MR Imaging of the Wrist and Hand

MRI of the Wrist

- Occult fracture
- Ganglion Cyst
- Tumor
- Ligament tear
- Avascular necrosis
- Arthritis
- Tendon Pathology
- Nerve Impingement
- Infection

Occult fracture

- Not visible on initial radiographs
  - follow-up xray, CT
- MRI:
  - MRI very sensitive for dx
    - Use T2fs / STIR to detect
    - Use T1 to DDx fx vs. bone bruise
  - Determine extent of injury
    - Osseous, soft tissue
  - can dx alternate cause of pain

-Capitate fracture

-Distal radial fracture

-Occult scaphoid Fracture NBA player
Ganglion Cyst
- Common at wrist, esp. dorsal
- May simulate mass, or may be occult source of pain if small or deep
- Joint >> tendon sheath
- MRI:
  - Lobulated
  - Fluid signal
  - Rim-enhancement
  - May indicate underlying ligament tear

Ganglia: Common Locations
- Dorsal
  - Deep to tendons
  - Adjacent to lunate/capitate joint
  - Weak area of capsule
  - Extends around dorsal intercarpal ligament
- Volar
  - Radial aspect off radioscapoid joint
  - Adjacent to radial artery – may be confused for vessel / aneurysm
- Other areas
  - Into carpal tunnel
  - Off tendon sheaths

Ganglion Cyst from Joint Extending Around Tendons

Volar Radioscapoid Ganglion

The “Angry Ganglion”

Extensor Tendon Ganglion

Tumor
- MRI may help DDx:
  - Malignant / benign lesion vs. ‘pseudomass’
  - Most soft tissue ‘masses’ are benign lesions with characteristic MRI features
    - Lipomas
    - Ganglion cysts
    - Hemangiomas / vascular malformations
    - Giant cell tumor of tendon sheath
- Osseous lesions
  - Radiographs important for DDx
  - MRI: solid vs. cystic (esp w contrast)
- Lipoma
  - Fat signal
  - No internal complexity

- Giant cell tumor of tendon sheath (GCTTS)
  - Location: tendon sheath
  - Signal: low T1, T2

- Nerve lesion
  - Fibrolipomatous hamartoma
  - Location: neural
  - Signal: high T1, fascicular pattern

- Glomus tumor
  - Location: distal digit
  - Signal: 'light bulb' on T2, Gd

- Malignant lesion
  - Synovial sarcoma
  - Solid, complex mass

- "Pseudomass"
  - Accessory muscle
  - Characteristic locations e.g., palmaris longus
  - Signal: same as muscle
- Aneurysmal bone cyst
- Fluid-fluid levels

Ligament tear
- Intrinsic ligaments
  - Scapholunate
  - Lunatotriquetral
  - Triangular fibrocartilage complex
    - central (radial aspect)
    - peripheral (ulnar side)
- MR arthrography
  - Increases accuracy for dx of tear

Triangular Fibrocartilage “Complex” (TFCC) Anatomy
- Triangular fibrocartilage
- Dorsal and volar radioulnar ligaments
- Ulnar-triquetral ligament
- Meniscal homologue
- ECU sheath

Central TFCC Tear
Perforations may not be clinically significant
-Peripheral TFCC tear

Peripheral TFCC Tear / LT Tear

ECU Subluxation / Peripheral TFCC Tear

ECU Tenosynovitis / Peripheral TFCC Tear

Ulno-lunate Abutment

Indirect Arthrogram – tear of central TFC with ulnar-lunate abutment

-Positive ulnar variance

-Cystic change in lunate

-TFCC tear
Scapholunate and Lunatotriquetral Ligaments

DORSAL AND VOLAR BANDS

These bands are more mechanically important than central membrane.

Direct MR arthrogram – scapholunate tear

Scapholunate Ligament Tear

SL or LT tear can cause carpal malalignment

Dorsal tilt of lunate (DISI deformity)

Scapholunate tear

Palmarflexion of scaphoid

Scapholunate advanced collapse (SLAC wrist)

DISI deformity

Proximal migration of capitate

Carpal osteoarthritis

Radiographic progression Of SLAC

Early - radioscaphoid joint narrowing

Intermediate

Late
**SLAC wrist**

**SLAC secondary to rheumatoid arthritis**

Inflammatory arthropathies can cause intrinsic ligament tears

**Extensive synovitis**

**Marrow edema**

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**Lunatotriquetral Ligament Tear**

Lunate may tilt in palmar direction along with scaphoid (VISI)

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**Lunatotriquetral ligament tear**

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**Avascular necrosis**

- **Lunate** (negative ulnar variance)
- **Scaphoid** (fracture)

Progression: density, fracture, collapse, OA

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**-Keinbock’s disease**

Replacement of fat signal c/w AVN
- Scaphoid fracture with AVN of the proximal pole

- Scaphoid nonunion
- Humpback deformity
- Acts like an SL lig tear
- Radiocarpal OA
... and AVN lunate

**“SNAC” Wrist**
Scaphoid Nonunion Advanced Collapse

- Scapholunate Advanced Collapse (SLAC)

**Arthritis**

- Osteoarthritis
  - Subchondral cysts cartilage loss, spurs
  - Distribution depends on etiology
  - Trauma, instability, predisposing factors

- Inflammatory arthropathies
  - Classic: rheumatoid arthritis
    - Carpus, MCPs
    - Diffuse involvement
    - Synovitis, erosions

- Type 2 lunate with secondary OA

**Rheumatoid Arthritis**
Marked synovial proliferation

Lunate articulates with hamate
Rheumatoid Arthritis
MRI can monitor activity, response to Tx

Erosions

Rheumatoid Arthritis
Tenosynovitis in multiple sheaths suggests an Inflammatory arthropathy

Tendon Pathology
- Tenosynovitis
- Tendon tear
- Pulley lesions

Extensor Tendons

DeQuervain’s Tenosynovitis
1st extensor compartment

Inflammation at distal forearm at crossing point of first and second extensor compartments

Intersection syndrome
Complete Tear – Extensor Tendon

Partial Tear – Flexor Carpi Radialis

Longitudinal Tear

-Chronic extensor tendon tear

Pulley Injuries

A series of pulleys surround the flexor tendons keeping them apposed to bone

Tear due to chronic overuse, esp in rock climbers

A2 and A4 pulleys are most commonly injured
Flexor tendon pulley injury

Pulley Lesion pre / post stress

Stenosing Tenosynovitis

Thumb: Ulnar Collateral Ligament Injury

Line coronals up with sesamoids

Dorsal Hood Injury

Disrupted ‘sagittal band’ allows ulnar subluxation of extensor tendon at MCP with flexion

Nerve Impingement

Median nerve
-Carpal tunnel syndrome
Ulnar nerve
-Guyon’s canal

Common in boxers
Carpal Tunnel

- Pisiform / hamate medially
- Carpal bones dorsal
- Flexor retinaculum volar
- Median nerve deep to retinaculum
- Flexor tendons
- Flexor carpi radialis: outside the carpal tunnel

Carpal tunnel syndrome

- Flexor tenosynovitis
- Separation of tendons by synovial tissue

CTS: Flexor Retinaculum Bowing

-Mass effect from muscle in carpal tunnel

CTS: Proximal Enlargement and Fasciculation

Fasciculation: Looks like dots inside

-Volar ganglion cyst in carpal tunnel
Guyon’s Canal

- Ganglion cyst with ulnar nerve impingement
- Septic arthritis
  - Joint effusion
  - Synovial thickening / enhancement
  - Subchondral edema
- Osteomyelitis
  - Marrow edema / enhancement

Infection

- Septic arthritis and osteomyelitis
**Routine MRI wrist:**
- Tendon pathology
- Carpal tunnel syndrome
- Ganglion cyst
- Acute trauma
- Osteoarthritis
- AVN
**MRI wrist with IV contrast:**
- Mass
- Infection
- Inflammatory arthropathy
**MR arthrogram:**
- Ligament tear

THANK YOU