

CASE REPORT

Open Access



Rare case of pediatric calcaneal osteosarcoma masquerading as a cystic lesion

Alan Alexander^{1*} and Brian Tsui¹

Abstract

Background Although osteosarcoma remains the most common primary malignant neoplasm in the bone in the pediatric age group, involvement of the foot is extremely rare.

Case presentation Our case demonstrates what appeared to be a bone cyst of the calcaneus at an outside institution after injury to the ankle. The patient was sent to our institution for further workup where a Computed Tomography scan revealed a permeative lytic lesion with faint calcifications. Based on our patient's radiograph, an aneurysmal bone cyst might be included in the differential diagnosis. A telangiectatic osteosarcoma can also demonstrate a cystic and lytic appearance on radiographs. Interestingly biopsy confirmed our patient had an osteoblastic osteosarcoma.

Conclusions A high degree of suspicion is often necessary for diagnosis of calcaneal osteosarcoma, especially in the setting of injury, and should not be overlooked.

Keywords Osteosarcoma, Pediatric tumors, Sarcoma, Radiographs, Computed tomography, Musculoskeletal

Background

Osteosarcoma remains the most common primary malignant neoplasm in the bone after multiple myeloma, and the most common in the pediatric age group [1]. Osteosarcoma classically arises in the metaphyses of the long bones [2], such as the distal femur. Involvement of the foot is rare, contributing to less than 1% of cases of osteosarcoma, with the majority involving the calcaneus and other tarsal bones. Cases of pediatric calcaneal osteosarcoma are even more rare, with approximately 3 cases published or mentioned in the literature [1, 3].

Case presentation

A 10-year-old boy presented with right ankle pain while jumping on a bed and twisting his ankle. He presented to an urgent care clinic where a radiograph was obtained

and demonstrated a predominantly cystic appearing lesion in the calcaneus (Fig. 1) without discrete fracture, thought to be an aneurysmal bone cyst. He denied any associated symptoms including numbness or tingling. Physical examination demonstrated a calcaneus tender to palpation with full range of motion limited by pain.

Based on the lack of pain improvement over weeks, the patient was referred to orthopedics at our tertiary care center for further management where a Computed Tomography (CT) scan was performed (Fig. 2) to assess for any fracture, which demonstrated a permeative lesion with mild radiodense matrix and cortical breakthrough suspicious for a malignant lesion. Biopsy was subsequently performed and yielded a definitive diagnosis of osteoblastic osteosarcoma.

Further workup demonstrated no metastatic disease and the patient underwent definitive surgery with distal amputation and prosthetic application.

Conclusions

The presenting symptoms of osteosarcoma can be non-specific and common in active children, adolescents, and young adults, resulting in a delayed diagnosis. Pain is

*Correspondence:

Alan Alexander
alanradiology@gmail.com

¹ Department of Radiology, University of California, Los Angeles, David Geffen School of Medicine, 757 Westwood Plaza, Los Angeles, CA 90095, USA



Fig. 1 AP, oblique, and lateral radiographs of the right foot demonstrate a large cystic lesion in the calcaneus with thinning of the lateral cortex, a sclerotic border, and without osseous or chondroid matrix. No pathological fracture or soft tissue extension is evident

usually the most common presenting symptom [1]. Posterior heel pain is a common pediatric complaint, with etiologies including calcaneal apophysitis, plantar fasciitis, contusions, bursitis, and stress fracture [4]. Plain film radiographs are generally the first imaging modality in evaluating an extremity. As in this case the differential diagnosis for a cystic lesion seen on radiograph including a simple bone cyst, aneurysmal bone cyst, osteoblastoma, or giant cell tumor may be initially considered given these are more common in the calcaneus [5]. Malignant lesions such as osteosarcoma may be clinically unexpected by the radiologist, leading to delayed or erroneous diagnosis [6].

Osteosarcoma generally demonstrates cloud-like opacities representing osseous matrix [7]. Osteosarcoma most commonly demonstrates both sclerotic and lytic components. Aggressive high-grade osteosarcomas

may demonstrate aggressive-appearing periosteal reaction. CT is also more sensitive in the detection of osseous matrix, allowing for the diagnosis. The aggressive appearance of osteosarcoma on CT is similar to those described on radiographs, as is seen in our case with cortical breakthrough and soft tissue components. Magnetic Resonance Imaging (MRI) is commonly performed for staging to assess size, joint involvement, and soft tissue extension.

While uncommon, osteosarcomas in the calcaneus can occur, and a high degree of suspicion is often necessary for diagnosis. In our specific case, the radiograph of our patient could suggest an aneurysmal bone cyst in the differential diagnosis. Interestingly, telangiectatic osteosarcoma can demonstrate a cystic and lytic appearance on radiographs, potentially giving

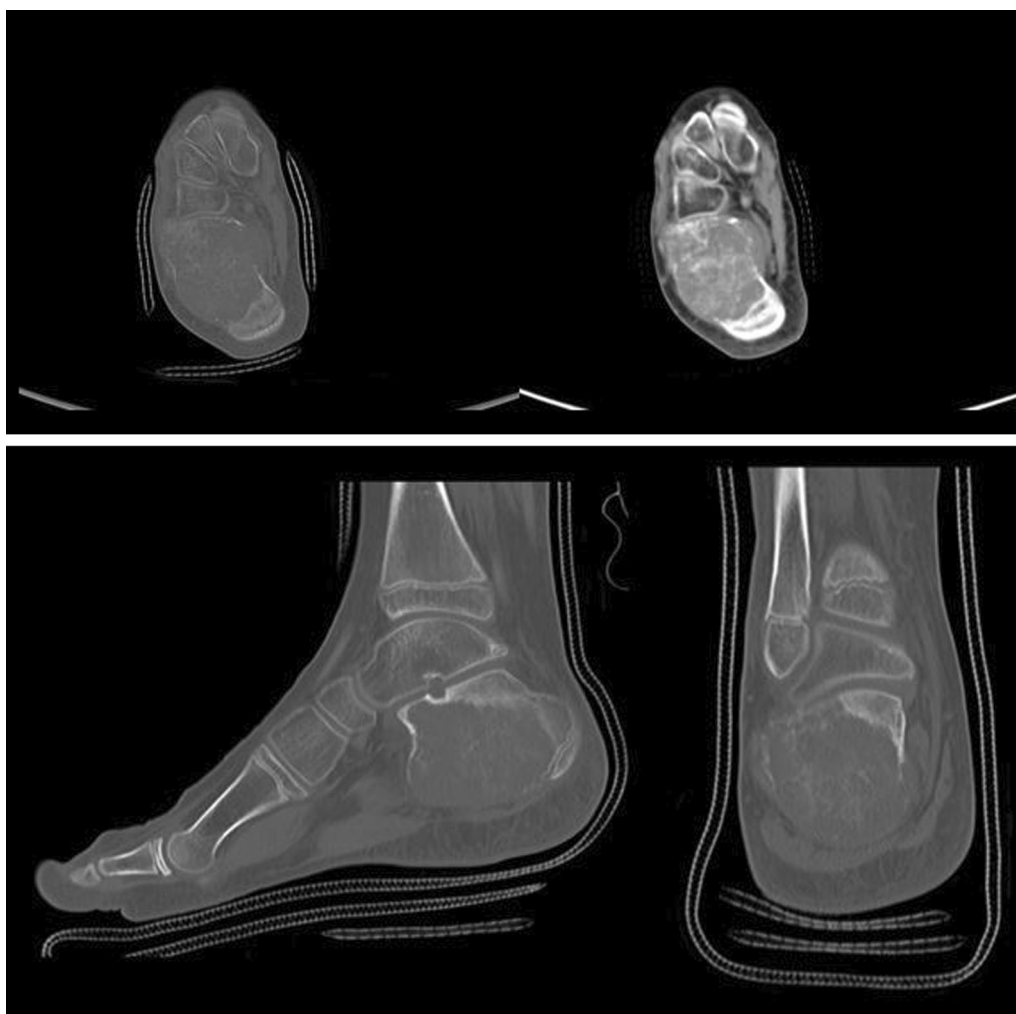


Fig. 2 Axial bone and soft tissue window, sagittal bone window and coronal bone window CT of the ankle demonstrate a permeative soft tissue lesion in the calcaneus without invasion of the physis/epiphysis with expansion of the bone and cortical breakthrough without ossification. Increased linear lace like density in the lesion suggests chondroid or ossific matrix

an appearance of an aneurysmal bone cyst, although our patient had an osteoblastic osteosarcoma. Cystic appearing lesions in the calcaneus, associated with pain, in the pediatric population warrant further evaluation with dedicated cross-sectional imaging to exclude underlying malignancy.

Abbreviations

CT Computed tomography
MRI Magnetic resonance imaging

Acknowledgements

Not applicable.

Author contributions

AA and BT prepared the manuscript, evaluated and interpreted the images, and read and approved the final manuscript. All authors have read and approved the manuscript.

Funding

No funding was received in relation to the preparation or submission of this manuscript.

Availability of data and materials

Not applicable.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Received (informed consent to publish).

Competing interests

The authors have no competing interests.

Received: 4 December 2022 Accepted: 24 June 2023
Published online: 12 July 2023

References

1. Choong PF, Qureshi AA, Sim FH, Unni KK (1999) Osteosarcoma of the foot: a review of 52 patients at the mayo clinic. *Acta Orthop Scand* 70(4):361–364
2. Yarmish G, Klein MJ, Landa J, Lefkowitz RA, Hwang S (2010) Imaging characteristics of primary osteosarcoma: nonconventional subtypes. *Radiographics* 30(6):1653–1672
3. Taslakian B, Issa G, Saab R, Jabbour MN, Khoury NJ (2013) Calcaneal osteosarcoma: a rare cause of heel pain in the paediatric population. *BMJ Case Rep*. <https://doi.org/10.1136/bcr-2012-008497>
4. Chiodo WA, Cook KD (2010) Pediatric heel pain. *Clin Podiatr Med Surg* 27(3):355–367
5. Biscaglia R, Gasbarrini A, Böhlting T, Bacchini P, Bertoni F, Picci P (1998) Osteosarcoma of the bones of the foot—an easily misdiagnosed malignant tumor. *Mayo Clin Proc* 73(9):842–847
6. Leithner A, Bodo K, Scheipl S, Radl R, Kastner N, Windhager R (2004) Two cases of calcaneal osteosarcomas presenting as aneurysmal bone cysts. *Foot Ankle Int* 25(11):815–818
7. Murphey MD, Robbin MR, McRae GA, Flemming DJ, Temple HT, Kransdorf MJ (1997) The many faces of osteosarcoma. *Radiographics* 17(5):1205–31

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Submit your manuscript to a SpringerOpen[®] journal and benefit from:

- Convenient online submission
- Rigorous peer review
- Open access: articles freely available online
- High visibility within the field
- Retaining the copyright to your article

Submit your next manuscript at ► [springeropen.com](https://www.springeropen.com)
