



Case report

Epiphyseal intramedullary osteoid osteoma in the distal radius: A case report and literature review

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ABSTRACT

Osteoid osteoma is one of the osteoblastic benign bone tumors, which occurs frequently at the cortex of long bones, usually in the diaphysis or metadiaphysis. Although the tumor location in the bone varies, epiphyseal intramedullary osteoid osteoma has been rarely reported. Herein, we report a 14-year-old male patient with epiphyseal intramedullary osteoid osteoma, occurring at the distal radius, with magnetic resonance imaging findings.

1. Introduction

Osteoid osteoma is one of the osteoblastic benign bone tumors first characterized by Jaffe as an entity in 1935 [1]. Although osteoid osteoma may occur in any bone, there is a predilection for the lower extremity, with $\geq 50\%$ of lesions occurring in the femur and tibia. Majority of tumors involve the cortex of long bones, usually in the diaphysis or metadiaphysis [2]. A few cases for epiphyseal osteoid osteoma have been reported with five at the intramedullary location [3–11]; however, magnetic resonance imaging (MRI) findings of the lesions are rarely reported. Herein, we describe a patient with intramedullary osteoid osteoma involving the epiphysis of the distal radius with MRI findings of the lesion.

2. Case presentation

A 14-year-old male patient who suffered from left wrist pain was admitted to our hospital. He did not have any underlying disease. On admission, his body temperature was 36.4 °C. Laboratory examination showed a white blood cell count of 6860/uL, C-reactive protein of 0.02 mg/dL, and erythrocyte sedimentation rate of 15 mm/h.

Left wrist radiograph and computed tomography (CT) showed an 8-mm radiolucent lesion with central dense radiopacity and adjacent eccentric minimal sclerosis in the distal radius, near the epiphyseal plate (Fig. 1). MRI demonstrated a central iso- to hypointense lesion with

hyperintense rim on the fat-suppressed T2-weighted image (WI). On T1WI, the central nidus had intermediate signal intensity with hypointense margin. Gadolinium-enhanced fat-suppressed T1WI showed a well-enhanced lesion. Moreover, a prominent bone marrow edema involving the epiphysis and metaphysis of the left distal radius was observed (Fig. 2). There was no synovial thickening or joint effusion. Bone scintigram demonstrated focal increased tracer uptake in the lesion, and physiologic tracer uptake in the physeal plate was also noted (Fig. 3).

Although the lesion had typical imaging findings for osteoid osteoma, chondroblastoma should be included as a differential diagnosis considering the patient's age and lesion location. Moreover, small chondroblastoma may be indistinguishable from an osteoid osteoma [12].

Wrist pain persisted despite the administration of nonsteroidal anti-inflammatory drugs. Curettage and bone graft were performed. In the histopathologic specimen examination, the central nidus of the lesion showed interconnected, delicate trabeculae of the woven bone. Furthermore, the trabeculae were thin and lined by osteoblasts, growing within highly vascularized connective tissues without evidence of inflammation. Thus, the lesion was diagnosed as epiphyseal intramedullary osteoid osteoma (Fig. 4).

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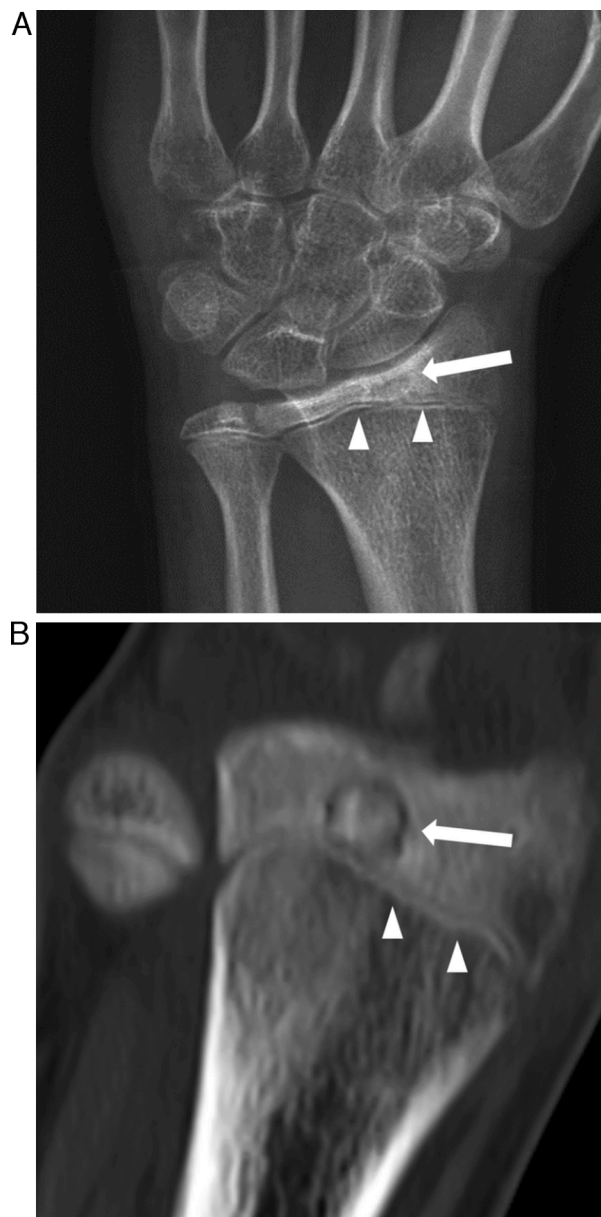


Fig. 1. Osteoid osteoma in a 14-year-old male patient.

A. Anteroposterior view of the left wrist, B. Computed tomography (CT) shows an 8-mm-sized radiolucent lesion with central dense radiopacity in the distal radius (arrows), near the epiphyseal plate (arrow heads).

3. Discussion

Osteoid osteoma usually involves the diaphysis or metaphysis of long bones and seldomly develops in the epiphysis [7]. Tumors are classified as cortical, medullary, or subperiosteal based on radiographic findings. Based on CT and MRI, tumors are also classified as subperiosteal, intracortical, endosteal, or intramedullary [12]. Cortical lesions represent ~75% of osteoid osteomas, with medullary lesions accounting for ~20% of tumors [13].

Typical MRI findings of osteoid osteoma include a central iso- to hypointense lesion with thin hyperintense peripheral rim on fat-suppressed T2WI. However, the central nidus may have variable signal intensity according to mineralization. Mineralized nidus may contribute to central iso- to hypo-intensity and unmineralized nidus is presented as high-signal intensity on T2WI. The central nidus has intermediate signal intensity on T1WI and shows mild to moderate

enhancement after injecting the contrast material. Osteoid osteoma is also frequently accompanied by bone marrow edema adjacent to the lesion [12].

We found four case reports for epiphyseal osteoid osteoma containing MRI findings [7,9–11], with two at the intramedullary location, and summarized in Table 1. The lesion had hypo- to intermediate signal intensity on T1WI and central hypo-intensity with peripheral hyperintense rim on T2WI. Two of four cases include contrast-enhanced image, showing peripheral enhancing rim.

A chondroblastoma is an uncommon benign chondroid tumor and frequently occurs in young individuals. The tumor is typically located in the intramedullary epiphysis of the long bone [12]. A chondroblastoma mimicking osteoid osteoma had been reported [14]. Thus, in young patients with epiphyseal intramedullary lesion, chondroblastoma should be included as a differential diagnosis. However, in our case, the lesion shows concentric pattern of mineralization rather than punctate

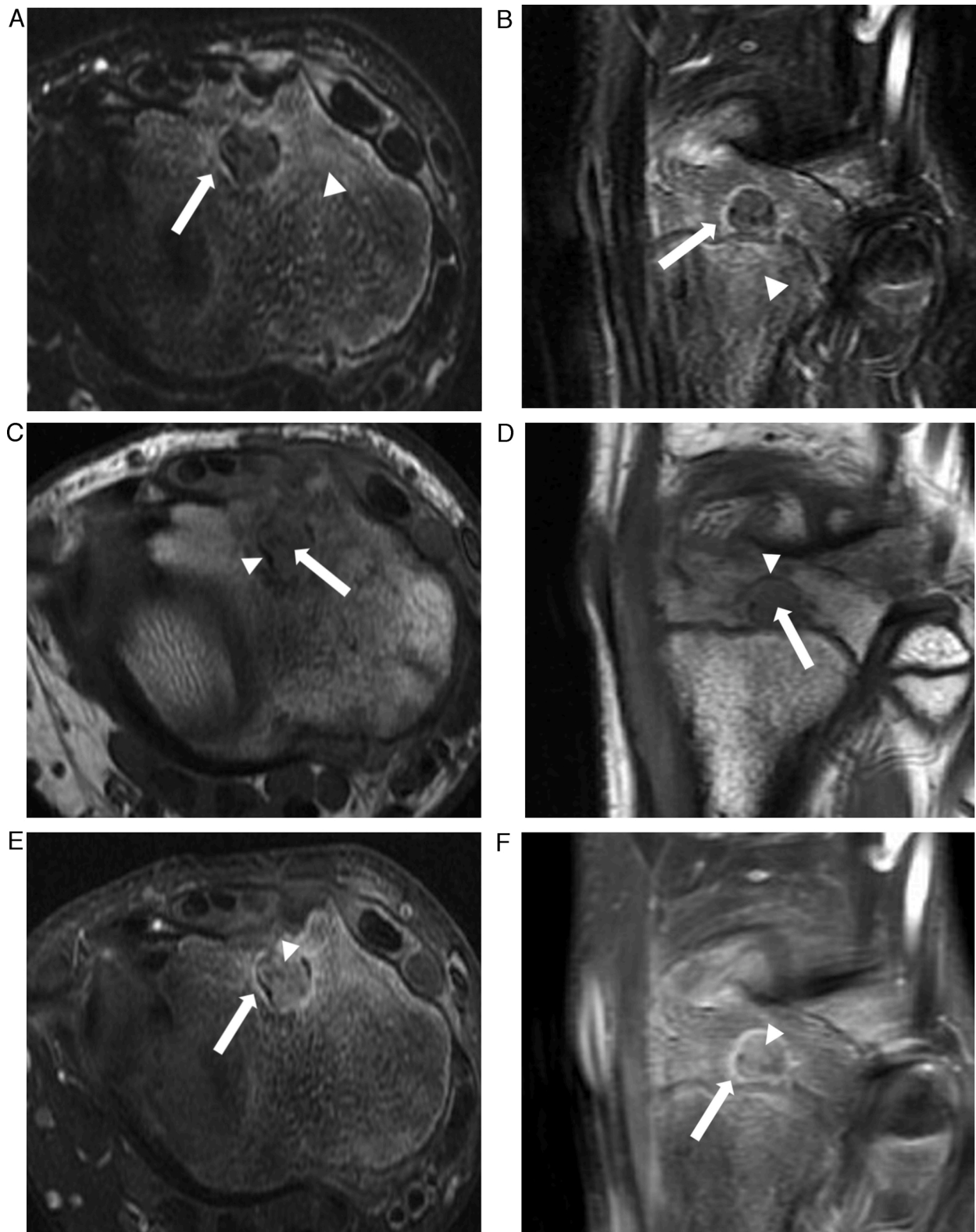


Fig. 2. Magnetic resonance imaging (MRI) of the left wrist.
 A. Axial, B. Coronal fat-suppressed T2-weighted image shows a central iso- to hypointense lesion with thin hyperintense peripheral rim (arrows) in the epiphysis of the distal radius. Poorly defined perilesional hyperintensity (arrowheads) suggesting bone marrow edema was also noted.
 C. Axial, D. Coronal T1-weighted image reveals intermediate intense central nidus (arrows) with hypointense margin (arrow heads).
 E. Axial, F. Coronal gadolinium-enhanced fat-suppressed T1-weighted image shows peripheral rim enhancement (arrows) as shown in high-intensity signal on T2-weighted image. The nidus shows diffuse mild to moderate enhancement (arrow heads).

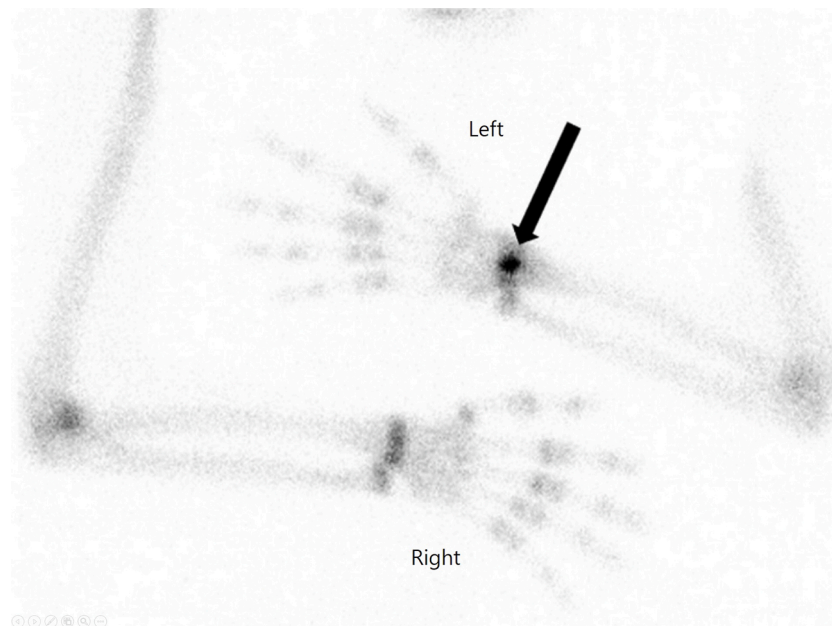


Fig. 3. Whole-body bone scintigram shows focal increased tracer uptake (arrow) in the left distal radius, and physiologic tracer uptake in both physeal plate considered as normal finding in young age was shown.

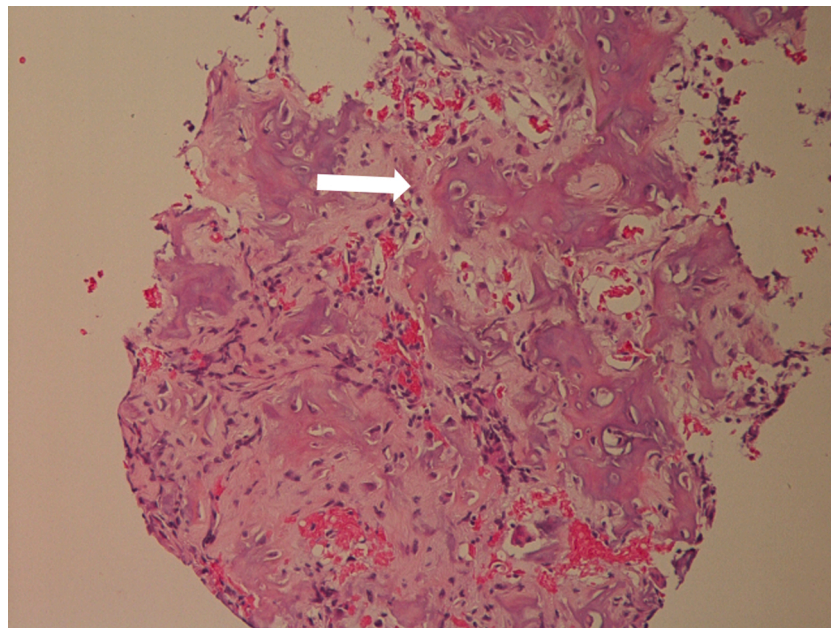


Fig. 4. Histologic specimen of the osteoid osteoma.

The central nidus of the lesion shows interconnected, delicate trabeculae of woven bone (arrow). Moreover, the trabeculae were thin and lined by osteoblasts, growing within the highly vascularized connective tissues without evidence of inflammation.

calcification. In MRI images, the nidus has concentric iso- to hypo-signal intensity and without demonstrable periosteal reaction. Therefore, we preoperatively diagnosed the lesion as epiphyseal intramedullary osteoid osteoma, rather than chondroblastoma, based on imaging findings.

4. Conclusion

Although epiphyseal intramedullary osteoid osteoma rarely occurs, its imaging findings are similar to that of osteoid osteoma occurring as a typical lesion and could be differentiated from other bone tumors

occurring in the epiphysis of the long bone.

Transparency document

The [Transparency document](#) associated with this article can be found in the online version.

Declaration of Competing Interest

The authors have no conflicts of interest.

Table 1
MRI findings of intraepiphyseal osteoid osteoma.

Authors (Ref. No.)	Year	Age/ Sex	Symptom	Involved bone	Location of the bone	MRI findings
Brody JM et al. (7)	1992	10/M	Right knee pain	Distal femur	Intramedullary	- Low-signal focus adjacent to growth plate with surrounding large area of diffuse medium signal replacing normally high-signal epiphyseal marrow of T1WI - Unossified nidus presented as an area of bright signal on T2WI
Morbidi M et al. (9)	2007	34/M	Right ankle pain	Distal tibia	Cortex	-Small intermediate intense lesion in T1WI -Central hypointense lesion with peripheral hyperintense rim on T2WI
Tamam C et al. (10)	2009	13/F	Right leg pain	Proximal tibia	Intramedullary	-Peripheral enhancement of the nidus on enhanced fat-suppressed T1WI with diffuse edema at the epiphysis
Deveci A et al. (11)	2014	16/M	Left wrist pain	Distal radius	Cortex	-Iso- to hypointense nidus on T1WI with mild enhancement on enhanced T1WI -Hypointense nidus with prominent perilesional edema on T2WI

Ref. No. = reference number, WI = weighted image.

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