

# Ultrasound Evaluation of Arthritis

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↑  
Syllabus

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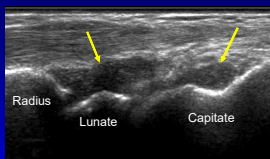
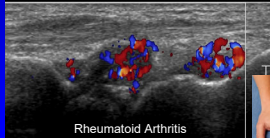

## Arthritis: approach

- Degenerative:
  - Osteophytes
  - Minimal if any synovial hypertrophy/hyperemia
- Inflammatory:
  - Synovial hypertrophy, hyperemia, erosions
  - Enthesitis
- Radiographs: appearance, distribution
- Laboratory values

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### Inflammatory Arthritis: role

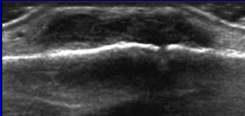
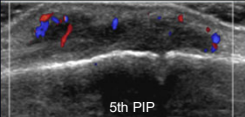
- Identify **synovitis** and erosions
  - Prior to initiating treatment
- Determine activity: hyperemia
- Aspirate or inject
- Follow-up after therapy
  - Decreased hyperemia
  - Decreased synovial thickness

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### Arthritis: synovitis

- 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)

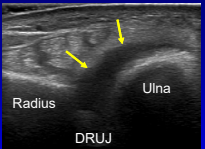
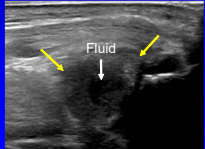



Backhaus M, Arthritis and Rheum 1999; 42:1232

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### Joint Effusion vs Synovial Hypertrophy


- Anechoic: fluid
- Hypoechoic:
  - Effusion vs. synovial hypertrophy
  - Compressible: fluid
  - Internal hyperemia: synovitis
  - \*flow may be absent

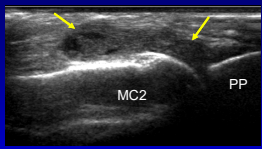
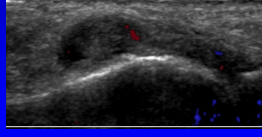



AJR 2000; 174: 1353

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### Synovitis: MCP joint



Sagittal Plane: 2<sup>nd</sup> MCP Joint

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### Pitfall Alert! Normal Joint Capsule Appearance

- Dorsal capsule thickness:
  - MCP 1: 6 mm
  - MCP 2: 4 mm
  - MCP 3-5: 3 mm
  - RC joint: 4 mm
  - MC joint: 3 mm
- Do not interpret as abnormal synovial hypertrophy

*\*Falkowski A et al. Eur J Radiology 2020; 124*

*\*Note normal echogenic triangular fibrocartilage (white arrow)*

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### Erosions

- Disrupted cortex in 2 planes
- Ultrasound not very good for erosions:
  - Better than radiographs
  - 40% sensitivity<sup>1</sup>, 29% false positives<sup>2</sup>: wrist/hand compared with CT
  - Very non-specific, time consuming
- Adjacent synovitis adds specificity
- Correlate with radiographs, labs, distribution

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

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### Rheumatoid Arthritis

*2nd MCP*

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### Rheumatoid Arthritis

*ECU*  
*Ulna*  
*Triquetrum*

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### Rheumatoid Arthritis

- 5<sup>th</sup> metatarsal head
  - Most common site for involvement
- Supplement dorsal evaluation with lateral and plantar view

*5<sup>th</sup> MT*  
*Sagittal: dorsal*  
*Sagittal: plantar lateral*  
*Transverse*

*Inanc N et al. US Bio Med 2016; 42:865*

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### Pseudoerosion: dorsal metacarpal head

*ET*  
*P*  
*M*  
*sensor tendon*  
*Dorsal metacarpal synovial*  
*P*  
*M*

*Radiology 2004; 232:716*

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### Pitfall Alert! Pseudoerosions Are Everywhere!

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

*\*Falkowski A et al. Eur J Radiology 2020; 124*

*\*Note lack of adjacent synovitis*

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### Psoriatic Arthritis

Note: joint space narrowing and extensive bone proliferation

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### Rheumatoid Arthritis

#### Tenosynovitis (paratenonitis):

- Simple fluid: anechoic
- Complex fluid: mixed echogenicity
- Synovitis:
  - Hypoechoic
  - Echogenic if gout

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### Tenosynovitis: rheumatoid arthritis

Short Axis      Long Axis: color Doppler

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### Synovitis: screening (<10 minutes)

- Hand and wrist: (5 joints per side)
  - 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

*Rosa J et al. J Clin Rheumatol 2016; 22: 179*

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### Psoriatic Arthritis: extensor tendon

- Enthesitis:
  - Thick tendon
  - Irregular bone
  - Hyperemia

*\*Correlation with radiography is helpful to show "fuzzy" cortex with inflammatory enthesitis*

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### Gout: crystal deposition

- Monosodium urate: negative birefringence
- Intra-articular:
  - Effusion, synovitis
  - Microtophi: double contour sign
- Tophi:
  - Associated with erosions
  - First metatarsophalangeal joint

Ankle Joint

Tibia

Talus

Microtophi

Tibia

Talus

Double Contour Sign

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### Tophi

- Hyperechoic heterogeneous with hypoechoic rim
- Tiny internal speckles\*
- “wet clump of sugar” appearance
- Variable shadowing: even without calcification

MT

PP

Fernandes et al. Skeletal Radiol 2011; 40:309

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### Gout: popliteus

Femur

Tibia

T2w

T2w

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### Gout: olecranon bursa

Humerus

Olecranon

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### Osteoarthritis: ultrasound

- Osteophytes
- Joint effusion
- Minimal synovial hypertrophy
- Variable hyperemia
- Possible intra-articular bodies

First CMC Joint: Thumb

First Metacarpal

Proximal Phalanx

Sagittal Plane: dorsal

Note: osteophytes (arrow) and intra-articular body (open arrow)

Keen HI et al. Radiol Clin N Am 2009; 47:581

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### Take Home Points

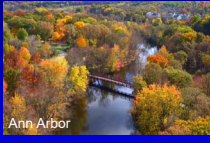
- Inflammatory versus degenerative
- Target approach: efficient
- Emphasize synovitis and hyperemia with imaging
- Erosions: time consuming, limited accuracy
- Gout:
  - Double contour sign
  - Tophi: cloud-like, echogenic, reflective foci
  - Knee: patellar and popliteus tendons

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Thank you!



NYC



Ann Arbor



San Diego

Syllabus on line and other educational material:  
[www.jacobsonmskus.com](http://www.jacobsonmskus.com)

