MR IMAGING OF THE WRIST

Wrist Instability

- Dissociative
  - Pattern apparent on routine radiographs
- Non-dissociative
  - Stress / positional radiographs
  - Dynamic fluoroscopy during stress
  - Arthrography
  - MRI / MR arthrography

Osseous Congruency

Look for intact carpal arcs

Joints – Should be Uniform in width

Disruption of Carpal Arcs

Acute scaphoid fracture with perilunate dislocation

Widening of scapholunate interval
Lateral view: Evaluate
- Lunate tilt
- Capitate-lunate angle
- Scapholunate angle

Make sure hand is straight

Lateral view:
- Lunate tilt
- Capitate-lunate angle
- Scapholunate angle

Lateral view:
- Lunate tilt
- Capitate-lunate angle
- Scapholunate angle

Transscaphoid perilunate dislocation

Lunate tilt results in pie-shaped configuration

Positional Radiographs
- Can help demonstrate carpal malalignment, intercarpal widening
- Radial / ulnar deviation, lateral flexion / extension

Lateral view:
- Lunate tilt
- Capitate-lunate angle
- Scapholunate angle

0 – 30 degrees

Lateral view:
- Lunate tilt
- Capitate-lunate angle
- Scapholunate angle

30 – 60 degrees
- **Radial deviation**
  Joint spaces maintained
  Scaphoid palmarflexes, rounded on AP

- **Ulnar deviation**
  Joint spaces maintained
  Scaphoid elongates on AP

- **Lateral flexion / extension**
  Capitate tilts with lunate

**Imaging under stress**

- **“Closed fist” view**
  - Places distractive stress on carpal ring
  - Can accentuate scapholunate widening

- **Video fluoroscopy**
  - Monitor during motion under applied stress
  - Visualize carpal instability patterns dynamically

**Arthrography**

- **Inject contrast into joint**
  - Visualize contrast passing between compartments
  - Documents ligament tear
  - Single compartment (radiocarpal) vs. triple compartment injection (may increase sensitivity)
Radioscaphoid injection

Early contrast extending through Lunatotriquetral ligament

Late - contrast in midcarpal joint

Scapholunate and Lunatotriquetral Ligaments
NORMAL ANATOMY

Disruption of dorsal and volar bundles

Scapholunate and Lunatotriquetral Ligaments
DORSAL AND VOLAR BANDS

These bands are more mechanically important than central membrane

Large tear SL ligament

Disruption of dorsal and volar bundles
Scapholunate Ligament Tear

Direct MR arthrogram – scapholunate tear

Tear on multiple slices
Widening of joint / malalignment
Intervening cartilage damage

Scapholunate tear
Palmarflexion of scaphoid

Dorsal tilt of lunate

Dorsal intercalated segment instability (DISI)

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

**Extensive synovitis**

**Marrow edema**

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**Lunatotriquetral Ligament Tear**

**Lunatotriquetral ligament tear**

- Lunate may tilt in palmar direction along with scaphoid
- Volar intercalated segment instability (VISI)

**Perforations may not be clinically significant**

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**TFCC – “Leak” or “Perforation”**

**Perforation**

- Contrast / fluid through ligament
- Seen on only 1 slice (“ask a friend rule”)
- Small diameter (1mm)

**TFCC “Tear”**

**Tear**

- Contrast / fluid through ligament
- Multiple slices (>1mm)
- Malalignment
- Cartilage damage

**Tears are more likely to be symptomatic**

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**TFCC IMPACTION**
Ulnar Impaction
AKA Ulno-lunate Abutment

“Direct” Arthrogram

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

Large communication
Underlying thinning
Cartilage damage

Central TFCC tear

TFCC: Peripheral attachments

Styloid
Foveal

Peripheral TFCC Tear
Combo LT Tear (or leak?)

...A ‘trickle’ or a FLOOD?
MRI can help

It's not all about MRI!
CT arthrography can also be useful

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Gd Contrast injected into radioscaphoid joint

Flood!!
Massive Peripheral TFCC Tear

Peripheral TFCC Tear
Extensor Carpi Ulnaris Tenosynovitis

Rheumatoid Arthritis
Masslike synovial proliferation

Rheumatoid Arthritis
MRI can monitor activity, response to Tx

-Capitate fracture

-Distal radial fracture

Erosions
Occult scaphoid fracture

NBA player

Avascular necrosis

Lunate (negative ulnar variance)
Scaphoid (fracture)
Progression: density, fracture, collapse, OA

Keinbock’s disease

Replacement of fat signal c/w AVN

Scaphoid fracture with AVN of the proximal pole

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

Scapholunate Advanced Collapse (SLAC)
- Type 2 lunate with secondary OA

Rheumatoid Arthritis

- Masslike synovial proliferation

Lunate articulates with hamate

Rheumatoid Arthritis

- Tenosynovitis in multiple sheaths suggests an inflammatory arthropathy

Septic Arthritis / Tenosynovitis

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

DeQuervain’s Tenosynovitis

- 1st extensor compartment

Intersection syndrome
Complete Tear – Extensor Tendon

Partial Tear – Flexor Carpi Radialis

Ganglia: Common Locations

- **Dorsal**
  - Deep to tendons
  - Adjacent to lunate/capitate joint
  - Weak area of capsule

- **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

- Fluid signal
- Dorsal intercarpal ligament
- Rim enhancement

Volar Radioscapoid Ganglion

The “Angry Ganglion”

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

- Mass effect from muscle in carpal tunnel

Median Nerve: Proximal Enlargement and Fasciculation

Fasciculation: Looks like dots inside nerve

proximal ➔ distal

- Volar ganglion cyst in carpal tunnel

Guyon’s Canal

- Guyon’s Canal

PROXIMAL ➔ DISTAL
Summary

- Size matters!
  - Larger communications (tear) are more likely to be symptomatic / mechanically significant than a “leak”
- Is the “band together?”
  - Evaluate dorsal and volar bands of SL and LT
- Malalignment / separation
- Chondrosis / arthritis

MRI Protocol

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

THE FUTURE RESOLUTION

T2 FSE fat sat
Problem is: you miss all those 40 micron leaks.

It's all relative!

Questions?

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