

## Cartilage Icing and Chondrocalcinosis Differentiating Gout from CPPD

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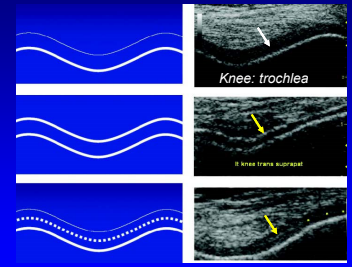


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## Introduction: double contour sign (US)

- Normal hyaline cartilage: hypoechoic
- Double contour sign:
  - Echogenic icing
  - Gout MSU crystals
  - Less likely CPPD crystal deposition
- Chondrocalcinosis:
  - CPPD crystal deposition disease



From: Thiele RG, Rheumatology 2007; 46:1116

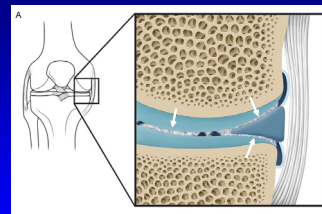
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## Introduction: knee radiographs

- Gout: monosodium urate crystals
  - Rarely calcify (only with renal disease): less dense
  - Crystals layer on hyaline cartilage: arthrogram effect
  - Characteristic tophi and erosion: popliteus
- CPPD crystal deposition disease:
  - Calcified: more dense
  - True chondrocalcinosis: menisci, hyaline cartilage
  - Calcifications: gastrocnemius tendon, synovium

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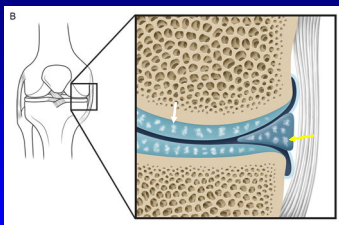
## Cartilage Icing: gout



\*Note subtle density and arthrogram effect coating the articular surfaces

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## Chondrocalcinosis: CPPD crystal deposition disease

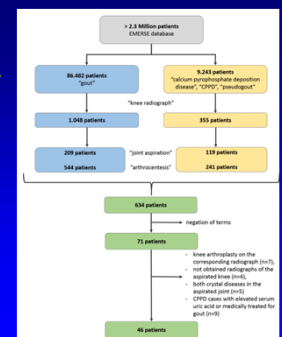


\*Note density from calcification and true deposition within fibrocartilage (yellow arrow) and hyaline cartilage (white arrow)

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## Materials and Methods

- Subject selection: see diagram
- 2 radiologists: consensus
- Evaluated AP and lateral knee radiographs for:
  - Cartilage icing
  - Chondrocalcinosis: meniscus and hyaline cartilage
  - Tophi
  - Gastrocnemius tendon calcification



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## Results

- 49 radiographic studies in 46 subjects
- 31 male, 15 female, mean age 66 years
- 39% (19/49) gout; 61% (30/49) CPPD
- Cartilage icing: both gout (32%) and CPPD (37%)
- Chondrocalcinosis: 50% of CPPD and 21% of gout
  - 79% PPV differentiating CPPD from gout
  - 100% PPV if hyaline cartilage
- Tophi: both gout and CPPD
- Gastrocnemius calcification: 89% PPV for CPPD

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## Calcium Pyrophosphate Dihydrate (CPPD): terminology

- Chondrocalcinosis: non-specific calcification of cartilage
  - If hyaline cartilage: CPPD is a primary consideration
- CPPD crystal deposition disease: documented crystals
- Pseudogout: clinical scenario of CPPD simulating gout
- Pyrophosphate arthropathy: characteristic joint findings
  - Chondrocalcinosis
  - Knee: gastrocnemius calcification, patellofemoral disease
  - Wrist: lunotriquetral and synovial calcification, radiocarpal disease

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## CPPD Crystal Deposition Disease

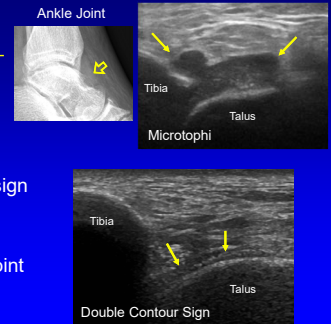


Chondrocalcinosis (menisci, hyaline), gastrocnemius and quadriceps calcification

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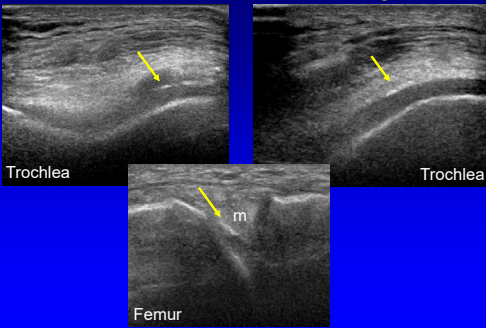
## Gout: crystal deposition

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



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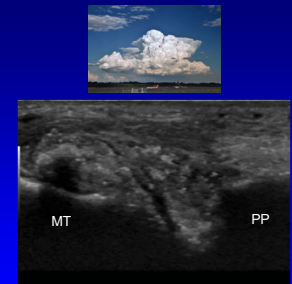
## Gout: Double Contour Sign



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## Tophi

- Hyperechoic cloud-like
- Tiny internal speckles\*
- Variable shadowing: even without calcification
- Associated with osseous erosion
  - Popliteus groove
  - 1<sup>st</sup> metatarsal head



Fernandes et al. Skeletal Radiol 2011; 40:309

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### Gout: knee

- 29% with asymptomatic hyperuricemia have tophi about the knee<sup>1</sup>
- Patellar tendon (especially distal):
  - May present clinically as a mass
- Popliteus tendon<sup>2</sup>
  - May appear as tendinosis or tear (MRI)
  - Most common tendon site for gout in knee<sup>3</sup>
- Bursa and trochlear cartilage

<sup>1</sup>Puig et al. Nucleosides Nucleotides and Nucleic Acids; 2008; 27:592  
<sup>2</sup>Ko et al. J Clin Rheum 2010; 16:209  
<sup>3</sup>Mallinson PI et al. Skeletal Radiol 2014; 43:277

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### Gout: patellar tendon

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### Gout: popliteus

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### Limitations

- Although joint aspiration was gold standard, selection biased introduced (likely more symptomatic)
- Often difficult to discern cartilage icing from chondrocalcinosis
- Reviewers did not take into account the density of the crystals
  - This should be corrected on follow-up study
- No pathology correlation for presumed tophi

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### Conclusions

- In subjects with joint aspiration-proven crystal disease of the knee, the radiographic finding of cartilage icing was identified in both CPPD and gout.
- In the diagnosis of CPPD versus gout, overall chondrocalcinosis, hyaline cartilage chondrocalcinosis, and gastrocnemius tendon calcification showed a positive predictive value of 79%, 100%, and 89%, respectively.

Falkowski A et al. PLOS One 2020

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### Thank you!

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