

# Snowstorm Appearance of Synovial Fluid on Musculoskeletal Ultrasound

CME Credits

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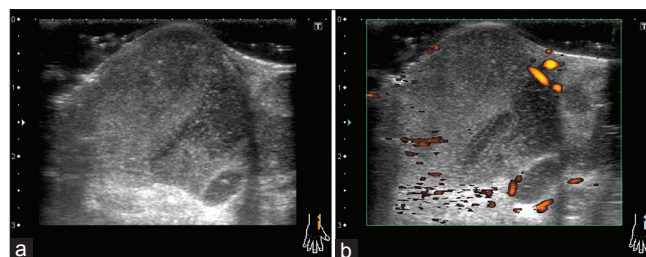
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Gout is a common type of inflammatory arthritis characterized by the deposition of monosodium urate monohydrate (MSU) in the synovial fluid and other tissues of the body.<sup>[1]</sup> A diagnosis of gout is based on a pattern of the bursa and joint involvement, characteristics of symptomatic episodes, typical time course, clinical evidence of tophus, high levels of serum urate, positive evidence from synovial fluid analysis, and evidence of urate deposition or gout-related joint damage based on imaging.<sup>[1]</sup> Among the possible imaging modalities, musculoskeletal ultrasound is a convenient, simple, efficient, affordable, noninvasive, and radiation-free method.<sup>[2]</sup>

The gold standard for the diagnosis of gout is the observation of MSU crystals in the nodule aspirate or synovial fluid. Based on musculoskeletal ultrasound observations, MSU crystal deposition presents as hyperechoic spots.<sup>[3]</sup> When MSU crystals are observed in the synovial fluid, a characteristic musculoskeletal ultrasound appearance of multiple hyperechoic foci floating within the joint cavity is described as a “snowstorm appearance.”

Case 1 was a 51-year-old man with a history of hyperuricemia and gouty arthritis who presented with acute arthritis of the right wrist. Figure 1 displays ultrasound images of the right wrist joint. Marked synovitis of the wrist joint accompanied by massive effusion [Figure 1a] and increased power Doppler signals [Figure 1b] was observed. The hyperechoic foci floating within the joint produced a “snowstorm appearance,” suggestive of gouty arthritis. The arthrocentesis revealed a thick white chalky fluid [Figure 2], and MSU crystals were identified using compensated polarized light microscopy. The characteristic symptoms, ultrasound images, and synovial fluid analysis confirmed the diagnosis of gout in the patient.

The characteristic “snowstorm appearance” is typical for gouty arthritis; however, it is not exclusive.<sup>[4]</sup> Case 2 was a 51-year-old woman without a history of hyperuricemia who suffered from



**Figure 1:** The gray scale (a) and power Doppler (b) ultrasound images of the right wrist joint of Case 1 revealed active synovitis with a snowstorm appearance



**Figure 2:** The arthrocentesis revealed a thick white chalky fluid in Case 1

chronic synovitis of the fifth finger of the right hand that was progressive in the past few months. Ultrasound imaging revealed active synovitis and fluid accumulation in the right fifth metacarpophalangeal joint and around the extensor tendon accompanied by increased power Doppler signals [Figure 3a and b]. In addition, there were floating hyperechoic foci, resulting in a “snowstorm appearance.” Upon aspiration, turbid fluid was reported [Figure 4], which looked like pus. A *Mycobacterium marinum* infection was confirmed by polymerase chain reaction.

The ultrasound features of MSU crystal deposition, including a double contour sign, tophus, and the “snowstorm appearance,”

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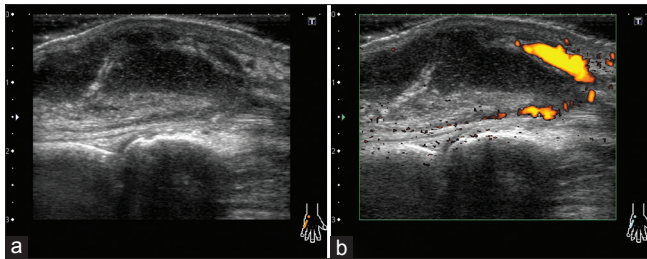
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**Figure 3:** The gray scale (a) and power Doppler (b) ultrasound images at the right fifth metacarpophalangeal joint of Case 2 revealed active synovitis and fluid accumulation with a snowstorm appearance

can provide evidence for establishing a diagnosis in patients who conceivably may have gout.<sup>[3]</sup> During ultrasound examination for the differential diagnosis of gouty arthritis, the observation of additional ultrasound features of gout indicates higher specificity in the diagnosis.<sup>[5]</sup> In addition to the imaging analysis, the pattern and characteristics of symptomatic episodes can provide important information.<sup>[1]</sup> If there is diagnostic uncertainty, ultrasound-guided synovial fluid aspiration can help to obtain the joint fluid that can be accurately analyzed, thus contributing to a definite diagnosis.

#### Ethical approval

The study was approved by the Institutional Review Board and Ethical Committee of National Taiwan University Hospital (201701077RINA).

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Nil.



**Figure 4:** Pus-like fluid is presented in Case 2

#### Conflicts of interest

There are no conflicts of interest.

#### REFERENCES

1. Neogi T, Jansen TL, Dalbeth N, Fransen J, Schumacher HR, Berendsen D, *et al.* 2015 gout classification criteria: An American College of Rheumatology/European League against Rheumatism collaborative initiative. *Arthritis Rheumatol* 2015;67:2557-68.
2. Filippucci E, Di Geso L, Grassi W. Tips and tricks to recognize microcrystalline arthritis. *Rheumatology (Oxford)* 2012;51 Suppl 7:vii18-21.
3. Fodor D, Nestorova R, Vlad V, Micu M. The place of musculoskeletal ultrasonography in gout diagnosis. *Med Ultrason* 2014;16:336-44.
4. Lamers-Karnebeek FB, Van Riel PL, Jansen TL. Additive value for ultrasonographic signal in a screening algorithm for patients presenting with acute mono-/oligoarthritis in whom gout is suspected. *Clin Rheumatol* 2014;33:555-9.
5. Ogdie A, Taylor WJ, Neogi T, Fransen J, Jansen TL, Schumacher HR, *et al.* Performance of ultrasound in the diagnosis of gout in a multicenter study: Comparison with monosodium urate monohydrate crystal analysis as the gold standard. *Arthritis Rheumatol* 2017;69:429-38.