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Traumatology

Osteochondroma of the Distal Tibia in an Adolescent: A Case Report

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Abstract **Case Report**

A 17-year-old male presented with a painful left ankle that had been worsening over the preceding 1 year. Clinical and radiographic inspection revealed marked bowing with a deformation of the fibula secondary to the laterally outgrowing bone lesion from the distal tibia proximal to the growth plate. MRI appearance suggestive of an osteochondroma of the lower extremity of the left tibia with signs of degeneration, It is surrounded by a cartilaginous cap, thickened in places, measuring 22 mm in maximum thickness. Although the radiographic characteristics of the lesion were indicative of osteochondroma, a typically asymptomatic and benign tumor that is usually identified as an incidental finding, the large size and symptoms associated with the lesion described in this article make it rather unusual. In this particular case, excessive bony outgrowth, pain, joint malposition, necessitated surgical intervention. The patient was successfully treated with resection of the tumor, after which gradual restoration of the alignment of the distal leg ensued without the need for fibular osteotomy. After more than 1 year of postoperative follow-up, neither radiographic nor clinical evidence of recurrence had been observed and the patient displayed a pain-free range of ankle motion without any physical limitations.

Keywords: Ankle, bone tumor, fibula, osteochondroma, tibia.

INTRODUCTION

Osteochondroma accounts for approximately 12% of all bone tumors, and about 45% of benign bone tumors [1]. Osteochondroma, also known as osseocartilaginous exostosis, represents a bony outgrowth covered by a thin cartilaginous cap.

The cartilaginous cap is generally understood to be the remnant of an epiphyseal plate where in skeletal maturation occurs by means of endochondral trabecular ossification and may occur at any location in any bone that develops from cartilage, but is usually found in an area of active metaphyseal growth in long tubular bones near the epiphyseal plate [1–4].

Osteochondroma displays a continuous cortex with marrow between the parent bone and tumor, and most typically occurs in the distal femur and proximal tibia [3, 5]. Osteochondromas arising in the foot account for 0.93% to 11.8% of all osteochondromas, and the most common site for pedal involvement of this neoplasm is the metaphysis of a digital phalanx [2].

Epidemiologically, the lesion most commonly appears during the second and third decades of life, and 70% of affected patients are 20 years of age or younger, and the male-to-female ratio is 2:1 [1, 2, 4, 6]. There are 2 types of osteochondromas: pedunculated or stalk-shaped (most common) and sessile or broad-based. Both types of osteochondroma display a cauliflower-shaped marginal expansion and retain the cortex and periosteum of the parent bone; growth of the tumor parallels that of the patient overall, and becomes quiescent upon closure of the host individual's epiphyses [1]. Typically, the hyaline cartilaginous cap covers the rounded end of the lesion, and the outgrowth points away from the nearest joint and the epiphyseal plate [1, 2]. In both sessile and pedunculated lesions, the cartilaginous surface is grossly irregular and displays a grayish-blue hue that measures 0.1 to 0.6 cm in thickness [1]. The sessile type of osteochondroma is at greater risk for malignant transformation in comparison to the pedunculated osteochondroma, and the cartilaginous cap usually covers the entire external surface of a sessile lesion [1,2].

Histologically, the tumor consists of a proliferating hyaline cartilaginous cap that merges into compact bone at its base [2, 4]. Endochondral ossification is seen at the cartilage-bone junction, and continues until skeletal maturation (2, 4). Early signs of malignancy include pain, continued growth beyond skeletal maturation, and irregularity and thickening of the cartilaginous cap to a thickness greater than 2 cm [1, 2, 4]. In lesions that undergo malignant transformation, 94% transform into chondrosarcoma, although other malignancies, such as osteosarcoma, fibrosarcoma, and malignant histiocytoma, can also develop [7].

The lesion, moreover, is usually larger than what is noted on radiographs because of the inability to visualize the cartilaginous cap radiographically. A computerized tomographic (CT) scan can be very useful in identifying cortical continuity, and magnetic resonance imaging (MRI) best demonstrates marrow continuity and the thickness of the cartilaginous cap [4]. Osteo- chondromas are autosomal dominant and display full penetrance, and this can lead to progressive skeletal deformity as the lesion grows [8].

CASE REPORT

A 17-year-old male presented to the senior author's (M.N.) private office for evaluation of her painful left ankle. She related a chief complaint of an approximately 1-year history of right ankle pain, and the pain had progressively worsened over the 3 months before her presentation. The remainder of his past medical history was unremarkable, and there was no apparent contributing family history related to the presence of bone tumors.

Physical examination of the patient revealed an intact neurovascular status to both lower extremities. Right ankle tenderness was elicited upon direct palpation of the anterior aspect of the distal tibiofibular junction, and right ankle range of motion was limited secondary to antalgic guarding. The remainder of the physical examination showed no other positive findings.

Radiographic evaluation revealed a large, broad-based, distal-lateral growth localized to the metaphyseal region of the tibia with a sclerotic, calcified cortical margin (Figure 1). MRI evaluation revealed a distal tibial metaphyseal lesion that measured 3.2 cm from medial-to-lateral and 6.4 cm from superior-to-inferior (Figure 2). The tibial outgrowth caused lateral bowing of the fibula. (Figure 2)

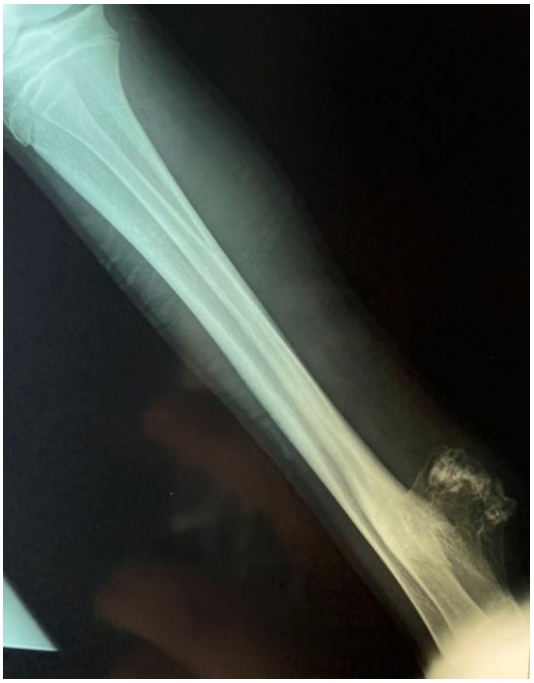

Figure 1: Left ankle plain films of 17-year-old male with expansile tibial tumor

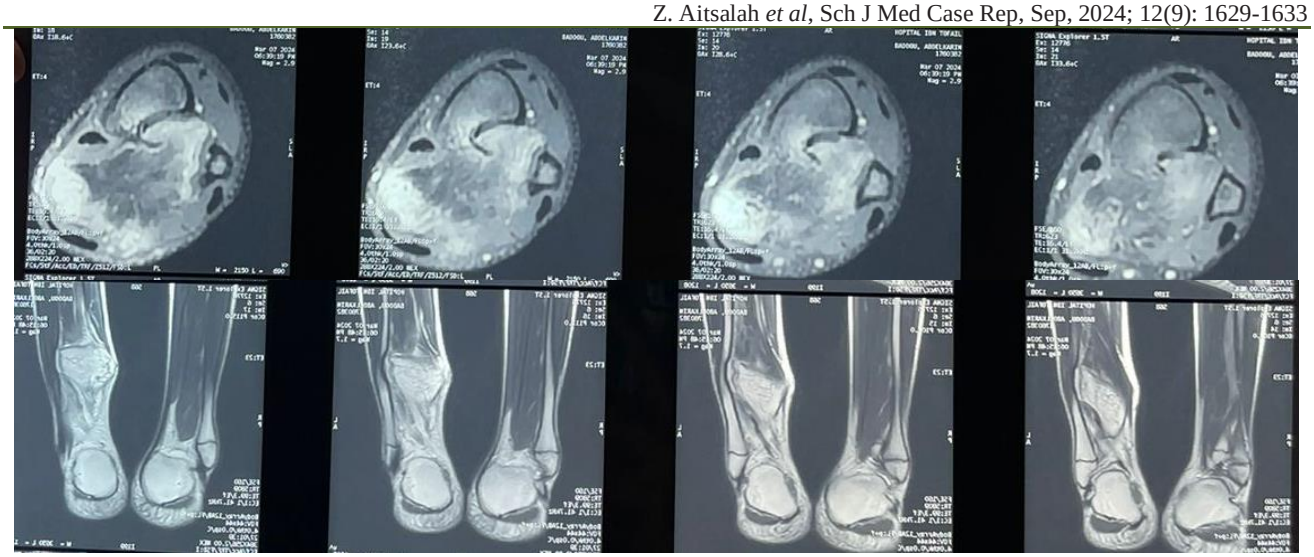

Figure 2 :MRI views of the expansile tumor. (A and B) Coronal views. (C) Axial view of the distal tibiofibular region. Note the continuity between the cortex of the tumor and that of the parent bone (tibial metaphysis). Also, the fibular corte

In light of the patient's poor response to conservative treatment, and the likelihood of a progressive fibular bowing, surgical treatment was recommended. After discussion with the patient's parents, surgical intervention in the form of resection of the osteochondroma, possible fibular osteotomy, and external fixation to correct the bowing deformity were recommended. The goals of the surgical intervention were to remove the osteochondroma, to restore full, pain-free ankle range of motion, and to spare the neurovascular structures, in particular the perforating peroneal artery.

The patient was taken to the operating room and positioned prone on the table, and administered epidural anesthesia after which the left lower extremity was prepped and draped and, after exsanguination, a thigh tourniquet was inflated to 350 mm Hg pressure. A 5-cm incision localized to the postero medial aspect of the distal tibial, situated medial to the Achillean tendon and paralleling its course, was then used to approach the tumor. Blunt dissection was carried down to the osteochondroma with care taken to avoid the neurovascular structures. The bone tumor was located near the perforating posterior tibial artery.

The posterior tibial pedicle was identified in the medial aspect of the surgical site. After identifying the boundaries of the osteochondroma and retracting the vital structures, a sagittal saw was used to resect the lateral-most aspect of the lesion. Medial resection was com- pleted with an osteotome, and a reciprocating rasp was used to try to restore the normal contour of the lateral metaphyseal region of the tibia (Figure 3).

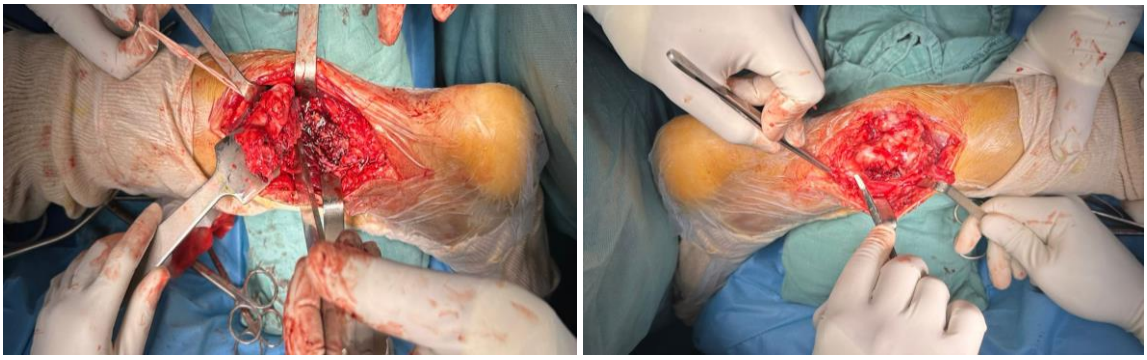

Figure 3 :intraoperative image showing osteochondroma before resection

The weakest and thinnest area of the fibula was at the apex of the lateral bowing. An intraoperative decision was made to avoid the use of a reconstructive fibular osteotomy and to allow the distal fibula to remodel over the ensuing 6 months before any further direct surgical intervention would be considered.

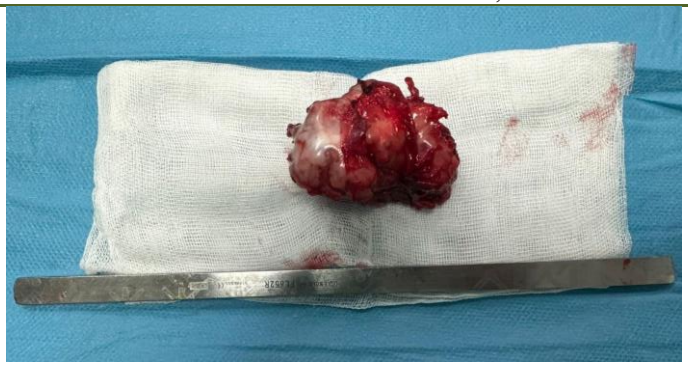

Figure 4 : intraoperative image showing osteochondroma after resection

Subsequent pathological inspection of the excised tumor revealed an elliptical portion of tan bone weighing 80g and measuring between 2cm and 5.2x2.5x3.5cm., Histologically, they correspond to thick, subnormally structured surface cartilage tissue. It rests on cancellous bone tissue with mature, calcified with large, congestive medullary spaces. There are no cellular atypia or abnormal mitoses. (Figure 4).

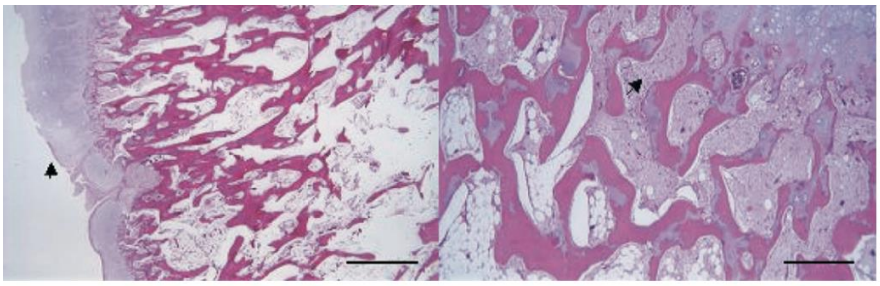

Figure 5: Histological assessment reveals a cartilaginous cap (bar 800 m)/(hematoxylin and eosin stain) and endochondral ossification (bar 150 m)/(hematoxylin and eosin stain)

The patient was maintained non–weight bearing for the first 5 weeks following the operation, and used a walking cast from the fifth to eighth weeks, at which time the patient resumed normal activities and displayed pain-free and full ankle range of motion.

The fibula continued to gradually remodel by thickening and straightening, and radiographic inspection at 12 months postoperative demonstrated substantial tibial remodeling with periosteal reaction (Figure 5).

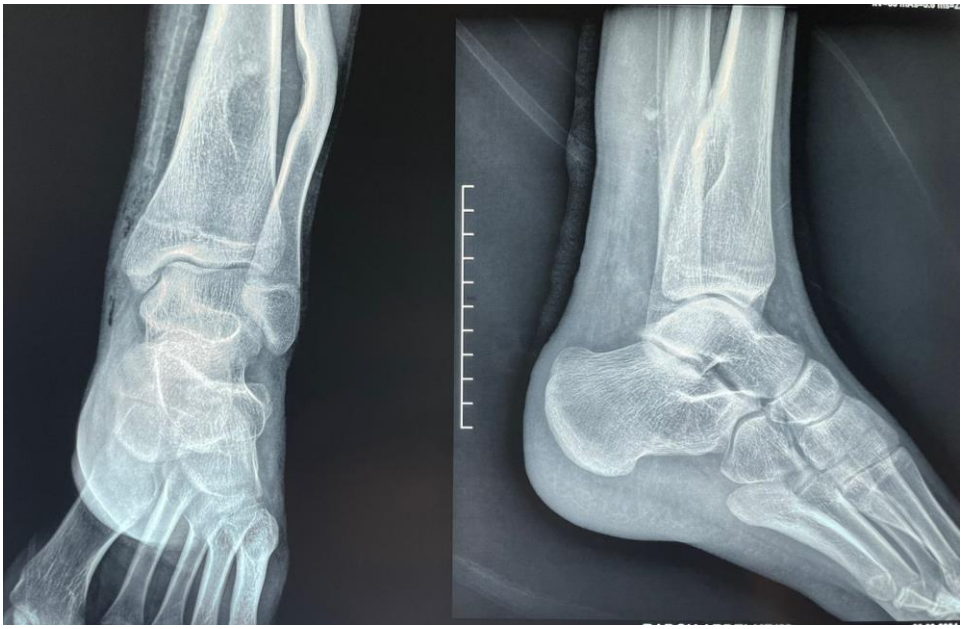

Figure 6 :Follow-up radiograph at 12 months postoperative. The fibula has thickened and continues to straighten. The periosteal reaction at the lateral aspect of the tibia is considered to be bone remodeling and not recurrence

At 1 years postoperative, the patient continued to display a pain-free and full range of ankle motion. To date, the patient continues to undergo periodic follow-up clinical and radiographic inspections.

DISCUSSION

Before presentation to our clinical practice, the patient described in this article had been treated conservatively and, despite increasing pain, surgical intervention had not yet been undertaken.

As the bone tumor continued to expand, the patient's pain increased to the degree that it limited activity and progressively deformed the fibula. Because of this symptomatology, and the extremely thin fibular cortical margins observed on the radiographs and MRI scans, we felt that continued nonsurgical management ran the risk of fibular fracture displacement and worsening pain.

Had the patient been non ambulatory or less painful, ongoing nonsurgical management might have been indicated. In this case an intraoperative decision was made to abstain from reconstructive fibular osteotomy, despite the high degree of fibular bowing. The fact that corrective fibular osteotomy would have been made at the apex of the deformity, also the site of the thinnest portion of the cortex, contributed to the decision to avoid osteotomy. Instead, a decision was made to observe gradual remodeling of the fibula over time. Without the tibial osteochondroma protruding into the fibula, the fibula slowly remodeled and gradually straightened over time.

In conclusion, when benign bone tumors begin to affect quality of life and activity level despite conservative management, surgical intervention becomes a serious consideration. Timely recognition of an expanding osteo- chondroma may prevent pathological fracture and angular deformation of long bone, as well as joint instability and degeneration. In the case described in this article, after excision of the tibial osteochondroma, casting and time allowed continued remodeling of the fibular bowing deformity (Figure 6) without the need for subsequent fibular osteotomy. The patient returned to full activity without any limitations and pain-free range of motion as the bowing deformity resolved naturally.

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