

Stress Fracture Along with Transient Osteoporosis in a 72-Year-Old Female with Hip Pain: A Case Report

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Purpose: Transient hip osteoporosis (THO) is a rare, self-limiting condition characterized by acute hip pain and bone marrow edema. Although typically benign, THO may coexist with or predispose to femoral neck stress fractures, creating critical diagnostic and therapeutic challenges. We report a case of concurrent THO and femoral neck stress fracture in an elderly patient and discuss implications for management.

Patients and Methods: A 72-year-old female presented with an eight-month history of persistent right hip pain. Initial radiographs suggested synovial chondromatosis; however, symptoms persisted despite conservative treatment. Repeat radiographs demonstrated subtle sclerotic change and a cortical fracture line at the medial/inferior femoral neck. MRI revealed mild-to-moderate joint effusion and diffuse bone marrow edema involving the femoral head and neck consistent with THO, along with a linear low-signal fracture line consistent with an established femoral neck stress fracture. The patient was initially managed with protected weight-bearing and analgesics.

Results: Symptoms persisted after conservative management, and prophylactic fixation with proximal femoral nail antirotation (PFNA) was performed. The patient experienced complete pain resolution by four months. At 18-month follow-up, radiographs demonstrated healing of the stress fracture with full return to weight-bearing.

Conclusion: Diffuse marrow edema suggestive of THO does not exclude a clinically meaningful femoral neck stress fracture, particularly in older adults with persistent atraumatic hip pain. Early MRI and close follow-up are essential for detecting occult fractures, guiding weight-bearing recommendations, and preventing progression to displacement.

Keywords: osteoporosis, hip joint, fractures, stress, femoral neck fractures, fracture fixation, intramedullary

Introduction

Transient hip osteoporosis (THO) is a rare and self-limiting condition characterized by acute onset of hip pain and bone marrow edema, predominantly affecting middle-aged men and women in the third trimester of pregnancy.^{1,2} Although the exact etiology of THO remains unclear, it is hypothesized to involve vascular factors, such as ischemia of the femoral head, and possibly the overactivity of the sympathetic nervous system.² Clinically, THO presents with spontaneous hip pain, often accompanied by a limping gait and restricted range of motion.¹ In X-ray imaging, generalized osteopenia is seen in the femoral head and neck. Magnetic resonance imaging (MRI) is the preferred diagnostic tool, revealing abnormal signal intensity in the femoral head and neck, with low T1 and bright STIR signals, and no structural collapse or subchondral fracture. Mild to moderate joint effusion is noted. Bone marrow edema that distinguishes THO from other hip disorders, like osteonecrosis.^{1,2}

Stress fractures, in contrast, are common injuries resulting from repetitive mechanical stress on bones, leading to microfractures when there is insufficient time for bone repair.³ These fractures are prevalent in athletes and older adults, particularly affecting weight-bearing bones such as the femoral neck.³ The pathophysiology of stress fractures involves an

imbalance in bone remodeling processes, often exacerbated by factors like decreased bone density and mechanical overload.³ Furthermore, stress of the femoral shaft among the elderly has been sparsely reported in the literature thus far.⁴⁻⁶

The potential concurrence of THO and stress fractures poses significant clinical challenges. The presence of bone marrow edema in THO may weaken bone integrity, potentially predisposing patients to stress fractures.^{1,7} Although the relationship between these conditions is not fully understood, some studies suggest that diminished bone density and increased osteoclastic activity in THO may contribute to the development of stress fractures.^{1,7} Conversely, stress fractures could also exacerbate the symptoms of THO, complicating the clinical presentation and management. Coexistence or concurrent development of THO and subchondral fracture is well-known; however, in this study, we report a case in which both THO and a stress fracture occurred simultaneously. This manuscript presents a case of a 72-year-old female with concurrent transient hip osteoporosis and a femoral neck stress fracture. By exploring this case, we aim to investigate the potential link between THO and stress fractures, examining whether THO can predispose patients to stress fractures or exacerbate their development. Understanding this relationship is crucial for optimizing diagnostic and therapeutic strategies, ultimately improving patient outcomes. We also aim to highlight the underdiagnosis of stress fractures, particularly in elderly patients, emphasizing the importance of considering this diagnosis even in less common demographics to ensure appropriate management and improved patient outcomes.

Case Presentation

A 72-year-old female presented with an eight-month history of persistent right hip pain. The pain was both functional and mechanical, worsened by walking, and associated with discomfort and limitation of external rotation at extremes. There was no reported history of trauma. Relevant past medical history and medication use were reviewed; however, bone mineral density data (DXA) and a metabolic bone work-up were not available in the records provided.

Initial radiographs obtained over the preceding months demonstrated multiple nodular calcified/ossified bodies adjacent to the right hip, raising suspicion for synovial chondromatosis. She was managed conservatively with anti-inflammatory medications and advised that surgery might be considered if symptoms progressed. However, there were no radiographic signs of degenerative joint disease (DJD), and despite ongoing conservative management, her symptoms persisted, prompting referral to our center.

On re-evaluation, the patient continued to report mechanical hip pain without improvement. Physical examination revealed pain provoked by external rotation; no locking or swelling was noted. A repeat anteroposterior pelvic radiograph demonstrated a subtle cortical fracture line with faint surrounding sclerosis at the medial/inferior femoral neck, consistent with a stress fracture (Figure 1). Given the patient's age and the inconsistency with the initial suspected diagnosis, MRI was performed for further evaluation. MRI demonstrated mild-to-moderate joint effusion and diffuse bone marrow edema involving the femoral head and neck, extending medially toward the subtrochanteric region. Within the edema, a linear low-signal line was identified, consistent with an established stress fracture (Figure 2). Based on these findings, a diagnosis of femoral neck stress fracture with concurrent transient hip osteoporosis was made. The patient was discharged with medical management and strict protected weight-bearing precautions.

Despite conservative management, the patient continued to experience persistent symptoms. After three months of follow-up, the decision was made to proceed with surgical intervention, and she underwent proximal femoral nail antirotation (PFNA) fixation. The procedure was performed under spinal anaesthesia with the patient positioned on an orthopaedic fracture table. As the fracture was incomplete, no reduction was required. The limb was prepped and draped, and prophylactic antibiotics (1 g intravenous cefazolin) were administered. A 5-cm incision was made at the greater trochanter, extending proximally through the fascia, followed by splitting of the gluteus medius. Under fluoroscopic guidance in anteroposterior and lateral views, the entry point was established, and an awl was introduced. The guidewire was advanced, and a 17-mm proximal reamer was used. A 214×10 mm nail (Mobtakeran Parsian Darman Company, Iran; BTT-212-240) was inserted. Under continuous fluoroscopic guidance, the guide was positioned correctly in the femoral head and neck, and the wire was advanced to a depth of 100 mm. A 95-mm helical blade was inserted using a spiral technique. Compression was applied, and a distal interlocking screw was inserted under fluoroscopic guidance. After thorough irrigation, the wound was closed in layers, including fascia and skin.

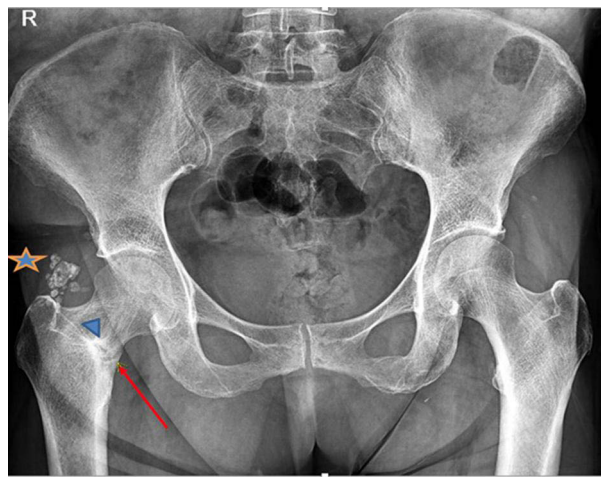


Figure 1 AP pelvic radiograph. Relative osteopenia of the right femoral head and neck (arrowhead) with a cortical fracture line and faint surrounding sclerosis at the medial/inferior femoral neck (arrow). Multiple well-corticated loose bodies adjacent to the right Hip. *indicates the femoral neck fracture site.

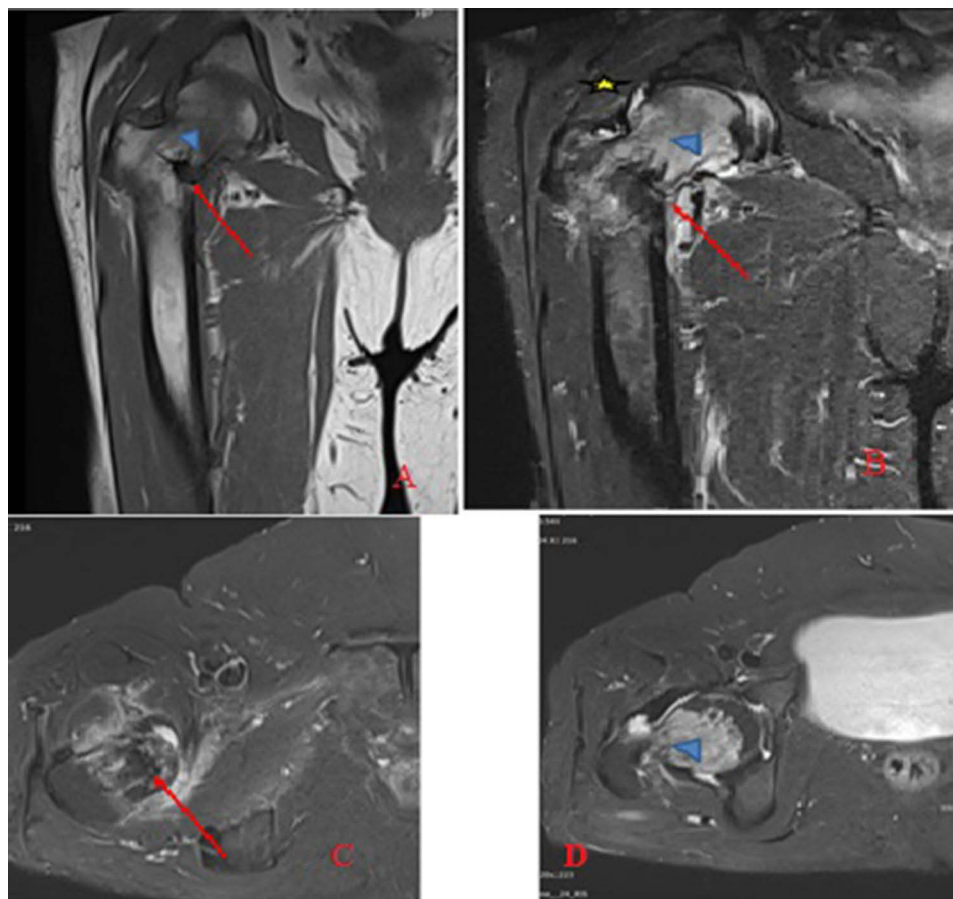


Figure 2 MRI of the right Hip in a 72-year-old female. (A) Coronal T1-weighted image shows diffuse marrow signal alteration in the femoral head and neck consistent with bone marrow edema (arrowhead) and a linear low-signal fracture line at the medial femoral neck (arrow). (B) Coronal STIR image demonstrates mild-to-moderate joint effusion (*), diffuse bone marrow edema (arrowhead), and the fracture line (arrow). (C) Axial STIR image shows bone marrow edema (arrowhead) and the fracture line (arrow). (D) [Describe exactly what panel D shows: eg, "Coronal T2-weighted image confirms ..." / "Sagittal STIR image shows ..."]. Symbols: arrowhead = bone marrow edema; arrow = fracture line; * = joint effusion.



Figure 3 Follow-up AP Hip radiograph at 18 months after fixation, demonstrating healing of the femoral neck stress fracture and satisfactory recovery.

Postoperatively, the patient had an uneventful recovery. Follow-up over four months demonstrated complete resolution of pain. At 18-month follow-up, radiographs demonstrated satisfactory recovery with a healed stress fracture; the patient was asymptomatic with a full range of motion and full weight-bearing (Figure 3).

Discussion

Magnetic resonance imaging (MRI) is the preferred diagnostic tool, typically demonstrating diffuse abnormal signal intensity in the femoral head and neck with low signal on T1-weighted sequences and high signal on fluid-sensitive sequences (eg, STIR), often accompanied by mild-to-moderate joint effusion.^{1,2} THO is usually described without femoral head collapse; however, concomitant fracture (including stress or insufficiency fracture) may occur and should be actively excluded, particularly in patients with persistent mechanical pain or an atypical clinical course. Careful assessment of fracture lines on MRI is therefore essential to differentiate THO from other hip disorders, such as osteonecrosis, and to guide appropriate management.^{1,2} In contrast, femoral neck stress fractures result from repetitive loading or insufficiency of compromised bone and may progress to displacement if not recognized and protected in time.^{3,8} Our case highlights how marrow edema consistent with THO may coexist with—mask, mimic, or potentially predispose to—an insufficiency-type stress fracture in an elderly patient.

A key diagnostic challenge in this patient was the prolonged symptom course and the initial radiographic impression suggestive of synovial chondromatosis due to periarticular calcified/ossified bodies. However, persistent mechanical pain without improvement, absence of radiographic DJD, and subsequent identification of a subtle cortical fracture line with surrounding sclerosis at the medial/inferior femoral neck shifted the diagnostic trajectory. MRI was decisive, demonstrating diffuse marrow edema in the femoral head/neck, consistent with THO, and revealing a linear low-signal fracture line consistent with an established stress fracture (Figure 2). This underscores the central point for clinicians: when hip pain persists despite “benign” radiographs or when the initial diagnosis does not fully explain the clinical picture, MRI should be obtained early to detect occult fractures and to characterize marrow edema patterns.^{2,9,10}

From a differential diagnosis standpoint, THO must be distinguished from osteonecrosis of the femoral head (AVN), inflammatory arthropathies, rapidly progressive osteoarthritis, septic arthritis, and neoplastic or metastatic processes. AVN is particularly important because it may also present with hip pain and MRI signal changes; however, AVN typically demonstrates a more focal subchondral lesion with characteristic patterns (eg, serpiginous margins and a “double-line” sign), whereas THO more commonly shows diffuse edema without structural collapse in the typical course.^{1,2,11} In our case, the diffuse edema pattern,

together with the absence of collapse, favored THO, while the concomitant linear low-signal fracture line supported an associated stress fracture rather than an isolated THO.

The pathophysiologic relationship between THO and stress fractures remains incompletely defined, but several plausible mechanisms exist. First, marrow edema and transient demineralization may reflect altered bone turnover and temporary reduction in bone strength, increasing vulnerability to insufficiency fractures under normal daily loading.^{2,7,11} Second, vascular dysregulation and increased intraosseous pressure—hypothesized contributors to THO—may impair microdamage repair and remodeling, further predisposing to fracture propagation.¹¹ Finally, in older patients (especially postmenopausal women), baseline reductions in bone density may compound any transient weakening related to THO, creating a “two-hit” scenario that increases fracture risk.^{2,12} Case-level literature has described femoral neck fractures developing during follow-up of THO, supporting the concept that THO may create a biologically vulnerable environment for fracture, even in the absence of trauma.⁷ While causality cannot be proven in a single case, our findings are consistent with a clinically meaningful association that should heighten surveillance for occult fractures in patients with THO-like MRI patterns and persistent mechanical pain.

Femoral neck stress fractures are uncommon overall and are historically emphasized in athletes and military populations; nonetheless, they are clinically relevant in older adults, where insufficiency mechanisms predominate and diagnostic delay can be consequential.^{8,13–15} Plain radiographs may be normal or subtly abnormal early, and continued ambulation can convert an incomplete fracture into a displaced one with major morbidity.⁸ Although the exact proportion varies across reports, femoral neck involvement is not negligible among stress fractures in older adults, reinforcing the need for high suspicion and early MRI in this demographic.^{12,16,17}

Management decisions in femoral neck stress fractures depend on fracture location (compression/inferior vs tension/superior), completeness, displacement, patient symptoms, and the ability to comply with protected weight-bearing. Compression-side incomplete fractures are often treated conservatively with strict protected weight-bearing and close follow-up, whereas tension-side lesions and displaced fractures typically warrant operative management due to higher risk of progression.¹⁸ In our patient, the fracture line was located at the medial/inferior femoral neck—suggestive of a compression-side lesion—yet symptoms persisted despite conservative measures, and MRI demonstrated established fracture features in the context of extensive marrow edema. Given the patient’s age, prolonged symptom duration, and failure of non-operative management, prophylactic fixation with PFNA was chosen to prevent progression and to allow pain resolution and functional recovery. The favorable outcome at four months and radiographic healing at 18 months support the appropriateness of escalation in this scenario.

Treatment of THO itself is generally conservative, focusing on pain control and protected weight-bearing until symptoms and imaging improve.^{2,19} Pharmacologic approaches such as bisphosphonates have been proposed to reduce pain and potentially accelerate recovery, but evidence remains limited and heterogeneous.¹⁹ When THO coexists with a stress fracture, management must prioritize fracture stability and prevention of displacement; therefore, decisions should be individualized based on fracture characteristics, symptom persistence, and patient-specific risk factors.

This case also illustrates an important systems-level point: evaluation of underlying bone health matters. In older patients presenting with atraumatic hip pain and stress fracture features, assessment for osteoporosis and metabolic contributors (including vitamin D status and other bone metabolism markers) is recommended, as these factors influence both treatment and prevention of recurrence.^{12,18,20,21} Incorporating bone health evaluation strengthens the clinical narrative and aligns postoperative care with the likely insufficiency etiology.

Limitations of this report include the inherent inability of a single case to establish causality between THO and stress fracture. Additionally, the absence of comprehensive baseline bone mineral density and metabolic bone laboratory data (if not available) limits conclusions about contributory systemic factors. Despite these limitations, the case highlights a practical and actionable message: diffuse marrow edema suggestive of THO does not exclude a clinically meaningful femoral neck stress fracture, and early MRI with careful scrutiny for fracture lines is essential in persistent hip pain, particularly in older adults.

Overall, clinicians should maintain a high index of suspicion for femoral neck stress fractures in atraumatic hip pain—even when THO is suspected—because timely diagnosis and appropriate protected weight-bearing or fixation can prevent displacement and improve outcomes.

Conclusion

This case highlights that THO-like marrow edema does not exclude a clinically relevant femoral neck stress fracture in older adults. In patients with persistent atraumatic hip pain and inconclusive radiographs, early hip MRI is essential to detect occult fractures and guide weight-bearing recommendations. Close follow-up is crucial to prevent progression to displacement and to optimize outcomes.

Data Sharing Statement

All data related to this case report are reported in the manuscript. Please contact the corresponding author in case of require any further information.

Ethics Approval and Consent to Participate

The Ethics Committee of Iran University of Medical Sciences (IUMS) approved publication of this case report (Approval No.: IR.IUMS.REC.1404.469). The patient provided both oral and written informed consent for publication of this report and any accompanying images. All identifying information has been removed to preserve confidentiality.

Consent for Publication

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the corresponding author upon request.

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Disclosure

The authors declare that they have no competing interest in this work.

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