

Focal Periphyseal Edema Zone on Magnetic Resonance Imaging in the Greater Trochanter Apophysis: A Case Report

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Learning Points for this Article:

Focal periphyseal edema zone on magnetic resonance imaging can occur in a non-weight bearing growth plate of the greater trochanter apophysis.

Abstract

Introduction: Magnetic resonance imaging (MRI) has been used to identify focal bone marrow edema or a focal periphyseal edema (FOPE) zone, in the closing growth plates of adolescent knees.

Case Report: In the current case, an 11-year-old boy reported pain in his left hip. He had been participating in gymnastic classes at school, but otherwise, he was not an active athlete. Based on MRI findings, he was diagnosed with a FOPE zone in his greater trochanteric apophysis. Discontinuity of the cartilaginous growth plate at the FOPE zone was indicative of osseous continuity between the metaphysis and apophysis.

Conclusion: This case suggested that a FOPE zone can occur in a non-weight bearing growth plate and through a tethering mechanism at the initial ossification site during skeletal growth plate maturation.

Keywords: Focal periphyseal edema, hip, greater trochanter apophysis, magnetic resonance imaging.

Introduction

Magnetic resonance imaging (MRI) findings have been used to identify focal bone marrow edema patterns that are centered at the growth plate and extend into the adjacent metaphysis and epiphysis of adolescent knee joints [1, 2, 3]. The lesion has been referred to as a focal periphyseal edema (FOPE) zone [1]. The FOPE zone may be associated with pain, resulting from chronic repetitive microtrauma [1]. In this report, we discuss a case with a FOPE zone in the greater trochanter apophysis.

Case Report

An 11-year-old boy reported pain in his left hip. At the initial evaluation, he appeared normally developed. He was not an active athlete, but he did participate in school gymnastic classes a few hours each week. At the physical evaluation, his hip joint had a full range of motion and was the same bilaterally. Tenderness over the lateral side of the left great trochanter was observed. No particular finding was evident based on the examination of plain radiographs (Fig. 1). The MRI showed bone marrow edema characterized by low signal intensity on a T1-weighted image and a high signal intensity on a fat-suppressed T2-weighted image of the entire left trochanteric area, involving

the metaphysis and the apophysis (Fig. 2). The finding was compatible with a reported FOPE zone. Discontinuity of the cartilaginous growth plate was observed, suggesting bony continuity at the FOPE zone. The size of the discontinuous area was 4.5 mm at the growth plate. No abnormal signals were observed on the MRI of the asymptomatic trochanter apophysis on the right side (Fig. 2).

An 11-year-old boy reported pain in his left hip. At the initial evaluation, he appeared normally developed. He was not an active athlete, but he did participate in school gymnastic classes a few hours each week. No particular finding was evident based on the examination of plain radiographs (Fig. 1). The MRI showed the lesion of bone marrow edema was characterized by a low signal intensity on a T1-weighted image, and a high signal intensity was noted on a fat-suppressed T2-weighted image when assessing the entire left trochanteric area, which involved the metaphysis and the apophysis (Fig. 2). The finding was compatible with a reported FOPE zone. Discontinuity of the cartilaginous growth plate was observed, suggesting bony continuity at the FOPE zone. The size of the discontinuous area was 4.5 mm at the growth plate. No abnormal signals were observed on the MRI of the asymptomatic trochanter apophysis on the right side (Fig. 2). The diagnosis of chronic physeal injury was rejected for

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Figure 1: An 11-year-old boy with a focal periphyseal edema zone. The plain radiograph shows no abnormalities.

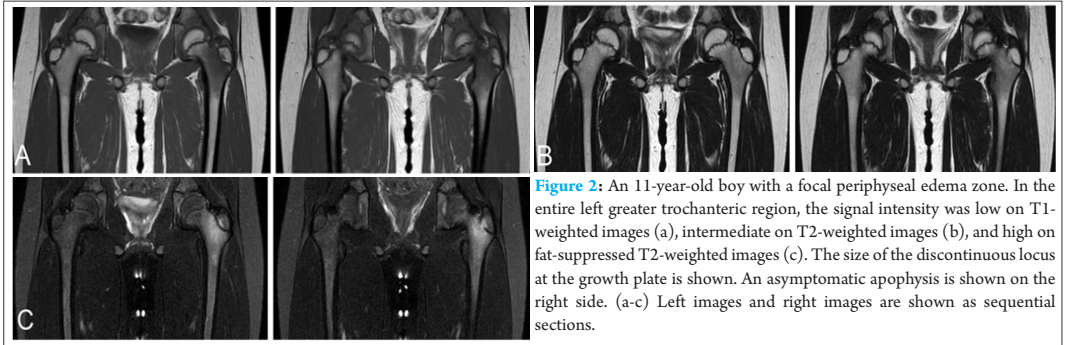


Figure 2: An 11-year-old boy with a focal periphyseal edema zone. In the entire left greater trochanteric region, the signal intensity was low on T1-weighted images (a), intermediate on T2-weighted images (b), and high on fat-suppressed T2-weighted images (c). The size of the discontinuous locus at the growth plate is shown. An asymptomatic apophysis is shown on the right side. (a-c) Left images and right images are shown as sequential sections.

the current case because chronic physeal injury is characterized by widening of the physis and irregularity of the metaphyseal line [4], which were not seen. Since there was no traumatic episode in the current case, differential diagnosis included neoplastic and inflammatory lesions. A follow-up MRI examination a week later showed the surrounding marrow edema pattern that was decreased on the T1-weighted image and on the fat-suppressed T2-weighted image (Fig. 3). A follow-up MRI examination 6 weeks after the initial MRI revealed that the abnormal signal intensity had almost completely diminished (Fig. 4). Therefore, the diagnosis of neoplastic lesions could be ruled out. As for infected lesions, osteomyelitis at the epiphysis, or apophyseal infection, was a possibility. However, the pain experienced was mild, and the bone marrow

the greater trochanter apophysis is a non-weight bearing example and suggests that a FOPE zone can occur in joints other than the knee [1].

During skeletal maturation of the growth plate, the initial ossification forms a bridge between the metaphysis and epiphysis, beginning at the center of the growth plate and expanding to include the whole growth plate [5, 6, 7]. The FOPE zone has been reported to originate at the initial ossification site [1]. The signal abnormality of a FOPE zone on an MRI may be due to microfractures [8, 9]. The occurrence of pain in the FOPE zone has been assumed to be the same as the tethering mechanism occurring in coalitions in the feet [8]. In support of this mechanism, the current FOPE zone existed in an area of defective cartilaginous tissue at the growth plate, suggesting the formation of a bone bridge at the initial site of ossification. Increased stress is assumed to be the cause of a FOPE zone, based on the data that show three-quarters of FOPE zone, cases were observed in patients who participated in competitive athletic activities [1].

In the current case, the patient was not an athlete, but he did participate in school gymnastic classes. Therefore, the possibility that the FOPE zone and the sporting activity could be related

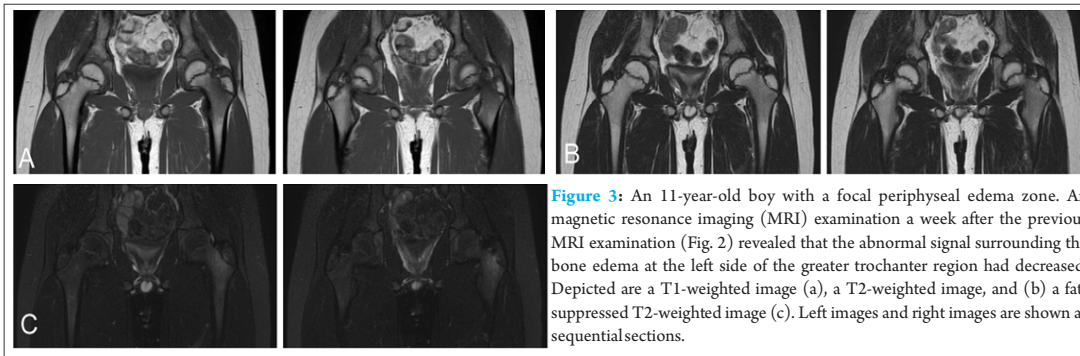


Figure 3: An 11-year-old boy with a focal periphyseal edema zone. An magnetic resonance imaging (MRI) examination a week after the previous MRI examination (Fig. 2) revealed that the abnormal signal surrounding the bone edema at the left side of the greater trochanter region had decreased. Depicted are a T1-weighted image (a), a T2-weighted image, and (b) a fat-suppressed T2-weighted image (c). Left images and right images are shown as sequential sections.

edema seemed not to have substantially manifested. On diagnosing, the possibility of an infection as highly unlikely, a wait, and see strategy was adopted. Blood examination was not performed. In fact, the hip pain had subsided 4 weeks after onset, and the MRI abnormality had improved without any treatment and by the patient abstaining from sport activities, including gymnastics. After ruling out the differential diagnoses of neoplastic and infected lesions, FOPE became the final diagnosis.

Discussion

In a previous report, FOPE zones were reported on knee MRI examinations in a series of 12 patients, comprising 7 girls and 5 boys ranging in age from 11 to 15 years old. The size of the FOPE zone ranged from 2 mm to 27 mm, and all lesions were centrally located at the growth plate [1]. The size of the current lesion was 4.5 mm in diameter and was located at the center of the trochanteric growth plate. These MRI findings, the clinical data, and the age of this patient are similar to those in the previous report, with the exception of the anatomical location. Among the reported 12 FOPE cases of the knee, one case involved the fibula in addition to 2 FOPE lesions, one at the distal femur epiphysis, and another at the proximal fibular apophysis. The proximal fibular apophysis bears less weight than the tibia. The current case in

cannot be discounted.

As for neoplastic lesions as the differential diagnosis of FOPE zones, bone tumors occur in proximity to the epiphysis or apophysis in children and can include chondroblastoma, chondromyxoid fibroma, and osteoid osteoma, all of which are benign in nature [10]. Osteolytic lesions were not present in the current case; therefore, the lesion was less suggestive of chondroblastoma or chondromyxoid fibroma, whereas osteoid osteoma is a small lesion characterized by surrounding bone marrow edema [11]. However, the characteristic clinical symptoms of night pain for osteoid osteoma were absent in the current case. Malignant bone tumors in children include osteosarcoma and Ewing's sarcoma, but the epiphysis or apophysis is not known sites for these tumors [10].



Figure 4: An 11-year-old boy with a focal periphyseal edema zone. In the follow-up examination 6 weeks after the initial magnetic resonance imaging, the abnormal signal intensity almost disappeared. T1-weighted image (a), T2-weighted image (b), and fat-suppressed T2-weighted image (c). Top and bottom images are sequential sections.

Conclusion

In summary, the case of a FOPE zone in the greater trochanter apophysis is reported. The current case supports a mechanism, whereby a FOPE zone occurs at the initial site of ossification at the growth plate, and the pain occurs as a result of a tethering mechanism.

Clinical Message

MRI findings have been used to identify focal bone marrow edema patterns that are centered at the growth plate and extend into the adjacent metaphysis and epiphysis of adolescent knee joints. The lesion has been referred to as a FOPE zone. In this report, the case of a FOPE zone in the greater trochanter apophysis is reported. The current case supports a mechanism that a FOPE zone occurs at the initial site of ossification at the growth plate.

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