Examination of the Painful Wrist
More Than a “Wrist Sprain”

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Objectives
1. Describe the sequelae of ligamentous disruption and fractures in the wrist.
2. Perform special tests to examine wrist instability patterns, such as scapholunate, lunotriquetral, and mid-carpal instability.
3. Identify radiographic changes seen with various wrist conditions

Regions to Cover
• Radial and radio-dorsal
• Central dorsal
• Ulnar and ulno-dorsal
• Volar

RADIAL WRIST EXAMINATION

IF IT IS A WRIST SPRAIN, THEN WHAT IS IT?

Tendons
Ligament
Bone
Capsule
### IF IT’S NOT A SPRAIN, THEN WHAT IS IT?

#### Fracture?
- Radial Styloid
- Scaphoid
- 1st metacarpal base (Bennett & Rolando)
- Trapezium

#### Osteoarthritis?
- First CMC
- Scaphotrapeziotrapezoid

#### Tendonitis?
- Radial Extensor Compartments

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### Radial Wrist Bony Anatomy

1. Radial Styloid
2. Anatomical Snuffbox (Scaphoid)
3. Trapezium
4. 1st Carpometacarpal Joint
5. Scaphotrapeziotrapezoid Joint
6. 1st Metacarpal

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#### Radial Styloid Fracture

**Fun Facts**
- 6% of distal radius fractures
- Extremely painful
- Highly innervated
- Bony location

**Key Features**
1. History of direct blow to the radial wrist
2. Tenderness distal radius
3. Radial Collateral Ligament Attachment

#### Special Testing
Palpation: distal most radial wrist
*Tenderness may be a fracture, a contusion, or OA associated with SLAC/SNAC Wrist.*

**Refer?**
Yes-needs Xray or CT to determine if the fracture is displaced

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#### Therapy
1. Immobilization of wrist and thumb
2. Edema control
3. Digit AROM & PROM
   
   *HOLD Wrist & Thumb CMC*
Scaphoid Fracture

**Fun Facts**
- Men 15-29 years old
- 80% articular surfaces
- Blood flow from distal to proximal

**Key Features**
1. Mechanisms
   1. Crushed under the distal radius
   2. Direct blow
   3. MVA
2. Radiology changes after 1-2 weeks because of post injury bone resorption

**Special Testing**
1. Palpation in the anatomic snuffbox with ulnar deviation, or
2. At the transverse wrist crease
   *Tenderness indicates fracture, non-union, instability, or OA*

**Therapy:**
1. Thumb Spica Splint
2. Edema control
3. Digit AROM & PROM
   *HOLD Wrist & Thumb CMC*

**Trapezium Fracture**

**Fun Facts**
- 1-5% of carpal fractures (3rd most common)
- Chip fractures are not treated
- Axial force of the 1st MC causes splaying of waist fractures
- ORIF avoids radial subluxation of thumb metacarpal

**Special Test**
Palpation at the base of the 1st metacarpal in opposition

**Bennett’s First Metacarpal Fracture**

**Fun Facts**
- Will frequently need surgery for some kind of fixation
- Causes post-traumatic OA

**Key Features**
1. Intra-articular fracture dislocation at the base of the first metacarpal
2. Mechanism is axial load on a flexed first CMC joint
Bennett Fracture


Palmar oblique ligament
Thumb extensors
Adductor pollicis longus tendon
Fig. 1

Bennett Fracture “Before”

Bennett’s Fracture “After”
Percutaneous Pinning versus Plate and Screws

Rolando’s First Metacarpal Fractures

Fun Facts
• 3 piece intra-articular fracture at the base of the first metacarpal
• “T” or “Y” shaped

Rolando Fracture


Metacarpal Shaft Fracture

First Carpometacarpal (1st CMC) OA

Fun Facts
- “Trapezium articulates with the Thumb”
- Second most common site of OA in the hand (after DIP)

Key Features
1. Painful pinching/grasping
2. Located at the 1st metacarpal base
3. Rule out “acute on chronic OA” vs carpal ligament injuries or capsular injury

First Carpometacarpal (1st CMC) Injury

Gen. Testing
1. Palpation: depression at the base of the 1st MC. Pearl: Oppose the thumb and small finger
2. Grind Test: axial compression and translation
3. Resisted Opposition Maneuver: applied to volar radial distal phalanx

Refer?
Only when the patient is ready for “Plan B”

First Carpometacarpal (1st CMC) Injury

Therapy
1. Opponens orthosis
2. Relative rest
3. Avoidance of pinching and gripping
4. NSAIDS

Scaphotrapezialtrapezoid (STT) OA

Special Testing
Palpated dorsally in the recess just proximal to the base of the 2nd metacarpal.

Scaphotrapezialtrapezoid (STT) Joint Injury

Key Features
1. Can be hard to differentiate from scaphoid fracture, carpal ligament injury, and capsular injury
2. Rule out “acute on chronic OA” vs carpal ligament injuries or capsular injuries
3. STT ligament attachments

Refer?
www.brown.edu
DeQuervain’s Tenosynovitis

Fun Facts
• Originally called Washerwoman’s Disease
• May be due to APL tendon variation

Key Features
1. First dorsal compartment
2. Caused by APL/EPB friction, stiffening/hypertrophy of the retinaculum
3. Severe cases may demonstrate triggering during thumb motion
4. Due to repetitive radial abduction

DeQuervain’s Tenosynovitis

Therapy
1. Thumb and wrist immobilization in radial abduction
2. Relative rest
3. NSAIDS
4. Corticosteroid injection

Radial Wrist Soft Tissue

1. First Extensor Compartment
   Extensor Pollicis Brevis
   Abductor Pollicis Longus
2. Second Extensor Compartment
   Extensor Carpi Radialis Longus
   Extensor Carpi Radialis Brevis
3. Third Extensor Compartment
   Extensor Pollicis Longus

DeQuervain’s Tenosynovitis

Special Testing
1. Finkelstein: (thumb), hand and wrist ulnarly deviated by examiner
2. 1st Compartment tension test: resisted thumb extension during wrist radial deviation

Refer?
Only for refractory cases requiring surgical release of the 1st Extensor compartment.

Intersection Syndrome

Fun Facts
• “Squeaker’s wrist”
• Racquet sport players/rowers/golfers

Key Features
1. 2nd dorsal compartment
2. Pain located dorsally and proximally to DeQuervain’s
3. Worsened by pulling/twisting of the hand and radial deviation
**Intersection Syndrome**

**Therapy**
1. Wrist Immobilization orthosis in wrist extension
2. Relative rest
3. NSAIDS
4. Corticosteroid injection

**Dorsal Radial Sensory Nerve (DRSN) Injury**

**Special Tests**
- Tinel's
- False Positive Finkelstein

**References**

- Watson HK, Weinzeig, eds. The Wrist. 2001, Lippincot Williams & Wilkins, Philadelphia PA.
ULNAR WRIST EXAMINATION

Triquetral Fracture

2nd most common isolated carpal fracture
Mechanism: hyperflexion of a radial deviated wrist or hyperextension of a ulnarly deviated wrist
Majority are dorsal avulsion or “chip” fractures
Avulsions are from the attachments of the radiocarpal and dorsal intercarpal ligaments or from impingement of the ulnar styloid
Visualized on lateral view, often missed on PA films

Triquetral Fracture

Symptoms: focal tenderness over the dorsum of the triquetrum
Because the injury is a hallmark of avulsion of the important dorsal wrist ligaments, cast immobilization of the wrist for 4 to 6 weeks is recommended to facilitate ligament healing, followed by progressive return to range of motion and strengthening of the wrist.
Lateral view of a dissected specimen showing the angulation that exists between the pisiform, the flexor carpi ulnaris and its distal attachments. Any contraction of this muscle generates a dorsal directed vector on the triquetrum that helps extending the proximal row during ulnar deviation.


Stabilize and support the dorsal aspect of the triquetrum when doing the pisotriquetral grind test as to not mistakenly perform an LT ballottement test.

Ulna: Head, styloid and neutral variance

Blood supply for the TFCC
Ulnar impaction syndrome

Sequence of events:
1. wearing of the articular disc region of the TFCC
2. chondromalacia of the ulnar head and proximal ulnar aspect of the lunate
3. disruption of the lunotriquetral ligament

Ulnar impaction syndrome results from:
- cogential variance
- acquired radial shortening due to trauma (distal migration of the radius due to radial head excision or malunion of DRFx)
- dynamic positive ulnar variance-forceful gripping in pronation

Ulnar Variance

<table>
<thead>
<tr>
<th>Type of Ulnar Variance</th>
<th>Image</th>
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<tbody>
<tr>
<td>Positive Ulnar Variance</td>
<td><img src="positive-ulnar-vari.pdf" alt="Image" /></td>
</tr>
<tr>
<td>Negative Ulnar Variance</td>
<td><img src="negative-ulnar-vari.pdf" alt="Image" /></td>
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TFCC Load test/unnocarpal stress test:
Performed by ulnarily deviating and axially loading the wrist and moving it volarly and dorsally or by rotating the forearm.

A positive test elicits pain, clicking, or crepitus and reproduces the subject’s symptoms.

Used to detect unnocarpal abutment or TFCC tears

Sn 100, Sp ?
+LR infinity, -LR 0, recommended


Gripping rotatory impaction test (GRIT)

Grip strength measured in:
1. Neutral—most familiar
2. Supination
3. Pronation—potentially most painful

Calculation: supination/pronation relative to neutral grip values

GRIT is the clinical assessment corollary to pronated grip xray. GRIT can identify symptomatic ulnar impaction syndrome

+LR 1.0, -LR 0, neutral recommendation


Distal radioulnar joint (DRUJ)

An Inherently Unstable Joint

Routes of Curvature of Ligamentous Tension

Routes of Curvature of Seat of Ulna

The superficial and deep portions of the radioulna ligaments

+LR 1.79, -LR 0.30 recommended


DRUJ test

**Figure 2**: Stress testing for pronator, deep fibers of the ligamentous structures for pain, mechanical instability, or both. The arm must be flexed with the opposite, non-affected arm.
Piano Key Test: gentle downward pressure applied to the distal end of the ulna, the head moves volarly but springs back when pressure is released, resembling the action of a piano key. When this maneuver causes pain, the subject may vocalize a "note" of discomfort.

Sn ? Sp ?

The fovea is the recess lying between the hyaline cartilage of the ulna pole and the ulna styloid. This fossa is richly vascularized; it serves as a point of insertion of the major DRUJ stabilizing ligamentous components of the TFC.
Ulna Fovea Sign: The examiner presses his or her thumb distally into the interval between the patient’s ulnar styloid process and flexor carpi ulnaris (FCU) tendon, between the volar surface of the ulnar head and the pisiform.

Reproducible pain in this area may indicate an UT ligament tear or foveal disruption of the TFCC.

Sn 95.2%, Sp 88.9% for foveal disruptions or UT ligament injuries

+LR 7.06, -LR 0.05, recommended

Ulnomeniscotriquetral dorsal glide (UMTDG): Place the thumb dorsally over the ulna bone, the radial side of the index finger over the pisotriquetral complex. Squeeze the index finger and thumb together to produce a dorsal glide of the pisotriquetral complex on the ulna.

Positive test: reproduction of pain or laxity

Sn 66%, Sp 64%, PPV 58%, NPV 69%

+LR 1.2, -LR 0.77, neutral recommendation

Ballottement test: secure the pisotriquetral unit with the thumb and index finger of one hand and the lunate with the other hand. Anterior and posterior stresses are placed on the LT joint. The criteria for a positive test are increased laxity and accompanying pain.

+LR 1.03, -LR 0.80, neutral recommendation

Compression test: Compression of the triquetrum from the ulnar snuffbox applies a radially directed force against the LT joint. Pain may indicate a disorder of the LT or triquetrotamate joint.
The position of the ECU in pronation (left) and with supination (right). The tendon is forced into an approximately 30 degree angle in the subsheath in supination.

Provocative maneuver: forearm supination with ulnar deviation

ECU subluxation as part of the dorsal radioulnar ligament.


**Central Dorsal Zone of the Wrist**

- **Bone**
  - Index and Long CMC joints
  - Scapholunate articulation
  - Capitohamate articulation
  - Distal radius – Lister’s tubercle

- **Soft Tissues**
  - 3rd and 4th Extensor compartments tendons
  - Ligament integrity – intrinsic and extrinsic ligaments supporting proximal scaphoid and lunate.
Intricate anatomy of the CMC joints on the Index and Long digits.

These are two of the stable rays.

Carpal Bossing

Dorsal Ganglion Cysts

Extensor tenosynovitis

Darn...the FOOSH again.
Scapholunate Ballottement

Scaphoid Shift test

Beginning position of test  Movement from UD into RD
Pressure is placed in a dorsal direction over the scaphoid tubercle

15.6 Wrist Views

- AP
- Lateral
- Oblique
- Additional:
  - Carpal tunnel view – obscure fractures such as hook of the hamate
  - Fist compression view – may show the SL separation if a plain PA does not.
  - Radial and ulnar deviations
    - Ulnar deviation sometimes called a scaphoid spot view

Ring Sign of the scaphoid

Terry Thomas sign

Terry Thomas sign. Gap between scaphoid-lunate=3mm on the AP wrist view. Scapholunate dissociation. Usually see 15. WHY?
Mild DISI deformity

SLAC – scapholunate advanced collapse

Scapholunate Dissociation
CID An example of a carpal instability dissociative pattern

Acute/Chronic Conditions
- A 17 year old female basketball and lacrosse player has had right wrist pain for about a year. She attended lacrosse camp this summer and "it got a lot worse." She knows of no specific injury to the wrist.

- Physical exam
  - Pain in the middle of her wrist, dorsal surface.
  - Subjective decrease in grip strength.
  - Decrease in active flexion and extension.

Acute/Chronic Conditions

Finger Extension Test
Acute/Chronic Conditions

Kienböck’s Disease

- **Etiology**
  - No definitive cause has been identified
  - Avascular necrosis of the lunate caused by:
    • Trauma causing microfractures or vascular disruption
    • Radial compression due to ulnar negativity
    • Anatomical differences in lunate vascularity
    • The current consensus is repetitive microtrauma in an at risk lunate.

- **Stages of Disease**
  - Stage 1 – no radiological changes or small fracture lines only present
  - Stage 2 – sclerosis of the bone, but normal size, shape, and carpal bone relationships
  - Stage 3A – collapse of the bony structure of the lunate
  - Stage 3B – collapse with proximal migration of the capitate or fixed rotation of the scaphoid
  - Stage 4 – degenerative changes in the radiolunate and adjacent intercarpal articulations

Kienböck’s Disease

- **Treatment options**
  - The earlier the diagnosis, the more treatment options, and thus a better prognosis.
  - Treatments include immobilization, revascularization, radial shortening, ulnar lengthening, intercarpal fusion, lunate resection, partial or full wrist fusion.

What is the diagnosis?

A vulnerable area – “space of Poirier”. A ligament free area on the volar wrist.
Extensor pollicis longus

Active IP extension
Active thumb retrusion

VOLAR WRIST EXAMINATION

Carpal tunnel syndrome

• Common complaints
  • Numbness +/- tingling
  • Pain
    • Median / Long finger
    • Better with shaking
    • “Dropping things”
    • A sensory problem
  • Nocturnal symptoms
  • Differentiate from PT Syndrome (Gessini, 1987)

Common Tests

• Tinel’s test
• Phalen’s test
• Reverse Phalen’s
• Carpal tunnel compression
  – Variability in Sn and Sp
  – Insufficient diagnostic accuracy
    • (Mondelli, 2001)
  – Flexor tenosynovitis
    • (El Miedany, 2008)
    • (-) EMG findings

Diagnostic Accuracy-Is it CTS?

• Shaking hands for relief
• Wrist ratio greater than .67
• CTQ-SSS > 1.9
• Decreased sensation thumb
• Age > 45
• All 5 positive \( \Rightarrow \) Sp. 99 (.97-1.0)

Carpal tunnel syndrome

• PT Examination:
  • Determine the severity:
    • Thenar eminence
    • Monofilament testing 3.61 or greater (Evans, 2011)
    • Persistence of symptoms (Boyd, 2005)
    • Carpal Tunnel Questionnaire (Symptom Severity Scale)
**Carpal Tunnel Questionnaire-Symptom Severity Scale (CTQ-SSS)**
- Levine et al, JBJS, 1993
- Symptom Scale – 11 items
- Each item scored 1-5; Mean
- Best predictor of failed conservative management (Boyd, 2005)
- Functional Scale – 8 items

**Carpal Tunnel Questionnaire-SSS**
- Using the CTQ-SSS to decide treat or refer??
  - 2.5 or lower shown high specificity (89%) for + response to conservative management (Ollivere, 2009)
  - Should see change in first 6 weeks (MCIC ~ .5) (Cheung, 2014)
  - Scores >3 shown + response with surgery
- Treat and refer??
  - Education and activity modification
  - Orthoses
  - Ultrasound

**Ulnar Tunnel Syndrome**
- Repetitive trauma (ie, work, sports)
- RA, Diabetes, CTS
- Ulnar nerve symptoms
  - Combined S/M
  - Sensory only
  - Motor only

**Sensory Changes**
(Differential Diagnosis)

**Motor Changes**
- Clawing
- +/- Abduction of small finger
- Atrophy
  - Hypothenar eminence
  - Thumb web span
- Weakness
  - PI, DI, L3 and 4
  - +/- Hypothenar m.
  - + Froment’s sign
  - Loss of Adductor Pollicis (AP)
Tests and Measures

- Examine the hook of the hamate (MOI?)
  - IP joint on the palm and place the tip of the thumb toward the index finger >> hook of hamate
- Soft tissue mass, ganglion
- Allen’s Test (circulatory component)
  - Pump hand then close to fist; occlude radial and ulnar arteries ; open hand; release pressure from radial artery and watch ... then release ulnar artery and watch; compare bilateral
- Monofilament testing for severity
- Phalen’s may recreate symptoms; Tinel’s over the ulnar tunnel -- more inconclusive

Treat or refer

- Treat >> Mild cases without motor symptoms with protection and activity modification
- Refer >> Suspect a fracture (MOI) or soft tissue mass
- Refer >> Motor signs or symptoms
  - Electrodiagnostics, vascular studies
  - Surgical exploration/release

Pisotriquetral Joint

- Arthritic changes
- Mal/non-union (MOI)
- Instability
- Inflammation
- Can provoke UTS
- Shear test
  - Compressive force and translation/rotation
- What to do?
  - Refer
  - May tx symptoms

Volar ganglion cyst
(Fernandes, 2014)

- Seen during observation
- Painful and +/- nerve symptoms
- Refer

www.carpaltunnelpros.com

Tendon Rupture

- Observation
- Test FDS -- block the DIP joints of other digits—be careful with the small finger!
- Refer!

www.aafp.org
www.nervesurgery.wustl.edu
http://www.scielo.org.za

Tendon Rupture

- Observation
- Test FDP -- block PIP of the same digit and flex DIP
- Refer

www.cram.com
Tendon Injuries

• Tenosynovitis
  – Palpate crepitus and thickness/fullness during active movement
  • Treat
  – Triggering and sticking
  • Referral

• Tendinitis
  • Palpate FCR (Flex and RD) and FCU (Flex and UD—extend and abduct the small finger)
  • MMT
  • Treat

www.ericksonhandsurgery.com

Thank You!
See you in Anaheim, CA for CSM 2016