Focal Periphyseal Edema (FOPE) in an Adolescent Female: A Case Report

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ABSTRACT
Focal periphyseal edema (FOPE) zones are unusual imaging findings first described in 2011 by Zbojniewicz and Laor. They appear as areas of bone marrow edema centered on the physis of the knee in adolescents nearing skeletal maturity. This condition is clinically significant because knee pain is a frequent reason for consultation in adolescent patients. In many cases, physical examination and radiographs do not provide sufficient findings for a definitive diagnosis, leading to symptom-based treatment without a clear etiology. We report the case of a 13-year-old adolescent presenting with unilateral anterior knee pain without a history of trauma or underlying pathology. The patient had been previously evaluated multiple times without a conclusive diagnosis. Magnetic resonance imaging (MRI) revealed specific findings consistent with a FOPE lesion or zone. Symptomatic treatment was subsequently offered.
Keywords: Knee; growth plate; adolescent; edema; magnetic resonance imaging.
Level of Evidence: IV

Edema perifisario focal en una adolescente: reporte de un caso

RESUMEN
Las lesiones FOPE (*focal periphyseal edema*) son hallazgos infrecuentes, descritas, por primera vez, en 2011, por Zbojniewicz y Laor, como áreas de edema en la médula ósea centradas en la fisis de las rodillas de adolescentes que están cerca de la madurez esquelética. Esto es relevante, ya que el dolor de rodilla es un motivo común de consulta de los adolescentes y, en muchos de estos casos, el examen físico y las radiografías no revelan los hallazgos suficientes para dar un diagnóstico específico, y se opta por indicar un tratamiento para resolver los síntomas, sin una etiología clara. Se presenta el caso de una adolescente de 13 años con dolor anterior de rodilla unilateral, sin antecedente de trauma o enfermedades de base, que había sido evaluada en otras oportunidades, sin que se llegara a un diagnóstico. Una resonancia magnética muestra hallazgos específicos y se diagnostica lesión o zona FOPE. Se administra un tratamiento sintomático.
Palabras clave: Rodilla; placa de crecimiento; adolescente; edema; resonancia magnética.
Nivel de Evidencia: IV

INTRODUCTION

Knee pain is a common reason for consultation in adolescents. In many cases, physical examination and radiographs do not provide sufficient findings to establish a specific diagnosis. Consequently, treatment is often aimed at symptom resolution despite the absence of a clear etiology. In this age group, it is important to consider physeal abnormalities—whether traumatic or atraumatic—and, particularly, the condition described by Zbojniewicz and Laor as focal periphyseal edema (FOPE), albeit a rare finding.[1]

This report presents the case of an adolescent girl with anterior knee pain, ultimately diagnosed with a FOPE lesion based on imaging studies.

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CLINICAL CASE

A 13-year-old adolescent with no relevant medical history presented to the Orthopedic Surgery Service with complaints of left knee pain. According to her mother, the patient had experienced spontaneous pain in her left knee for the past year without any history of trauma. She had visited the emergency department twice for the pain, where she was prescribed analgesics and advised to rest.

Physical examination revealed mild edema of the left knee, without joint effusion or skin changes. The arc of motion was 0° to 120° of flexion-extension, limited by pain. Tenderness was focalized in the distal third of the left thigh, corresponding to the area of the distal femoral metaphysis. There was no evidence of ligamentous instability, meniscal signs, or palpable masses. Peripheral pulses were intact, and no neurological deficits were observed in the lower limbs.

Magnetic resonance imaging (MRI) of the left knee revealed peripheral edema in the distal femur and proximal tibia, with no other abnormalities of clinical significance.

Based on these findings, two potential diagnoses were proposed: FOPE lesion or inflammatory monoarthritis of rheumatic origin. Management included the use of crutches, physical therapy, analgesics, and referral to the Rheumatology Service for further evaluation.

Three months later, the patient returned for follow-up after consultation with the Rheumatology Service, which did not yield a definitive diagnosis. She continued to report severe knee pain and had undergone a privately obtained MRI. This new MRI clearly identified a FOPE lesion in the distal femur, with no additional pathological findings (Figure). Based on this, a diagnosis of FOPE lesion involving the proximal tibia and distal femur of the left knee was confirmed. The patient and her mother were informed about the low prevalence of this condition. Management was focused on physical therapy and analgesics to alleviate symptoms.

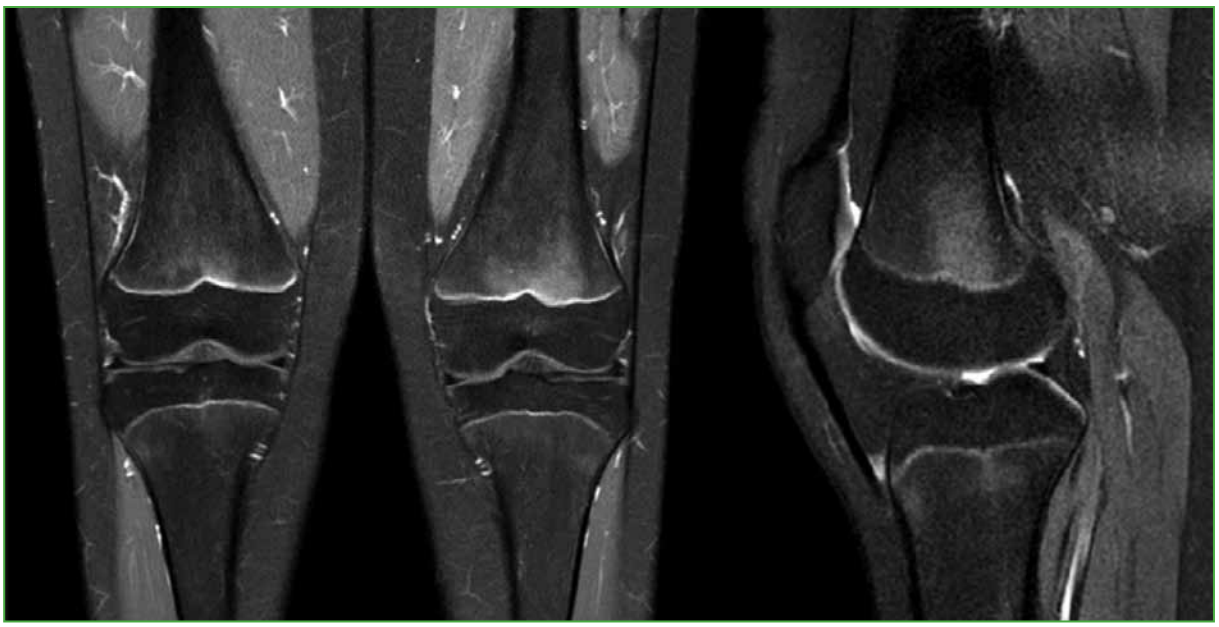

Figure. MRI of the knee. Central and symmetric bone marrow edema in the bilateral distal femoral metaphysis, intensified in the left knee.

DISCUSSION

FOPE lesions were first described in 2011 by Zbojniewicz and Laor, who identified areas of bone marrow edema centered in the physis of the knees in adolescents nearing skeletal maturity, particularly between the ages of 12 and 16—the age range to which our patient belongs.[1] These areas have been associated with painful symptoms in young patients but are also linked to the normal process of physeal closure in adolescents, suggesting that they may represent a physiological rather than pathological phenomenon. [2,3]

While there is no specific pathophysiological mechanism connecting FOPE lesions to the female sex, it is notable that many reported cases involve female patients.[4,5] FOPE lesions most commonly occur around the knee (distal femur, proximal tibia, proximal fibula), though they have also been described in other locations, such as the greater trochanter.[6,7]

The edema observed in the central region of the physis may result from increased stress on the bone tissue due to reduced elasticity in this area, compounded by microtrauma. The isolated descriptive findings of FOPE lesions on MRI, along with episodes of pain, support this as a plausible explanation for the associated symptoms. [8]

Plain radiographs are generally not helpful for confirming the diagnosis, as they are often normal or fail to reveal alterations that correlate with the clinical presentation. MRI, on the other hand, is more valuable due to its detailed findings. FOPE lesions exhibit the following MRI characteristics:[4]

- Areas of edema in the metaphyseal and epiphyseal regions of the physis
- Symmetric edema
- Hypointensity on T1-weighted sequences and hyperintensity on T2-weighted sequences
- Variable extension
- Location in the central portion of the physis or slightly eccentric
- A slightly open, narrow physis in the area of edema

These imaging features are particularly useful for differentiating FOPE lesions from other conditions, such as osteomyelitis, tumors, or traumatic injuries, which typically present with more asymmetrical imaging findings and are less likely to span the physis.[9]

In some adolescents, the degree of edema may be insufficient to cause noticeable symptoms. Consequently, many FOPE lesions may go undiagnosed if they do not result in pain or limitations in physical or athletic activities. [3]

FOPE lesions are self-limiting, and once diagnosed, follow-up imaging or further studies are generally unnecessary. Most cases resolve spontaneously with physeal closure, though residual knee pain can persist for up to three years in some patients. [4]

Treatment primarily involves rest and limiting physical activity for approximately four weeks, as was recommended for this patient. Physical activities can be gradually resumed as symptoms decrease in intensity.[2]

CONCLUSIONS

FOPE lesions, or FOPE zones, represent a physiological event occurring in the physis of patients nearing skeletal maturity. Although poorly described in the literature, they should be considered a potential cause of anterior knee pain in adolescents.

Conflict of interest: The authors declare no conflicts of interest.

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