Case Report
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Transient migratory osteoporosis: report of a case with sequential multifocal involvement

Abstract

Transient migratory osteoporosis (TMO) is a rare condition characterized by sudden, non-traumatic joint pain and bone marrow edema that resolves spontaneously. Its etiology remains unclear, but may involve microtrauma, microcirculatory alterations, and accelerated bone remodeling phenomena. We describe the case of a 57-year-old man, previously healthy, who presented with mechanical right knee pain of three weeks' duration. Physical examination revealed localized tenderness along the medial joint line, and the initial radiograph was normal. Magnetic resonance imaging (MRI) demonstrated a subchondral insufficiency fracture of the medial femoral condyle, and off-loading with subsequent rehabilitation was initiated. Three months later, the patient developed new onset left knee pain and left forefoot pain. Repeat MRI identified a new insufficiency fracture in the left knee and stress-related bone changes in the forefoot. Bone densitometry showed osteopenia, and laboratory studies were unremarkable. Considering the migratory pattern and imaging findings, a diagnosis of TMO was established. The patient progressed favorably, with complete symptom resolution after six months. TMO is a diagnosis of exclusion that should be considered in middle-aged adults presenting with acute joint pain after a thorough physical examination and structured clinical assessment. Prognosis is generally good, with only temporary loss of bone mineral density. Medical follow-up and rehabilitation treatment are essential for maintaining patient functionality. This case also highlights the importance of distinguishing transient migratory osteoporosis from osteonecrosis, which may present with similar early symptoms but requires a different therapeutic approach.

Keywords: transient migratory osteoporosis, bone marrow edema syndrome, insufficiency fracture, magnetic resonance imaging, osteopenia

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Introduction

Transient migratory osteoporosis (TMO), also known as regional migratory osteoporosis, is a bone marrow edema syndrome characterized by acute non-traumatic joint pain, diffuse bone marrow edema on magnetic resonance imaging (MRI), and transient loss of bone mineral density. Although considered rare, transient migratory osteoporosis has likely been underdiagnosed, with small series estimating its incidence to be well below 1% of patients presenting with acute atraumatic lower-limb pain. Its early clinical and imaging overlap with other causes of bone marrow edema often contributes to diagnostic delay or misclassification. Differentiation from osteonecrosis is essential, given the substantial overlap in early clinical and imaging features. TMO predominantly affects middle-aged men and occurs mainly in the lower limbs, with sequential involvement of the hip, knee, ankle, and foot.[1–5]

Its etiology remains unclear, although several mechanisms have been proposed, including repetitive microtrauma, local inflammation, and alterations in bone microcirculation. In the acute phase, there is a substantial loss of bone mineral density, often exceeding 30%, with complete recovery over several months, supporting the hypothesis of a regional accelerated bone remodeling phenomenon.[2] Several relevant risk factors have been identified, including sudden mechanical overload, smoking, mineral metabolism abnormalities, and prior similar episodes.[3]

From a clinical standpoint, early recognition is essential to avoid unnecessary invasive investigations and to differentiate TMO from other potentially serious conditions, such as osteonecrosis, insufficiency fractures, osteomyelitis, or complex pain syndromes.[1,4]

We report the case of a patient with clinical and imaging findings compatible with transient migratory osteoporosis, illustrating its clinical course, diagnostic challenges, and characteristic features that help distinguish it from other entities within the bone marrow edema spectrum.

Case presentation

A 57-year-old man, previously healthy and with no history of recent trauma, presented with a three-week history of mechanical right knee pain, worsened by walking and prolonged weight-bearing, without significant relieving factors and without associated systemic symptoms. He worked in an administrative role but maintained an active lifestyle with regular daily walking. On physical examination, he exhibited a slightly antalgic gait, localized tenderness along the medial joint line and the medial femoral condyle, and preserved range of motion, although painful in the terminal degrees of flexion. There was no visible joint effusion or deformity, and no neurological or vascular abnormalities were noted. Plain radiography of the right knee showed no relevant structural abnormalities, namely no fracture lines, subchondral collapse, or significant degenerative changes (Figure 1). Initial laboratory evaluation, including complete blood count, C-reactive protein, erythrocyte sedimentation rate, renal function, calcium–phosphate metabolism, vitamin D, thyroid function, and liver parameters were unremarkable, with no evidence of infection, inflammatory disease, or acute metabolic pathology. Given the persistence of symptoms, an MRI was performed without contrast, as there was no clinical suspicion of infectious or inflammatory arthropathy, and was preferred over CT because of its superior sensitivity for detecting early bone marrow edema and intra-articular pathology. The T2/STIR MRI sequence revealed diffuse subchondral

bone marrow edema of the medial femoral condyle, associated with a subchondral insufficiency fracture line, without signs of cortical collapse or additional articular involvement (Figure 2). Based on these findings, conservative treatment with partial weight-bearing for 3 weeks and analgesia was initiated, followed by a rehabilitation program aimed at pain control, gait training, and muscle strengthening.

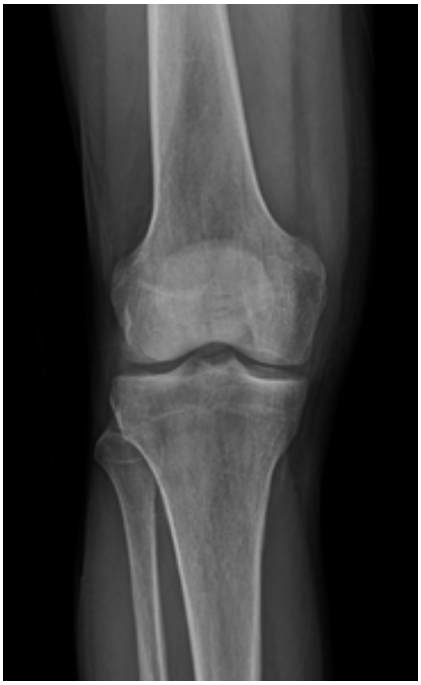

Figure 1 Plain radiograph of the right knee (anteroposterior view) showing no evidence of fracture lines, subchondral collapse, or significant osteoarticular abnormalities

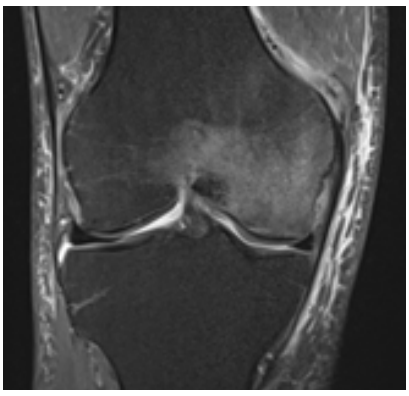

Figure 2 Magnetic resonance imaging of the right knee, coronal T2-weighted STIR sequence, demonstrating diffuse bone marrow edema of the medial femoral condyle and a subchondral insufficiency fracture line, without cortical collapse

Three months after the initial episode, the patient experienced near-complete resolution of right knee pain but developed new left knee pain and left forefoot pain, both progressively worsening and aggravated by weight-bearing. Physical examination revealed tenderness along the medial joint line of the left knee and over the dorsal aspect of the forefoot, without local inflammatory signs, deformity, or significant limitation in joint mobility. Repeat MRI of the left knee demonstrated a medial femoral condyle insufficiency fracture with diffuse bone marrow edema similar to that observed previously in the right knee (Figure 3), while imaging of the foot showed findings consistent with stress-related bone changes in the metatarsal heads and the bases of the proximal phalanges of the second to fourth toes, without cortical collapse or features suggestive of osteonecrosis (Figure 4). Given the recurrence, multifocal distribution of the lesions, and migratory pattern, an evaluation of bone metabolism was performed. Bone densitometry demonstrated osteopenia with a T-score of −1.9 in the lumbar spine and −1.3 in the femoral neck. Complementary laboratory studies remained within normal limits, revealing no significant metabolic deficiencies or systemic inflammatory abnormalities. The clinical evolution, combined with characteristic imaging findings and the absence of structural bone destruction or articular collapse, supported the diagnosis of transient migratory osteoporosis. The patient repeated the previous treatment approach, including partial weight-bearing and participation in a rehabilitation program. Six months after diagnosis, he was asymptomatic, walking normally, and without any functional limitations, with no further episodes reported up to the last follow-up. Although a follow-up DEXA scan was initially considered, the patient's full clinical recovery and lack of persistent symptoms made immediate re-evaluation unnecessary. A repeat study may be considered during long-term follow-up if clinically indicated.

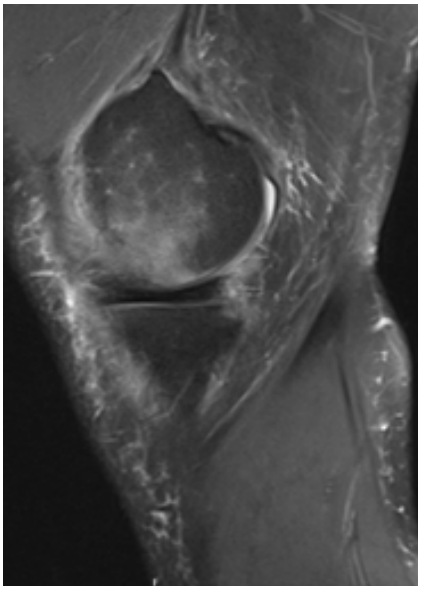

Figure 3 Magnetic resonance imaging of the left knee, sagittal T2-weighted STIR sequence, showing a medial femoral condyle insufficiency fracture associated with extensive bone marrow edema

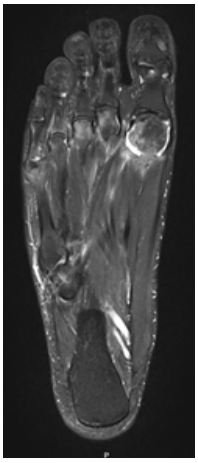

Figure 4 Magnetic resonance imaging of the left foot, coronal T2-weighted STIR sequence, revealing bone marrow edema in the metatarsal heads and the bases of the proximal phalanges of the second to fourth toes.

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Discussion

The case presented clearly illustrates the clinical and imaging spectrum of transient migratory osteoporosis, a rare and frequently underdiagnosed condition. Early diagnosis helps avoid unnecessary investigations and potentially harmful interventions and allows timely initiation of appropriate treatment. The multifocal and sequential progression observed in this patient, with initial involvement of the right knee followed by manifestations in the left knee and in the left foot, is consistent with the migratory pattern described in the literature, which may involve two to seven joints over the course of months or years.[4,5] This recurrent and regional behavior reinforces the understanding of transient migratory osteoporosis as a dynamic bone remodeling syndrome rather than a localized lesion.

Imaging findings were crucial for diagnosis. Plain radiographs remained normal in the early stages, since demineralization changes usually become visible only several weeks after symptom onset.[1,4] Magnetic resonance imaging demonstrated the typical pattern of diffuse subchondral bone marrow edema, without collapse of the articular surface. In both episodes, insufficiency fractures were identified, which are described as part of the pathophysiology of the disease and represent microtrabecular damage induced by mechanical overload. It is important to highlight that the clinical and radiological behavior remained benign, with no progression to deformity or subchondral collapse.

Bone densitometry revealed osteopenia, a common finding in published series, suggesting that a reduced baseline bone mineral density may predispose to the migratory pattern. This association is supported by studies showing transient losses greater than 30 to 70 percent in the affected region during the acute phase, with gradual recovery after resolution of symptoms. Although osteopenia alone does not fully explain transient migratory osteoporosis, it contributes to the recognition of a condition that results from the combination of repetitive microtrauma, underlying bone fragility, and an exaggerated remodeling process described as a regional accelerated bone remodeling phenomenon.[2,3,6–9] Current hypotheses support that transient migratory osteoporosis arises from microtrabecular insufficiency triggered by mechanical overload, leading to an exaggerated regional bone remodeling response. This 'regional accelerated remodeling' results in transient demineralization, marrow edema, and mechanical weakening without structural collapse.

The differential diagnosis of transient migratory osteoporosis is wide and essential to prevent inappropriate management. Osteonecrosis is the main condition to exclude, as it shares some initial clinical and imaging characteristics but differs in the presence of focal lesions, segmental bone necrosis, and potential subchondral collapse. In this case, the absence of risk factors for osteonecrosis, such as chronic alcohol use, prolonged corticosteroid therapy, or renal disease, together with the diffuse and homogeneous pattern of bone marrow edema, allowed this diagnosis to be excluded reliably. Other conditions such as isolated insufficiency fractures, bone infection, inflammatory arthritis, gout, or complex pain syndromes must also be considered, although none had clinical or imaging support in this patient. Complex regional pain syndrome was excluded given the absence of autonomic or trophic changes. Infectious or inflammatory arthritis was unlikely due to the normal inflammatory markers and absence of synovitis. An isolated insufficiency fracture could not explain the migratory and multifocal pattern. Osteonecrosis was ruled out based on the homogeneous diffuse edema pattern without subchondral collapse or serpiginous necrotic lines.[1,4,10] The therapeutic approach in this case relied on conservative measures, which are considered first line in the management of transient migratory osteoporosis. Partial weight bearing, analgesia, and a structured rehabilitation program allowed effective pain reduction, functional recovery, and minimization of the risk of new lesions. Although bisphosphonates have been reported to accelerate clinical and radiological recovery in transient migratory osteoporosis, their use remains optional. In this case, conservative management was preferred due to the patient's favorable clinical evolution and the self-limited nature of the condition. Overall, this case reinforces the importance of recognizing the clinical and imaging patterns of transient migratory osteoporosis, emphasizing the central role of magnetic resonance imaging in diagnosis and follow-up, as well as the need for a comprehensive patient evaluation that includes bone densitometry and metabolic assessment to exclude associated conditions and guide prevention of future episodes.[3–6]

Conclusion

Transient migratory osteoporosis is a rare, self-limiting, and frequently underdiagnosed condition whose clinical presentation may mimic potentially serious disorders, requiring a careful approach to avoid misdiagnosis and unnecessary treatment. The case presented highlights its migratory and multifocal nature, the usefulness of magnetic resonance imaging as the examination of choice, and the fundamental role of excluding osteonecrosis and other causes of bone marrow edema in the diagnostic process. Early radiographs may be entirely normal, making MRI essential for timely diagnosis and appropriate management.

The complete recovery achieved with conservative management confirms the excellent prognosis and underscores the importance of a clinical strategy that prioritizes joint protection and functional rehabilitation.

Patient consent

Written informed consent was obtained from the patient for publication of this case report and the accompanying images.

Conflict of interest

The authors declare no conflicts of interest.

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Author contributions

All authors contributed to the clinical management of the patient, drafting of the manuscript, and approval of the final version.

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