Numerous articles in well controlled studies have shown the value of magnetic resonance imaging in the evaluation of osteomyelitis, in particular, in the diabetic foot. Magnetic resonance imaging findings of two cases of rheumatologic conditions that mimic osteomyelitis are reviewed. One patient had clinical findings equivocal for osteomyelitis, and the other patient had a new onset of symptoms that were suggestive of osteomyelitis and had no previous history of any rheumatologic or arthritic condition.

**Case 1**

A 45-year-old female with a 7-year history of rheumatoid arthritis and history of positive purified protein derivative of tuberculin presented with diffuse soft tissue swelling overlying the left ankle. The patient had not had documented pulmonary tuberculosis. The patient’s soft tissue swelling had been present for approximately 4 months. With weightbearing, she began to experience more discomfort. The patient had been on prednisone to control her rheumatoid arthritis.

On physical examination, there was a notable soft tissue mass on the plantar and medial aspect of the foot. It was firm and rubbery on palpation and there was mild erythema in this region. Plain film radiographs showed soft tissue density along the plantar and medial aspect of the foot. Degenerative changes of the talonavicular joints and cuneiform joints were present on plain film radiographs.

The patient also had a previous history of bunion surgery. The magnetic resonance examination showed edema in the soft tissue and irregular areas of bony involvement within the lateral talus and calcaneus (Fig. 1). The soft tissue nodule and the talus and calcaneus showed irregular areas of low signal intensity on T1-weighted images and irregular mottled areas of hyperintensity on the T2-weighted images.

Without knowledge of her clinical history, osteomyelitis was initially suspected. However, after the patient’s long history of rheumatoid arthritis and the presence of a firm, rubbery soft tissue nodules were revealed, a presumptive diagnosis of rheumatoid pannus was also suggested. The results of the open biopsy confirmed a large rheumatoid nodule with chronic synovitis and pannus formation. Acid-fast and fungal stains were negative.

**Case 2**

A 58-year-old male with a history of human immunodeficiency virus (HIV) over the last 5 years presented with a complaint of progressive foot and ankle pain on the lateral aspect of the left foot that prevented him from weightbearing. He had a previous history of a fracture of the base of the fifth metatarsal. The patient had night sweats and fevers prior to admission. On physical examination, his left foot, along the fifth metatarsocuboid joint, was swollen, warm, erythematous, and tender. This area extended for approximately 4 cm. The patient’s complete blood work was performed which included a white blood cell count of 6.3 thousand, a sedimentation rate of 57 mm/hr (modified Westergren test), and an elevated uric acid of 10.3 mg/dl.

Plain film radiographs showed a nonunion fracture of the base of the fifth metatarsal with pseudoarthrosis and additional soft tissue swelling lateral to the fracture site.
The bone scan showed increased flow and pool in the region of the base of the fifth metatarsal. Magnetic resonance imaging showed irregular inflammatory changes at the site of the nonunion fracture of the base of the fifth metatarsal. In addition, a well defined nodular area of hyperintensity was noted on T2-weighted magnetic resonance images within the soft tissues. Well defined erosions into the cortex of the fifth metatarsal, but without evidence of intrinsic inflammatory changes within the bone, were present (Fig. 2).

In light of the previous patient in Case 1, an alternative diagnosis in addition to osteomyelitis was suggested. Clinical correlation with the managing podiatric medical team revealed that there was an elevated uric acid level. Presumptive diagnosis of gout was also entertained and the results of the needle biopsy of this fluctuant area revealed tophaceous gout. The patient was placed on allopurinol and colchicine.

Discussion

Numerous recent studies have shown the high sensitivity, specificity, and accuracy of magnetic resonance in the evaluation of osteomyelitis. However, no imaging test is 100% sensitive or specific. Direct consultation between the managing clinical team and the radiologist can improve clinical interpretation and avoid unnecessary intravenous antibiotic coverage or surgical intervention.

These two cases illustrate the importance of clinical, radiologic, and pathologic correlation in facilitating the early identification of a rheumatologic process mimicking osteomyelitis. In the second case, the diagnosis of gout was unknown prior to the patient’s presentation. The presence of well defined erosions on the magnetic resonance images, a feature not usually seen with typical bacterial osteomyelitis, prompted consideration of a possible alternative diagnosis, tophaceous gout.

Although gout is typically noted along the first metatarsophalangeal joint and occasionally in the hand, other joints can be affected. Furthermore, gout is an uncommon cause of other unusual conditions including tenosynovitis around orthopedic plates, within the carpal tunnel causing carpal tunnel syndrome, within the bursa causing gouty bursitis, and can cause tendon rupture.

What is less well recognized is the deposition of gout along fracture sites. Although a normal uric acid does not exclude gout, a high normal or elevated uric acid level should heighten the suspicion of gout causing any of the above conditions. During biopsy of any soft tissue lesions related to the conditions listed above, a microscopic evaluation with polarized light microscopy should be performed.

Rheumatologic pannus within the calcaneus and talus is an unusual manifestation of rheumatoid arthritis. Previous reports have noted that cystic bone lesions could be intraosseous rheumatoid nodules and rheumatoid nodules have been reported in the vertebrae in patients with rheumatoid
These intraosseous rheumatoid nodules appear to be different from the intraosseous, large cystic lesions adjacent to joints of rheumatoid arthritis. Large rheumatoid-related juxta-articular cysts are thought to be caused by an increased intra-articular pressure described in patients with strenuous physical activity, “robust rheumatoid arthritis.” The cause of intraosseous rheumatoid pannus away from the joint spaces or in the vertebrae is not known. Both of the patients were at risk for development of infection. In Case 1, the patient was on prednisone and in Case 2, the patient had HIV.

The typical magnetic resonance findings of infection are irregular areas of low signal intensity on T1-weighted images and progressive hyperintensity on T2-weighted images. Typically, there are surrounding edema and inflammatory changes in the soft tissues adjacent to the areas of osteomyelitis. This results in a feathery, hyperintense appearance on T2-weighted images around the bony abnormalities. Frequently, a penetrating ulcer or

Figure 2A. Anteroposterior radiograph showing a nonunion fracture with bony exostosis adjacent to the fracture site.

Figure 2B. Lateral coned down plain film radiograph shows no obvious changes of osteomyelitis. The exostosis and nonunion fracture are still evident and no central erosions are present.

Figure 2C. Technetium-99m-methylene diphosphonate nuclear medicine bone scan shows increased uptake at the site of the base of the fifth metatarsal. The uptake is greater than would be expected for an old nonunion injury.

Figure 2D. Sagittal T1-weighted images (TR=600, TE=20) show inflammatory changes extending to the subcutaneous tissues and well defined erosions (curved arrows) involving the cuboid and proximal base of the fifth metatarsal. The nonunion fracture line is still evident (straight arrow).
other soft tissue abscess may be present. The sensitivity of the magnetic resonance will be increased when fat suppression or short tau inversion recovery images are used. For evaluation of adjacent soft tissue abscess, fat suppressed post-gadolinium enhanced images will greatly increase sensitivity of detection of this. However, gadolinium enhancement will also be seen with rheumatoid arthritis and gout.

While the magnetic resonance findings of osteomyelitis are strongly suggestive, other features may mimic this pattern. In the two cases of rheumatologic conditions, interosseous rheumatoid pan-nus and tophaceous gout mimic the appearance of osteomyelitis. Neoplasms and fractures may be associated with localized edema and inflammation. However, neoplasms, whether soft tissue or bone neoplasms, typically show well defined masses. Though they are typically hypointense on T1-weighted images and hyperintense to subcutaneous fat on T2-weighted images, they are not usually associated with significant edema.

Furthermore, the margins of these lesions, unlike infection, tend to be relatively well defined. Charcot’s joint and stress fractures give a feathery appearance of edema on magnetic resonance. Typically, fractures show linear patterns of the fracture site. These fracture lines are not seen with osteomyelitis or neoplasms. Acute Charcot’s bony changes can be associated with significant edema; this is the hardest condition to distinguish from osteomyelitis.

**Summary**

The authors highlight the importance of close clinical and radiologic correlation in patients with either known rheumatologic conditions or with increased risk factors for rheumatoid arthritides. Some rheumatoid conditions may mimic osteomyelitis.

**Acknowledgment.** Nancy Carnes.

**References**