A 52-year-old man presented with knee pain of 1 month’s duration following a twisting injury. Recently, the pain intensified while golfing, at which time he noticed a nontender suprapatellar mass. Radiographs and magnetic resonance imaging were obtained (Figure 1).

Your diagnosis?

Figure 1: Lateral radiograph (A) and sagittal T2-weighted MRI (B).
DIAGNOSIS: Gouty tophus involving the distal quadriceps tendon.

CASE REPORT

On initial physical examination, a nontender suprapatellar mass was palpated and signs of a lateral meniscal tear were elicited. Medical history was significant for obesity, type II diabetes, hypertension, and hyperlipidemia.

Radiographs and magnetic resonance imaging (MRI) demonstrated a lobulated soft-tissue mass partially splitting the quadriceps tendon and causing extrinsic erosion of the patella (Figures 1 and 2). The mass demonstrated low T1-signal and intermediate T2-signal with heterogeneous lobular enhancement after administration of gadolinium.

Computed tomography (CT) at CT-guided needle biopsy revealed intermediate increased density (160 HU, less than calcium) within the mass (Figure 2). The needle biopsy specimen was consistent with gouty tophus and ruled out neoplasm. The tophus was subsequently excised and the tendon repaired. No intra-articular evidence of gout was found during arthroscopic repair of the symptomatic lateral meniscal tear. No additional joint or soft-tissue findings of gout were found on physical examination. Subsequently, the serum uric acid level was elevated and on further questioning, the patient recalled a previous gouty attack involving the foot.

Gout has been termed “the great mimic” for its ability to resemble multiple conditions. In atypical presentations such as this, imaging plays an important role in providing clues pointing to the diagnosis of gout and guidance for accurate needle biopsy to make the diagnosis.

ETIOLOGY

Gout, a relatively common rheumatologic condition, accounts for 5% of all patients with arthritis. Predominantly a male disorder, it occurs 20 times more frequently in males than females. When it presents in females, it occurs in postmenopausal women. Ninety percent of gout cases are classified as primary and result from a purine metabolism disorder leading to increased production or impaired renal excretion of uric acid. However, a specific enzyme defect is found in only 1% of primary gout cases. Ten percent of gout cases are secondary to a variety of diseases and medications and occur...
with greater frequency in association with obesity, diabetes mellitus, hypertension, and hyperlipidemia, as in this case. It has also been associated with myeloproliferative disorders and renal disease, alcohol consumption, hypothyroidism, and pregnancy. Gout can be related to lead intoxication such as that due to ingestion of “moonshine” alcohol (saturnine gout) and may be precipitated by acute illness. It is rarely seen in patients with rheumatoid arthritis, systemic lupus erythematosus, or ankylosing spondylitis.3 Gout also may occur secondary to medications. Diuretics, especially thiazides, are commonly used drugs known to cause hyperuricemia due to reduced renal clearance of urate. Likewise, cyclosporine, commonly used in transplant patients, and intra- venous heparin have been associated with gout.3 In this case, the patient was not taking medication predisposing to gout.

The biochemical hallmark of gout is hyperuricemia, which is present in 90% of patients with clinical gout.2 The diagnosis of gout is established by identification of monosodium urate crystals in synovial fluid or tophi. Under polarized light microscopy, urate crystals have characteristic strong negative birefringence, whereas calcium pyrophosphate crystals seen in calcium pyrophosphate deposition disease have weakly positive birefringence. Urate crystals can be identified in 85% of patients with acute gout attacks. Several phases may occur in the clinical evolution of gout.3 Asymptomatic hyperuricemia occurs in up to 18% of the population and represents the asymptomatic phase. Twenty percent of these cases develop acute gouty arthritis or uric acid renal calculi, marking the end of the asymptomatic phase.

Passage into the acute phase of gouty arthritis is heralded by intense inflammation elicited by the urate crystals in synovial fluid of joints or bursae and can mimic septic arthritis, tenosynovitis, or cellulitis. Acute gout classically presents as a monoarthritis (70%) and most commonly involves the first metatarsophalangeal joint. The asymptomatic period between acute attacks is known as interval, or intercritical, gout. In most (75%-80%) patients, a second acute gout attack develops within 2 years although some patients never experience a second acute attack.

Chronic gout is accompanied by deforming oligo- and polyarticular arthritis that can mimic rheumatoid arthritis. Fifteen percent of patients develop tophi, which are typically non-tender, irregular, hard masses that commonly affect synovium and subchondral bone and the ear helix. A tophus occurring in the subcutaneous or peri- tendinous tissues of the elbow, hand, foot, knee (as in this case) and forearm, can mimic sarcoma. Pathologically, tophi consist of large urate crystal aggregations surrounded by chronic inflammatory reaction, including foreign body giant cells.4 The dense, thin, shiny skin overlying the tophus may ulcerate with extrusion of white pasty material containing urate crystals.

**IMAGING**

Imaging of any soft-tissue mass should begin with radiographs to evaluate the underlying bone for protrubance, destruction, or reactive change. The soft tissues should be closely examined for any telltale signs within the mass itself. In tophaceous gout, radiographs typically show nonspecific swelling and increased soft-tissue density at the tophus. The erosion of the superior patella in this case is somewhat unusual in location but consistent with the final diagnosis of gouty tophus.

In general, the radiographic hallmarks of chronic gout reflect the target sites of urate crystal deposition in tissues with poor blood supply such as cartilage, tendon sheaths, bursae, and juxta-articular tissues.1 These hallmarks include tophi, juxta-articular erosions with sclerotic borders and overhanging cortical margins, joint space preservation (in the absence of cartilage deposition), and normal bone mineralization (in the absence of intraosseous deposition). These radiographic findings typically occur in an asymmetric polyarticular distribution and affect the feet (especially the first metatarsophalangeal joints), ankles, knees, hands, and elbow, in decreasing order of frequency. The spine may also be involved. Intraosseous deposition of urate crystals may result in sclerosis and tophi may develop calcification, especially in renal failure.

Ultrasound can be used to evaluate superficial tissues and has been successfully used to evaluate the quadriceps tendon.3 However, ultrasound is operator-dependent and image evaluation can be difficult without the benefit of real-time examination. Confusing artifactual hypoechoic regions can occur if care is not taken during scanning and the role of ultrasound in evaluation of masses usually is limited. However, ultrasound can directly visualize adjacent vessels and exclude aneurysms when a pulsatile mass is palpable. It can be helpful for image-guided biopsy by providing direct real-time visualization of the needle, mass, and adjacent vessels during the procedure. Magnetic resonance imaging is unparalleled in its ability to discriminate various soft tissues, bones, and neurovascular structures and is widely recognized as the cross-sectional imaging modality of choice for evaluation of bone and soft-tissue masses. In general, soft-tissue masses demonstrate nonspecific low T1-signal and high T2-signal on MRI. However, the appearance can be more specific in fat, hemorrhage, calcification, dense fibrosis, and vascular spaces, which can provide important signs to narrow the differential diagnosis.

The MRI appearance of tophaceous gout is not specific, but important clues suggest gout. On unenhanced T1-weighted imaging, tophi typically demonstrate nonspecific low signal and
are isointense with muscle. The reported appearance on T2-weighted imaging has varied from low to high signal, but heterogeneous low to intermediate signal T2-signal has been reported most commonly. Therefore, gout should be considered when a soft-tissue mass demonstrates low to intermediate T2-signal, especially when the mass erodes adjacent bone, as in this case.

Soft-tissue amyloid deposition may also show low T1- and low T2-signal and differentiation must be made in view of the clinical setting and histology, if needed. The radiographic and MRI findings could also represent unusual neoplasm, such as synovial sarcoma or clear-cell sarcoma (malignant melanoma of soft parts). The location in this case would raise the possibility of post-traumatic pseudotumor. However, the telltale high T1-signal due to methemoglobin is absent, as illustrated.

On CT, tophi are masses with paste-like intermediate increased density (160 HU), which is greater than soft tissue and less than calcification. Gerster et al demonstrated the presence of urate crystals and the absence of calcium pyrophosphate deposition disease crystals or calcium containing compounds in tissue from tophi with this CT appearance. Urate stones in the urinary tract are similarly radiolucent on radiographs and intermediate increased density on CT due to the greater ability of CT to discriminate tissue densities. In this case, CT demonstrates this characteristic appearance as well as provides the guidance for biopsy, which yielded the histologic diagnosis.

SUMMARY

This case depicts an unusual presentation of gout, which could be mistaken for sarcoma. The radiographic and MRI findings suggest gout whereas the CT appearance is most specific. Therefore, CT should be considered when MRI demonstrates low to intermediate T2 signal in a heterogeneously enhancing soft-tissue mass around a joint, tendon, or bursa, especially when radiographs show adjacent erosion with a sclerotic margin. Gouty tophus is not excluded by a normal serum uric acid level. Computed tomography or ultrasound can be used to guide needle biopsy to provide diagnostic tissue.

REFERENCES


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