45 degrees flexion
3C: 3B + stripping of all humeral soft tissue, may need to flex the elbow to more than 90 degrees or unable to obtain an unsubluxed position

Recent literature review: In 2010, Kesmezacar et.al; Long term result of conservative treatment of ‘simple’ elbow dislocation (~ 8 years); Compare non-injury and injury sides
Flexion and extension range diminished on the injured elbow (p< 0.05) supination/pronation range -- no difference; 19% had residual elbow instability; 28% ulnar nerve irritation or symptoms; 15% has mild degeneration of ulnohumeral joint
66% mild to moderate heterotopic ossification; only 19% reported a feeling of full recovery; others complained of mild pain during strenuous work, sports activities, sensation of stiffness, weakness… etc.
Elbow ABCDE (high risk sign): Air under skin; Bleeding with excessive Bruises; Circulation compromise; Detection of nerve irritation or palsy; Extreme age

ABCD may signify major soft tissue injury resulted in global elbow instability, or even compartment syndrome; Elderly patients tend to have missed fractures whereas the teenagers may have plastic deformity of forearm bones and avulsion fracture of epiphysis or chondral fracture, these may result in future bony causes of elbow instability

Congruent reduction: After closed reduction, ensure congruent reduction of ulnohumeral and radiocapitellar joints; when elbow flexion more than 90 degrees to hold the reduction, the congruency of joint is difficult to be assessed by plain X-rays; I don’t agree minor subluxation of elbow joint should be treated conservatively as pseudo-subluxation due to pain without further investigations or surgical exploration; More than 100 degrees flexion for ‘congruent’ elbow reduction may indicate further investigations or EUA +/- surgical intervention

Common patterns of incongruency - Global instability pattern; PLRI pattern; coronal incongruent pattern (valgus and varus)

Revisit of elbow Anatomy: Constraints to elbow instability [Static constraints: Primary constraints - Ulnohumeral articulation (ulnar column), MCL, LCL (especially LUCL)

Secondary constraints: radial head – capitellum articulation(radial column), common flexor and extensor origins, capsule] [Dynamic constraints (stabilizers): All muscles that cross the elbow joint producing compression forces at the elbow joint to prevent subluxation when the static constraints are all gone - anconeus, triceps, brachialis]

Management of “simple” acute elbow dislocation: Closed reduction (under sedation) urgently; check for perfect articular congruity

If high risk signs are present or ‘congruent’ reduction with more than 100 degrees elbow flexion required or ‘pseudo-subluxation’; consider further investigations CT scan/MRI or EUA +/- surgical intervention (always for incongruent reduction!);

Stability test at 30, 60, 90, 100 degrees of elbow flexion and supination (make the MCL band taut if any remained) Exploration may be indicated if the elbow could only be stabilized with more than 100 degrees flexion even with ‘congruent’ reduction

Any incongruency or gross unstable joint [more common in global (multidirectional) instability stage 3B & C] need operative treatment

Surgical treatment: I prefer to use lateral approach first; lateral arthrotomy to remove any loose intra-articular osteochodral or cartilage fragments(always found!); examine the coronoid process, capitellum, trochlea, radial head neck for occult fractures that may require fixation; any interpositional soft tissue removed; drainage of the haematoma may decrease chance of myositis ossifican and arthrofibrosis; retrieve the avulsion fracture for ligament repair if any; repair LUCL, LCL and annular ligaments, common extensors muscles but not the capsule. Medial approach will be added in gross unstable joint, ulnar nerve irritation symptoms before operation; fixation of anteromedial facet of coronoid process required; MCL repair performed as well

Ligaments almost always can be repaired though not strong enough for immediate mobilization exercise; I won’t perform ligament reconstruction in acute situation to limit the bone carpentry which may decrease chance of HO; Minor subluxation sometimes present even with elbow flexion to 100 degrees; provided secure ligaments repair, clearance of
intra-articular interpositional fragments and stable fracture fixation, it then can be treated conservatively as pseudo-subluxation; Rarely, if the elbow joint is still very unstable, external fixator is applied for early mobilization especially poor ligaments’ quality repair or major chondral fracture seen

Rehabilitation: when perfect reduction is achieved and the elbow is stable; resting splint for 1-3 weeks (depends on the stability) with elbow flexion at 90 degrees and supination/neutral/pronation (depends on the stable position assessed (usually supination) active exercise afterward. 3+3 regime: when perfect reduction is achieved but elbow is stable only in certain position; 3 week cast (90-degree flexion); then 3 week hinge brace for flexion/extension, free rotation with elbow at 90-degree flexion

**Conclusions:** no hesitation to explore and perform ligaments repair by open surgery; In my experience, no increase incidence of HO, elbow stiffness, arthrofibrosis... in compared to the literature of conservative treatment; better anatomical restoration, allow to remove all ‘unexpected’ intra-articular osteochondral or cartilagous fragments and drainage of haematoma; functional outcome is satisfactory and no case of elbow instability.

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**Management of terrible triad**

Professor Michael MCKEE

*Division of Orthopaedic Surgery, Department of Surgery, University of Toronto, Canada*

The ‘terrible triad’ of the elbow (elbow dislocation with a radial head and coronoid fracture) is difficult to treat due to the conflicting aims of ensuring elbow stability while maintaining early motion of the joint. Information guiding treatment is sparse in the literature. We believe concentric articulation at the ulno-humeral and radio-capitellar joints need to be restored to achieve a stable reduction. We advocate preservation of the radial head through surgical repair or replacement. The lateral collateral ligament complex (LCL) is repaired through the same incision. We also aim to restore the anterior buttress of the elbow joint by repair of the coronoid process or the anterior capsule attachments. Further surgery to address other soft tissue damage to the elbow may also be required. Treatment needs to be titrated to each case to achieve a stable reduction. An acceptable result will be achieved if sufficient stability is obtained such that early motion can be instituted, and complications avoided.

Dislocation of the elbow joint is the second commonest of the upper extremity, following that of the shoulder. After closed reduction the rate of recurrent instability is low despite extensive damage that normally occurs to the soft tissue envelope surrounding the elbow during this injury. Both the medial and lateral collateral ligaments are usually disrupted in addition to the capsule. Damage may also affect the common flexor and extensor origins, the secondary soft-tissue restraints. Complex dislocations of the elbow joint are those in which there is an associated intra-articular fracture; the presence of which increases the risk of recurrent instability. Fractures may involve the coronoid process, radial head or olecranon process/proximal ulna or any combination of these structures. The ‘terrible triad of the elbow’, a term originally coined by Hotchkiss, involves a dislocation of the ulno-humeral joint with a fracture
of both the radial head and of the coronoid process. This combination of injuries renders the elbow extremely unstable and treatment is fraught with complications including stiffness, recurrent instability, and arthrosis. Its name reflects the relatively frequent unsatisfactory outcome following this injury pattern even with optimal treatment. Difficulty in treating this injury is compounded by the relative lack of information regarding its incidence, management, results and complications. Most information must be extrapolated from other studies of elbow dislocation that include details on subgroups of patients often only demonstrating some of the features of this injury. The pathoanatomy of elbow dislocation is often described using the Horii circle of soft tissue disruption which progresses from lateral to medial in three stages. Disruption may pass through soft tissues or bone or both. It is unclear what determines the exact path of disruption. Fracture of both the radial head and coronoid process does not necessarily imply a larger energy has been imparted to the elbow during this injury as compared to a simple dislocation. However, the results following the terrible triad injury are far worse than those following a simple elbow dislocation. This may be a high-energy injury and one in which there should be a high index of suspicion for other injuries to the upper limb girdle.

The elbow joint has a propensity to become stiff after injury. After a simple dislocation there is often a residual loss of full extension resulting in a 5-15° flexion contracture. This is both more severe and more likely after more complex injuries including fracture dislocations when the added risk of heterotopic ossification (HO) may lead to a further deterioration in the functional outcome. Stiffness can usually be reduced by early motion of the joint after injury. Melhoff et al showed that a poor outcome after simple dislocation was associated with elbows that had been immobilised for greater than two weeks. Other authors have concluded that poor results are obtained from prolonged immobilization after dislocation with fractures of the coronoid process or radial head.

We believe that the aims of surgery must be to restore a concentric reduction of the ulnohumeral joint and to maintain radiocapitellar contact. This should allow early-protected motion of the elbow to prevent stiffness developing. The radial head should be fixed and retained if possible or replaced with a prosthesis. The anterior column of the joint must also be reconstructed either by fixing the coronoid process or reattaching the anterior capsule of the elbow, (if the fragment itself is too small to attach), to help prevent posterior subluxation of the ulna in extension. It is critical to repair the lateral collateral ligament. On occasion, especially with associated ulnar nerve pathology, medial collateral ligament repair is indicated. Hinged or static external fixation remains an option for those elbows that remain unstable. This approach will be detailed in the presentation.

Posterolateral rotatory instability

Professor Graham KING
Department of Surgery, University of Western Ontario, Canada

The etiology, diagnosis and management of posterolateral rotatory instability of the elbow will be reviewed. The surgical technique for ligament repair and reconstruction will be presented and the postoperative rehabilitation will be discussed.
**Introduction**

Fractures of the distal humerus are increasingly common clinical problems that pose significant technical challenges to the treating surgeon. These fractures occur in adults in a bimodal fashion; elderly patients, primarily females, suffering low velocity fall-related fractures and younger patients, typically males, sustaining high velocity fractures. Both groups present treatment challenges, including open wounds, difficult exposure, significant articular involvement, and underlying osteoporotic bone. To treat these fractures effectively, it is critical to understand the underlying anatomy and anatomical concepts. While basic anatomy will not be covered in detail in this chapter, it is important to keep in mind the angular anatomy of the distal humerus for accurate reconstruction of alignment. The capitellum projects anteriorly approximately 35 to 40 degrees. The trochlea is oriented at approximately 4 to 8 degrees of valgus relative to the long axis of the humerus and internally rotated 3 to 4 degrees relative to the trans-epicondylar axis.

**Indications for Fixation**

The majority of intra-articular distal humerus fractures require surgical fixation for restoration of optimal elbow function. This is due primarily to the disadvantages of non-operative treatment including elbow stiffness following prolonged immobilization, difficulty in obtaining and maintaining an adequate intra-articular closed reduction, the possibility of late displacement of fragments leading to articular incongruity and arthritis, malunion, or nonunion. A thorough pre-operative evaluation should be performed, including a detailed, documented neurovascular exam and confirmation of an intact skin barrier. The surgical technique employed is based largely on pre-operative fracture characterization. Extra-articular fractures and uni-columnar fractures are generally characterized adequately on plain films. Intra-articular fractures may benefit from computed tomography to enhance surgical planning. Three-dimensional reconstructions from CT scans are used regularly by the authors in complex C Type fractures and have been shown to increase both intra and inter-rater reliability with the AO classification system. Supplementation of plain films with pre-operative traction radiographs under general anesthesia has been advocated by some authors.

**Approach**

Patient positioning, depending on associated injuries and surgeon preference, is the next consideration. The authors preference for bi-columnar fractures is the lateral decubitus position with the operative arm supported over a bolster and a non-sterile tourniquet over the proximal arm. This allows for a stable work surface, minimizes assistants required and allows ease of intraoperative imaging. At this point, there are a number of options for exposure of the distal humerus, which are largely based on the degree of articular involvement and the size of fracture fragments. These will be discussed. The authors preferred approach is the triceps-splitting approach.
Reduction and Fixation

After an appropriate exposure has been performed, the fracture then requires anatomic reduction with stable internal fixation. Principles of intra-articular distal humerus fracture fixation include:

1. Anatomic articular surface reduction and fixation, creating an “articular block”
2. Stable fixation of the articular block to the humeral diaphysis
3. Plating with pre-contoured plates on each column
4. Alignment must be anatomically restored, while length may be shortened to compensate for metaphyseal comminution or bone loss

Whether the plating occurs at 90 degrees (perpendicular) or 180 degrees (parallel) to each other is a current matter of controversy (Figure 6). Recent published biomechanical evidence suggests that parallel plating has a higher construct stiffness compared to perpendicular configuration in models of comminution. Additionally, locking screw constructs performed significantly better than non-locking. We utilize a parallel plating technique with locking screws used based on underlying bone quality.

Rehabilitation

One of the most important underlying principles of distal humerus fracture surgical fixation is stable fixation to allow early range of motion (ROM). Recent literature on complex elbow instability due to fracture demonstrates a critical period of 6 months following surgical fixation in which the majority of patients will regain functional ROM. Functional ROM is defined as flexion of 130 degrees, and extension of 30 degrees, making a flexion-extension arc of motion of 100 degrees. Forearm rotation is rarely affected.

Valgus extension overload syndrome
(Thrower's elbow): Diagnosis and treatment

Dr Denise EYGENDAAL
Consultant Orthopaedic Surgeon
Upper Limb Unit, Amphia Hospital, Breda, Netherlands

The overhead athlete is defined as an athlete who uses his/her hand in an overhead position. Sports such as baseball, football, swimming, volleyball, javelin, waterpolo and tennis are examples of overhead sports that subject the shoulder to extreme ranges of motion, forces and accelerations/decelerations over many repetitions. The motion in the overhead athlete is a highly skilled movement performed at extremely high velocity, which requires flexibility, muscular strength, coordination, synchronicity, and neuromuscular control of the whole body. This overhead motion, in for example baseball players, tennis players, and javelin throwers, generates extraordinary demands on the elbow joint. Specific injuries in these athletes can be caused by chronic stress overload or repetitive micro traumatic stress observed during the overhead motion. As the elbow extends at over 23000/s, a medial shear force of 300 N and lateral compressive force of 900 N is produced. In addition, the valgus stress applied to the elbow during the acceleration phase of throwing is 64 Nm. The posterior compartment is subject to tensile, compressive, and torsional forces during acceleration and deceleration.
Abstracts of Lectures (cont’)

Radial head fracture: Fix it or replace it
Dr Denise EYGENDAAL
Consultant Orthopaedic Surgeon
Upper Limb Unit, Amphia Hospital, Breda, Netherlands

Radial head fractures are the most common of all elbow fractures. They occur in 33% of elbow fractures and up to 5% of all fractures. Average age at the time of fracture is 45 years old. The radial head usually fractures from a fall on the outstretched hand with the elbow flexed between 0 and 80° in various degrees of flexion.

Classification of radial head fractures
Mason described 3 types of fractures, depending on the displacement and number of fragments. Type 1 - not displaced, type 2 - displacement >2 mm, type 3 - comminuted fractures, with multiple displaced fragments. Type 1 fractures are most common, followed by types 2 and 3.

The most recent augmentation of Mason’s classification was based on over 300 radial head fractures. It uses the Mason classification to describe the morphology of the fracture, but a suffix is added to clearly identify any associated lesions that may have an impact on elbow functioning and stability.

<table>
<thead>
<tr>
<th>Radial head fracture Mason</th>
<th>Associated lesion</th>
</tr>
</thead>
<tbody>
<tr>
<td>I, II, III</td>
<td>Articular</td>
</tr>
<tr>
<td></td>
<td>c (coronoid)</td>
</tr>
<tr>
<td></td>
<td>o (olecranon)</td>
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<tr>
<td>Ligamentous</td>
<td>m (MCL)</td>
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<td></td>
<td>l (LCL)</td>
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<tr>
<td></td>
<td>d (DRUJ)</td>
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</tbody>
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Diagnosis of radial head fractures

The history will usually reveal a fall on the outstretched hand. Inspection of the palm of the hand may reveal small wounds or indentations in the palm. The elbow and forearm of the patient are usually held in an antalgic position with the forearm somewhat pronated and the elbow slightly flexed. A swelling is noted on the posterolateral side of the elbow, where a haematoma may be visible. This represents a haemarthrosis and is a typical finding in elbow fractures. A visible haematoma on the medial side of the elbow may be an uncommon sign of medial collateral ligament damage or rupture and should be noted. Range of motion will be painful and limited by pain or mechanical block. Gross instability may be present in more severe types of radial head fractures. Palpation will reveal tenderness over the lateral side of the elbow and radial head. If the examiner carefully places a thumb or finger over the radial head and rotates the forearm, an incongruency or crepitations may be palpable. More commonly, pain is noted by the patient when the fracture ‘rolls’ under the thumb. Other joints of the upper extremity should be investigated and special care needs to be taken when examining the wrist of the patient. When in doubt there should be a low threshold to order additional radiographs to investigate the wrist in particular.

Plain anteroposterior (AP) and lateral radiographs of non-displaced fractures, type I often do not reveal a clear fracture on the initial image. Signs of a radial head fracture will include an anterior and, more importantly, a posterior fat pad sign as an indication of a haemarthrosis, where the blood in the elbow elevates the posterior fat pad out of the olecranon fossa. Incongruency of the ulnohumeral joint may be noted as a sign of associated ligamentous lesions.

Displaced type II and III fractures are easier to detect on plain radiographs. The number of fragments and their displacement should be noted, as they will dictate the ultimate treatment. If operative treatment is contemplated, a computed tomography scan (CT) is recommended to evaluate the fracture in more detail. A MRI scan is not routinely used, but should be ordered if ligamentous lesions are suspected.

Treatment of radial head fractures

Associated lesions should be treated on their own accord.

Type I radial head fractures are treated conservatively. Functional treatment may involve aspiration of the joint, with or without the injection of a local anesthetic. This should be done in strict aseptic circumstances. Aspirating the joint is not difficult when a clear haemarthrosis is present. The lateral epicondyle, tip of the olecranon and radial head form a triangle when the elbow is flexed. A clear swelling is palpable within this triangle A needle is directed perpendicular to the skin and is introduced into the joint in the center of the triangle. The elbow’s capsule can contain approximately 20 ml. In the author’s personal experience, aspirating the joint only, decreases pain significantly and injection of a local anesthetic is not always necessary. The arm can be held in a sling for comfort for a limited time but the patient should be urged to immediately mobilize the elbow as pain allows.

Repeat clinical examination and imaging should be done at 1 or 2 weeks following the fracture, to make sure no secondary displacement has occurred. At this time it is usually also somewhat easier to evaluate the stability of the elbow.
Type II fractures should be treated operatively. Arthroscopic evaluation, reduction and internal fixation of radial head fractures has been described with good results. Open reduction and internal fixation (ORIF) however, remains the standard of care for type II fractures. Several techniques have been described to fix the radial head. Different types of screws or pins have been used with some success. 10-15% of proximal radius fractures include the radial neck and in these patients, plate and screw fixation can be necessary. Whichever technique used, it is important that a perfect reduction and stable fixation are obtained so that range of motion rehabilitation can be started as soon as possible.

Radial head excision was the gold standard in the past and is still recommended by many, for simple type III radial head fractures. Associated lesions are found in up to 80% of type III fractures and these dictate part of the treatment. If stable fixation cannot be achieved in type III fractures, radial head replacement with a metal radial head replacement has been shown to achieve better results. The radial head should therefore be replaced by a metal prosthesis in type III c, III m or III d fractures and is currently recommended in type III fractures complicated by other associated injuries. Early postoperative motion is again crucial for a good result.

Coronoid fracture:
My preferred approach and fixation method

Professor Graham KING
Department of Surgery, University of Western Ontario, Canada

The patterns of coronoid fractures will be reviewed along with their associated injuries. The surgical management and rehabilitation of these fractures will be outlined including that of concomitant bone and soft tissue injuries.
Abstracts of Lectures  (cont')

Olecranon fracture: How to fix it?
Dr WONG Hin Keung  
Associate Consultant  
Department of Orthopaedics and Traumatology  
Princess Margaret Hospital

Olecranon fractures account for 10% of all fractures of the upper extremities. They are caused by direct impact on the elbow joint, abrupt triceps contraction, or falling on the extended arm combined with rotation of the trunk. Undisplaced olecranon fractures in elderly patients should be treated conservatively. Displaced olecranon fracture will lead to loss of extensor mechanism of the elbow joint. Open reduction and internal fixation is necessary for displaced olecranon fractures to restore extensor function. Treatment options include tension band wiring (TBW) using Kirschner wires plus figure-of-eight wire loop, intramedullary screw fixation and anatomical plate fixation. The first two methods are useful in simple transverse fractures without comminution of articular surface. Plate fixation is appropriate for severely comminuted fractures, distal fractures involving the coronoid process, oblique fractures distal to the midpoint of the trochlear notch and Monteggia fracture-dislocations of the elbow.

Low-profile plate with classical lag and multidirectional angle-stable screws demonstrated biomechanical advantages over TBW. Moreover, the complication rate of a TBW remains high. They include infection, malunion/nonunion, hardware-related symptoms, and ulnar palsy etc.

All the three ways are effective methods for the treatment of olecranon fractures. Fixation methods should be selected depending on the type of fracture.

Distal humerus fracture: Tips and Pearls
Dr TANG Ning  
Consultant and Team Head  
Trauma Team, Department of Orthopaedics and Traumatology  
Prince of Wales Hospital

Distal humerus fractures occurs from children to adult and also with increasing incidence in the elderly. Classification for distal humerus fracture help to record the pathoanatomy involved and surgical planning. The use of different imaging technique for accurate diagnosis is important. With more stress on functional outcome, surgical management (osteosynthesis) will be discussed. In children, accurate diagnosis of the pathology and use of smooth k-wire and casting will usually result in good clinical outcome while in adult the use of param-tricipital approach without osteotomy and ulnar nerve transposition with strategically placed anatomical plates as treatment of choice for majority of the patients.

The importance of stable fixation and soft issue preservation so while minimizing the trauma we can allow early functional training, which plays a crucial role for a successful clinical outcome.
Lateral epicondylitis: Role of conservative treatment

Ms Cynthia COOPER
Adjunct Faculty, Department of Occupational Therapy,
A.T. Still University, Mesa, Arizona, USA

Lateral epicondylitis (also called tendinosis, tendinopathy, etc.) has significant impact on patients’ ability to perform daily activities and negatively affects their overall quality of life. People with this diagnosis may be unable to pick up their children, stir or cut food, or put away groceries without pain. Friends and family members may not understand their limitations since the problem is not readily visible to other people. The diagnosis is not generally inflammatory but rather degenerative. Proximal conditioning and ergonomics play a large role in this diagnosis. This presentation highlights therapy interventions that provide controlled stress to targeted tissues, especially the ECRB, to promote well-organized and well-nourished tissues with greater tolerance to physical demands. Therapy should target interventions that promote pain relief, scapular stabilization, ergonomic awareness, tendon tissue that is well-organized and well-vascularized, and patient education for lifestyle changes that promote healthy and effective upper extremity biomechanics. Benefits and disadvantages of splinting will be discussed, and progression of exercises and home programs will be identified.

Lateral epicondylitis: Should we use arthroscopic or open release?

Dr Denise EYGENDAAL
Consultant Orthopaedic Surgeon
Upper Limb Unit, Amphia Hospital, Breda, Netherlands

Lateral epicondylitis is generally a self-limiting condition. The average duration of a typical episode varies from six months to two years, but most patients (90%) respond to conservative treatments and recover within one year. In a small group of patients (about 10%), however, conservative strategies fail to relieve lateral elbow complaints; this group requires surgical intervention. Despite the wide-ranging literature investigating the numerous treatments for lateral epicondylitis, no single intervention has been proven to be the most efficient.

The goal of treatment is to reduce lateral elbow pain, return function and thereby improving the quality of life of the patient, with minimal adverse effects.

‘Watchful waiting’ (or ‘wait and see’) includes avoiding pain-provoking activities, icing, wearing braces and using non-steroidal anti-inflammatory drugs (NSAID’s) if necessary. This wait and see policy is as effective as any other treatment at one year after symptoms have started.

Physical therapy, focusing on eccentric strength and stability exercises for wrist extensors and flexors, may be helpful in achieving normal strength and flexibility, thereby improving functioning in daily life.
Corticosteroid injections may offer improvement of symptoms in the short-term (first six weeks), but have little long-term benefit, a high recurrence rate and no additional advantage over less invasive treatment forms. Because of this and of some well-documented side effects, treatment using corticosteroid injections should be used with caution.

There is little evidence to support the use of extracorporeal shockwave therapy (ESWT) or laser-therapy as a treatment modality. Evidence on the use of acupuncture, botulinum toxin therapy or autologous blood injection for treatment of lateral epicondylitis is still insufficient and therefore no conclusions can be drawn regarding its role in treating lateral epicondylitis.

Surgical treatment is recommended for those patients who are not responding to conservative treatment after at least six months to a year. Surgical techniques are various, including open, percutaneous and arthroscopic treatment. Method of treatment consists mainly of tenotomy (tendon release) or excising pathological tissue. Research investigating which approach is superior, reveals that the less invasive approaches (percutaneous or arthroscopic) allow faster return to work, than the open procedure. Although every surgical procedure has its advantages and disadvantages, no technique appears to be superior. Reported success rate of operative intervention is good (approximately 80%), regardless of the method of treatment or surgical approach.

Elbow arthritis: Role of elbow arthroscopy
Professor Graham KING
Department of Surgery, University of Western Ontario, Canada

The indications and contraindications for elbow arthroscopy in arthritis will be outlined. The surgical technique, rehabilitation and results will be reviewed.

Treatment of elbow stiffness: My approach
Dr Denise EYENDAAL
Consultant Orthopaedic Surgeon
Upper Limb Unit, Amphia Hospital, Breda, Netherlands

The elbow can move from 0 to 145 degrees of flexion. Some hyperextension is normal. Pronation and supination range from 85 to 80 degrees. Range of forearm rotation is comparable between both sides but it is higher in women than in men and inversely correlated with age.

In clinical setting contra-lateral side serves for comparison of flexion, extension and rotation as the range of motion can vary dependent from age, gender and constitutional variances.

Morrey et al (1985) stated that an elbow needs a minimal range of motion (ROM) of 100 degrees flexion/extension and 100 degrees of pronation/supination to function adequately in daily life.

However in specific groups of patients, as professional athletes, even a slight extension deficit of 10 degrees can result in a dysfunction of the elbow.
Generally the patient notices loss of extension earlier than loss in flexion or rotation. A supination deficit will be earlier noticed by the patient than a limitation of pronation.

Interference for instance with daily living activities as eating or hygiene activities are more disabling with limited supination since it may not be compensated sufficiently, whereas lack of pronation can easily be compensated by abduction of the shoulder and flexion of the elbow.

In conclusion the definition of stiff elbow is dependent on the patient, his demands and the ability to cope with stiff elbow.

In adults, non-traumatic elbow contractures are usually caused by an inflammatory process as osteoarthritis, rheumatoid arthritis, acute or chronic septic arthritis and periarticular ossifications after head injury.

The elbow is affected more frequently than any other joint by post-traumatic stiffness; the complex anatomy and proximity of tendons, muscles, ligaments and overlying skin play an important role.

Posttraumatic contractures can be classified into extrinsic (extra-articular) or intrinsic (intra-articular) pathology. The extrinsic contracture involves the skin (skin burns, post-traumatic contractured wounds or hypertrophic scars), the posterior and anterior capsule, the medial and lateral collateral ligaments, muscles surrounding the joint and peri-articular ossifications. The intrinsic or articular components consist of intra-articular adhesions, cartilage damage or abnormal anatomy of the articular surface. This is in most patients the result of a trauma resulting in a posttraumatic osseous anatomy.

In most cases there is a mixture of extrinsic and intrinsic factors as an intrinsic contracture will always result in secondary contracture of extrinsic structures. Extrinsic contracture can possible lead tot intra-articular adhesions or secondary osteoarthritis of the joint.

The exact aetiology of the extrinsic of posttraumatic contractures is poorly understood; immobilization resulting in adhesions seems to play a role. Another study has show a increase of myofibroblasts in the capsule of a posttraumatic elbow.

Heterotopic ossification can be a sequel of a traumatic event in which organized bone is formed in the surrounding tissues of the elbow joint. The exact etiology is still unclear; proliferation of mesenchymal cells into cartilage or osteoblasts after trauma, in the presence of bone morphogenic protein, may play a role.

Contractures due to imbalanced muscles as in spastic flexion deformity of the elbow after a cerebral vascular accident or in spastic, hemiplegic children must be carefully assessed by a specialized team consisting of a neurologist, an orthopedic surgeon and a specialized team for rehabilitation.

History taking is of utmost importance in the work-up of stiff elbow. The details about any traumatic lesion, trauma mechanism, the non-surgical treatment or surgical treatment in the past should be known.

The next questions have to be answered before starting an assessment and treatment plan.

- What is the dominant arm?
- What is the occupation of the patient and what are his or her limitations, due to the stiff elbow in daily life, occupation and sports.
• Is the elbow also painful or is it just a decrease in range of motion that limits the patients in daily functioning?
• Which decrease of movement of the elbow is the most disabling in this particular case?
• Has the loss in range of motion been progressive or stable over the last year?

At physical examination evaluation must be performed of:
• The skin around the elbow
• Previous surgical or posttraumatic scars
• Neurological evaluation
• Evaluation of muscle strength and voluntary control of muscles
• The bony alignment
• Stability of the elbow joint
• Wrist function especially of the function of the distal radioulnar joint
• Passive and active range of motion in comparison to the uninjured side

Preferably the above mentioned items are registered in a validated rating system as the Mayo Elbow performance score or the EFA (elbow functional assessment) test. Preoperative imaging consists of standard radiographs of both elbows and wrists.

In intrinsic contractures CT scan is mandatory in every case; preferably including a three dimensional reconstruction.

To evaluate the activity of periarticular ossifications bone scintigraphy can be performed. MRI is in most cases not necessary.

Nonsurgical treatment consists of an appropriate rehabilitation programme using (turnbuckle) splints under supervision of a specialized physiotherapist.

In order to preserve the gain in range of motion after active and passive exercises splinting can be used. In the past, dynamic splints that apply a constant tension to the soft tissues over long periods of time (i.e. 12-23 hours/day) were popular. However patient adjusted static braces appear to be more effective although further studies have to be done.

These braces, which use the principle of passive, progressive stretch, are applied for much shorter periods of time and are better tolerated by patients.

Manipulation under anaesthesia is, in general, not advised because of possible complications as periarticular fractures, ulnar nerve injury, periarticular ossifications and elbow instability.

Surgical release is indicated in stiff elbows when non-operative treatment has failed and function is severely impaired.

The type of surgery depends on the osseous integrity and pre-operative range of motion.

If it is mainly an contracture of capsule, muscles and ligament a arthroscopic or open limited approach can be performed. If heterotopic ossification (HO) plays a role arthroscopic surgery is not indicated and excision of the HO is mandatory in combination with an extended approach.

Different surgical approaches has been described; the choice of type of approach is based on many factors as the site of any previous incision, the presence of neuropathy and location of periarticular ossifications and intra-articular deformities. The lateral column procedure was first described by Mansat in 1998. The advantage of this approach is the ability to see and treat both the anterior and posterior ulnohumeral and radiocapitellar joint through one
incision with preservation of the collateral ligaments. A disadvantage is that patients with a ulnar neuropathy or calcifications in the medial collateral ligament cannot be treated using one single incision; in those cases a medial approach is preferred. The disadvantage of a medial approach is the risk of injury of the ulnar nerve.

Previous reports of the results of surgical release have shown an overall improvement in ROM.

Mansat and Morrey treated 38 elbows using a limited lateral approach to the anterior and posterior aspects of the capsule. The mean preoperative arc of flexion was 49 degrees. At mean of 3 years postoperatively, the mean arc of flexion was 94 degrees. The mean total gain was 45 degrees. Marti et al. performed a capsulectomy using a lateral approach on 43 elbows and an additional medial approach was used on 24 elbows to excise ulnar adhesions and perform a more extensive capsulectomy. They achieved an improvement in ROM from 45 degrees to 99 degrees. The rehabilitation program we used in was rather aggressive in comparison to other studies; some mention continuous passive motion and dynamic splinting as risk factors for development of periarticular ossifications. In our series, using a minimal invasive lateral approach, 2 patients had minimal periarticular ossifications; in both cases not symptomatic. The ROM was similar at 3-, 12- and 24 months. Prolongation of physical therapy after 3 months did not improve the functional outcome and probably can be reduced after 3 months.

Kelberine published a comparative study between open and arthroscopic artholysis of the elbow; the results are almost similar with a significant higher improvement in flexion (7 degrees) in the open group.

Heterotopic ossification: Prevention and treatment

Professor Graham KING

Department of Surgery, University of Western Ontario, Canada

The prevention of heterotopic ossification of the elbow remains challenging. This lecture will discuss possible techniques to reduce heterotopic ossification and the surgical management of heterotopic ossification when it occurs.
Plenary Lecture
Therapists’ role in management of elbow stiffness
Ms Cynthia COOPER
Adjunct Faculty, Department of Occupational Therapy, A.T. Still University, Mesa, Arizona, USA

Elbow fractures have poorer outcomes and higher complication rates than other fractures. Generally speaking, loss of elbow flexion is more limiting to one’s function than is loss of extension, but this may differ according to the individual needs of the patient. Elbow flexion contracture is the most common complication, which may be related to immobilization, soft tissue trauma, and/or intra-articular trauma. The goals of elbow rehabilitation are to recover motion and strength, remodel scar, prevent joint contracture, and restore/maintain joint stability. This presentation will describe hand therapy evaluation and rehabilitation for all phases of healing. Suggestions for edema control, coordinated breathing with exercise, pain management, orthotics, and manual therapy will be presented. Quality of motion will be emphasized, and strategies will be provided to identify and minimize co-activation of antagonist musculature with exercise. Concluding thoughts will identify ways to promote patient-centered care and maximal patient participation in the management of elbow stiffness.

Plenary Lecture
My approach to distal humerus fracture in the elderly
Professor Graham KING
Department of Surgery, University of Western Ontario, Canada

Non-operative and operative treatment of distal humeral fractures will be discussed in the context of older patients with fragility fractures. The indications, technique, results and complications will be reviewed.
Evidence-based-medicine:
Treatment on elbow fracture in elderly

Dr HO Sheung Tung
Chief of Service and Consultant
Department of Orthopaedics and Traumatology
Caritas Medical Centre

The unique anatomy of elbow joint and its propensity to stiffness makes the management of elbow fracture in elderly challenging. The evidence on the some of the queries of elbow fracture treatment in elderly will be examined:

1. elbow fracture as a cue to osteoporosis
2. locking versus nonlocking plate in fixation of osteoporotic elbow fracture
3. orthogonal versus parallel double column plate fixation of distal humerus fracture
4. the role of total elbow arthroplasty in distal humerus fracture
5. the nature history of displaced olecranon fracture in elderly
6. plate fixation versus tension band wiring of olecranon fracture
7. the role of olecranon excision in low demand elderly
8. conservative versus operative treatment in Mason II radial head fracture
9. internal fixation versus radial head arthroplasty in comminuted radial head fracture
10. the role of radial head excision
1. Local review of treatment of hand enchondroma (artificial bone substitute vs autologous bone graft) in tertiary referral centre: 8 year experiences

Hung YW • Ko WS • Liu WH • Chow CS • Kwok YY • Wong CWY • Tse WL • Ho PC
Department of Orthopedics & Traumatology, Prince of Wales Hospital and Alice Ho Miu Ling Nethersole Hospital

Purpose:
To evaluate the treatment outcome of enchondroma of hand with artificial bone substitute vs autologous (iliac) bone graft

Methods:
A total of 24 patients with hand enchondroma from January 2001 to December 2013 who underwent operation at the Prince of Wales Hospital and Alice Ho Miu Ling Nethersole Hospital in Hong Kong were reviewed. Thorough curettage of the tumour was performed in all patients, followed by either autologous bone graft impaction under general anaesthesia in 13 patients, or artificial bone substitute in 11 patients (10 procedures were performed under local or regional anaesthesia and 1 was done under general anaesthesia). The functional outcomes and bone incorporation were measured by QuickDASH (Quick Disabilities of the Arm, Shoulder, and Hand) scores and radiological appearance, respectively. The mean follow-up period was 59 months.

Results:
There were eight men and 16 women, with a mean age of 40 years. Overall, 17 cases involved phalangeal bones and 7 involved metacarpal bones. Among both groups of patients, most of the affected digits had good range of motion and function after surgery. One patient in each study group had complications of local soft tissue inflammation. One patient in the artificial bone substitute group was suspected to have recurrence 8 years after operation. Among the autologous bone graft group, four patients had persistent donor site morbidity at the last follow-up. In all patients, radiographs showed satisfactory bone incorporation.

Conclusions:
Artificial bone substitute is a safe and effective treatment option to hand enchondroma, with satisfactory functional and radiographic outcomes. It offers additional benefit to allow the procedure to be done under local anesthesia on day case basis with minimal complication.

2. Hemi-hamate osteochondral autograft arthroplasty for treatment of acute and chronic fracture-dislocation of the proximal interphalangeal joint of finger in a local regional centre

Lam YY • Chan YF • Chan PT • Lam MY • Chow YY
Department of Orthopaedics and Traumatology, Tuen Mun Hospital

We retrospectively reviewed 12 patients who underwent hemi-hamate osteochondral autograft arthroplasty for the treatment of acute and chronic fracture-dislocation of the proximal interphalangeal joint (PIPJ) of finger.
The average articular surface involvement of the fracture was 51% with all involved subluxation or dislocation of PIPJ. Duration from injury to operation ranged from 2 days to 6 months with one of the patients had delayed presentation at around 6 months after initial injury. Two of the patients had hemi-hamate osteochondral autograft arthroplasty after failed K wire fixation.

The mean duration of follow up was 17 months. The active arch of motion of PIPJ was over 70 degrees. One of the patients showed radiographic sign of graft absorption with no symptoms. Two of the patients complained of mild pain or discomfort over donor site with no major donor site complications noted.

Hemi-hamate osteochondral autograft arthroplasty is a safe and reliable treatment for acute finger PIPJ fracture-dislocation beyond fixation as well as salvage procedure for chronic dislocation or for cases failed initial fixation. Discussion and conclusion:

Anatomically precontoured locking plates provide a safe and effective option for the treatment of severe olecranon fractures.

3. Distribution of sesamoid bones in the hand: A study in the Chinese population

Lam GYT • Chow ECS • Ng B • Ho J • Mak S • Chan CW
Department of Orthopaedics and Traumatology, United Christian Hospital

Objective:
To report the prevalence and distribution of hand sesamoid bones in Chinese ethnic group and its left-right symmetry.

Methods:
Data on patients admitted to a regional hospital from January 2011 to June 2014 with hand radiographs taken were retrieved. Exclusion criteria included previous hand fracture, inadequate radiological views and those of non-Chinese ethnic group.

Results:
A total of 307 hand radiographs (162 left and 145 right; 181 males and 126 females) in 266 patients were reviewed. Bilateral hand radiographs were available in 41 patients. Their mean age (± standard deviation) was 48.8 ± 11.3 years (range, 25-69 years). The total number of sesamoid bones identified was 1,641. Sesamoid bones were found at the first metacarpophalangeal joint (MCPJ) at a rate of 100%, while the prevalence at the second MCPJ, third MCPJ, fourth MCPJ, fifth MCPJ as well as the first interphalangeal joint was 59.0%, 2.93%, 0%, 47.6% and 28.0%, respectively. Bilateral hand radiographs showed 100% symmetrical distribution of sesamoid bones in right and left sides.

Conclusion:
This is the first study to report prevalence of sesamoid bones in the Chinese Population and the first study to identify the symmetry of sesamoid bones in bilateral hands. The result revealed that the Chinese ethnic group had a higher prevalence of sesamoid bones at the third MCPJ when compared with other ethnic groups. The distribution of sesamoid bones was symmetrical in bilateral hands.
4. **Review of functional outcome of metacarpophalangeal joint arthroplasty using self locking small joint implant – an alternative option than silicon interposition arthroplasty**

Dr Siu YC • Dr Tse WL • Dr Wong WY • Dr Ho PC  
*Department of Orthopaedics and Traumatology, Prince of Wales Hospital*

**Introduction:**
Metacarpophalangeal joints (MCPJ) contribute most of the total finger flexion arc (77%). It is very disabling for those patients suffered from inflammatory joint disease with destruction of cartilage or subluxation of MCPJ developed. Silicon interposition arthroplasty still remains the gold standard treatment for these patients. But early breakage of implant complicated with silicon synovitis was observed in young patient with high functional demand. Self-locking finger joint (SFLJ) implant may be a good choice especially for young patients.

**Method:**
33 MCPJ arthroplasty with SFLJ were performed from 2008 to 2014 in our center and reviewed. The latest post-operative motion arc, average extension lag and ulna drifting were compared with pre-operative data. A new radiological review system was proposed to review these SFLJ X-rays systematically.

**Results:**
The average motion arc was significantly improved from 38 °to 52.7 °. The average ulna drift was around 23 °and the average extension lag was 12 °. All results were comparable with those with silicon interposition arthroplasty performed. Zone 1 radiolucency was noted in 20 cases and one case of broken implant was noted. Average 0.6mm subsidence of the implant was noted also. Despite the above radiological findings, all patients were clinically asymptomatic and with significant improved hand function.

**Conclusion:**
SFLJ may be a good choice for those young and high functional demand patients with MCPJ problem.

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5. **Arthroscopic debridement of thumb CMCJ**

Wong CWY • Tse WL • Ho PC  
*Department of Orthopaedics and Traumatology, Prince of Wales Hospital, The Chinese University of Hong Kong*

Thumb CMCJ arthritis is a common condition. Arthroscopic procedures offers the less invasiveness, better visualisation and judgement. Surgical techniques and our results were demonstrated.

From Apr 2002 to Aug 2013, 76 thumb CMCJ arthroscopic debridement & synovectomy was performed in 65 patients (female 51, male 14) at the average age of 56. All patients failed nonoperative care for 6months. They were follow-up on average of 59 months. 38 cases were Eaton & Littler Stage II, 36 Stage III, I Stage IV and I Stage I. The operation was done
6. Arthroscopic Management of elbow ganglion, 8 years follow-up

Wong CWY • Tse WL • Ho PC

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

Ganglion cysts are frequently seen around joints, especially over wrists and feet. They are now commonly treated arthroscopically, such as dorsal and volar wrist ganglion, meniscal cysts in knee, and supraglenoid cyst in shoulder. However, it is uncommon to find ganglion cyst in elbow, and arthroscopic management of elbow ganglion is rarely reported. We report 2 cases of elbow ganglion treated arthroscopically and the results in 8 years follow-up. The success of surgery demonstrated that arthroscopic management of elbow ganglion is a good alternative to open method. It enjoys similar benefits of arthroscopic excision of ganglion cysts in other joints, including minimal invasiveness; increase ability to identify intra-articular pathology, and better cosmetic appearance.

7. Elbow osteoarthritis: Results of arthroscopic osteocapsular arthroplasty

Wong CWY • Tse WL • Ho PC

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

Elbow osteoarthritis is a common condition. The formation of bone spurs, loose bodies and capsular contracture produce disabling end-range and exertion pain, locking and stiffness. Arthroscopic osteocapsular arthroplasty is a minimal invasive and effective option to relieve patients' symptoms and improve their function. It could also be a viable buy-time procedure before arthroplasty. Clinical results were evaluated.

A retrospective review was conducted on 38 elbows with primary osteoarthritis in 37 patients (32 male, 6 female, average age of 52) who underwent arthroscopic osteocapsular arthroplasty from Jan 2010 to Apr 2014. The mean follow-up duration was 26 months (5-56). Preoperative pain, motion, elbow function score were compared with those at the latest follow-up.
8. Anatomical precontoured locking compression plates for the treatment of distal third humeral fractures: a retrospective analysis

Liu KK • Wong HK • Wong KY • Cheung KW
Department of Orthopaedics and Traumatology, Princess Margaret Hospital

Introduction:
Using traditional plating system for the treatment of extra-articular distal third humeral fracture is challenging due to the difficulty in contouring of the plate, the inadequate locking holes in fixing distal fracture fragments, and the possible need of employing double plating. The new anatomically precontoured extra-articular locking compression plate (LCP) for distal humerus has solved these problems. Its application is simple. This retrospective study aimed to evaluate the clinical and functional outcome after surgical fixation with this implant.

Methods:
From 2009 to 2014, clinical and functional outcomes of 14 patients who underwent posterior plate osteosynthesis with (Synthes) extra-articular distal humeral LCP were analysed for an average period of 15.5 months.

Results:
Thirteen patients (5 male and 8 female) had bone union with an average time of 6 months (range, 3-17). The remaining patient had good bone healing on follow-up x-rays. Three patients with preoperative radial nerve palsy had full recovery, the latest by 12 months. One patient had hardware complaint. None had wound complications, infections or postoperative radial nerve palsy. The mean elbow range of motion was 118 degrees (range, 90-140). The mean Mayo Elbow Performance Score (MEPS) was 89 points (range, 70-100).

Conclusion:
Anatomically precontoured LCP is an excellent and effective implant of choice for the treatment of extra-articular distal third humeral fractures.
9. A Study on the measurement of wrist motion range using the smartphone gyroscope application

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² Department of Hand Surgery, First Affiliated Hospital of Zhejiang University, China
³ Department of Hand Surgery, China Japan Union Hospital of Jilin University, China

Introduction:
Measurement of the wrist range of motion (ROM) is important for evaluating patients with hand and wrist disorders. The study aimed to compare a new alternative of wrist ROM measurement by using the Smartphone Gyroscope (GY) application with the conventional use of a manual universal goniometer (GO).

Materials and Methods:
Wrist ROM, including flexion, extension, radial and ulnar deviation, were measured in 372 wrists of 186 Chinese subjects without wrist disorder by using smartphone GY and manual GO in a standard setting at the same occasion.

Results:
Mean age was 48.9 years old, and 51.6% was male. The mean degrees of the wrist motions between GY and GO were similar when the patients performed flexion (73.9 vs 80.1, p<0.05), extension (49.9 vs 58.0, p<0.05), radial deviation (23.9 vs 27.2, p<0.05) and ulnar deviation (35.6 vs 37.0, p<0.05). The Pearson correlation were 0.799 for flexion, 0.826 for extension, 0.731 for radial deviation, and 0.726 for ulnar deviation (all p-values <0.05), which indicated a strong to very strong correlation between the two measurement methods.

Conclusion:
With the popularity of smartphone, self-measurement of wrist ROM can be performed by the patients outside a clinical setting. However, the position-sensitive nature of GY may lead to potential error. Patients need to follow a set of standard instructions before measurement and the results can be reported at medical consultations.
Sonographic evaluation of effects of the volar plate on trigger finger
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Department of Orthopaedic Trauma and Microsurgery Center,
Seikeikai Hospital, Osaka, Japan

Purpose:
To evaluate trigger fingers with an ultrasound device and clarify differences between fingers
with and without continuous locking or snapping symptoms in terms of the thickness of the
A1 pulley, flexor tendon and volar plate.

Methods:
We evaluated 30 trigger fingers, which were divided into two groups: Group 1, 16 fingers with
locking or snapping; and Group 2, 16 fingers without these symptoms. We also evaluated 32
contralateral fingers as controls (Control 1 and 2 groups). We compared each group to the
respective control group in terms of thickness of the A1 pulley and volar plate, and cross-
sectional area of the flexor tendon. In addition, 9 fingers with locking or snapping treated
using corticosteroid injection were evaluated in terms of symptoms and sonographic findings
again after 3-4 weeks.

Results:
Thickness of the A1 pulley and cross-sectional area of the flexor tendon were greater in both
Groups 1 and 2 than in controls. Thickness of the volar plate was greater in Group 1 than
in Control 1, although no significant difference was seen between Group 2 and Control 2.
In Group 1, 8 of the 9 fingers improved locking or snapping symptoms with corticosteroid
injection and sonographic findings showed thickness and volar prominence of the volar plate
were significantly decreased with corticosteroid injection, in addition to reduced thickness of
the A1 pulley.

Conclusion:
In addition to thickening of the A1 pulley, thickening of the volar plate may represent an
important contributor to continuous snapping or locking symptoms.
1. **Arthroscopic assisted minimally invasive management of perilunate dislocations and fracture-dislocations**

Liu B • Chen SL • Zhu J • Yang C • MD • Shen J • Wang ZX • Deng JZ • Liu C
Department of Hand Surgery, Beijing Jishuitan Hospital,
The fourth Clinical College of Peking University, Beijing, China

**Purpose:**
The purpose of this study was to evaluate the functional and radiographic outcomes of perilunate dislocations and fracture-dislocations treated with arthroscopic assisted reduction and percutaneous fixation.

**Methods:**
Between 2012 and 2013, 26 patients who had a dorsal perilunate dislocation or fracture-dislocation were treated. 17 of them were reviewed at a mean follow-up of 13 months (range, 7 to 26 months). Clinical outcomes were evaluated on the basis of range of motion; grip strength; modified Mayo wrist score; Quick Disabilities of the Arm, Shoulder and Hand questionnaire; and Patient-Rated Wrist Evaluation score. Radiographic evaluations included time to scaphoid union, measurement of radiologic parameters, and any development of arthritis.

**Results:**
The range of flexion-extension motion of injured wrist averaged 82% of the values for contralateral wrist. The grip strength of the injured wrist averaged 77% of the values for the contralateral wrists. The mean Quick Disabilities of the Arm, Shoulder and Hand score was 11, and the mean Patient-Rated Wrist Evaluation score was 15. According to modified Mayo wrist scores, overall functional outcomes were rated as excellent in 6 patients, good in 5, fair in 4, and poor in 2. Nonunion developed in 1 patient with a trans-scaphoid perilunate injury. Reduction obtained during the operation was maintained within normal ranges in all patients. Arthritis had not developed in any patient by the final follow-up.

**Conclusions:**
Arthroscopic assisted reduction with percutaneous fixation is a reliable minimally invasive method for acute perilunate injuries in that it provides satisfactory functional and radiologic outcomes at early follow-up.

2. **Treatment of the nonunited scaphoid waist fracture**

Zhan HH • Gong KT • Kan SL • Lu YJ • Li RH
Department of Hand Surgery, Tianjin Hospital, Tianjin, China

**Objective:** To evaluate the results of treatment of unstable nonunited scaphoid waist fracture by anterior wedge graft and internal fixation with the use of kirschner wires.

**Methods:**
Twelve adult male patients with unstable nonunited scaphoid waist fracture with a humpback deformity were treated by reduction of the collapse deformity, insertion of anterior wedge
Abstracts of Visiting Scholars’ Papers (cont’)

graft, and internal fixation with the use kirschner wires. The mean patient age was 32.5 years, and the mean duration of the nonunion before surgery was 15.7 months. The follow-up time ranged from 9 to 23 months (mean, 12.5 mo). All nonunions healed with radiographic union.

Results:
Union was achieved in a mean of 3.6 months. Most of the patients had satisfactory correction of scaphoid deformity and the associated dorsal intercalated segment instability. Postoperatively, improvements were seen in the range of wrist flexion and extension, grip strength, and degree of dorsal intercalated segment instability.

Conclusions:
The results of the series suggest that the method of anterior wedge graft and internal fixation with the use of kirschner wires is effective for the treatment of unstable nonunited scaphoid waist fractures.

3. Reconstruction of shoulder function for brachial plexus injuries by combination of nerve transfer and arthroscopic release: cases report

Zhao X • Lao J • Gu YD
Huashan Hospital, Fudan University, Shanghai, China

Purpose:
To introduce the results of combination of nerve transfers, and arthroscopic release to reconstruction of shoulder function in two case of the upper trunk of brachial plexus injuries.

Methods:
In the first stage, nerve transfers of spinal accessory to suprascapular, and triceps long to axillary nerve were performed. After functional recovery of the muscles supplied by the suprascapular, and axillary nerves, arthroscopic shoulder release was performed for augmentation of shoulder function in the second stage. The results were measured with muscle strength, motion range of shoulder, ASES, Constant-Murley Score, Neer Score, and patient’s satisfaction with surgery.

Results:
The Supraspinatus and deltoid strength restored to MRC grade 4 after the first stage and the same after the second stage; Active motion range of external rotation (ER) and forward flexion (FF) were zero and 74°after the first stage, and were 50°and 130°after the second stage in one case, and were -45°and 80°after the first stage, and were 30°and 135°after the second stage in another case, respectively. ASES, Constant-Murley Score, Neer Score were all improved after each stage in the two patients, respectively. Both patients were satisfied with results of operation.

Conclusion:
Combination of nerve transfer, and arthroscopic release reconstructed a good shoulder function in two cases of brachial plexus injuries.
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