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Diagnostic Imaging

The role of whole-body magnetic resonance imaging in diagnosing chronic recurrent multifocal osteomyelitis

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ABSTRACT

Chronic recurrent multifocal osteomyelitis (CRMO) is an uncommon idiopathic inflammatory disorder. The diagnosis is often delayed because a variable clinical presentation and limited awareness among care providers. We present an 11-year-old female diagnosed with CRMO and her imaging workup. In particular, this case highlights the role of whole-body magnetic resonance imaging to enhance detection and diagnosis of CRMO.

Introduction

Chronic recurrent multifocal osteomyelitis (CRMO) is an uncommon idiopathic inflammatory disorder that is characterized by recurrent episodes of noninfectious osteomyelitis. Giedion et al. reported the first case of CRMO in 1972, describing it as a subacute and chronic recurrent symmetric osteomyelitis. The authors also described the disease process as having multiple bone lesions that predominantly affect the metaphyseal regions [1,2]. The varied clinical presentation of CRMO contributed to it being reported by many different names in the literature. It was not until 1978 that Probst et al. firmly established the disease's name as CRMO [1].

CRMO manifests as remitting and relapsing musculoskeletal pain with a protracted course. It primarily affects children and adolescents, with a female-to-male ratio of 2-4:1 [1,3]. The initial presentation typically consists of swelling and pain over the affected bone. Associated radiographic findings suggestive of osteomyelitis are also noted at the time of presentation.

Unfortunately, the diagnosis of CRMO is often delayed because of its variable clinical presentation and limited awareness of this condition among care providers [2]. To avoid delays in diagnosis, it is imperative that both clinicians and radiologists understand the presentation and the radiological findings of CRMO.

This case report describes the clinical presentation of an 11-year-old female with CRMO and her diagnostic imaging

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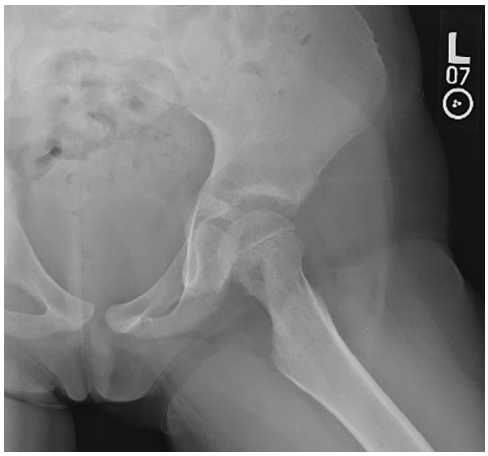

Fig. 1 – Left hip radiograph, frog-leg view. Eccentric lytic lesion at the medial aspect of the proximal femoral metaphysis. L, left.

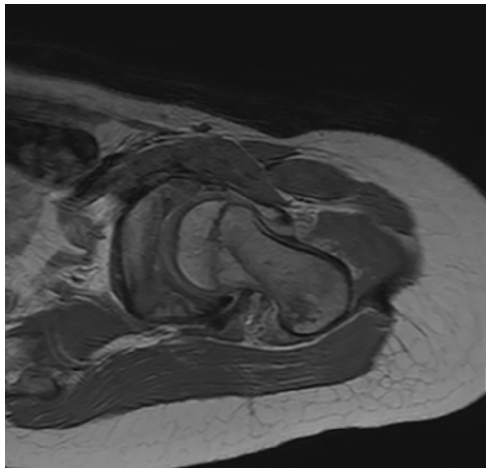

Fig. 2 – Left hip magnetic resonance imaging, oblique axial proton density sequence; curvilinear low signal intensity line abuts the physis in the proximal femoral metaphysis consistent with an occult fracture.

workup. In particular, this case report highlights the role of the sequences performed during a whole-body magnetic resonance imaging (MRI) to enhance detection and diagnosis of this previously unrecognized condition in this patient.

Case report

An 11-year-old girl presented to our facility with chronic multifocal joint pain. Her medical history is significant for a left hip injury sustained after doing cartwheels at the age of 7 years and complaints of chronic multifocal joint pain since the time of injury. Radiographs of the left hip obtained at the time of injury demonstrated an eccentric lytic lesion abutting the medial aspect of the proximal femoral metaphysis (Fig. 1). These plain radiograph findings prompted further evaluation with a left hip MRI. The initial hip MRI demonstrated a fracture involving the left femoral epiphysis, metaphysis, and diaphysis with surrounding marrow edema (Fig. 2). The fracture line was not evident, even in retrospect, on plain radiograph. Despite treatment, the patient continued to have pain in her left hip. A repeat MRI was performed 1 month later to evaluate for resolution. The second MRI showed unchanged left proximal femoral marrow edema surrounding a stable-appearing fracture line and no evidence of callus (Fig. 3A-C). The lack of healing raised concerns for an underlying pathologic process predisposing to a fracture. At the time, differential diagnostic considerations included osteomyelitis and Langerhans cell histiocytosis. Although typically epiphyseal in location, chondroblastoma was also included in the differential, given the extensive marrow edema. Ewing sarcoma, lymphoma, or leukemic involvement of the bone were considered to be less likely differential diagnostic considerations because there was no associated soft tissue mass. The patient was referred for a left hip curettage. Evaluation of the pathology sample showed bone fragments and hematopoietic elements but no evidence of either acute inflammation or malignancy.

Over the course of the next 4 years, the patient continued to experience waxing and waning pain in her left hip. She also complained of intermittent pain in her knees and right shoulder. The patient subsequently presented with a 1-month history of right ankle pain that was associated with warmth and swelling, findings that were concerning for osteomyelitis. Radiographs of the patient's right ankle showed a mottled appearance of the lateral aspect of the distal right tibial metaphysis with mixed areas of sclerosis and lucency (Fig. 4).

The patient was referred to a pediatric rheumatologist for further evaluation because of the multifocal joint involvement. Laboratory studies revealed a mildly elevated C-reactive protein and erythrocyte sedimentation rate. No other laboratory abnormalities were found. A whole-body MRI was ordered after consultation with a pediatric radiologist. The following MRI sequences were obtained: axial diffusion-weighted imaging (DWI), axial apparent diffusion coefficient (ADC), and coronal whole-body short-tau inversion recovery (STIR). The MRI study showed a hyperintense signal within the left femoral head and neck, and proximal diaphysis on the STIR sequence, with corresponding hyperintensity on DWI and ADC sequences (Fig. 5A-C). Confluent STIR hyperintensity was also noted in multiple areas to include the right proximal humerus, acetabular roofs, knees, and distal tibiae without restricted diffusion.

The diagnosis of CRMO was made based on a combination of the clinical presentation, chronicity of the complaints, the multifocal involvement, history of a negative bone biopsy, and the most recent MRI findings.

Discussion

CRMO is characterized by an insidious onset of vague pain, swelling and tenderness over an affected joint [4]. The course of CRMO consists of intermittent periods of exacerbations and improvement in musculoskeletal pain. The mean onset of symptoms has been reported between 8-14 years of age [1,4,5]. Several studies have demonstrated that the symptoms can last