Osteoid Osteoma in a 20-Year-Old Soccer Player

To the Editor:

Henry Jaffe first described osteoid osteoma in 1935 as a benign osteoblastic tumor with a central core of vascular osteoid tissue and a peripheral zone of normal sclerotic bone. Radiographically, the lesion appears as a round-to-oval, radiolucent nidus usually less than 1 cm in diameter. Osteoid osteoma is typically located in the diaphysis of long bones and may extend into the metaphysis. Histologically, increased osteoblastic cells actively produce woven bone, and a loosely arranged fibrous stroma is present. The peripheral sclerotic zone consists of dense reactive bone with many interconnecting bony trabeculae.

The tumor is found most often in the femur, followed by the tibia, which together account for more than 50% of all cases. Other long tubular bones, including those of the hand and foot, account for 20% of all cases. From 2% to 10% of cases occur in the feet. The talus is most often affected, and any of the tarsal bones (1% to 3%), metatarsals (0.5% to 1.0%), or phalanges (2% to 4.8%) can be involved. The lesion is most frequently observed in patients between the ages of 7 and 25, and it occurs twice as often in males as in females.

Pain is typically the initial indicator of this tumor. Pain tends to be worse at night and is frequently reduced with salicylate nonsteroidal anti-inflammatory drugs. Intense pain is related to vasodilation induced by an increased prostaglandin concentration within the nidus. Increased tension and edema resulting from the increased vascularity directly stimulate local afferent nerve fibers. Soft-tissue swelling and tenderness may be present in the area, and symptoms may last from weeks to years. After several years, the osteoid osteoma will spontaneously resolve as dense reactive bone replaces the nidus.

Because this is a benign tumor, immediate surgical resection is not necessary. Management with salicylate nonsteroidal anti-inflammatory drugs has been proven to reduce the clinical symptoms. If surgical intervention is necessitated by the inefficacy or intolerance of nonsteroidal anti-inflammatory drugs, resection of the entire nidus is required for the most favorable clinical response. Preoperative administration of tetracycline and the use of an ultraviolet lamp for fluorescence allow optimal visualization intraoperatively. This technique allows for verification of complete removal of the nidus. Removal may be performed by drilling, burring, or curettage, while percutaneous techniques may minimize the surgical resection and operative time.

Case Report

A 20-year-old male college soccer player presented to the office of the senior author (H.J.P.) with severe pain on the medial side of the right foot. There was point tenderness isolated in the first metatarsal–medial cuneiform area. The pain had a gradual onset with an increase in severity over the course of 5 months. The pain was aggravated by running and had progressed to the point where the patient was limping, necessitating the use of crutches. The patient's medical, surgical, and family history and review of systems were unremarkable. Conventional radiographs were obtained at the time of presentation and offered no evidence of fracture or osseous lesion. The patient was placed on sulindac, 200 mg twice daily, for pain and scheduled for a technetium-99m bone scan.

Bone scintigraphy revealed increased uptake at the right first metatarsal base and adjacent medial cuneiform, consistent with microfracture (Fig. 1). The patient was treated for a stress fracture, dispensed a CAM Walker (Zinco Industries, Inc, Pasadena, California), and instructed to continue taking the sulindac for pain. The patient was also referred for appropriate rehabilitative treatment.

Figure 1. Bone scan demonstrating increased uptake in the first metatarsal–medial cuneiform area of the right foot.
After attempting to return to preseason soccer training, the patient returned with unresolved pain in the medial side of his right foot 5 months later. The pain continued to be aggravated by ambulation. The patient was concerned about the persistence and progression of the pain and his ability to prepare for the approaching fall soccer season. The foot was again immobilized with a CAM Walker, and computed tomography (CT) and magnetic resonance imaging (MRI) were ordered to help pinpoint underlying soft-tissue or osseous pathology.

The CT scan revealed a lesion consistent with osteoid osteoma (Fig. 2). The lesion was located in the distal, dorsolateral aspect of the medial cuneiform and measured $6.0 \times 4.0$ mm. The lesion was described as sclerotic centrally with surrounding peripheral lucency. The MR image showed diffuse bone marrow edema in the right medial cuneiform (Fig. 3).

The patient was instructed to take aspirin, 325 mg three times daily with food. Clinical symptoms continued over the next 2 weeks, and the patient requested that the lesion be removed surgically. The lesion was removed by curettage and the patient was placed in a rigid below-the-knee cast and instructed to use crutches. The specimen was sent for pathologic evaluation and confirmed as osteoid osteoma tissue (Fig. 4).

**Discussion**

The clinical presentation of this patient could have indicated any of several osseous pathologic entities, including stress fracture, osteoid osteoma, Brodie’s abscess, and eosinophilic granuloma. Stress fracture was a reasonable diagnosis given the patient’s history and clinical and radiographic findings. The persistent pain and lack of clinical improvement with treatment led to further exploration of the cause of the symptoms.

In this situation, additional imaging studies should be ordered. However, bone scintigraphy further complicated the clinical picture and made accurate diagnosis more difficult. Both stress fracture and osteoid osteoma demonstrate increased uptake in the scan phase of the technetium-99m scan. Therefore, this test was not helpful in pinpointing the osseous pathology. Fine-cut CT should be performed when radiographs are negative for osseous pathology and ra-

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**Figure 2.** Computed tomographic scan showing a nidus in the dorsolateral aspect of the medial cuneiform (arrow).

**Figure 3.** Sagittal T2-weighted magnetic resonance image displaying diffuse bone marrow edema in the right medial cuneiform.

**Figure 4.** Low-power photomicrograph of the nidus shows fibrovascular tissue and numerous osteoblasts indicating osteoid osteoma (H&E).
dionucleotide scanning demonstrates increased uptake. Computed tomography should be performed not only for diagnostic purposes but also to localize the tumor accurately prior to surgical excision.5, 6

The clinical presentation of stress fracture is consistent, with patients reporting a gradual onset of pain over 2 to 3 weeks. The pain typically occurs during activity and subsides with rest.7 In this case, the patient presented with pain that had gradually worsened over a period of 5 months and was not relieved by rest.

Because up to 50% bone loss is necessary for the detection of stress fractures on radiographs, this diagnostic modality lacks sensitivity. Also, overlap of the tarsal bones in the midfoot on routine radiographs presents difficulty in diagnosis.8 Stress fractures in the epiphyseal region of bone or in areas of primarily cancellous bone, including the cuneiforms, appear radiographically as focal sclerosis. However, these findings usually are not present until 24 weeks after the onset of symptoms. Stress fractures in diaphyseal, cortical bone present with periosteal new bone formation and can be seen 2 weeks after the onset of symptoms. Because of the lack of radiographic evidence and the questionable clinical presentation of a midtarsal stress fracture, bone scintigraphy would be the gold standard for diagnosis. The bone scan of a stress fracture would reveal a localized, well-defined, sharply demarcated area of uptake. However, it may not be possible to differentiate infection or neoplasm from a stress fracture.8

In the case reported here, it is important to consider the anatomical location and likelihood of stress fracture formation. The tibia, femur, and metatarsals are the most frequent sites of stress fractures in the lower extremity. Incidence is related to the groups studied and the activity involved.8 Within the foot, the metatarsals are most commonly affected, followed by the calcaneus and navicular. In a study of 1,338 stress fractures in soldiers completing basic training, 53% occurred in the metatarsals, 27% in the calcaneus, and 1.3% in the navicular. No stress fractures were reported in any of the cuneiforms.10 Stress fractures of the cuneiforms are very rare.9 In another study of 250 US Marine Corps recruits with 839 scintigraphic abnormalities, six occurred in a cuneiform. Of those six, only two were confirmed radiographically as stress fractures.11

Given the lack of specificity of bone scanning and the unlikelihood of a stress fracture in the cuneiforms, CT should be performed for an accurate diagnosis of either osteoid osteoma or a stress fracture of a tarsal bone.8, 9 Computed tomographic scans offer the benefit of increased specificity of either pathology and more accurate localization of the osteoid osteoma or fracture when surgical intervention is necessary.5

Conclusion

Osteoid osteoma is an uncommon osseous pathology in the midtarsal region that presents difficulty in diagnosis because clinical features can be atypical and radiographic findings may not be characteristic. The atypical symptoms, low index of suspicion, and lack of diagnostic value of the initial plain film radiographs may lead to the misdiagnosis of osteoid osteoma as a stress fracture. The physician must be aware that pain in any of the three cuneiform bones is not likely to be the result of a stress fracture. Therefore, CT and MRI are essential for confirmation of suspected osseous pathology in the cuneiform region.

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References