

Ultrasound Evaluation of Arthritis

Jon A. Jacobson, MD FACR
FSRU, FAIUM, RMSK

Professor of Radiology
Lenox Hill Radiology, NYC
University of California, San Diego



Syllabus

1

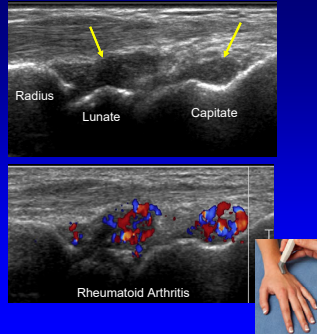
Arthritis: approach

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

2

Inflammatory Arthritis: role

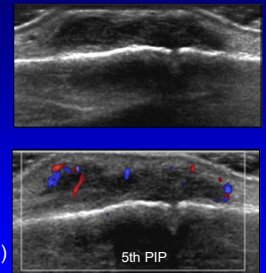
- Identify **synovitis** and erosions
 - Prior to initiating treatment
- Determine activity: hyperemia
- Aspirate or inject
- Follow-up after therapy
 - Decreased hyperemia
 - Decreased synovial thickness



3

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)



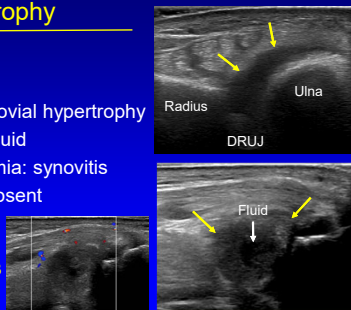
Backhaus M, Arthritis and Rheum 1999; 42:1232

4

Joint Effusion vs Synovial Hypertrophy

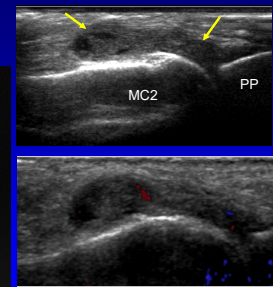
- Anechoic: fluid
- Hypoechoic:
 - Effusion vs. synovial hypertrophy
 - Compressible: fluid
 - Internal hyperemia: synovitis
 - *flow may be absent

AJR 2000; 174: 1353



5

Synovitis: MCP joint



Sagittal Plane: 2nd MCP Joint

6

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*

7

Erosions

- Disrupted cortex in 2 planes
- 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

8

Rheumatoid Arthritis

9

Rheumatoid Arthritis

10

Rheumatoid Arthritis

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

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

11

Pseudoerosion: dorsal metacarpal head

Radiology 2004; 232:716

12

Pitfall Alert! Pseudoerosions Are Everywhere!

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

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

**Note lack of adjacent synovitis*

13

Psoriatic Arthritis

Note: joint space narrowing and extensive bone proliferation

14

Tenosynovitis (paratenonitis):

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

Rheumatoid Arthritis

Short Axis

Long Axis

15

Tenosynovitis: rheumatoid arthritis

Short Axis

Long Axis: color Doppler

16

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

17

Psoriatic Arthritis: extensor tendon

- Enthesitis:
 - Thick tendon
 - Irregular bone
 - Hyperemia

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

Proximal phalanx

Middle phalanx

18

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

19

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

20

Gout: popliteus

Femur

Tibia

T2w

T2w

21

Gout: olecranon bursa

Humerus

Olecranon

22

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

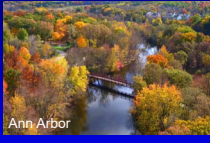
23

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

24

Thank you!



Syllabus on line and other educational material:
www.jacobsonmskus.com

