Thank you Dr. Kenneth Means!
Hand & Wrist Anatomy: Bones

Carpals
- Trapezium
- Trapezoid
- Scaphoid

Metacarpals
- Hamate
- Capitate
- Pisiform
- Triquetrum
- Lunate

Phalanges
- Distal
- Middle
- Proximal

Anterior view
- 1
- 2
- 3
- 4
- 5

Posterior view
- Distal
- Middle
- Proximal
- Head
- Shaft
- Base

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Hand & Wrist Anatomy: Tendons
Hand & Wrist Anatomy: Nerves

- Autonomous area for testing - Ulnar nerve
- Digital branches of ulnar
- Palmar cutaneous branch of ulnar
- Dorsal cutaneous branch of ulnar
- Ulnar
- Autonomic area for testing - Median nerve
- Digital branches of median
- Palmar cutaneous branch of median (spared in carpal tunnel syndrome)
- Median
- Autonomous area for testing - Radial nerve
- Radial
- Dorsal cutaneous branch of ulnar
- Radial
Hand & Wrist Anatomy: Vascular
Wrist Radiographic Anatomy

http://www.chosun.ac.kr/~jdakim/lecture/gradu/hand.htm
Normal Radiographic Parameters

• Things to check for on every X-ray:
  • On the A/P:
    • Gilula’s lines
    • Scapholunate gap

  - Scaphoid appearance
- A good lateral x-ray should have palmar pisiform edge lying between palmar scaphoid and palmar capitate edges
- Also, the metacarpals should be parallel to the forearm
Normal Radiographic Parameters

Things to check for on every X-ray:
  - On the lateral:
    - Scapholunate angle
      - NI 30-60 degrees (avg. 47 degrees)
    - Capitolunate angle
      - NI 0 +/- 15 degrees
    - Radiolunate angle
      - NI 0 +/- 15 degrees
Hand & Wrist Sports Injuries

- Hand
  - Baseball “Mallet” Finger
  - Jersey Finger
  - Gamekeeper’s / Skier’s Thumb (UCL)
  - Bennett’s Fracture
  - Metacarpal Neck Fractures (Boxer’s)
  - Metacarpal Shaft Fractures
  - Trigger Finger
Hand & Wrist Sports Injuries

• Wrist
  • Scaphoid Fracture
  • Hamate Hook Fracture
  • Distal Radius Fracture
  • Wrist “Dislocation”
  • Hypothenar Hammer Syndrome
  • ECU Subluxation
  • TFCC Injury
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Baseball “Mallet” Finger

- Appearance: Flexed DIP joint with inability to extend.
- Cause: Loss of integrity in the extensor mechanism at the base of the distal phalanx
Baseball “Mallet” Finger

- Pathology
  - Laceration / Avulsion of distal extensor tendon
  - Fracture involving extensor tendon insertion

- Treatment
  - Closed injuries: DIP Extension Splinting unless a Large Fracture w/ joint subluxation
  - Open injuries: Repaired
Hand & Wrist Sports Injuries

- Hand
  - Baseball “Mallet” Finger
  - **Jersey Finger**
  - Gamekeeper’s / Skier’s Thumb (UCL)
  - Bennett’s Fracture
  - Metacarpal Neck Fractures (Boxer’s)
  - Metacarpal Shaft Fractures
  - Trigger Finger
Jersey Finger

• Not Named After New Jersey…
  • Mechanism of Injury

• Cause: Loss of flexor mechanism integrity at the distal phalanx
Jersey Finger

- **Pathology**
  - Tendon tear or avulsion fracture involving insertion at distal phalanx

- **Treatment: Repair**
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Gamekeeper’s / Skier’s Thumb

• Pathology: Thumb UCL Injury
• Acute Injury
  • Skiing
  • Fall on outstretched thumb
  • Struck by ball / opponent
• Chronic Injury
  • Football linemen
  • Gamekeepers
Gamekeeper’s / Skier’s Thumb

• Treatment
  • Partial Tear: Non-op w/ Thumb Spica Splint then PT
  • Complete Tear: Surgical Repair in less than 3 wks
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Bennett’s Fracture

- 23 y.o. M baseball player
- Injured right thumb diving for a ball
- Pain, tenderness, and swelling at base of the metacarpal
- No gross deformity
Bennett’s Fracture

- Fracture Pattern
  - Oblique fracture line with a triangular fragment at ulnar base of metacarpal
  - Triangular fragment remains attached to trapezium w/ proximal displacement of the metacarpal
  - Associated w/ metacarpal subluxation/dislocation
- Opposing Forces
  - Metacarpal shaft is displaced dorsally & radial direction due to force of abductor pollicis longus and adductor pollicis
- Treatment
  - Surgery with CRPP vs. ORIF
Hand & Wrist Sports Injuries

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  • **Metacarpal Neck Fractures (Boxer’s)**
  • Metacarpal Shaft Fractures
  • Trigger Finger
Metacarpal Neck Fracture

- **Appearance:** Intrinsics flex MC head
- **Finger Specific Evaluation**
  - Ring & Small (Boxer’s) Fingers
    - Studies suggest up to $70^\circ$ flexion tolerated
  - Index & Middle Fingers
    - No more than 15-20$^\circ$ flexion ok
- **Treatment**
  - Cast if no malrotation or pseudoclawing
  - If Surgery, CRPP or “bouquet pinning” if border digit (IF/SF)
Metacarpal Neck Fracture

- 26 y.o. M professional baseball pitcher involved in altercation with a wall
- Right index finger pain, tenderness, swelling, and rotation deformity
Metacarpal Neck Fracture

Reduction Maneuvers

CRPP: Bouquet Pinning
Hand & Wrist Sports Injuries

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Metacarpal Shaft Fracture

- Non-operative w/ Cast, if possible
- Operative Indications:
  - Open fractures
  - Multiple fractures
  - Any malrotation
  - Unstable fx’s – border metacarpals more often unstable
- Multiple operative options: K-wires, IO wires, IM pins/rods, lag screws, plate/screws, transverse pinning
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Trigger Finger

- i.e., Stenosing Tenosynovitis
- Fishing Analogy
  - Like Having a Knot in Your fishing line
  - Knot gets caught in fishing rod hooks
Trigger Finger

- Risk factors for developing a trigger digit:
  - Repetitive power grip, e.g. golf, baseball, tennis
  - DM, RA, other inflammatory arthropathy, tendonopathy, etc.

- Treatment options
  - Splint PIPJ in extension
  - Corticosteroid injection – will typically try a total of 2; does not need to be injected into the sheath/tendon
  - Surgical release
Trigger Finger

Surgical Treatment: Release A1 Pulley
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Hand & Wrist Sports Injuries

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Scaphoid Fracture

- Most common carpal bone fracture
- sometimes initial XR’s negative for 1-2 weeks
- Avascular Necrosis & Nonunion are concerns especially for waist or proximal pole fractures
Scaphoid Fracture

- Typically from a fall onto an outstretched hand (FOOSH)
- Young patient (as opposed to most distal radius fractures)
- May initially seem relatively benign
- Delayed presentation not uncommon because patient not seeking treatment or missed at initial presentation
Scaphoid Fracture

- What is not controversial?
  - Surgery for Displaced & Unstable fractures

- What is controversial?
  - How to reduce/stabilize?
    - Open / CRPP / Scope
  - How to treat Nondisplaced fractures?
    - Immobilization vs. operative fixation
Hand & Wrist Sports Injuries

- Wrist
  - Scaphoid Fracture
  - **Hamate Hook Fracture**
  - Distal Radius Fracture
  - Wrist “Dislocation”
  - Hypothenar Hammer Syndrome
  - ECU Subluxation
  - TFCC Injury
Hamate Hook Fracture

- 24 yo 2\textsuperscript{nd} baseman pro baseball player
- 12 months of vague ulnar sided hand/wrist pain and sense of weakness
- No neurovascular symptoms or signs
- Flexor tendons intact
Hamate hook fx - nonunion fragment
Opposite left side intact hamate hook
Ulnar nerve branch to SF - ulnar digital nerve

Ulnar artery

Ulnar nerve branch to RF - SF common digital nerve
Deep ulnar motor nerve branch

Hamate hook removed through this space
Hamate hook nonunion excised
Base of hamate now smooth after hook excision
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Distal Radius Fractures

- **Colle’s**- dorsal displacement
  - Stable, extraarticular ⇒ cast
    (VT < -20° RL < 10mm)
  - Unstable, intraarticular ⇒
    (VT > -20° RL > 10 mm)
  - CREF +/- ORIF +/- ICBG
Distal Radius Fractures

- **Smith’s**: volar displacement
  - Volar ORIF with 3.5mm locking plate

- **Chauffer’s**: radial styloid
  - AARIF

- Beware of Greater & Lesser Arc injuries
Hand & Wrist Sports Injuries

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Wrist “Dislocation”

...just mindin’ my own business
Wrist “Dislocation”

- 49 y.o. playing rugby
- Right wrist injury while at the bottom of a pileup
- Presents to ED with pain, swelling, and median nerve symptoms
Hand & Wrist Sports Injuries

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Hypothenar Hammer Syndrome

- 52 y.o. M baseball bullpen coach
- Several months of ulnar sided wrist pain now with increasing pain in ring and small fingers
- X-ray and MRI negative for hamate hook fracture or nonunion
After 24 hours of thrombolytics
Operative intervention

- Trifurcate vein graft from dorsal hand
Hand & Wrist Sports Injuries

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  - Distal Radius Fracture
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  - TFCC Injury
ECU Subluxation

- 32 y.o. F professional golfer
- Several months of wrist pain
- Now with mechanical symptoms at the ulnar dorsal side of the wrist
- Nonoperative options (splinting, activity modification, NSAIDS, corticosteroid injection) failed to relieve symptoms to her satisfaction
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TFCC Injury

• 22 y.o. M baseball player Right ulnar sided wrist pain for several months when batting
TFCC Injury

- Tenderness at palmar/ulnar wrist
- No instability of the distal radioulnar joint (DRUJ) with pronation/supination or stress maneuvers
- MRI shows central tear of the triangular fibrocartilage complex (TFCC)
- Activity modification, NSAIDS, splinting, corticosteroid injections trialed all with temporary relief
TFCC Injury
TFCC Tear
More chronic TFCC tear at peripheral margin of central disc
More acute central TFCC tear with unstable flap
Debriding the more chronic tear
Debriding the more acute tear
Central TFCC after debridement to stable rims (volar, radial, and dorsal rims visible on this photo)
Hand & Wrist Sports Injuries

- Very Complex Anatomy & Pathology
- Be Afraid of What you Don’t Know…
- Critically evaluate X-rays & Consider MRI when indicated
- Sport Associated Injury Recognition