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Case Reports and Series

Foot and Ankle Osteoid Osteomas

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ABSTRACT

Foot and ankle osteoid osteomas (OOs) are often cancellous or subperiosteal and rarely present with a periosteal reaction. Additionally, the large number of disorders included in the differential diagnosis and the nonspecific findings on radiographs complicate the diagnosis. We performed a manual search of the senior surgeon's hospitals' operating room records for the terms "benign bone tumor," "foot," "ankle," and "osteoid osteoma" from January 2003 until December 2014. Of 87 surgically treated patients with lower extremity OOs, 9 patients (11%) with foot or ankle OOs were included. The mean age at presentation was 21 (range 6 to 30) years; all 9 (11%) patients were male. The patients were evaluated for swelling, pain, trauma history, night pain, response to pain relievers, duration of complaints, and interval to diagnosis. The mean follow-up period was 48 ± 24 months, and no recurrences had developed. The mean American Orthopaedic Foot and Ankle Society scale score was 59.04 ± 11 before surgery and 91.56 ± 6 after surgery. The difference was statistically significant at $p \leq .0003$. Most previous studies have been limited to case reports. The need for findings from a case series was an essential determinant of our decision to report our results. Patients usually have been treated conservatively, often for a long period. However, delays in treatment cause social, economic, and psychological damage. In conclusion, the presence of atypical findings on radiographs has resulted in a preference for magnetic resonance imaging instead of computed tomography; however, the diffuse soft tissue edema observed on MRI can lead to the use of long-term immobilization and a delay in the diagnosis.

Osteoid osteoma (OO) is a vascularized, osteogenic, benign bone tumor that was first defined by Heine in 1927 (1) and first described by Jaffe in 1935 (2). OOs constitute 10% of all benign bone tumors and 19.4% of all benign bone tumors in the foot and ankle, with a particular predilection for the talus and calcaneus (3,4). OOs can be divided into 3 types according to their location: intracortical, cancellous, and subperiosteal (5). Although long bone OOs cause an aggressive subperiosteal reaction owing to their intracortical location, foot OOs often occur in the cancellous bone or subperiosteally and might not cause a periosteal reaction (5,6). Because of these subtle radiologic findings, the complex anatomy of the ankle and foot with the wide array of disorders included in the differential diagnosis, and the rarity of OOs in this region, a delay can occur in diagnosing foot and ankle OOs. Thus, when a patient presents with foot or ankle pain that is especially longstanding, cannot be diagnosed, and is resistant to medical treatment, the presence of an OO should be considered (7). In the present study, we retrospectively evaluated the epidemiology, radiologic features, surgical treatment options (including open and percutaneous methods), and functional outcomes of foot and ankle OOs. Most previous studies were limited to case reports; the largest study (8) was a review reported in 2015 and was also based substantially on case reports. The need for the findings from a case series was an essential determinant of our decision to report our series.

Patients and Methods

The study was performed in accordance with the ethical standards of the Declaration of Helsinki. All patients provided informed consent before inclusion in the study, and a local ethics committee approved the study protocol. The present retrospective study found 87 surgically treated patients with a preoperative diagnosis of a lower extremity OO from January 2003 to December 2014. We performed a manual search of the senior surgeon's (V.G.) operating records for the terms "benign bone tumor," "foot," "ankle," and "osteoid osteoma." Of the 87 patients, 9 patients (11%) had a foot or ankle OO and were included in the present study. The patient data reviewed included sex, age, site of the lesion, clinical and radiologic findings, swelling, pain, response to pain relievers, duration of complaints, interval to diagnosis, biopsy and

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Table
Demographic data, diagnostic data, and surgical methods

Pt. No.	Age (y)	Location	Delay in Diagnosis (mo)	Treatment	Imaging Finding				Pathologic Finding
					Radiography	CT	MRI	Scintigraphy	
1	16	Calcaneus	12	RFA	None	Nidus	None	NP	NA
2	20	Talus	12	En bloc resection	None	None	NP	None	Nidus
3	25	Cuboid	12	Burr down	None	Nidus	None	Nidus	Nidus
4	30	Calcaneus	36	Cortical peeling	None	Nidus	None	NP	Nidus
5	6	Metatarsal	12	Burr down	None	Nidus	None	NP	Nidus
6	15	Calcaneus	18	En bloc resection	None	Nidus	None	NP	Nidus
7	11	Talus	18	Cortical peeling	None	Nidus	Nidus	Nidus	Nidus
8	17	Fibula	6	En bloc resection	None	Nidus	None	Nidus	Nidus
9	10	Talus	48	RFA	None	Nidus	Nidus	NP	NA

Abbreviations: CT, computed tomography; MRI, magnetic resonance imaging; NA, not applicable; NP, not performed; Pt. No., patient number; RFA, radiofrequency ablation.

treatment modality, and functional results. The preoperative and postoperative clinical outcome scores were calculated using the American Orthopaedic Foot and Ankle Society (AOFAS) scale score (9). Patients who had undergone previous percutaneous or open surgical treatment with recurrence were excluded from the study. Preoperative radiographs, computed tomography (CT), magnetic resonance imaging (MRI), and scintigraphy examinations were performed.

Statistical Analysis

Statistical analysis was performed using SPSS software (IBM, Armonk, NY) using an unpaired Student's *t* test and the Fisher exact test. Statistical significance level was set at $p \leq .05$.

Results

The mean age was 21 (range 6 to 30) years, and all the patients were male (Table). Statistical significance was not found for age, similar to the finding for our lower extremity long bone OO patients ($p \leq .33$). The lesion locations were as follows: calcaneus in 4 (44%), talus in 2 (22%), distal fibula in 1 (11%), metatarsal in 1 (11%), and cuboid in 1 (11%; Figs. 1–3).

The mean interval to the diagnosis was 18 (range 12 to 48) months. All patients reported night pain, localized tenderness, a response to pain relievers, pain with weightbearing, local swelling, and an antalgic gait. Slight erythematous changes and a local skin temperature increase were present in 2 patients (22%). The complete blood count,

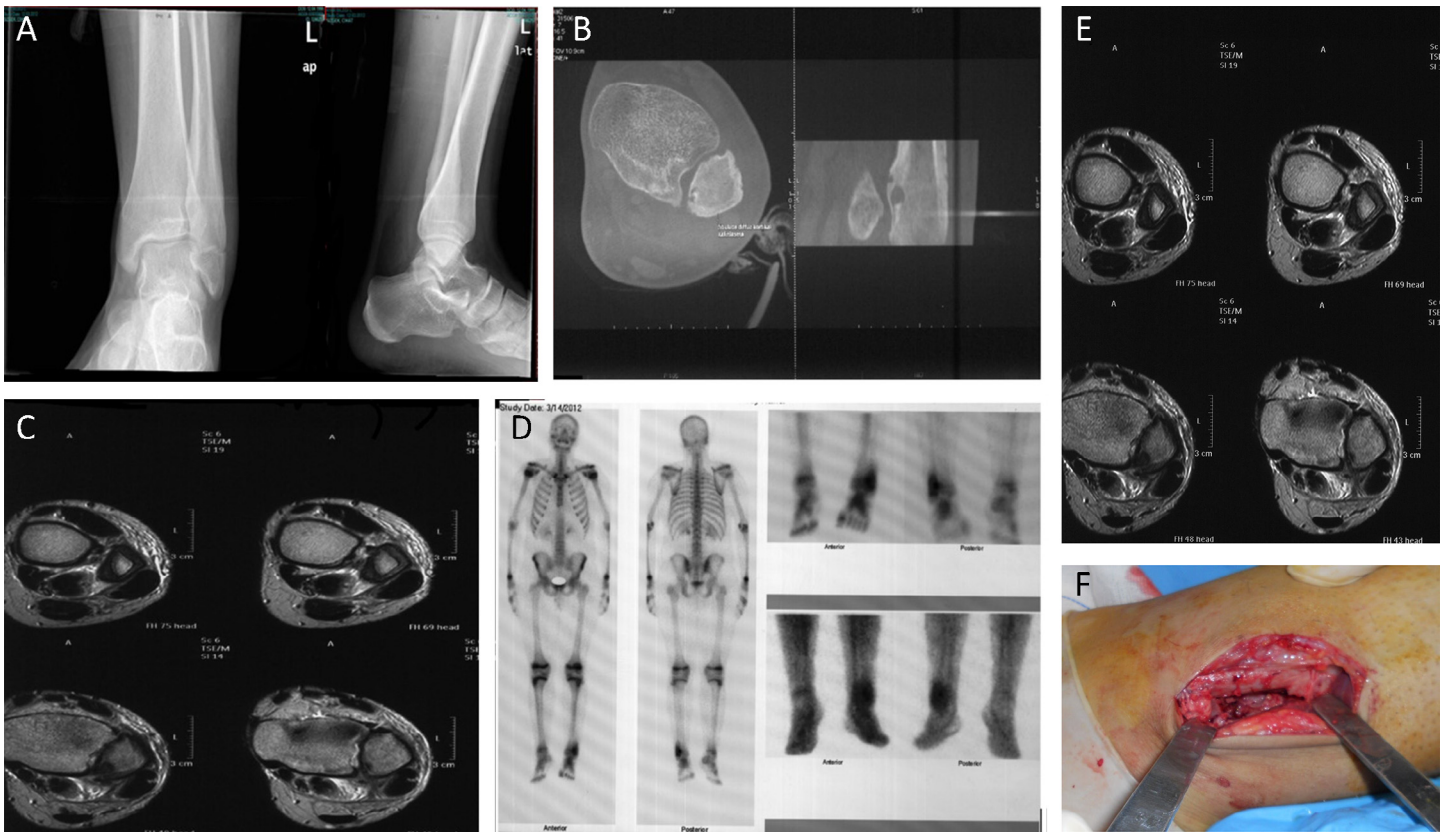

Fig. 1. Images of patient 8, a 17-year-old male. *(A)* Anteroposterior and lateral ankle radiographs showing a lucent posterolateral lesion in the distal fibula compatible with an osteoid osteoma nidus. *(B)* Axial computed tomography (CT) scan of the left ankle showing a lytic subcortical lesion with diffuse cortical thickening. *(C)* Technetium-99m methylene diphosphonate intravenous (20 mCi) contrast-enhanced bone scan showing focal diffuse increased uptake in the distal fibula. *(D)* Coronal CT scan of the left foot and ankle showing a lytic subcortical lesion with diffuse cortical thickening. *(E)* Ankle T1-weighted magnetic resonance image showing a low signal, thickened cortex and the nidus. However, the nidus is not as clear as seen on the CT scan because of the soft tissue edema. *(F)* Perioperative image of the lesion showing a cherry red spot sign and nidus.