Osteoid osteoma is a benign, osteoblastic, and painful tumoral lesion. It is most common in the first three decades of life and in males. Osteoid osteoma represents 11% of benign bone tumors and 2.5% to 5% of primary bone tumors. The lesion typically has a diameter of 1 to 2 cm and has a rich vascular structure. It is generally found in long bones, with the femur being the most common location. Osteoid osteoma occurs in the foot in 2% to 10% of cases. The most common location in the foot is the talar bone (4%). Osteoid osteoma occurs more frequently in the talar neck than in the talar body. In a series of cases of talar osteoid osteoma reported by Capanna et al, the body of the talus was involved in 5% of patients, with the talar neck being involved in all the others. Although the talus is the fourth most common bone involved in osteoid osteoma, diagnosis can be challenging because when the tumor is located in the talus, the clinical presentation differs from the classic symptoms of osteoid osteoma. Extra-articular osteoid osteomas typically produce night pain responding to salicylates, whereas intra-articular lesions lead to recurrent synovitis and cause symptoms similar to those of monoarthritis. The cortical type of osteoid osteoma is the most common, and the subperiosteal type, the least common. Five percent of osteoid osteomas are subperiosteal, located most often in the femoral neck and the foot. In the series of talar cases reported by Capanna et al, subperiosteal lesions accounted for 75% of cases and medullary lesions for 25%. The nidus is surrounded by reactive bone, which is stimulated by prostaglandins released by the lesion itself.

Osteoid osteoma has four typical diagnostic features: 1) a lesion diameter of approximately 1 cm, 2) a round or oval shape, 3) a homogeneous dense center, and 4) a 1- to 2-mm radiolucent peripheral zone. Because lesions in the foot are commonly cancellous, their radiologic features differ from those typically seen in osteoid osteoma at other locations, making the diagnosis more difficult. Although there are several treatment options, the main rule is complete removal of the lesion. We describe a patient with a subperiosteal osteoid osteoma in the talar neck adjacent to the ankle joint that was treated by means of arthroscopic complete excision.

Case Report

A 16-year-old boy presented to the department of orthopedics, Gaziosmanpasa University Hospital, Tokat,
Turkey, with pain, swelling, and stiffness in his right ankle. He had been experiencing intermittent pain and swelling of his right ankle for 1 year, and he sustained an injury 1 month before presentation as he forcefully plantarflexed his right ankle while riding a bicycle. Physical examination revealed diffuse swelling of the right ankle; pain during palpation, especially on the anterior aspect of the ankle; and a 20° loss of dorsiflexion compared with the left ankle attributable to diffuse swelling with synovitis. Movements at the subtalar joint were free. Standard radiographs showed irregular calcifications and sclerosis anterior to the talar neck (Fig. 1 A and B). Computed tomography (CT) showed expansion of the anterior cortex of the talar neck and a round, moderately dense lesion with clear margins (nidus) surrounded by a radiolucent zone and a sclerotic layer (Fig. 1 C and D). The diameter of the lesion was measured as 1 cm on the CT scan. The calcifications seen on the standard radiographs were found to be the expansion of the anterior cortex of the talar neck. Magnetic resonance imaging (MRI) also demonstrated classic findings of osteoid osteoma in the same location (Fig. 1 E and F). The diagnosis of subperiosteal osteoid osteoma at the talar neck was made with the help of CT and MRI. Because the lesion had a typical appearance on CT and MRI, we did not perform any other confirmatory tests, such as scintigraphy.

We performed ankle arthroscopy under spinal anesthesia. A noninvasive ankle distraction device and an arthroscopic pump (Arthrex Inc, Naples, Florida) were used during arthroscopy. As we placed the anterolateral portal, effusion from inside the ankle joint was noted. After the arthroscopic was introduced into the joint, diffuse synovitis, especially at the anterior aspect of the joint, was seen and removed with a motorized shaver through the anteromedial portal. Removal of the synovium cleared the view, demonstrating a yellowish, dome-shaped expansion at the talar neck (Fig. 2A). We cleaned the margins of this dome-shaped structure and removed the lid using an arthroscopic grasper, which revealed the lesion underneath. A free sclerotic bone (nidus) in the center and surrounding red-purple soft tissue were observed (Fig. 2B). During this process, the nidus moved into the medial gutter owing to the high-pressure pump flow. The nidus was removed from the medial gutter with the help of an arthroscopic grasper (Fig. 2C). The remaining soft tissue inside the lesion was removed with the shaver. Surrounding reactive bone walls of the lesion were partially removed with the help of a bur, and the tumor was completely removed (Fig. 2D). We also used fluoroscopy intraoperatively to ensure that the tumor was completely eradicated. The removed nidus and dome-shaped expanded anterior cortex are shown in Figure 3. No grafting was needed after removal of the tumor. Histologic analysis of the material demonstrated typical findings of osteoid osteoma (Fig. 4). The symptoms disappeared immediately after surgery, and active and passive ankle exercises were started. Partial weightbearing was started at week 2 and full weightbearing at week 4. No recurrence of the lesion was seen on standard radiographs and CT scans at 1-year follow-up (Fig. 5). Clinical evaluation 15 months after surgery revealed no symptoms, and there was full range of motion of the ankle.

Discussion

Although the etiology of osteoid osteoma remains unknown, fairly detailed general principles regarding its diagnosis and treatment have been established. The diagnosis can be made very accurately by correlating clinical symptoms and radiologic findings. Although some authors believe that the long-term application of nonsteroidal anti-inflammatory drugs can be as effective as surgical treatment, there are three main approaches to the treatment of osteoid osteoma: 1) en bloc resection of the tumor and surrounding bone, 2) removal of the nidus and graded removal of surrounding reactive bone using either a curette or a bur, and 3) either MRI- or CT-guided core-drill excision or destruction of the nidus by means of radiofrequency, laser, or ethanol ablation. Wide en bloc resection of the tumor has some disadvantages. It is difficult to assess the exact dimensions of the tumor, and because it weakens the bone, internal fixation, grafting, and postoperative immobilization may be needed. According to Sluga et al, curettage is as effective as en bloc resection while being less invasive.

Currently, intralesional excision techniques and percutaneous techniques are the most widely used treatment methods. Campanacci et al report a 100% success rate with intralesional excision techniques and an 83% success rate with percutaneous techniques. Other studies report success rates of 78.9% to 95% in primary applications and 97% to 100% in secondary applications with the CT-guided percutaneous radiofrequency technique. Computed tomography-guided percutaneous radiofrequency ablation has been reported to be a safe, effective, simple method that shortens the hospital stay. Percutaneous techniques can also be applied with the guidance of MRI. Percutaneous techniques enable either removal of the lesion by means of the bur-down technique.
**Figure 1.** Radiologic views of osteoid osteoma. Anteroposterior (A) and lateral (B) standard radiographs of the ankle joint reveal irregular calcifications and sclerosis anterior to the talar neck. Axial (C) and sagittal (D) computed tomographic scans show expansion of the anterior cortex of the talar neck and a round, fairly dense lesion with clear margins (nidus) surrounded by a radiolucent zone and a sclerotic layer. Axial T1-weighted (E) and sagittal T2-weighted (F) magnetic resonance images show the nidus surrounded by reactive bone and bone edema.
(high-speed bur or drill bits) or destruction of the tumor by means of radiofrequency, laser, or ethanol ablation.2

Arthroscopy-assisted excision of intra-articular osteoid osteomas also has been reported. Hip,14, 15 knee,16 shoulder,17 and ankle14, 18-21 joints are among the locations for intra-articular osteoid osteomas treated by arthroscopic methods. To our knowledge, there have been six cases of osteoid osteoma in the talar neck treated by arthroscopic removal.4, 18-21 All of these osteoid osteomas were located subperiosteally, and enough material for histologic investigation was obtained in five of the six.18-21 There were no recurrences during 1-year follow-up in any of these cases. To obtain enough material, it has been recommended that the use of motorized instruments be avoided before removal of the nidus in one piece.4, 18-21 We agree that until a significant amount of lesion material for histologic examination is obtained, motorized instruments should not be used for excision of the tumor. The nidus can be removed using an arthroscopic grasper.

In the present case, owing to the high-pressure flow of the arthroscopic pump, the nidus moved into the medial gutter, where it was removed in one piece.

Figure 2. Arthroscopic views of osteoid osteoma. A, Initial view of the ankle joint showing the yellowish, dome-shaped expansion at the talar neck (arrow). B, After removal of the lid of the lesion, a free sclerotic bone (nidus) in the center and surrounding red-purple soft tissue were observed. C, The nidus in the medial gutter. D, The appearance of the tumoral contents (nidus and soft-tissue component) after complete excision. mm indicates medial malleolus; n, nidus.
This problem can be avoided by delaying use of the pump until after removal of the nidus. This was an easy procedure because the lesion was located subperiosteally, it could be located easily after anterior synovectomy, and it was easily approached through the anteromedial portal. We placed the arthroscope into the anterolateral portal and manipulated the tumor through the anteromedial portal, which was easy because the tumor was located anteromedially in the talar neck. We did not use any extra portals, such as a central anterior portal, to access the tumor and did not apply any specific technique or instrument other than standard arthroscopic manipulations and instruments. We believe that any surgeon experienced in ankle arthroscopy can easily remove a subperiosteal osteoid osteoma of the talar neck.

Figure 3. Removed nidus (left) and dome-shaped expanded anterior cortex (right).

Figure 4. Histologic view of the focus of osteoblastic proliferation surrounded by reactive sclerotic bone (H&E, x15).

Figure 5. Lateral radiographic (A) and computed tomographic (B) views of the talar neck 1 year after arthroscopic removal of the tumor.
The ankle joint capsule and ligaments may be damaged during exposure of the dorsal neck of the talus for open excision. The standard method of resection involves removal not only of the nidus but also of a large amount of surrounding bone to ensure that the entire nidus has been resected. Although standard techniques (en bloc resection and curettage) are effective, they may weaken the bone and necessitate bone grafting, and they may be complicated by delayed healing and fracture through the site of resection. Although arthroscopic removal of osteoid osteoma can be performed on an outpatient basis, open surgery (arthrotomy) usually requires hospital admission. Because there is minimal soft-tissue damage and minimal removal of normal bony tissue surrounding the lesion, patients can use the extremity earlier after the arthroscopic excision than after open surgery.

Conclusion

Arthroscopic treatment of subperiosteal osteoid osteoma at the anterior talar neck is easy, effective, and minimally invasive. It is possible to remove the nidus in one piece by using gentle and careful manipulations.

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References