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Case Report: Benign Fibrous Histiocytoma of the Calcaneus in a 19-Year-Old Male

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Abstract **Case Report**

Benign fibrous histiocytoma (BFH) of bone, presenting histologically as a non-ossifying fibroma (NOF), is a well-documented entity in long bone metaphysis but remains exceptionally rare in the calcaneus. We report the case of a 19-year-old male with a several-month history of progressive left heel pain causing significant functional impairment, including school absenteeism, with no antecedent trauma. Plain radiographs revealed a large, well-defined radiolucent lesion in the calcaneal body with a thin sclerotic rim and cortical thinning; computed tomography confirmed an expansile lytic lesion without aggressive features, initially interpreted as a unicameral bone cyst. After comprehensive preoperative evaluation, the patient underwent surgery via a sinus tarsi approach: extensive curettage was performed, and the osseous defect was reconstructed with autogenous iliac crest bone graft supplemented with Cerament®. Histopathological analysis of the curetted specimens confirmed a benign fibrohistiocytic tumour with spindle cell proliferation in a storiform pattern, establishing the definitive diagnosis of NOF. The postoperative course was uneventful; pain resolved completely within five weeks, and full weight-bearing was authorized at two months. Radiological follow-up at six months confirmed near-complete osseous consolidation without evidence of local recurrence. This case highlights the diagnostic challenges inherent to lytic calcaneal lesions, where imaging overlap with unicameral and aneurysmal bone cysts may obscure the true diagnosis, and underscores the indispensable role of histopathological confirmation. The favourable clinical and radiological outcomes demonstrate that thorough curettage combined with autogenous and synthetic bone grafting represents an effective surgical strategy for symptomatic BFH in critical weight-bearing sites. Clinicians should consider BFH/NOF in the differential diagnosis of calcaneal lytic lesions in adolescents and young adults.

Keywords: Benign fibrous histiocytoma, Non-ossifying fibroma, Calcaneus, Bone tumour, Curettage, Bone grafting, Cerament®, Lytic lesion, Hindfoot surgery.

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INTRODUCTION

Benign fibrous histiocytoma (BFH) represents a diverse group of mesenchymal neoplasms, frequently encountered in soft tissues and skin; however, their manifestation in bone is less common (Gleason & Fletcher, 2008). Within skeletal contexts, these lesions often present as non-ossifying fibromas (NOF), particularly in children and young adults (Clarke *et al.,* 1985). These tumours are typically benign, though their presence can lead to pain and structural compromise, particularly in weight-bearing bones (Kafchinski *et al.,* 2025). While frequently asymptomatic and discovered incidentally, some patients experience localized pain, swelling, or even pathological fractures.

The calcaneus, a critical component of the hindfoot, endures substantial biomechanical stress, making any osseous lesion within it a potential source of significant morbidity (Chirayath *et al.,* 2024). Unicameral bone cysts (UBCs) and aneurysmal bone cysts (ABCs) are among the more prevalent benign lesions affecting this bone, but fibrous histiocytomas are less frequently documented in this specific anatomical site (Örgüç & Arkun, 2020; Pretell-Mazzini *et al.,* 2014). This report details the clinical presentation, diagnostic pathway, surgical management, and subsequent favourable outcome of a benign fibrous histiocytoma of the calcaneus in a 19-year-old male. This case contributes to the understanding of this rare presentation in an anatomical location that presents unique challenges for diagnosis and treatment.

Background and Literature Review

Epidemiology and Clinical Presentation of Benign Fibrous Histiocytoma in Bone

Benign fibrous histiocytomas encompass a spectrum of fibrohistiocytic lesions, with non-ossifying fibroma (NOF) being a common variant in bone, predominantly affecting the metaphysis of long bones in children and adolescents (Clarke *et al.,* 1985). These lesions account for a notable percentage of benign bone tumours, though precise epidemiological data for BFH specifically in the calcaneus are scarce due to its rarity (De Salvo *et al.,* 2022). While often asymptomatic and discovered incidentally during imaging for unrelated conditions, symptoms such as localized pain, swelling, or tenderness can arise, particularly with increasing lesion size or microfractures. The aetiology remains unclear, but they are generally considered developmental anomalies rather than true neoplasms. In some instances, lesions persist into adulthood, exhibiting clinical and radiological features distinct from those observed in childhood, including a propensity for pain and involvement of atypical sites like the pelvis or ribs (Clarke *et al.,* 1985).

Imaging Features and Differential Diagnosis of Calcaneal Lesions

Radiographically, benign fibrous histiocytomas, particularly NOFs, typically appear as well-demarcated, eccentric, lytic lesions with a sclerotic rim in the metaphysis of long bones. In the calcaneus, a bone with complex anatomy, lytic lesions necessitate a broad differential diagnosis. This includes unicameral bone cysts (UBCs), aneurysmal bone cysts (ABCs), chondromyxoid fibromas, giant cell tumours, and osteoblastomas (Örgüç & Arkun, 2020; Pretell-Mazzini *et al.,* 2014). UBCs often present as centrally located, radiolucent lesions with cortical thinning, frequently in skeletally immature patients (Pretell-Mazzini *et al.,* 2014). Chondromyxoid fibromas, although rare, also manifest as lytic lesions and can occur in the calcaneus, requiring biopsy for definitive diagnosis. Advanced imaging modalities, such as computed tomography (CT) and magnetic resonance imaging (MRI), offer enhanced detail regarding lesion morphology, cortical integrity, and soft tissue involvement, crucial for differentiating these entities and planning surgical interventions (LI *et al.,* 2016). Bone scans can also demonstrate cold defects in some instances of malignant fibrous histiocytoma, though this is less typical for benign variants.

Surgical Management Strategies for Benign Bone Tumours of the Calcaneus

The management of benign bone tumours, including those affecting the calcaneus, depends on factors such as tumour type, location, size, patient age, and symptomology. For asymptomatic, small, stable lesions like certain NOFs, conservative observation with serial imaging may suffice. However, symptomatic lesions, those causing structural compromise, or those at high risk for pathological fracture often require surgical intervention. Curettage, involving the mechanical removal of the tumour tissue, remains a standard surgical approach. Following curettage, the resulting osseous defect is often filled to prevent recurrence and promote bone healing. Common filling materials include autogenous bone graft, allograft, or synthetic bone substitutes such as calcium phosphate cements (e.g., Cerament®). The selection of graft material influences bone integration and long-term outcomes. Minimally invasive techniques, while often discussed for osteoid osteomas, are less frequently applied to larger, lytic lesions in the calcaneus due to anatomical constraints and the need for thorough debridement (Ghanem, 2006; Shu & Ke, 2022; Tepelenis, Papathanakos, *et al.,* 2021). Complete resection of the lesion is paramount to minimize local recurrence, particularly for aggressive benign tumours (Tepelenis, Skandalakis, *et al.,* 2021).

Case Presentation

Patient History and Clinical Course

A 19-year-old male was referred to the Orthopaedic outpatient clinic in May 2023, presenting with a painful cyst in the left calcaneus. The pain significantly impacted his daily activities, leading to school absenteeism. He reported experiencing intermittent pain for several months, which had gradually worsened. No history of trauma was reported. The patient had no other significant medical history or relevant family history of bone lesions.

Radiographic and Diagnostic Workup

Initial plain radiographs of the left foot revealed a large, well-defined, radiolucent lesion within the body of the calcaneus, characterized by a thin sclerotic rim (Figure 1). The cortical bone appeared thinned but intact. No periosteal reaction or soft tissue component was evident. Given the lesion's size and the patient's symptoms, a comprehensive pre-operative evaluation was initiated. This included a computed tomography scan, which confirmed the presence of a lytic lesion, compatible with an aneurismatic bone cystic. The CT scan further delineated the extent of the lesion within the calcaneus, showing no evidence of aggressive features or invasion into adjacent structures (Figure 2). The imaging findings, in conjunction with the clinical presentation, suggested a benign entity, most consistent with a unicameral bone cyst or a non-ossifying fibroma (Örgüç & Arkun, 2020; Pretell-Mazzini *et al.,* 2014).

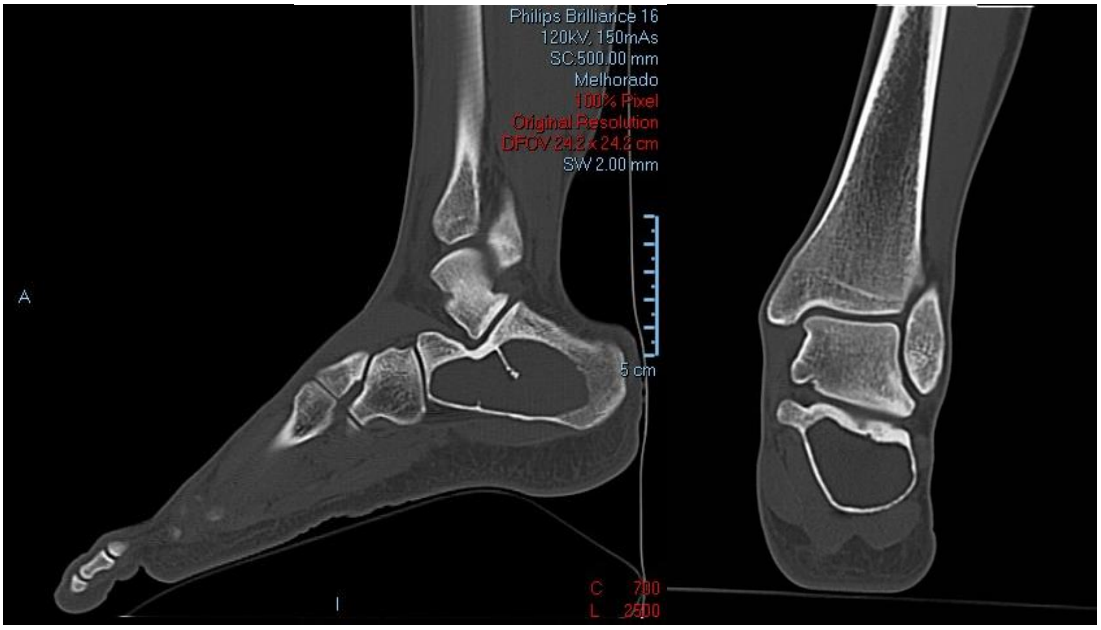

Figure 1: CT scan image showing the best defining characteristics of the lesion shown in the initial CT scan

Figure 2: Initial radiograph of the patient upon presentation in the Orthopaedic clinic

Surgical Intervention

Approximately one year after the initial presentation and thorough pre-operative assessment, the patient underwent surgical intervention. The procedure involved a sinus tarsi approach to the left. After careful exposure, the cortical bone overlying the cystic lesion was opened. Extensive curettage was performed to meticulously remove the entire contents of the cyst, which were predominantly liquid. Samples of the curetted material and cyst wall were collected for histopathological examination. Following complete debridement, the cavity was thoroughly irrigated. The defect was then packed with an autogenous bone graft harvested from the patient's iliac crest, supplemented with Cerament®, a synthetic bone substitute. The combination of autograft and allograft/substitute is a common strategy to enhance osteoinduction and osteoconduction, facilitating bone regeneration and structural support.

Postoperative Course and Follow-up

The patient's postoperative recovery was uneventful. At five weeks post-surgery, he reported complete resolution of the pain. At the two-month follow-up, with continued absence of pain, he was permitted to bear full weight on the affected foot. Radiographic assessments at two months post-operation indicated early signs of bone graft integration and partial filling of the calcaneal defect. Six months after the surgical procedure, follow-up imaging confirmed nearly complete osseous filling of the former cyst cavity (Figure 4). Crucially, the patient remained free of pain, and there was no evidence of cyst recurrence or other complications. The histopathological analysis of the surgical specimens identified a benign fibrohistiocytic tumour of the left calcaneus, with morphological

characteristics consistent with a non-ossifying fibroma (NOF) (Clarke *et al.,* 1985). This pathological diagnosis confirmed the pre-operative suspicion of a benign entity.

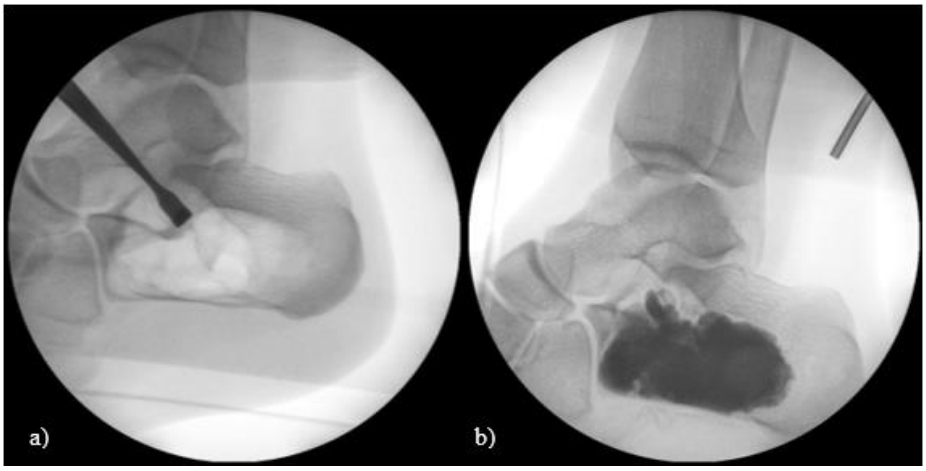

Figure 3: Fluoroscopic intraoperative images: a) the bone cyst after clearing, drainage and curettage; b) after supplementation with bone graft and Cerament®

Figure 4: Weightbearing plain radiograph 6 months after surgical intervention showing complete bone filling

DISCUSSION

Diagnostic Challenges and Pathological Findings

The diagnosis of benign fibrous histiocytoma (BFH) in bone, particularly non-ossifying fibroma (NOF) in atypical locations like the calcaneus, presents diagnostic challenges (Clarke *et al.,* 1985). While classic NOFs in long bone metaphysis are often characteristic on radiographs, calcaneal lesions can mimic other benign conditions, including unicameral bone cysts (UBCs), aneurysmal bone cysts (ABCs), or even early stages of more aggressive tumours (Örgüç & Arkun, 2020; Pretell-Mazzini *et al.,* 2014). The present case highlights this, where initial imaging suggested a large radiolucent cyst in the calcaneus. Definitive diagnosis relied on histopathological examination, which confirmed a benign fibrohistiocytic tumour with morphological features aligning with NOF. The pathological findings typically reveal spindle cells arranged in a storiform pattern, often with admixed multinucleated giant cells and foam cells, differentiating it from purely cystic lesions (Gleason & Fletcher, 2008). The delay from initial presentation to surgery, approximately one year, allowed for comprehensive diagnostic workup, which is appropriate for complex benign lesions to exclude other pathologies. This interval also enabled a detailed assessment of symptom progression and the lesion's stability.

Treatment Considerations and Surgical Outcomes

Treatment for symptomatic benign bone lesions in weight-bearing areas like the calcaneus necessitates careful consideration of surgical options. Curettage is a widely accepted method for removing benign tumours, aiming for complete removal of the lesion while preserving bone integrity. The technique employed in

this case, involving thorough curettage followed by bone grafting, aligns with established practices for managing such lesions. The use of autogenous iliac crest bone graft provides osteoinductive and osteoconductive properties, promoting robust bone healing. Supplementation with Cerament®, a synthetic bone substitute, offers additional structural support and a scaffold for new bone formation, potentially accelerating the consolidation process. The positive outcome in this patient, with complete pain resolution and nearly full osseous integration at six months, underscores the efficacy of this combined approach. Early weight-bearing at two months post-surgery, facilitated by the structural stability provided by the graft, further contributed to a rapid return to function for this young patient.

Comparison with Existing Literature and Similar Case Reports

The occurrence of benign fibrous histiocytoma, specifically NOF, in the calcaneus is relatively uncommon compared to its prevalence in the long bones (Clarke *et al.,* 1985). While studies document NOFs in adults, they often report locations such as the diaphysis of long bones or the pelvis, with the calcaneus being a rare site (Clarke *et al.,* 1985). A comprehensive review of calcaneal fractures and associated lesions highlighted the complexity of this anatomical region, yet specific mention of NOF as a common differential is less frequent than for other entities like UBCs or chondromyxoid fibromas (Chirayath *et al.,* 2024). The patient's age (19 years) places him at the upper end of the typical age range for NOF, which often regresses spontaneously in younger individuals. However, the persistent pain and substantial size of the lesion necessitated intervention, aligning with literature advocating surgical management for symptomatic or large lesions. The successful outcome observed, including complete pain relief and radiological evidence of healing without recurrence, reinforces the effectiveness of thorough curettage and bone grafting in such rare presentations. This case contributes to the limited body of evidence regarding NOF affecting the calcaneus, particularly in young adults.

Implications for Clinical Practice

This case underscores the importance of a detailed diagnostic approach for lytic calcaneal lesions, even when initial imaging suggests a benign process. While many benign bone lesions are asymptomatic, symptomatic presentations, particularly with pain limiting activity, warrant thorough investigation and often surgical intervention (n.d.-a). Pathological confirmation remains the gold standard for definitive diagnosis, guiding appropriate treatment and prognosis. The favourable outcome achieved through curettage and combined bone grafting highlights a reliable treatment strategy for benign fibrous histiocytomas in challenging anatomical locations. Clinicians managing bone tumours should consider BFH/NOF in the differential diagnosis of calcaneal lesions, particularly in adolescents and young adults, and recognize that effective surgical management can lead to excellent functional recovery and pain resolution. Long-term follow-up is beneficial to monitor for any potential, albeit rare, recurrence or complications.

CONCLUSION

A case of benign fibrous histiocytoma, pathologically confirmed as a non-ossifying fibroma, of the calcaneus in a 19-year-old male is presented. The patient suffered from significant pain and school absenteeism. Following comprehensive diagnostic workup, surgical intervention included curettage and defect filling with autogenous iliac crest bone graft and Cerament®. The postoperative course demonstrated successful pain resolution and robust radiological healing, with near-complete osseous filling of the lesion at six months. This case illustrates the successful management of a rare presentation of benign fibrous histiocytoma in a critical weight-bearing bone, emphasizing the value of precise diagnosis and established surgical techniques for favourable patient outcomes.

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