

Acute Hip Pain

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Case Presentation

A 57-year-old man presented with right hip pain which had begun a few months prior and was thought to be related to his work as a truck driver. He denied any history of recent trauma or mechanical symptoms, such as clicking, locking, instability, giving way, or buckling. There is no significant medical or surgical history. Imaging work-up included initial radiographs, followed by MRI (**Fig.**).



Figure. Single radiograph of the right hip (**A**) demonstrates no evidence of acute fracture or dislocation. Minimal decrease bone mineralization is noted. Coronal proton density weighted sequence (**B**) reveals hypointense signal within the femoral head and neck with sparing of the acetabulum. A fat-suppressed intermediate sequence (**C**) shows corresponding hyperintense signal. No fracture is identified. Subsequent MRI was performed after 3 months (**D**), demonstrating interval resolution of bone marrow edema within the right femoral neck and head.

Key clinical finding

Acute, transient hip pain

Key imaging findings

Localized bony demineralization and edema of the hip

Differential diagnoses

Occult hip fracture

Osteonecrosis

Septic arthritis

Regional migratory osteoporosis (RMO)

Transient osteoporosis of the hip (TOH)

Discussion

Acute onset of hip pain in an adult has a relatively broad differential. Serious and potentially treatable processes, such as hip fractures, osteonecrosis, and a septic joint must be considered and appropriately worked-up or excluded. Less common and often self-limiting processes, such as regional migratory or transient osteoporosis of the hip, are potential considerations, especially in the setting of localized and transient bony demineralization or marrow edema pattern on MRI.

Occult Hip Fracture

An occult fracture of the hip is an essential differential diagnosis to consider in the setting of acute hip pain. A non-displaced fracture can be occult on plain radiographs. On MRI, T1-weighted sequences will show hypointense fracture lines; fluid-sensitive sequences will show associated marrow edema. In the setting of a stress changes/fracture, an incomplete hypointensity at medial cortex may be seen.

Osteonecrosis

Osteonecrosis (avascular necrosis of the hip) is a multifactorial process; common risk factors include trauma, glucocorticoids, alcohol abuse, systemic lupus erythematosus, radiation, pancreatitis, and sickle cell anemia. The femoral head is the most commonly affected site of the hip. Trauma is nearly always unilateral; systemic, non-traumatic cases of osteonecrosis are often bilateral. Early radiographs show patchy sclerosis of the femoral head, while late radiographs show irregularity, fragmentation, and collapse of femoral head articular surface. MR is 97% sensitive and 98% specific for osteonecrosis. The pathognomonic "double line" sign seen on T2-weighted sequences consists of a low signal intensity line at periphery of the infarct with a bright inner line along the interface with infarcted bone. A circumscribed subchondral "band-like" lesion with low T1 signal intensity is also pathognomonic for osteonecrosis.¹

Septic arthritis

Septic arthritis may occur at any joint. In adults, the knee is the most commonly affected joint with the majority of cases occurring from hematogenous spread; the hip is less commonly involved. Early in the disease process, plain radiographs are often normal. The earliest sign is typically a small joint effusion, followed by joint space narrowing due to cartilage destruction and marginal erosions. Hyperemia leads to periarticular osteoporosis; however, a sclerotic host reaction can occur if the septic joint is bacterial. MRI has 100% sensitivity and 77% specificity in the diagnosis of a septic joint. Fat-suppressed T2-weighted sequences will show a hyperintense joint effusion and hyperintense subchondral bone. Post contrast fat-suppressed T1-weighted sequences will demonstrate synovial thickening, subchondral bone enhancement, and an occasional adjacent soft tissue abscess.²

Regional Migratory Osteoporosis (RMO)

RMO is defined as sequential polyarticular arthralgia of the weight bearing joints associated with severe focal migratory osteoporosis. Men in their fifth and sixth decades of life are most commonly affected. The condition involves only the lower extremities, especially the knee, ankle, and foot, with lesser involvement of the hip joints. This distribution helps differentiate RMO from transient osteoporosis of the hip (discussed below). Migration may occur in the same or at a different joint and occurs at an unpredictable time interval after the onset of symptoms. Usually, the joint nearest the affected joint is the next to be involved. The patient's clinical examination demonstrates generalized tenderness and a warm, edematous affected joint. The overlying skin is often affected by inflammatory changes, and muscle atrophy is frequently noted. Imaging findings of RMO are indistinguishable from transient osteoporosis of the hip, except for the migratory pattern. Systemic osteoporosis is a more recently recognized accompanying feature that hints at an underlying etiology and an approach to the management of this condition.^{3,4}

Transient Osteoporosis of the Hip (TOH)

TOH is a rare skeletal disorder that usually affects healthy middle-aged men and women during the third trimester of pregnancy or immediate postpartum period.^{5,6} The condition affects men twice as often as pregnant or postpartum women.⁷ TOH presents spontaneously with sudden-onset of pain at the affected joint. Pain is worse with weight bearing and may be disabling. Symptoms gradually subside within 4 to 9 months and may recur.³ Although many studies have tried to determine the etiology for TOH, the exact cause remains unknown.

Conventional radiographs are often normal in the early stages of TOH. Within 4 to 8 weeks,

however, patients develop variable and often profound osseous demineralization of the femoral head and neck, sometimes extending into the acetabulum. There is a loss of the subchondral bone within the femoral head that can progress to complete absence of the osseous architecture, known as "phantom appearance of the femoral head."⁸ Joint effusions develop in most cases, but the joint space remains intact; no subchondral erosions are evident.³ Skeletal scintigraphy shows homogenous increased uptake in the femoral head and neck on all three phases, before demineralization is seen on radiographs.⁹

Magnetic resonance imaging has become the modality of choice for early diagnosis of TOH, with the typical changes seen within the first 48 hours after the onset of symptoms.³ MR imaging shows diffuse, ill-defined edema (decreased signal on T1 and increased signal on fat-suppressed T2-weighted images) without focal subchondral or articular surface defects. Edema extends from the articular surface of the femoral head to the femoral neck, can involve the intertrochanteric region and the acetabulum, and may spare the subchondral region of the femoral head.¹⁰ Fat-suppressed contrast enhanced images show abnormal enhancement with a similar distribution. A joint effusion may be present.

Clinical improvement occurs over several weeks to months without any specific treatment. The radiographic appearance gradually returns to normal, usually lagging behind clinical improvement by 4 to 8 weeks.⁸ MR imaging and skeletal scintigraphy both show complete resolution within several weeks, but may take up to 11 months.^{8,10}

Diagnosis

Transient osteoporosis of the hip (TOH)

Summary

Transient osteoporosis of the hip (TOH) is a benign self-limiting condition that can be differentiated from other etiologies of a painful hip (hip fracture, osteonecrosis, septic joint, etc.) on the basis of radiologic and clinical findings. Radiographic evidence of focal demineralization is the single most important finding and may become evident within 4 to 8 weeks of symptom onset. MRI often shows characteristic changes within 48 hours of initial symptom presentation and helps exclude other etiologies of bone marrow edema. The treatment of TOH is typically supportive with resolution within several weeks to months.

References

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