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Case Report

Multifocal Bone Infarctions Mimicking Inflammatory Pelvic Disease in a Child with Sickle Cell Disease: An MRI Diagnostic Pitfall

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Abstract

A 12-year-old child with known sickle cell disease presented with inflammatory-type pelvic pain. There was no associated fever, and the infectious work-up was negative. Given the inflammatory characteristics of the pain, a rheumatologic disorder was initially considered. Laboratory investigations showed negative HLA-B27 testing and a negative rheumatoid factor.

Magnetic resonance imaging (MRI) of the pelvis was subsequently performed. Coronal and axial fluid-sensitive sequences demonstrated multiple areas of abnormal bone marrow signal involving the pelvic bones and the proximal femora. The lesions were geographic and relatively well defined, with characteristic serpiginous margins and increased signal intensity on fluid-sensitive sequences.

On T1-weighted images, the lesions showed peripheral serpiginous low-signal-intensity rims with relative preservation of the central marrow signal. The multifocal distribution and characteristic morphology of these lesions, in the setting of known sickle cell disease, were highly suggestive of multifocal bone infarctions.

Keywords: *Sickle Cell Disease (SCD); Magnetic Resonance Imaging (MRI); Inflammatory-Type Pelvic Pain; Multifocal Bone Infarctions*

Introduction

Sickle cell disease (SCD) is a hereditary hemoglobinopathy characterized by recurrent vaso-occlusive phenomena that can lead to ischemic injury in multiple organs. The skeletal system is frequently involved, particularly in children, with musculoskeletal manifestations including bone infarction, osteonecrosis, osteomyelitis, and septic arthritis [1,2].

Bone infarction results from microvascular occlusion and subsequent ischemia of the bone marrow and represents an important cause of acute or recurrent bone pain in patients with SCD [2,3]. Its clinical presentation may overlap with infectious or inflammatory musculoskeletal disorders, making the diagnosis challenging, particularly in pediatric patients. Magnetic resonance imaging (MRI) is highly sensitive for detecting bone marrow abnormalities and plays a central role in assessing the extent and distribution of skeletal involvement [3,4].

Case Presentation

We report the case of a 12-year-old child with known sickle cell disease presenting with inflammatory-type pelvic pain, in whom MRI demonstrated multifocal bone infarctions involving the pelvis and proximal femora, initially raising the differential diagnosis of an inflammatory musculoskeletal disorder.

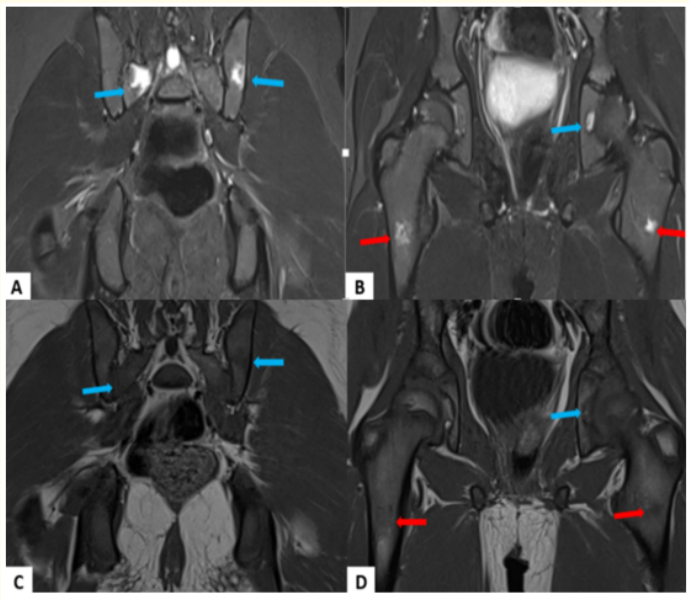

Figure 1: *Coronal STIR (A and B) and T1-weighted (C and D) MR images of the pelvis demonstrate multiple bilateral medullary lesions involving the proximal femora (Red arrows) and pelvic bones (Blue arrows), lesions exhibit geographic and serpiginous margins, with peripheral low signal intensity on T1-weighted imaging and corresponding high signal intensity on STIR images, while the central marrow signal is relatively preserved.*

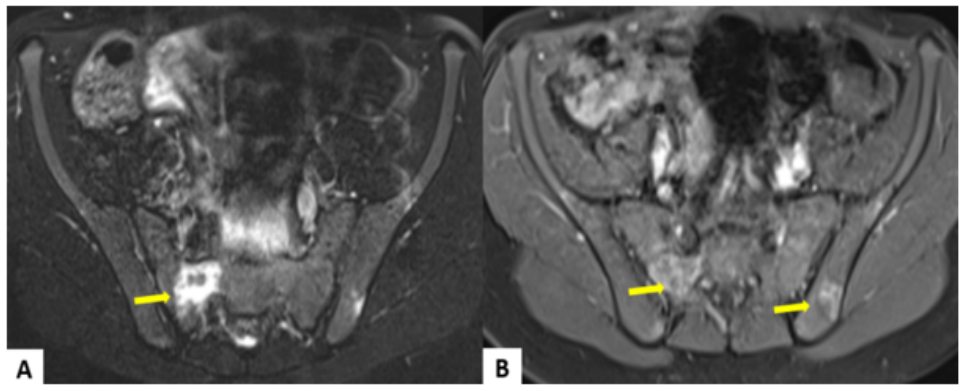

Figure 2: *Axial fluid-sensitive (A) and contrast-enhanced fat-suppressed T1-weighted (B) MR images demonstrate focal medullary abnormalities adjacent to the sacroiliac joints, with high signal intensity on the fluid-sensitive sequence and enhancement after gadolinium administration (Yellow arrows). The abnormalities are predominantly intraosseous, without definite MRI features of sacroiliitis or associated soft-tissue collection.*

No imaging findings strongly suggestive of an infectious process, such as a focal abscess or extensive adjacent soft-tissue collection, were identified on the available MRI sequences. In conjunction with the absence of fever and the negative infectious work-up, osteomyelitis was considered less likely.

The final diagnosis was multifocal bone infarctions related to sickle cell disease.

Discussion

Sickle cell disease (SCD) is associated with a broad spectrum of musculoskeletal complications, mainly resulting from recurrent vaso-occlusion, chronic anemia, and increased susceptibility to infection. Bone involvement represents a major source of morbidity and includes medullary bone infarction, osteonecrosis, osteomyelitis, septic arthritis, and chronic marrow changes [2-4]. Vaso-occlusive phenomena result from obstruction of the microcirculation by sickled erythrocytes, leading to reduced blood flow, tissue hypoxia, and ultimately ischemic necrosis of the bone marrow [2,3].

Bone infarction is one of the most frequent skeletal manifestations of SCD and may involve both the axial and appendicular skeleton [3,4]. Medullary infarctions predominantly affect the metaphyseal and diaphyseal regions of long bones, whereas involvement of the epiphysis is generally referred to as osteonecrosis or avascular necrosis. The femora are commonly affected, although pelvic and other axial skeletal locations may also occur [3,4]. Multifocal involvement, as observed in our patient, reflects the systemic nature of the underlying vaso-occlusive process.

MRI is particularly valuable for detecting and characterizing bone marrow involvement. The appearance of bone infarction varies according to its stage. In established lesions, a geographic or serpiginous peripheral low-signal-intensity rim on T1-weighted images surrounding relatively preserved central marrow is characteristic. On fluid-sensitive sequences, the peripheral component may demonstrate increased signal intensity related to reactive marrow edema, producing a characteristic serpiginous appearance [3,5]. Contrast enhancement may occur, particularly at the periphery of the infarct, and should therefore not be interpreted as evidence of infection in isolation [5].

In our patient, MRI demonstrated multiple bilateral medullary lesions involving the pelvic bones and proximal femora. Their geographic and serpiginous morphology, peripheral low signal intensity on T1-weighted images, corresponding high signal intensity on STIR images, and relative preservation of central marrow signal strongly supported the diagnosis of multifocal bone infarctions in the context of known SCD. The distribution of the abnormalities was particularly noteworthy because some lesions were located adjacent to the sacroiliac joints.

This juxta-sacroiliac distribution is clinically relevant. The patient presented with inflammatory-type pelvic pain, prompting an initial rheumatologic evaluation, including HLA-B27 and rheumatoid factor testing, both of which were negative. When bone infarction occurs close to an articulation, associated marrow edema may potentially simulate an inflammatory osteoarticular process. Careful analysis of lesion morphology and distribution is therefore essential to recognize the predominantly intraosseous nature of the abnormalities and avoid attributing juxta-articular marrow signal changes automatically to primary joint inflammation.

The present case highlights the importance of integrating clinical background with MRI findings in children with SCD presenting with pelvic pain. Recognition of the characteristic morphology and multifocal distribution of medullary infarctions may help establish the correct diagnosis and avoid unnecessary investigations or inappropriate treatment for an inflammatory or infectious disorder. Nevertheless, MRI findings should always be interpreted in conjunction with clinical and laboratory data because substantial imaging overlap may exist between the different musculoskeletal complications of SCD [3,5].

Differential diagnosis

Several conditions may mimic bone infarction in a child with sickle cell disease, particularly when bone pain has inflammatory characteristics and MRI demonstrates multifocal marrow abnormalities.

Osteomyelitis

Osteomyelitis represents the most important differential diagnosis of bone infarction in patients with sickle cell disease. Both conditions may present with acute bone pain and marrow edema on MRI, and substantial overlap exists between their imaging appearances. Indeed, MRI findings alone may not always reliably distinguish acute bone infarction from osteomyelitis [6,7].

Clinical and laboratory correlation is therefore essential. Fever, prolonged focal pain, localized swelling, elevated inflammatory markers, positive blood cultures, and associated soft-tissue or subperiosteal collections favor infection. In contrast, multifocal painful sites are more commonly associated with vaso-occlusive bone infarction [6,8]. In our patient, the absence of fever, negative infectious work-up, multifocal distribution of the lesions, absence of abscess or significant adjacent soft-tissue collection, and characteristic serpiginous morphology favored bone infarction over osteomyelitis.

Sacroiliitis and juvenile spondyloarthritis

Sacroiliitis was another relevant differential diagnosis because the patient presented with inflammatory-type pelvic pain and some of the marrow abnormalities were located immediately adjacent to the sacroiliac joints. This clinical presentation initially prompted rheumatologic investigations, including HLA-B27 testing.

Active sacroiliitis on MRI is primarily characterized by subchondral bone marrow edema adjacent to the sacroiliac joint, potentially associated with synovitis, capsulitis, enthesitis, or enhancement. Structural changes such as erosions, sclerosis, fat metaplasia, or ankylosis may develop with more established disease. In our patient, however, the abnormalities were predominantly intraosseous and multifocal, extending beyond the sacroiliac region to involve the proximal femora and other pelvic sites. Their geographic and serpiginous morphology was also more consistent with medullary infarction than with primary inflammatory sacroiliitis. The negative HLA-B27 result supported the initial diagnostic reassessment, although HLA-B27 negativity alone does not exclude juvenile spondyloarthritis.

Chronic nonbacterial osteomyelitis

Chronic nonbacterial osteomyelitis (CNO), including its multifocal form, chronic recurrent multifocal osteomyelitis (CRMO), should also be considered in children presenting with inflammatory bone pain and multifocal marrow lesions. CNO is an autoinflammatory sterile bone disorder that predominantly affects children and adolescents and frequently involves the metaphyseal regions of the long bones, although pelvic and axial involvement may also occur.

MRI typically demonstrates bone marrow edema, most conspicuous as hyperintense lesions on STIR or other fluid-sensitive sequences, and whole-body MRI is particularly useful for demonstrating clinically silent multifocal lesions. The absence of fever and negative infectious investigations in our patient could therefore initially be compatible with CNO. However, the known history of sickle cell disease, together with the characteristic geographic and serpiginous morphology of the lesions, peripheral low-signal-intensity rims on T1-weighted images, relative preservation of central marrow signal, and typical multifocal medullary distribution favored vaso-occlusive bone infarctions.

Overall, the combination of the patient's underlying sickle cell disease, multifocal lesion distribution, characteristic MRI morphology, and absence of clinical or laboratory evidence of infection supported the diagnosis of multifocal bone infarctions secondary to sickle cell disease.

Conclusion

Multifocal bone infarction should be considered in children with sickle cell disease presenting with pelvic pain, even when the clinical presentation suggests an inflammatory musculoskeletal disorder.

MRI plays a key role in recognizing the characteristic geographic and serpiginous marrow abnormalities and in demonstrating their multifocal distribution.

Juxta-articular infarcts, particularly near the sacroiliac joints, may mimic inflammatory sacroiliitis, while osteomyelitis and chronic nonbacterial osteomyelitis remain important differential diagnoses. Careful integration of MRI findings with the clinical context and laboratory data is therefore essential to establish the correct diagnosis and avoid unnecessary investigations or inappropriate treatment.

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