

# Ultrasound of Arthritis: Pathology and Scanning Protocol

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## Disclosures

- Consultant: Bioclinica
- Book Royalties: Elsevier
- Not relevant to this lecture

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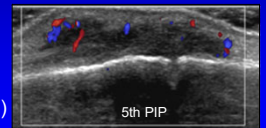
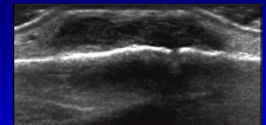
## Arthritis: approach

- Degenerative:
  - Osteophytes
  - Minimal if any synovial proliferation
- Inflammatory:
  - Synovial proliferation and erosions
  - Enthesitis
- Radiographs: appearance, distribution
- Laboratory values

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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)

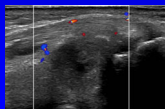
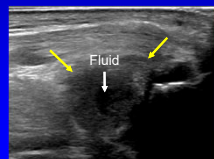
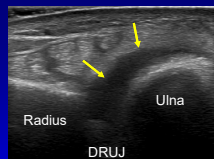


Backhaus M, Arthritis and Rheum 1999; 42:1232

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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

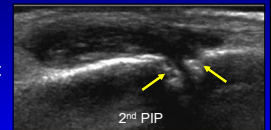


AJR 2000; 174: 1353

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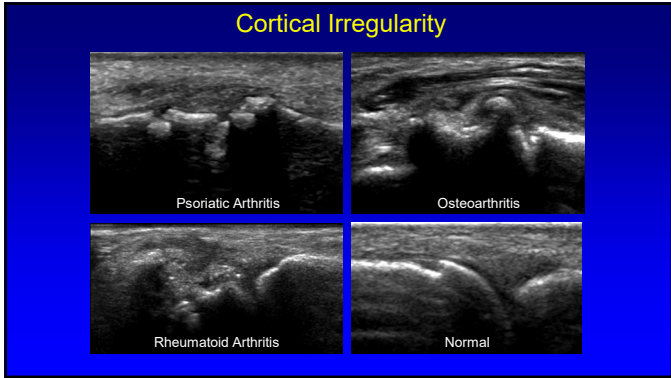
## Erosions

- 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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### Outline: arthritis

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- Rheumatoid arthritis
- Spondyloarthropathy
- Gout
- Osteoarthritis

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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

Radius      Lunate      Capitate

Rheumatoid Arthritis

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### Joint Assessment: dorsal

- Wrist:
  - Radiocarpal joint (RC)
  - Midcarpal joint (MC)
  - Distal or inferior radioulnar joint (IRU)
- Hand:
  - MCP and PIP joints
  - 1<sup>st</sup> CMC (if symptomatic)

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### Synovitis: MCP joint

MC2      PP

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

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### Pitfall Alert! Normal Joint Capsule Appearance

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

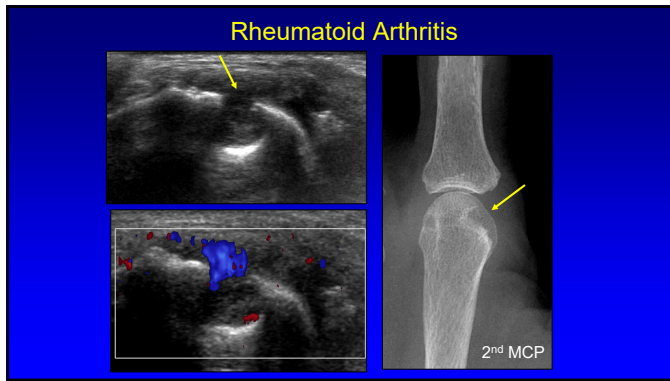
MCP2      PP

Radius      Lunate      Capitate

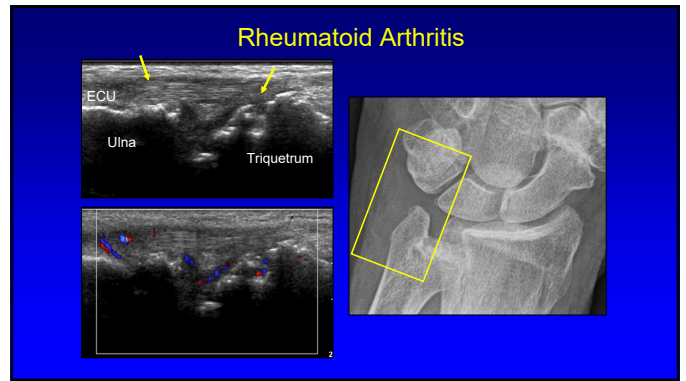
*\*Note normal echogenic triangular fibrocartilage (white arrow)*

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

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**Pitfall Alert!**  
**Pseudoerosion**

- Metacarpal head: dorsal
- Up to 37% of metacarpal heads: 2<sup>nd</sup> 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

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**Pseudoerosion:**  
**dorsal metacarpal head**

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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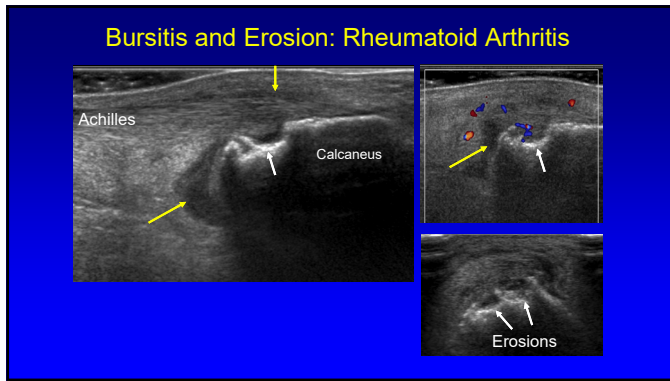
**Rheumatoid Arthritis**

**Erosion + Synovitis**

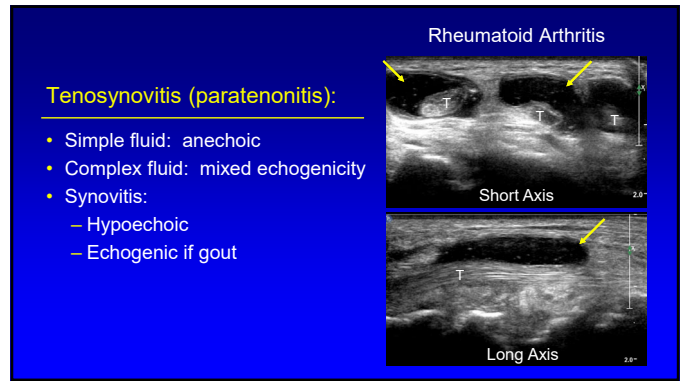
5<sup>th</sup> MT erosion: 69% sensitivity,  
85% specificity for RA

Zayat AS et al. Ann Rheum Dis 2015; 74:897

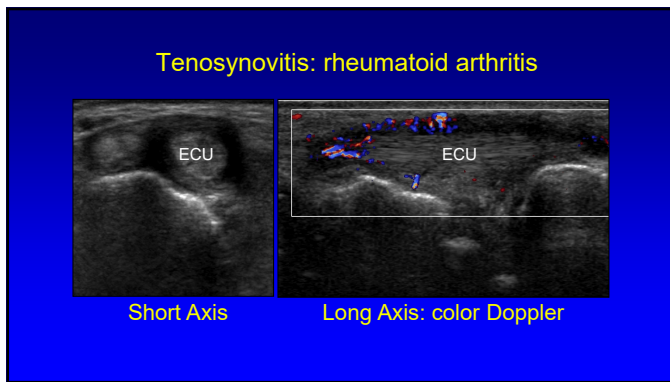
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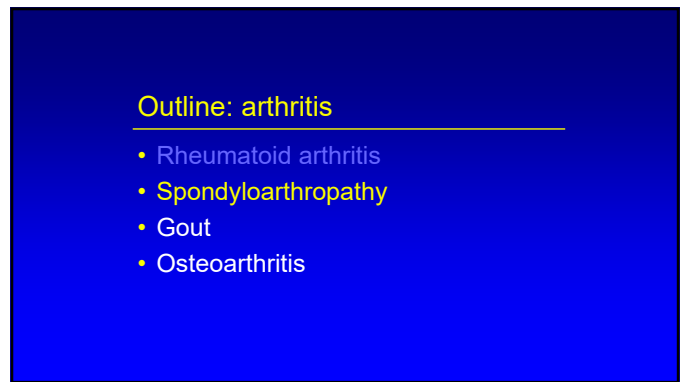
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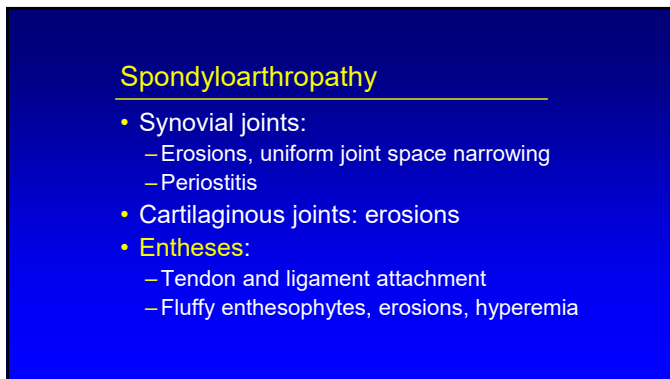
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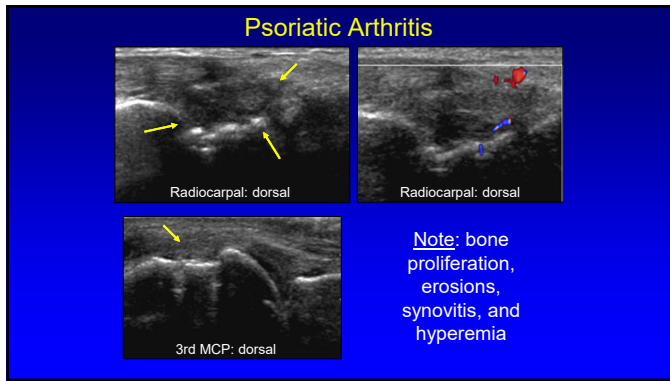
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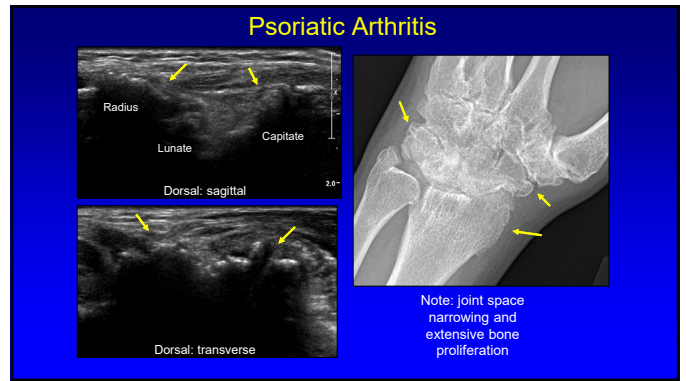
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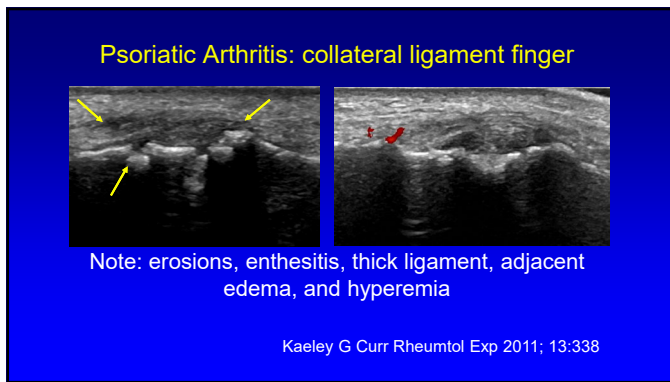
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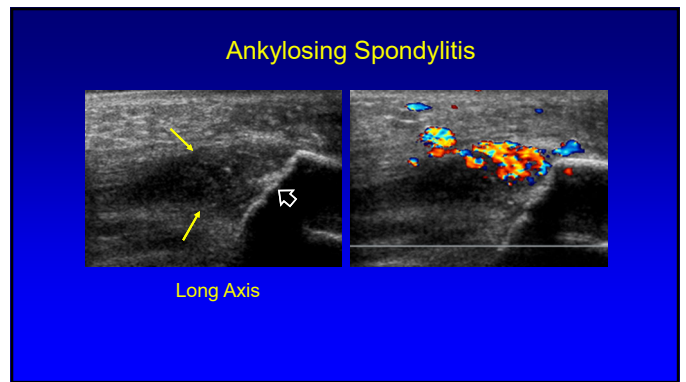
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### Outline: arthritis

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- Rheumatoid arthritis
- Spondyloarthropathy
- **Gout**
- Osteoarthritis

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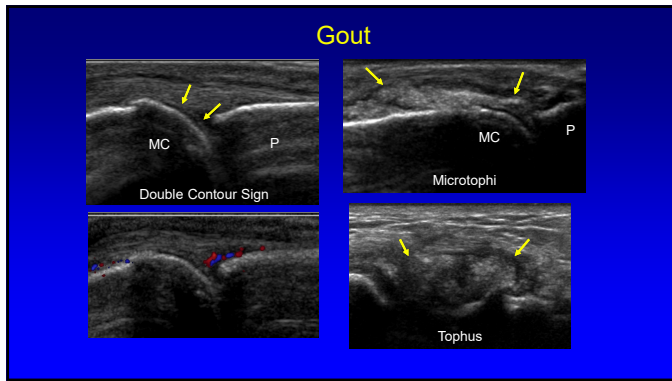
### Gout: *intra-articular*

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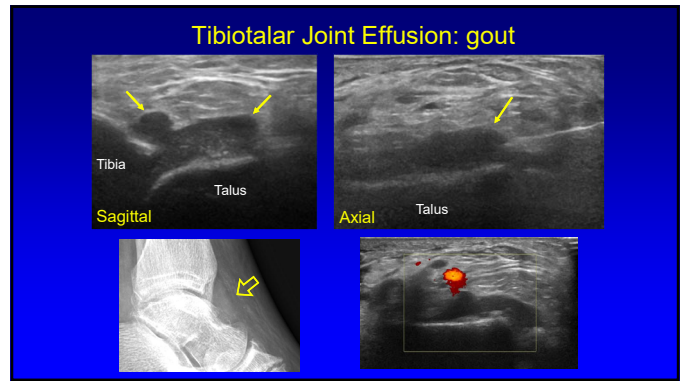
- Monosodium urate crystal deposition in joint
- Joint effusion<sup>1</sup>:
  - Microtophi
  - Cartilage icing: double contour sign (ultrasound)
- Synovitis
- Erosions
- Knee: common site<sup>2</sup>

<sup>1</sup>Thiele RG, Rheumatol Int 2010; 30:495  
<sup>2</sup>Miguel et al. Ann Rheum Dis 2012; 71:157

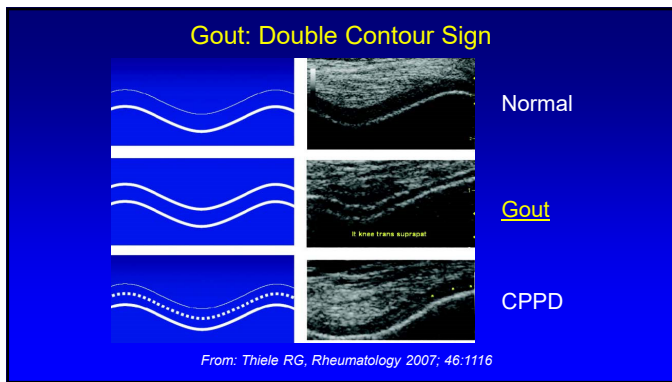
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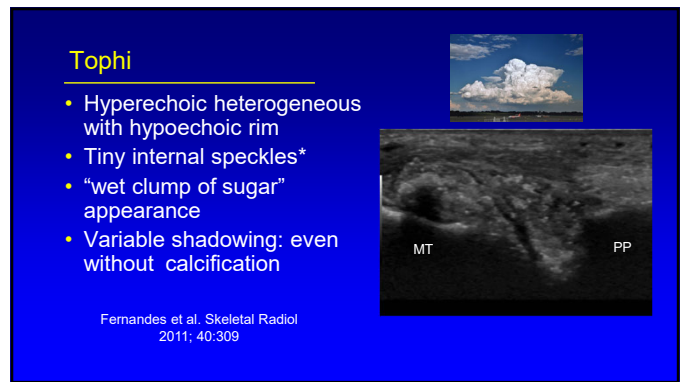
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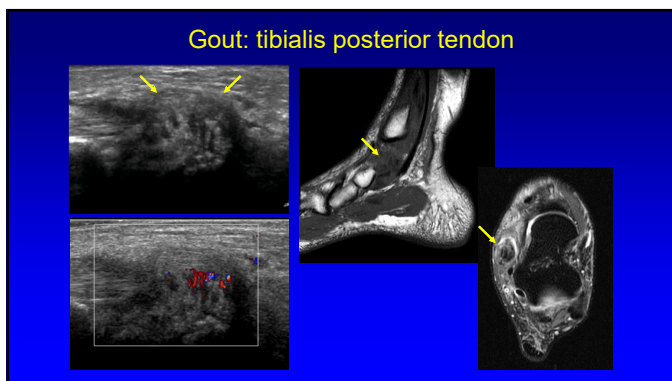
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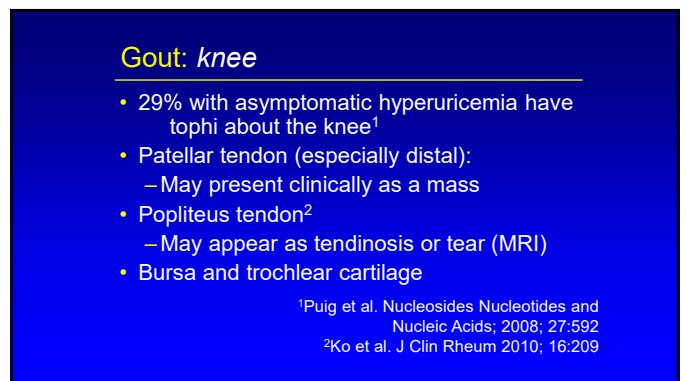
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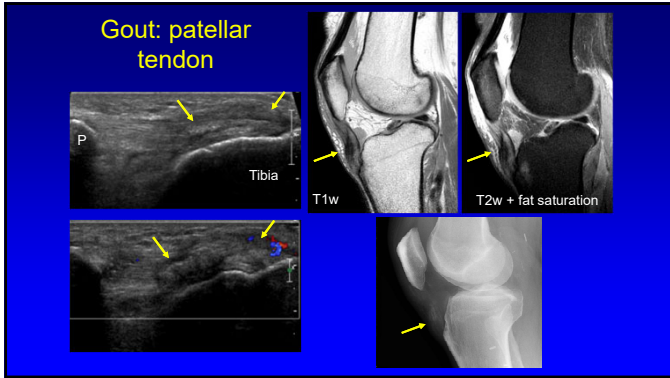
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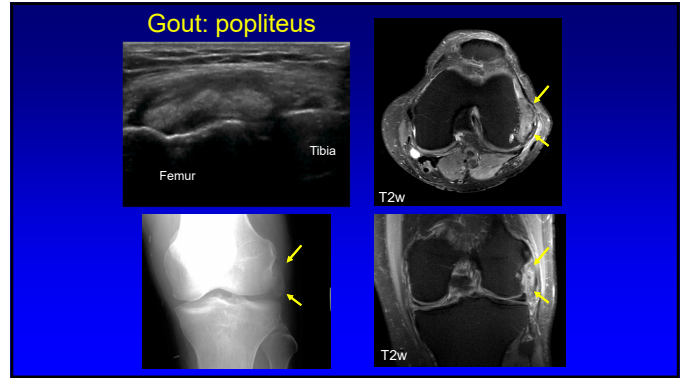
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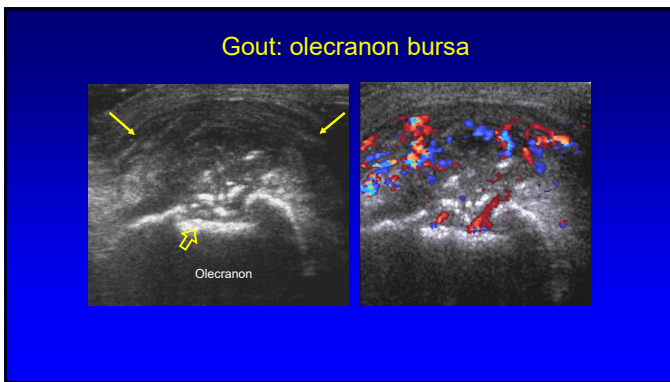
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**Outline: arthritis**

- Rheumatoid arthritis
- Spondyloarthropathy
- Gout
- **Osteoarthritis**

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**Osteoarthritis:**

- Hands:
  - Interphalangeal
  - 1<sup>st</sup> CMC joint
- Shoulder:
  - Acromioclavicular joint
- Later: knees and hips
- Feet: 1<sup>st</sup> MTP joint

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**Osteoarthritis: ultrasound**

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

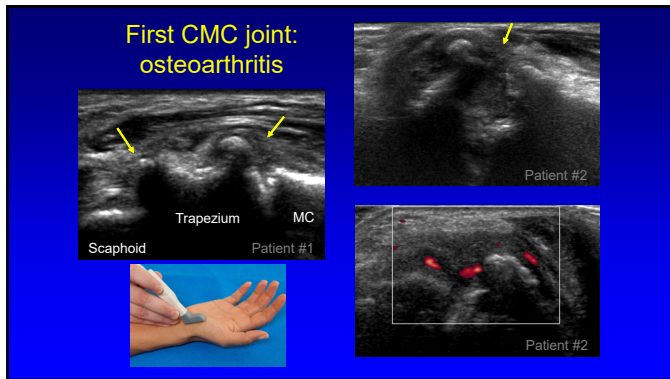
**First CMC Joint: Thumb**

First Metacarpal  
Proximal Phalanx

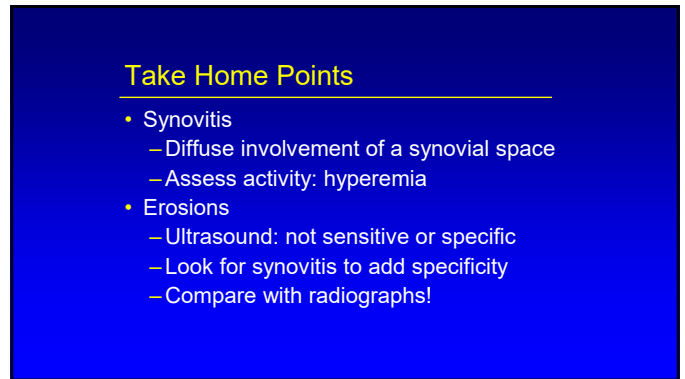
Sagittal Plane: dorsal  
Note: osteophytes (arrow) and intra-articular body (open arrow)

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

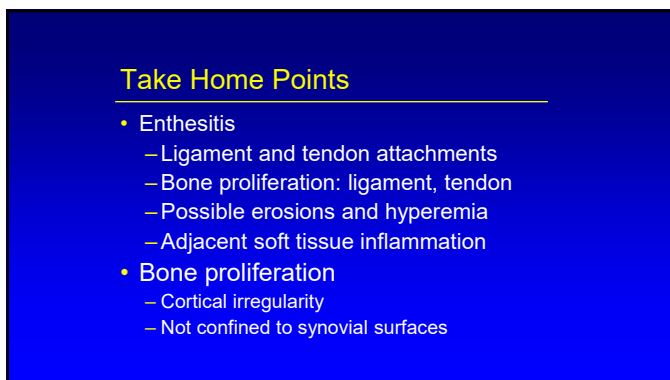
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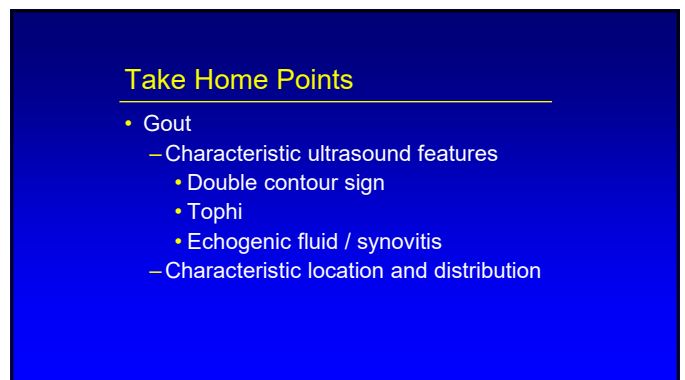
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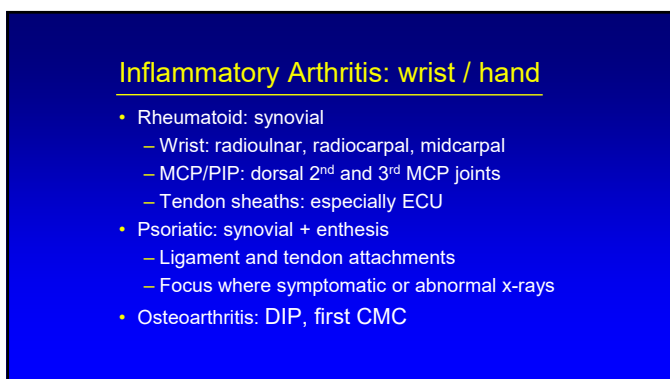
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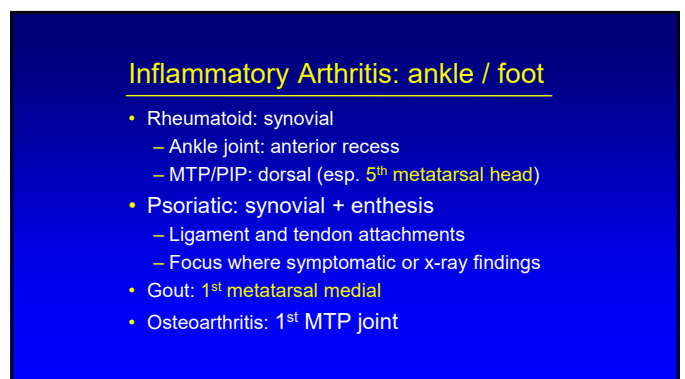
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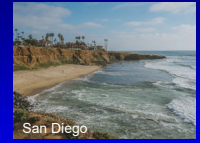


## Ultrasound: arthritis diagnosis

- To add specificity of ultrasound findings:
  - Correlate with history
  - Correlate with lab values
  - Review radiographs!
  - Look at distribution

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Thank you!



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[www.jacobsonmskus.com](http://www.jacobsonmskus.com)



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