

Atypical Presentation of Osteoid Osteoma in a Toddler in the MR, SPECT/CT and F-18 FDG PET/CT: Case Report

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Abstract

Osteoid osteoma is a benign tumor with typical presentation in diagnostic imaging modalities in adults. However, there is limited number of reports of cases in childhood. This case report presents atypical imaging features of an osteoid osteoma in a child with MR, SPECT/CT and F-18 FDG PET/CT.

Keywords: Osteoid Osteoma; FDG; SPECT/CT; MR

Introduction

Osteoid osteoma is the benign tumor presented in the long bones and axial skeleton. The typical presentation of the tumor is pain exacerbating in the night which responds to the NSAID's. The typical imaging characteristics usually leads to easy diagnosis however in some special circumstances combination of imaging modalities are required. Bone scintigraphy, might clearly indicate the nidus as focal activity spot and diagnose the lesion. Additionally, SPECT/CT might show activity accumulation corresponding to the nidus in CT. However, there are previous reports that the bone scan might not show increased accumulation in the nidus [1]. In a previous review analysis FDG PET/CT was presented as an efficient modality in the estimation of the nidus activity which might indicate the severity and activity of the disease as shown well as respond to treatment modalities [2]. In this case report atypical imaging characteristics of an extremity osteoid osteoma in SPECT/CT, PET/CT and MR imaging is presented in a toddler.

Case Report

A two years eight months baby girl attended to the hospital for right thigh pain. Plain radiographs showed large sclerotic expansive lesion in the right thigh. The patients/guardians consent was obtained prior to imaging procedures and MR imaging was performed in order to determine the lesion which showed the bone marrow edema, large sclerotic area as well as central nidus and diagnosed the case as osteoid osteoma (Figure 1). Additional after intravenous administration of Tc-99m methylene diphosphonate dose adjusted according to age three phase whole body and spot planar bone scan and at the same time SPECT/CT imaging was performed to the patient for verifying osteoid osteoma. The patient presented with significant accumulation of the sclerotic large lesion in the early and late phase images (Figure 2). The imaging characteristic was also atypical for osteoid osteoma in the bone scintigraphy. After fasting for the examination and intravenous administration of F-18 Fluorodeoxyglucose in the dose adjusted according to the age, PET examination was performed in craniocaudal direction from head to toe with additional low dose CT scanning for attenuation correction. PET/CT imaging revealed focal nidus activity accumulation with SUVmax of '6.5' without any additional activity in the sclerotic part of the lesion and excluded a malignant tumor (Figure 3).

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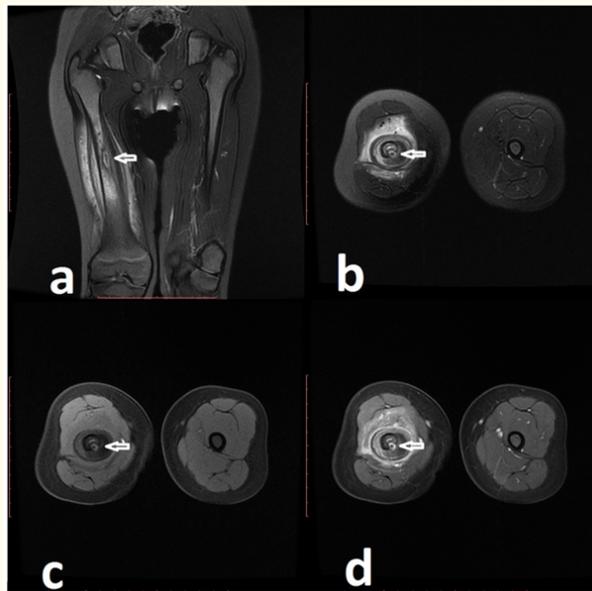
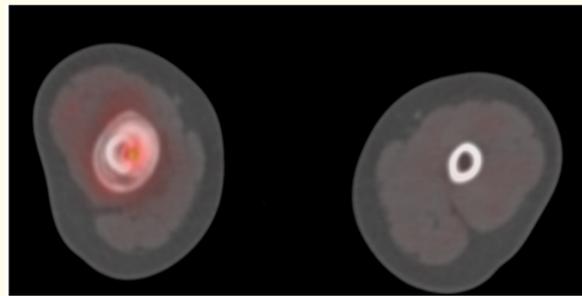


Figure 1: MRI images of the lesion in the 1/3 mid diaphysis of the right femur; coronal (a) and axial (b) sections of the lesion in fat saturated T2A images show the hypointense nidus and surrounding hypointense sclerosis sharp edge narrow transition zone hyperintense ovoid lesion with neighboring medulla and muscle edema. Contrast enhanced fat saturated T1A images (d) show significant contrast enhancement compared to and T1a fat saturated images (c).

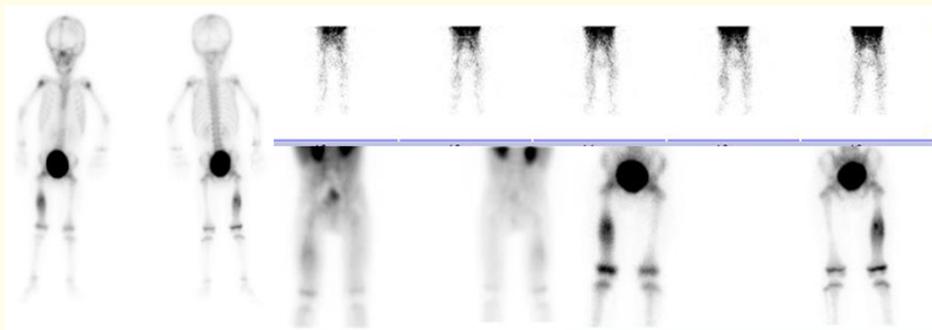


2a

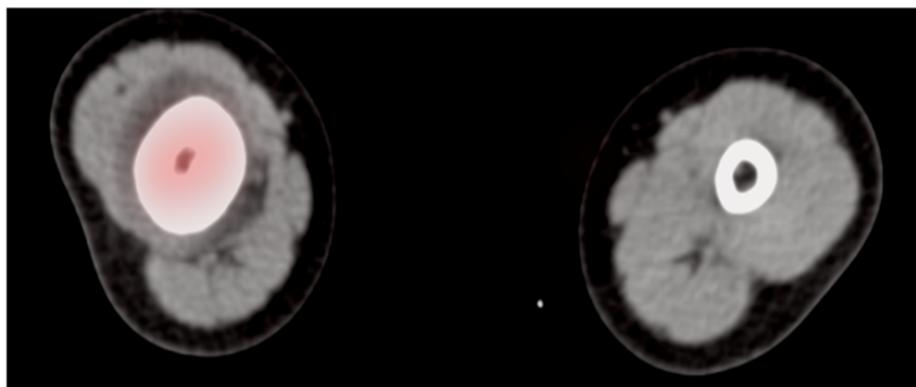


2b

Figure 2: F-18 FDG PET/CT images of the patient; multiple intensity projection images show the nidus activity as a focus in the medial portion of the right thigh (a). Cross sectional images in axial projection demonstrated the nidus activity in the corresponding lesion on CT fusion.



3a



3b

Figure 3: Bone scintigraphy images show the increased vascularity corresponding to the mid 1/3 portion of the femur and late phase activity accumulation in planar and whole body images (a). Additional SPECT/CT images showed significant activity accumulation in the sclerotic expansive lesion without discrete nidal activity (b).

Discussion and Conclusion

The imaging algorithm of the osteoid osteoma includes plain radiographs, CT, bone scintigraphy and additional MR imaging. Recently functional cross sectional imaging modalities including SPECT/CT and PET/CT with Na-Fluoride and F-18 Fluorodeoxyglucose are performed for imaging of osteoid osteoma [2]. In case of suspicious findings and faint visualization of the nidus additional imaging modalities might be necessary as in this case. Osteoid osteoma might not show increased activity in FDG PET/CT however previous reports have demonstrated that the FDG accumulation in the nidus of osteoid osteoma might indicate the activity of the lesion and additionally fades after the treatments [3]. Previous several case reports demonstrated FDG uptake in the nidus of the osteoid osteoma however there is non-FDG avid lesions reported in the literature [4]. A recent study addressed the value of FDG PET/CT in determination of Osteoid osteoma in especially cases with the lesions adjacent to the ankles and vertebrae [3]. In that study the sensitivity of bone scintigraphy accepted as insufficient and the authors prefer to perform FDG PET/CT before and after treatment. The FDG PET/CT may aid in the differential diagnosis of Osteoid osteoma in the cases with uncertainty about the other diagnostic imaging modalities according to the previous case reports [5]. According to Evangelista, *et al.* FDG PET/CT imaging might improve staging of the disease in 15% of the patient population compared to bone scintigraphy [6]. The correspondence of the nidus activity with the symptoms of the disease in some patients might explain the higher prognostic impact of the FDG PET/CT in Osteoid osteoma. Another recent study showed the radiofrequency ablation treatment outcome of the Osteoid osteoma by FDG PET/CT in three patients [7]. The authors performed dynamic quantitative PET/CT imaging for the lesions with additional MR imaging and outlined the similarities with Osteoblastoma. Additionally, they showed decrease in SUV max levels as high as 50% in the post RF images and complete absence in the late follow up in six months.

In this case report the radiologic imaging features of the lesion was also not typical and FDG PET/CT demonstrated the nidus activity and confirmed the diagnosis sufficiently. The bone scintigraphy could not determine a clear nidus activity which showed large expansive lesion with significantly increased activity accumulation and vascularity. MRI of the patient also remained conclusive with significant soft tissue edema and reactive expansive sclerosis. The malignant bone tumors or other benign conditions had to be excluded. The differential diagnosis of Osteoid osteoma includes osteoblastoma and benign conditions including stress fractures, Brodie's abscess [2]. The Osteoid osteoma might show mildly increased uptake at the nidus of the lesion with reported SUVmax values of 2 - 4 in previous reports [2,3,8]. The uptake of this cases lesion was higher '6.5' and additionally reactive sclerotic zone was predominant with increased activity in three phases of bone scan and corresponding MR sequences. However, this report includes the Osteoid osteoma at the earliest age as far as we know in the literature. This might explain atypical presentation of the lesion in imaging studies we have no knowledge about the presentation in these ages. This case report shows that Osteoid osteoma might present with atypical imaging findings in MR and bone scintigraphy and FDG PET/CT might also reveal important additional information firstly in the literature in the youngest patient reported.

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