Joint Pathology, Screening For Synovitis, and Pulley Injuries

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Joint Effusion: wrist
- Radiocarpal joint
- Midcarpal joint
- Distal radioulnar joint

Joint Effusion and Synovitis
- Distention of joint recesses
  - Anechoic: simple fluid
  - Other: complicated fluid or synovium
- Sonography cannot differentiate sterile from septic joint fluid

AJR 2000; 174: 1353
**Inflammatory Arthritis: role**

- Identify synovitis and erosions
  - Prior to initiating treatment
- Determine activity: hyperemia
- Aspirate or inject
- Follow-up after therapy
  - Decreased hyperemia and synovial thickness
  - Lack of synovial thickness improvement at 3 months predicts progression* 

*Chen YC et al J Clin Rheum 2017; 23:73

**Synovial Hypertrophy**

- Synovial locations:
  - Joint recess, bursa, tendon sheath
- Hypoechoic compared to adjacent subcutaneous fat
  - May be isoechoic or hyperechoic
- Hyperemia: variable
  - Represents activity of inflammation
  - Decreased: treatment (even NSAIDS)

Backhaus M, Arthritis and Rheum 1999; 42:1233

**RA: dorsal wrist**

- Sagittal Plane: Radiocarpal and Mid-carpal Joints

**RA: MCP joint**

- Sagittal Plane: 2nd MCP Joint

**Rheumatoid Arthritis**

- Sagittal Plane: MCP joint

**Pitfall Alert! Normal Joint Capsule Appearance**

- 200 hands/wrists
- Dorsal capsule thickness:
  - Metacarpal 1: 6 mm
  - Metacarpal 2: 4 mm
  - Metacarpal 3-5: 3 mm
  - Radiocarpal joint: 4 mm
  - Midcarpal joint: 3 mm
- Do not interpret as abnormal synovial hypertrophy

*Note normal echogenic triangular fibrocartilage (white arrow)*

*Unpublished Data*
Erosions

- Ultrasound not very good for erosions:
  - Better than radiographs
  - 40% sensitivity¹, 29% false positives²:
    wrist/hand compared with CT
  - Very non-specific, time consuming
- Adjacent synovitis adds specificity
- Correlate with radiographs, labs, distribution

¹Dohn UF M, Arthritis Res Ther 2006; 8:1
²Finzel S. et al. Arth Rheumatism 2011; 63:1231

Pitfall Alert!
Pseudoerosion

- Metacarpal head: dorsal
- Up to 37% of metacarpal heads: 2nd most common
- Bare area: no hyaline cartilage
- Unlike erosion:
  - Smooth
  - Maximum depth: 2 mm
  - No adjacent synovitis

Boutry N. et al. Radiology 2004; 232:716

Pitfall Alert! Pseudoerosions Are Everywhere!

- 200 hands/wrists
- Pseudoerosions: 100%
- Metacarpal heads: all
  - 2nd: 92%
  - 3rd: 86%
- Carpal bones:
  - Lunate: 82%
  - Triquetrum: 84%
  - Distal ulna: 22%

*Unpublished Data
*Note lack of adjacent synovitis
Psoriatic Arthritis

Dorsal: transverse
Dorsal: sagittal

Note: joint space narrowing and extensive bone proliferation

Radius
Capitate
Lunate

Cortical Irregularity

Psoriatic Arthritis
Osteoarthritis
Rheumatoid Arthritis
Normal

Erosions: specificity

- To add specificity to bone irregularity:
  - Correlate with history
  - Correlate with lab values
  - Review radiographs!
  - Look at distribution
  - Evaluate for adjacent synovitis (if acute)

Inflammatory Arthritis: wrist / hand

- Rheumatoid: synovial
  - Wrist: radioulnar, radiocarpal, midcarpal
  - MCP/PIP: dorsal
  - Tendon sheaths: especially ECU
- Psoriatic: synovial + enthesis
  - Ligament and tendon attachments
  - Focus where symptomatic
- Osteoarthritis: DIP, first CMC

Gout

Double Contour Sign
MC
P

Tophus

Synovitis: screening

- Hand and wrist: (6 joints – actually 10)
  - Radiocarpal, midcarpal, distal radioulnar (dorsal)
  - MCP2 and 3 (dorsal): transverse and sagittal
  - Any symptomatic site
  - Cine: flexor and extensor tendons (short axis)
- Ankle and Foot:
  - Ankle joint
  - MTP5 (dorsal and plantar)
  - Any symptomatic site

**Pulley Tear**
- A2 and A4 pulleys: most important
- Sagittal image
  - Bowstringing
  - Hypoechoic edema / hemorrhage
- Dynamic evaluation*

* Radiology 2002; 222:755

**A2 – 4 Pulley Injury**

**A4 Pulley Injury: bowstringing**

**Flexor Digitorum Longus Avulsion and Pulley A4 Tear**

**Trigger Finger:**
- Stenosing tenosynovitis: A1 pulley
- Thick and hypoechoic pulley
- Hyperemia: 91%
- Tendinosis: 48%
- Tenosynovitis: 55%

Trigger Finger: thumb

Case #1  Case #2

Take Home Points

• Joint evaluation: dorsal recesses
  – Fluid: compressible and not color flow
• Inflammatory arthritis:
  – Emphasize synovitis
  – Hyperemia
  – Erosions: many pitfalls
• Pulley injuries
  – Bowstringing

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