Recurrent Knee Pain in a Young Athlete

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A 22-year-old male collegiate basketball player with a history of right knee pain presents with pain and swelling of his right knee. Physical exam reveals local swelling and tenderness over the right proximal tibial-fibular joint.

Figure 1: Frontal radiograph of the knee, which demonstrates a 2.2 x 1.7 cm rounded calcific density (black arrow) overlying the right tibiofibular joint.

Figure 2: A lateral radiograph of the knee, which demonstrates the density (black arrow) and confirms its location within the tibiofibular joint.
Figure 3: Oblique radiograph of the knee. In this figure, the tibiofibular joint space is better demonstrated. The rounded density is again identified (black arrow). Also note degenerative osteophytosis of the superior aspect of the fibular head (white arrow).

Figure 4: A coronal proton density MR with fat suppression obtained at the level of the posterior tibia and fibular head demonstrates a mixed intensity lesion (black arrow) within the tibiofibular joint adjacent to the synovium. Signal characteristics confirm that this is an ossification and not simply a calcification. A linear area of hyperintensity within the joint space represents a small joint effusion (white arrow). Also noted is high signal intensity within the fibular head (white arrowhead) indicative of edema, consistent with a bone bruise. This patient also had a sprain of the tibialis posterior tendon, not shown.
Figure 5: A coronal proton density MR with fat suppression image. It was obtained more anteriorly than Figure 4. It demonstrates an abnormal high signal along the lateral aspect of the proximal tibia (black arrow) and medial femoral condyle (white arrow), again consistent with edema due to bone bruise.

RADIOLOGIC DIAGNOSIS: This is a case of osteochondromatosis of the proximal tibiofibular joint with associated bone bruise and degenerative osteoarthrosis.

DISCUSSION

Synovial osteochondromatosis is an uncommon condition caused by synovial metaplasia that generates multiple calcified periarticular bodies. The lesion commonly presents as monoarticular joint pain and swelling in patients who relate a history of several years of such symptoms. It presents more commonly in males than females by a factor of between two and four. While individuals of any age can be affected, it is most often diagnosed in persons aged 20 to 50 years. Current medical therapy is centered around non-steroidal anti-inflammatory drugs, while surgical treatment consists primarily of arthroscopic examination and excision of loose bodies from the joint space with limited synovectomy of the affected synovium. Important differential diagnostic considerations of synovial osteochondromatosis in the knee include pigmented villonodular synovitis, osteoarthritis, chondrosarcoma, osteochondroma, osteochondritis dissecans, and fracture with an avulsed fragment.1,2

Synovial osteochondromatosis is a benign intrasynovial process caused by nodular proliferation of the synovial membrane. Fragments can break off of the synovial surface within the joint. These bodies can grow, calcify, and ossify within the periarticular synovial fluid. The condition can occur in a primary or secondary form, but the etiologies are not specifically known. The primary form occurs as ectopic cartilage within synovial fluid without identifiable joint pathology. A secondary form can develop in a setting of preexisting joint pathology, including osteoarthritis, rheumatoid arthritis, osteochondritis dissecans, neuropathic osteoarthropathy, osteonecrosis, or fracture. Etiology of the second form is based on fragment production by the underlying disease process.2

With the primary etiology, the knee is the joint that is most often affected, comprising 60%-70% of cases. Other sites that can commonly be affected include the shoulder, the elbow, and the hip. The process appears to occur in three phases: initial active intrasynovial disease without loose bodies, a transitional phase with osteochondral nodules on the synovial membrane and free bodies in the cavity, and finally a quiescent disease state with multiple free intrasynovial osteochondral bodies.3 Transformation to malignancy is rare. Cases have been reported of coexisting chondrosarcoma, but a causal relationship has not been established. Osteochondromatosis does appear to have a predilection for knees with a history of repeat minor trauma and/or degenerative joint disease. Whether trauma or degenerative disease contribute to the proliferation of synovial nodule or to their fragmentation is not known.4

Patients with synovial osteochondromatosis often complain of chronic, progressive, monoarticular pain, and swelling exacerbated by physical activity. Mechanical symptoms can also present, including limited range of motion, grating, and joint locking. Medical therapy with non-steroidal, anti-inflammatory drugs can provide some relief, depending on the degree of nodule proliferation, size and characteristics of the free bodies, and the physical stress placed upon the joint. Surgical excision of free bodies within the joint space is also an appropriate intervention, with partial or total synovectomy depending on the degree of recurrence.3

The classic radiographic appearance of synovial osteochondromatosis is multiple, spheroid, calcified masses within the joint cavity. The bodies tend to have a “popcorn ball” appearance characteristic of calcified cartilage. Joint effusion and degenerative changes are frequently noted as well. Serial imaging studies may reveal changes in numbers and sizes of masses, as some of the calcified bodies grow and other are reabsorbed into the synovial membrane. Lack of calcification or ossification of free bodies renders them relatively lucent, with opacity similar to water. It is worth noting that the dynamic nature of the fragmented nodules can lead to normal findings in a patient with osteochon-
dromatosis. Computed tomography (CT) scanning also can only be used for identification of calcified loose bodies; it cannot provide visualization of unmineralized fragments.5,6

The best modality for visualizing synovial osteochondromatosis is magnetic resonance imaging (MRI). MRI imaging may be diagnostic, even when calcification is minimal or absent, because uncalcified bodies of cartilage appear characteristically lobulated. They also appear isointense or slightly stronger in intensity than muscle tissue on T1- and T2-weighted images. Signal intensity correlates with the quantity of calcium present in the nodule. The degree of composing cellular component compared to acellular hyaline matrix and the quantity of calcium present in the nodules correlates with the signal intensity. Gadolinium enhancement can also be added to increase the sensitivity of the scan and assist in identifying lesions. MRI may also reveal areas of high signal intensity consistent with synovial thickening and joint effusion. Plain radiographs are useful adjuncts to MRI when the presence of calcification is ambiguous. Still, further evaluation can be achieved via nuclear imaging; lesions induce increased radionuclide uptake on technetium-99m bone scans in affected areas.7-9

REFERENCES


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