SPORTS RELATED INJURIES
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MAY 2014

Plan for today
1. Epidemiology of wrist and hand sports related injuries
2. Wrist and hand injuries
   1) Ligamentous injuries
      a. SLIL
      b. TFCC
      c. Thumb UCL
      d. Collateral ligaments at the PIP level
2) Bony injuries
   a. Scaphoid Fracture
   b. Boxer’s Fracture
3. Return to sports : a quick look at the literature and tricks from the field

Epidemiology
• Wrist and hand injuries count for 3 to 9 % of all sports injuries (Rettig 1998)
• ASHT survey (1991) : 8-20% of all sports injuries involving wrist and hand.
• Different sports…different countries
  – Italy : Polacco et al. (1967)
  – France : Thiebault (1980)
  – USA : Rettig (1998) (Epidemiology of hand and wrist injuries in sports)

LIGAMENTOUS INJURIES
ScaphoLunate Interosseous Ligament (SLIL)
HAPPENING MORE OFTEN THEN WE CAN THINK OF?
Carpal Instability

- SL ligament is the most commonly affected ligament in the wrist
- Results from fall on an extended wrist or from strong repetitive grasp
- SL tear: 21% of intraarticular wrist fracture and 6.7% of extraarticular fractures

Clinical Evaluation

- X-Ray
  - Clenched fist: increased gap = (+) Terry Thomas sign
  - Cortical ring sign = "foreshortened appearance of the distal pole of the scaphoid rotated on its axis by scapholunate dissociation, one of the manifestations of carpal instability syndromes"
  - Lateral view = abnormal SL angle (<60°)
- Watson’s test/Scaphoid Shift Test (Watson 1988)
- Finger-Resisted Extension Test
- SL Ballottement

6 stages of SL tear

(Dr Garcia-Elias, IFSSH Orlando 2010)

1. Partial tear of volar ligament (dorsal intact)
   - Immobilisation for 3 weeks followed by DTM
2. Complete tear
   - Ligament repair necessary
3. Complete tear
   - Impossible to repair
4. Scaphoid Subluxation
   - Reducible
5. Scaphoid Subluxation
   - Partially Reducible
6. Scaphoid Subluxation
   - Irreducible

SL injuries (AJSM 2003)

- Wrist arthroscopy is now the standard method of diagnosing intercarpal ligament injuries.
- It is important for the athlete to have a stable, pain-free wrist with near normal ROM and grip strength after repair.

Scaphoid Biomechanics

- Darth-thrower’s motion (Moritomo, 2007)
  - Functional wrist position
  - Wrist mobilisation minimizing SL stress
  - Not recommended after surgery
  - Dr Garcia-Elias
  » April 2013

Strengthening

SL Ligament

- NOT ECU!!!!!!
- FCR, ECRL/APL/FCU
- With a complete tear, do not strengthen FCR as it would encourage SL dissociation (Green 2005)
Stabilisation Tape

- Course given by Ms. Ann Porretto-Loehrke, PT,DPT,CHT,COMT, during Philadelphia Hand Meeting
- GREAT course on taping technique for the whole upper extremity
  - See section in Rehab of the Hand
- Techniques that could be applied right now for many upper extremity conditions

Stabilisation with taping… wrist in supination & UD and thumb flexion

- Hypafix underneath and Leukotape P on top

A splint…why not

- Wrist Restore
  - Testing weight-bearing with and without it
  - Cross fit
  - Acrobat
  - Weight-lifting
  - ...

Proprioception

- New concept ?!

Proprioception

Proprioception of the Wrist joint: A review of current concepts and possible implications on the Rehabilitation of the Wrist
Dr Elisabet Hagert
Journal of Hand Therapy 2010; 23:2-17

Dr Hagert’s article

- Well-detailed stages of rehabilitation including some exercises ideas
- Immobilisation not helping wrist proprioception
- Conscious/Unconscious Proprioception
- Suggestion: Read it and re-read it again!
Proprioception...Powerball

Functional wrist ROM

- Palmer et al.
  - Extension 30°
  - Flexion 5°
  - RD 10°
  - UD 15°
- Ryu et al.
  - Extension 40°
  - Flexion 40°
  - 40° of RD/UD
- Gartland/Werley
  - Extension 45°
  - Flexion 30°
  - UD 15°
  - Pro/Sup 50°
- Brumfield/Champoix
  - Extension 40°
  - Flexion 40°

IT’S BETTER TO HAVE A STIFF WRIST THAN AN UNSTABLE ONE!

Triangular FibroCartilage Complex (TFCC)

Is it so complex?

TFCC

What is it again?

TFCC (eorthopod)

- Soft tissues of the wrist are complex as the name suggests
- It can be a very disabling wrist condition
- Makes it possible for the wrist to move in different directions (6)
- It stabilises the DRUJ while improving the ROM and gliding action within the wrist
**TFCC injury causes**

- Degenerative
  - Repetitive pronation
- Traumatic
  - Fall on outstretched hand (most common)
  - Sports
    - Gymnastic
    - Golf
    - Hockey
    - …

**Epidemiology**

- 50% TFCC involvement when in presence of an ulnar styloid fracture
- 50% of distal radius fracture = Ulnar styloid fracture
  - 25% = nonunion

**MRI and TFCC**

- Josby 2007
  - Sensitivity 74%
  - Specificity 80%
  - My personal experience!!!
    - Especially with Work Accidents
      - False-positive

**Clinical Examination**

- TFCC
  - TFCC load
  - Passive Hyperpronation
  - Hyperextension
  - GRIT
  - Weight-bearing test
  - Ulnar Fovea Sign
  - Medical Imagery
    - Arthro-MRI vs Arthro-CT scan

**TFCC**

- GRIT
  - JHT 2001, LaStayo
- Journal of Physiotherapy (Prosser 2011)
  - Limited value of those tests
  - MRI not much better

**The GRIT:**

A Quantitative Measure of Ulnar Impaction Syndrome

\[
\text{GRIT ratio} = \frac{\text{supinated grip strength value}}{\text{pronated grip strength value}}
\]
TFCC

- GRIT Test
  - Gripping Rotatory Impaction Test
  - I do it with and without the Wrist Widget
  - Helps to follow the evolution
  - Helps for your clinical evaluation
  - DRUJ
  - TFCC

Dynamic + ulnar variance

- The GRIT:
  - A Quantitative Measure of Ulna Impaction Syndrome
  - It is a diagnostic tool that can help identify patients with symptomatic Ulnar Impaction Syndrome (UIS)
  - The difference in ulnar variance from a standard X-ray to a pronated-gripped x-ray did positively influence the GRIT

- Unfortunately, patients who undergo just TFCC debridement or repair often continue to be symptomatic because of continued increased ulnocarpal force transmission and concomitant irritation to the TFCC on pronation and gripping activities.

Dynamic X-ray

- Pronated and maximally gripped radiographic measure of ulnar variance
- Compare to standard ungripped, forearm-neutral variance

A splint…minimally invasive

- Wrist Widget
  - Grip strength
  - WB
  - Sports
    - Hockey
    - Tennis
    - Golf

Grip testing

<table>
<thead>
<tr>
<th>GRIP STRENGTH (lb.)</th>
<th>Neutral</th>
<th>Supination</th>
<th>Pronation</th>
<th>Pronation with wrist widget</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right Hand</td>
<td></td>
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<tr>
<td>Left Hand</td>
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Nonsurgical treatment

- If the wrist is stable
  - Splint for a few weeks
  - Steroid injection?
  - Therapy
- If the wrist is unstable
  - Cast on your wrist and forearm for about 6 weeks
  - Therapy
### Therapy
- Resting splint: Gauntlet
- Functional splint: Wrist Widget
  - Sometime, taping can be used
  - Ulnar-Boost Splint: functional?
- Strengthening of surrounding structures and stabilisers
  - ECU and its subsheath
  - Pronator Quadratus
  - Interosseous Membrane

### Surgical treatment
1. Arthroscopic debridement
2. Wafer procedure
   - Feldon et al., *Wafer distal ulna resection for TFCC tears and/or UIS* (JHS, 1992)
3. Open repair: complex tear allowing the surgeon to have a better look at it!
   - Some surgeons prefer that technique for repair of the dorsal portion of the TFCC.

### Surgical treatment
<table>
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<tr>
<th>Diaphyseal Shortening</th>
<th>Ulnar head osteotomy</th>
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<tbody>
<tr>
<td>Internal fixation</td>
<td>Arthroscopic or open method (Feldon wafer)</td>
</tr>
</tbody>
</table>
| Higher complication rate |  - Less invasive  
| Delayed union         |  - Equal relief to diaphyseal shortening |
| Nonunion              |  - 2-3 mm of shortening possible |
| Hardware removal      |                      |

### Satisfaction
- TFCC debridement including an ulnar shortening might be needed to restore the normal transmission of load to the ulnar wrist (Dobyns, 1990)

### TFCC
- 66-87% success rate with arthroscopic debridement (Stade 1a)
- Ulnar shortening osteotomy (Byung Sung Kim, 2011)
- Minami (JHS 1996): failure of debridement when in presence of ulnocarpal conflict

### Gymnastics
- 87.5% of a gymnastic population siting the wrist as the primary focus of pain (Mandelbaum, 1989)
- TFCC tears are the most commonly reported ligamentous injuries in gymnast’s wrist
  - High incidence of ulnar-positive variance (Dobyns, 1990)
UIS and Gymnast

- Weight-bearing on an immature wrist
  - Up to 16x body weight on the wrist
- Report of 46-77% wrist pain with professional gymnasts
- Immature wrist: Radial pain (physis)
- Mature wrist: Ulnar pain (TFCC)

Explaining the pain...

Radial side
- Stress reaction
- Stress fracture
- Synovial cyst
- Dorsal impaction
- Scaphoid impaction

Ulnar side
- TFCC tear
- Unstable DRUJ
- Lunotriquetral chondromalacia
- ECU tenosynovitis
- ECU subluxation

Physiology

Stress reaction
- Decrease distal radius growth
- Positive ulnar variance
- TFCC increase load
- Excessive load at distal radius

Ulnar Collateral Ligament (thumb UCL)

Skier’s thumb but No gamekeeper’s thumb!

UCL of thumb’s MCP (Skier’s thumb)

- Mechanism
- Grades (Rehab. of the Hand)
  - I: most common, microscopic tearing of fibers. No loss of ligament integrity;
  - II: portion of fiber has torn completely;
  - III: complete ligament rupture

Stener’s lesion

- Torn ligament may become trapped superficially to proximal edge of adductor aponeurosis.
- Surgical cases: ALL THE TIME!
  - Said to happen in 60-70% of grade III injuries (Stener 1962)
  - McCue & Cabrera (1992)
    - Delay of up to 2 months in repairing ligament ruptures in selected patients did not result in significant compromise of thumb function
**UCL treatment**

- Grades
  - I: Immobilisation in a thumb spica 2-3 weeks
    - PROM around 4 weeks
    - Strength around 5 weeks
  - II: Immobilisation in a thumb spica 4-5 weeks
    - Some surgeons will include the wrist as part of the splint … I prefer to leave the wrist free
  - III: cast for about 4 weeks if (-) for a Stener’s lesion

**Early controlled ROM**

- Dorsal protection splint allowing MCP flexion while avoiding lateral stress

- Use of a hinged splint (Michaud et al., JHT 2010)

**Taping (Ms. Porretto-Loehrke)**

- A few studies on taping
  - Moulton 2001
  - Walsh 2010
  - Yao & Park 2008
  - Rehab of the Hand – Ann Porretto-Loehrke

**Collateral Ligament (PIP level)**

  Whys is it so neglected ?!?!
Why?

- *Coach’s finger = PIP joint dislocation*
  - Frequent neglect of immediate treatment encountered in contact sports! (McCue, 1978)

Management of Complex PIPJ Injuries
(Sweet & Blackmore PHC 2012)

- Guiding principles for therapy
  - Please refer to 2011 Rehabilitation of the Hand and Upper Extremity 6th edition
  (Chapter 31 by Feehan)

Management of PIPJ Fractures and Dislocations (Chinchalkar 2003)

Rettig 2004

- The PIP is the most commonly injured joint in sports!
- Return to sport may be immediate when splinting is allowed
- Most PIP dislocations are stable and can be treated with splinting or buddy taping
- X-ray for all of them!

Therapeutic guidelines (Chinchalkar 2003)

- Treatment should be based on:
  - Mechanism of injury
    1. Laterally directed PIPJ dislocation forces
    2. Dorsally directed PIPJ dislocation forces
    3. Volarly directed PIPJ dislocation forces
    4. Axially directed PIPJ forces
  - Classification of injury

PIPJ intraarticular fracture: a football player (1 year F/u)
Early motion with lateral support

Early motion (Feehan PHC 2012)

Conclusion (Chinchalkar 2003)
- "PIP joint injuries are the most common and most undertreated joint injuries of the hand"
- "Careful therapist management of these injuries is paramount in regaining complete and pain-free hand function"

PIP Splint

Immobilisation
- Minimally Invasive…

BONY INJURIES
SIMPLER THAN LIGAMENTS ?!?
**Immobilisation**

- Minimally Invasive
  - Uninvolved joints need to be moving!
  - Need a good understanding of fracture biomechanics
- Early Active Mobilisations
  - Easier to prevent stiffness than to treat it
  - We do it for tendon repairs...why not for fracture (Dr Lalonde, IFSHT Orlando)
- Exceptions: unstable fractures
  - Scaphoid
  - Bennett

**Scaphoid Fracture**

*Please tell me it’s not broken!*

**Scaphoid Fracture (AJSM 2003)**

- Most common and also most problematic wrist fracture
- 70% of all carpal fractures (Rettig 1995)
  - 1% incidence in football player (Rettig)
- Any contact-sport athlete who has radial wrist pain should be considered to have a scaphoid fracture until proven otherwise (AJSM 2003)
  - Dr Rettig’s preference: MRI studies

**Internal fixation**

- Although internal fixation of acute scaphoid fractures is still controversial, it has become more accepted as the standard of treatment for this difficult problem (Rettig, 2003)

David Beckham

Patrick Kane ... 2012
How do we immobilise ?!

- Barton (1992)
  - Wrist only
    - Thumb free
- Doomberg (JBJS 2010)
  - Cast vs splints
    - No difference

My own preference...

Conservative treatment

- In the athlete
  - Undisplaced Fracture
    - Healing in 90% with 9-12 weeks of immobilisation (Patel)
    - Riester et al.
      - Silastic cast
      - 6 months!

Return to play and nonunion

- Playing cast and a short arm thumb spica during nonathletic activities
  - 90% union rate (Reister, 1985) (Rettig, 1994)
- Redondo and Rebak (1996)
  - Increased nonunion rate in playing cast group
  - 39% of athletes with a playing cast required surgery to obtain union
    - 15% in the cast-only group

Hand fracture

- 2/3 of hand fractures are in the metacarpals (Singletary, JHT 2003)
  - Largely in athletes younger than 30
  - 75% in athletes 14-18 y/o
  - About 80% of sport’s related metacarpal fractures are non-displaced or only slightly displaced (Redler, 1967) (Rettig, 1989)
    - Low energy injury

Boxer’s fracture

Not for boxers!
Hand fracture

• Most common complications
  – Baratz 1997 (Hand Clinic)
    • Joint contracture and tendon adhesions
• Early ROM
  – I strongly suggest to have a look at Ms. Feehan’s chapter on Fracture in REHAB OF THE HAND.

Reduction and fixation (Rettig, 1989)

CRIF
• 5-10% of sport’s related metacarpal fracture require K-wire fixation
• Well-suited to stabilising well-reduced simple transverse and short oblique fractures.

ORIF
• 5-10% of all sports related metacarpal shaft fracture (50% of those that require reduction and stabilisation) require open operation.
• Irreducible, markedly unstable, and open fractures.

Dr Jabaley (2000)

• Hand Fracture, Repair, Reconstruction and Rehabilitation

IT DOES NOT MAKE SENSE TO FIX A FRACTURE AND NOT MOVE IT!

A simple splint...

Return to sport after metacarpal fracture (Rettig, 1989)

• Average overall time lost 14 days (0 to 56 days)
• Basketball: 20 days (2-56 days)
• Football: 11 days (0-21 days)
• Stable fracture splinted: 12 days
• Fracture requiring surgery: 22 days
• Percutaneous pinning: 36 days (21-56 days)
• ORIF: 14 days (7-21 days)

Return to play

How to predict ?!!
Return to Play

- Nothing left to chance by the medical team
  - Skate alone, no contact, with contact, …
- Could vary a whole lot depending on the sports and on the position played
- We have to consider the risks of reinjury as well as the risk of causing other injuries
  - Thumb injury (football)
  - Wrist splint : radial head fracture

Safe return to play!

Wrist stability

- Grip strength
  - 80% ?
  - Different wrist positions could be helpful
  - With and without splint

Wrist stability

- Weight-Bearing
  - With and without splint

Return to sports

What do we know

Protecting the Injured Hand for Sports (JHT, 1991)

- Detailed knowledge of the mechanics of the particular sport, including the movement required in performing the skill, the forces involved, and the environment in which the sport is played. (Mayer, 1989)
- Needs approval and clearance from the physician before being fitted for a protective device for sports.
Splinting…the ART

1. Adequate protection from reinjury
2. Light weight and compact
3. Does not interfere or allows minimal interference with the functional skills of each athlete.
   • The splint must conform to the rules governing each particular sport at the level at which the athlete is competing.
     – Hotline phone number: (414-632-5949)

Fitting the splint

• Molding the splint to the sport equipment makes the necessary static hand position functional for the athlete (Mayer, 1986)
  – The athlete should bring the required piece of equipment or glove to the therapist's office.
  – May need a sports splint exclusively for practice and competition (PIP in flexion)
    • And a PIP joint splint in complete extension at night

Casting in sports (DeCarlo et al., 1994)

• Goals (Bassett, 1979):
  – Provide adequate protection to the injured part and prevent further injury;
  – Allow the injured player to participate safely and effectively;
  – Protect opposing players against injury from the device;
  – Satisfy game officials that the above are met within the rules governing the particular sports.

Conclusion on splinting (Hilfrank, 1991)

“The fabrication of sports protective devices for the hand and wrist is well suited to the hand therapist. Knowledge of splinting materials, splint construction, and the anatomy and kinesiology of the hand and wrist are essential to providing protection, whereas knowledge of sports adds the missing dimension for effective and useful splinting for the athlete.”

Predicting return to play

• What are the studies telling us
  – Psychological aspect is extremely important (equal or superior to objective measures)
    • There are multiple studies looking at ankle and knee injuries…NOT MUCH ON HANDS!
  – Player’s perception of his abilities to return to play is also a good indicator of an eventual return.
  – “Athlete may feel irrationally that they are exceptions to the natural and fundamental laws of healing!” (Singletary, JHT 2003)

Dr Sylvain Guimond
Montreal Canadiens
PhD in Sports Psychology

Return to play depends a whole lot on the player’s perception:
  – The actual status of the player could affect his perception
    • A star player can delay his return to the game without fear of losing his job!
    • There is a need for well detailed return to play protocol (as it is starting post-concussion)
Is the athlete telling you the truth?

X-ray?
- When callus is seen on x-ray and local signs of injury are minimal or resolved, strengthening and conditioning exercises may be initiated, and the patient may be returned to competitive play with protective hand gear (Singletary, JHT 2003)

Treating the athlete … COMMUNICATION
- Speak to referring physician
  - What’s the plan?
  - Realistic goals
- Speak to the athlete
  - Needs to understand the plan and the healing timeframe
- Speak to anyone involved
  - Medical team (physician and therapists)
  - Trainers & Coaches
  - Parents

Patient’s goals
- Immediate and long term goals should be set
- Need for appropriate and realistic goals
- Cannot rely on usual measures such as ROM and grip strength
  - 80% of normal grip strength used to be a measure for return to sports (personal communication with Dr Sylvain Gagnon)

COMMUNICATION… is the key!!!
- Early rehabilitation
  - Indications & contra-indications
  - Realistic expectations
- Constant communication insuring a constant follow-up
  - Re-injury risks
- Stay away from complications
  - Wrist sprain are often times underestimated
    - Could lead to terrible consequences

Treating Athletes
Elite Athletes
A great book (2012)

- *Elite Athlete's Hand and Wrist Injury*
- Guest Editor: Michelle G. Carlson, MD

HAND CLINICS
Volume 28, Number 3
August 2012

Ken Griffey Junior

- Wrist fracture
- Results = CAREER ENDING INJURY?

Merci beaucoup!

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