World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(CASE REPORT)

Primary osteosarcoma of the calcaneus in an elderly patient: Case report and brief literature review

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World Journal of Advanced Research and Reviews, 2026, 30(01), 179-183

Publication history: Received on 24 February 2026; revised on 31 March 2026; accepted on 02 April 2026

Article DOI: https://doi.org/10.30574/wjarr.2026.30.1.0825

Abstract

Osteosarcoma is the most prevalent primary malignant bone neoplasm, defined by the direct production of osteoid by tumor cells. Its typical localization involves the metaphysis of long bones, with a predominance in the knee region and the proximal humerus. Involvement of the foot is exceptional, and calcaneal engagement accounts for less than 1% of reported cases. We present the case of a 77-year-old female patient with primary osteosarcoma of the right calcaneus, whose initial clinical presentation mimicked a post-traumatic lesion, resulting in a delayed diagnostic suspicion. The clinical, diagnostic, and therapeutic particularities of this infrequent anatomical site are analyzed, with an emphasis on the management challenges in patients of advanced age.

Keywords: Osteosarcoma; Calcaneus; Bone neoplasms; Malignant tumor; Case report

1. Introduction

Osteosarcoma is a malignant mesenchymal tumor characterized by the formation of osteoid by neoplastic cells. It represents the most common primary malignant bone neoplasm worldwide (1,2,3). Its epidemiological behavior is bimodal: an initial peak during the second decade of life and a second peak in individuals over 60 years of age, a cohort in which it may be associated with Paget's disease, prior radiation therapy, or malignant transformation of preexisting bone lesions (1).

From an anatomical perspective, most cases are localized in the metaphysis of long bones, particularly the distal femur, the tibia, and the proximal humerus. In contrast, involvement of the pedal skeleton is unusual, representing less than 1% of total osteosarcomas. Within this group, involvement of the calcaneus is particularly rare. Both low incidence and clinical non-specificity contribute to frequent diagnostic delays (3,4).

The present report describes a case of primary osteosarcoma of the calcaneus in an elderly patient and contextualizes its clinical implications in light of the available literature.

2. Case presentation

A 77-year-old female patient, a retired secretary, with a medical history of arterial hypertension and cognitive impairment currently under evaluation. Her surgical history included a cesarean section and phacoemulsification. She reported no known drug allergies and no significant traumatic history prior to the onset of the current clinical presentation.

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The patient sought consultation due to progressive pain in the right ankle of four months duration, associated with edema and functional gait limitation. She reported a history of minor trauma affected limb, which was initially interpreted as the trigger for the pain, thus directing initial management toward a pathology of mechanical origin.

During the evaluation at a primary care facility, swelling was documented at the level of the right calcaneus. Bone curettage and biopsy were considered; however, prior to the procedure, the patient was referred for evaluation by orthopedic oncology.

On physical examination, the patient was in good overall condition, with no evidence of masses or lymphadenopathy in other locations. The right ankle showed increased volume on the lateral aspect, with extension toward the anterior and posterior peroneal regions. No superficial collateral circulation was evident. The lesion was non-tender to palpation, and the distal neurovascular status was preserved.

As part of the initial imaging study, a plain radiograph of the right calcaneus was requested, which reported a lesion with ill-defined borders at the level of the inferior calcaneal tuberosity, featuring cortical destruction and a permeative pattern (Figure 1). Given the finding of a bone lesion, a magnetic resonance imaging (MRI) of the right ankle was performed. The report described a heterogeneous lesion involving the calcaneus with soft tissue extension, consistent with typical characteristics of a malignant tumor (Figure 2).

Figure 1 Radiograph of the right calcaneus

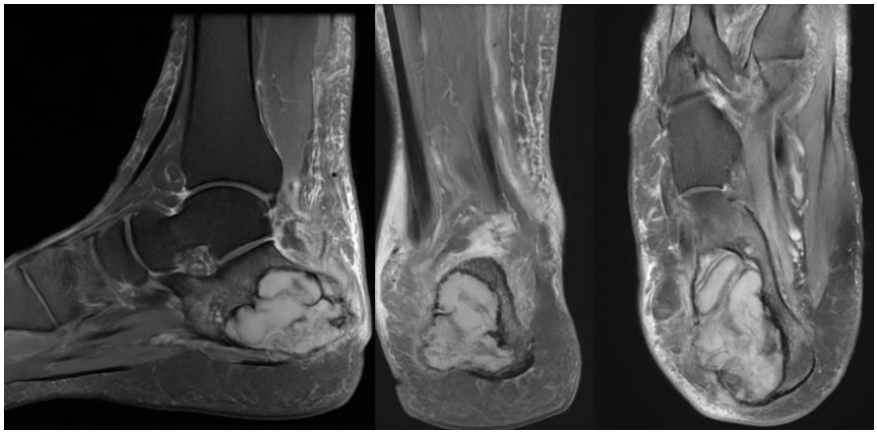

Figure 2 Nuclear magnetic resonance imaging of the right ankle

Given the suspicion of a primary bone neoplasm, a biopsy of the lesion was performed under oncological planning. Macroscopic description revealed multiple hemorrhagic fragments of dark-brown appearance and soft consistency, all of which were processed for histological study. Microscopically, the lesion was predominantly composed of abundant multinucleated giant cells distributed within a fibrocellular stroma, featuring areas of bone resorption with a cystic pattern. Interspersed within this, a high-grade malignant spindle cell component was identified, exhibiting marked nuclear atypia and high mitotic activity, associated with osteolytic changes. No overt osteoid production was observed under polarized light (Figure 3). Finally, immunohistochemical analysis showed nuclear positivity for MDM2 and SATB2, while staining was negative for SALL4, p63, and CD163 (Figure 3). The Ki-67 proliferation index was heterogeneous, with estimated foci between 20% and 30% (Figure 3).

Based on the morphological and immunophenotypic findings, a diagnosis of high-grade giant cell-rich bone sarcoma was established, consistent with osteosarcoma, localized in the right calcaneus.

For systemic staging purposes, a total-body bone scintigraphy was performed, which revealed a hyperuptake lesion in the right calcaneal bone, suggestive of a primary malignant process, with no other areas of pathological uptake. Computed tomography (CT) of the chest showed no nodular lesions or findings suggestive of metastatic disease, with a radiological report consistent with expected age-related changes.

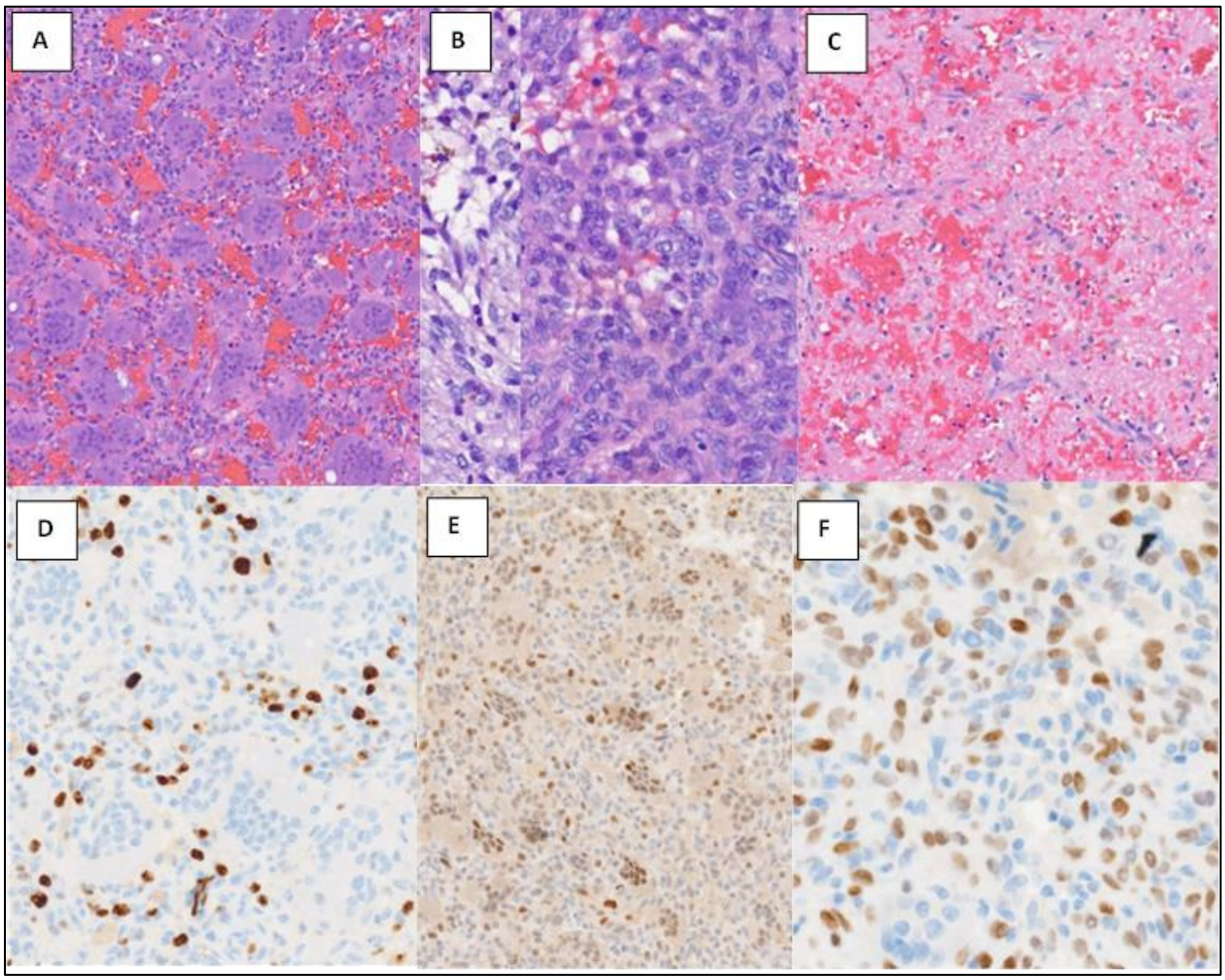

Figure 3 Histopathology of the lesion. A. Giant cell component. B. Sarcomatous component. C. Cystic-type vascular component. D. Heterogeneous Ki-67 expression with estimated foci between 20–30%. E. Nuclear positivity for MDM2. F. Nuclear positivity for SATB2

3. Discussion

Osteosarcoma exhibits a bimodal distribution, with an initial peak during adolescence and a second peak in individuals over 60 years of age (1). In the latter group, it may present as a primary tumor or associated with underlying bone conditions such as Paget's disease, prior radiation therapy, or sarcomatous transformation of pre-existing lesions. In the presented patient, no evident predisposing factors were identified, suggesting a *de novo* primary osteosarcoma—a less frequent occurrence in the geriatric population that can complicate the initial recognition of the disease (2,3).

Localization in the calcaneus is exceptional. Osteosarcomas of the foot represent less than 1% of all cases, and within this region, the calcaneus constitutes one of the rarest sites (3). Contemporary reviews of primary calcaneal tumors show that the majority of lesions in this location are benign, leading to a low index of suspicion for a primary malignant lesion (3,4). Consequently, chronic hindfoot pain is initially attributed to mechanical, inflammatory, or degenerative causes, particularly when there is a history of minor trauma, as occurred in this case.

Persistent, progressive pain and localized swelling should be considered red flags. In the tarsal bones, the clinical presentation may be more insidious than in long bones, where classic radiographic patterns of aggressiveness are usually more evident. This behavior favors diagnostic delays and, in some cases, greater local extension at the time of definitive treatment.

From an imaging perspective, osteosarcoma is associated with aggressive bone destruction, ill-defined margins, and periosteal reaction; however, in short bones like the calcaneus, these findings may not be as prominent as in the metaphysis of long bones (4,5). Magnetic resonance imaging (MRI) is essential for delimiting intramedullary extension, assessing cortical and soft tissue involvement, and surgical planning. Likewise, systemic staging via chest CT is mandatory, given osteosarcoma's marked predilection for pulmonary dissemination—a principal prognostic determinant alongside the presence of metastasis at diagnosis and the response to chemotherapy (5,6).

Definitive diagnosis relies on a histopathological study obtained through a meticulously planned biopsy. The correct selection of the biopsy tract is fundamental to prevent contamination of anatomical compartments and to allow for its complete resection during the definitive procedure—a principle widely accepted in orthopedic oncology. In the hindfoot, where the anatomy is complex and surgical planes are limited, this consideration becomes particularly relevant. The identification of malignant osteoid produced by pleomorphic tumor cells confirms the diagnosis, regardless of the predominant histological subtype.

The treatment of osteosarcoma requires a multidisciplinary approach combining systemic chemotherapy and surgery with adequate oncological margins. However, in patients over 70 years of age, tolerance to conventional chemotherapy regimens may be lower, and survival rates are typically inferior compared to younger populations (5). Therefore, therapeutic decisions must be individualized, considering functional status, comorbidities, and quality of life expectancy.

In the calcaneus, achieving clear margins may necessitate ablative procedures due to the technical difficulty of performing wide resections while preserving the stability and function of the hindfoot. In this context, amputation should not be interpreted as a therapeutic failure but rather as a strategy oriented toward optimal local control of the disease. Several series have demonstrated that when negative margins are achieved, local control is comparable to that of limb-salvage procedures, with the advantage of more predictable functional rehabilitation and a lower risk of complications associated with complex reconstructions (5,6,7).

This case underscores the necessity of maintaining a high index of suspicion in the face of persistent hindfoot pain in elderly patients, even in the absence of evident predisposing factors. Furthermore, it contributes evidence to the limited existing literature on primary osteosarcoma of the calcaneus in the geriatric population—an exceptional entity that poses unique diagnostic and therapeutic challenges.

4. Conclusions

Osteosarcoma of the calcaneus is an infrequent entity whose clinical presentation may mimic benign pathology, favoring diagnostic delays. Persistent pain and swelling in the hindfoot, even in patients of advanced age, should prompt an exhaustive evaluation.

Adequate biopsy planning and a multidisciplinary approach are critical prognostic determinants. The therapeutic objective remains resection with tumor-free margins, individualizing the surgical strategy according to the anatomical and clinical characteristics of each patient.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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