# Serial Imaging in a Case of Regional Migratory Osteoporosis

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## ABSTRACT

Regional migratory osteoporosis (RMO) is an uncommon disorder that predominantly affects middle-aged males, presenting as migrating arthralgia involving the lower extremities. It is a transient condition that involves joints without preexisting disease and resolves spontaneously without long-term sequelae. We describe serial imaging findings in a patient with RMO followed over a period using various imaging modalities which showed typical migrating osteopenia involving the knee, ankle, and foot.

**Key words:** Computed tomography; joints; magnetic resonance imaging; regional migratory osteoporosis

## Introduction

Regional migratory osteoporosis (RMO) is the term first given by Duncan *et al*., who described it as polyarticular disease.[1] It was first described as transient osteoporosis in 1959 by Curtiss and Kincaid in pregnant women in third trimester as an uncommon and self-limiting disease.[2] Very few cases have been described in literature till now, where the affected bones shows transient areas of signal changes due to bone edema which resolve spontaneously and sometimes shows migratory pattern affecting other bones. We present a case of classical RMO with serial imaging.

## Case Report

A 41-year-old, overweight gentleman presented with progressive pain in his right knee for 2 weeks duration. Clinical examination and radiograph of knee showed no abnormality. Subsequently, magnetic resonance imaging (MRI) of knee was done in another hospital in March 2011, which showed hyperintense signal changes in the medial femoral condyle on the fat suppressed T2-weighted (T2W) images (TR 800 and TE 17) and hypointensity on T1W (TR 400 and TE 21) images [Figure 1]. All laboratory investigations were normal. He was advised biopsy for confirmation, but patient was undecided. His pain resolved spontaneously. However, the pain in right knee recurred in November 2011 and this time computed tomography (CT) done at other center showed mild osteopenia in the intercondylar region with minimal sclerosis of the medial femoral condyle [Figure 2]. He was then reassured that the condition is benign and treated symptomatically. Later, bone scan was also done which showed increased uptake (not shown).

In February 2012, his symptoms recurred involving right knee and also left ankle. He was referred to our hospital. MRI imaging done at our center on 1.5T Siemens Avanto MRI machine with following parameters (PD TSE FS TR 3500 TE 42 and FOV 256 × 256, T2 TSE TR 4340 TE 82 FOV 320 × 320, T1W SE TR 512 TE 11 FOV 320 × 320) were used. Proton density fat-saturated (PDFS) images showed hyperintense signal changes in intercondylar region and medial condyle of right femur. However as compared to previous images, the signal intensity in medial femoral condyle had reduced [Figure 3]. Hyperintense signals were also noted in left talus [Figure 4]. This confirmed the diagnosis of RMO.

In December 2012, right knee was again symptomatic and imaging revealed increased signals in medial condyle of femur with complete disappearance of signals from intercondylar region seen on previous MR scans [Figure 5].

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In November 2013, pain recurred again. MRI this time showed hyperintensity on PDFS images in the posterior aspect of the lateral tibial condyle and patella without signal changes in femoral condyles [Figure 6]. Imaging of ankle showed normal talus. However, calcaneum and medial cuneiform showed hyperintensity [Figure 7]. Significant resolution of the hyperintensity in medial femoral condyle and talus was noted. This time patient was treated with bisphosphonates.

## Discussion

Transient osteoporosis is a condition that affects the weight-bearing joints of lower extremity, noticed in overweight, middle-aged males in 4$^{th}$–7$^{th}$ decades, commonly affecting hip followed by knee, foot, and ankle joint.[3] It was originally described in 1959 by Curtiss and Kincaid in pregnant women (third trimester) as self-limiting disease.[2] The term, regional migratory osteoporosis was coined by Duncan *et al*., who described it as polyarticular disease.[1] It can affect same joint at different locations, or affect different joints. When it affects different joints then disease can be called as RMO.[4,5] Migration of the disease has been described in sequential form involving different portion of the same bone, intra-articular spread,[6] proximal to distal spread,[7] as well as involvement of the contralateral joint.[8]

The average period of migration of the disease was 4 months and slightly lesser duration of 3 months for the next.[8] Others have mentioned durations of few months to a few years.[9,10]

Patients usually presents with pain, which can be severe making them nonambulatory. On examination, there can be tenderness with or without joint effusion.[11]

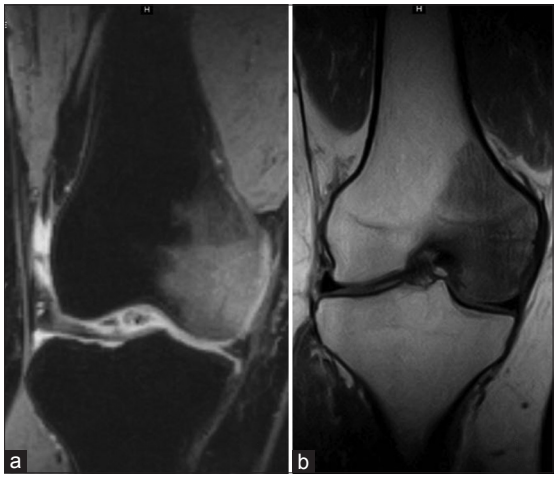


**Figure 1:** (a) T2-weighted (T2W) fat suppressed coronal image showing medial condylar hyperintense signal changes. (b) T1W coronal image showing medial condylar hypointensity

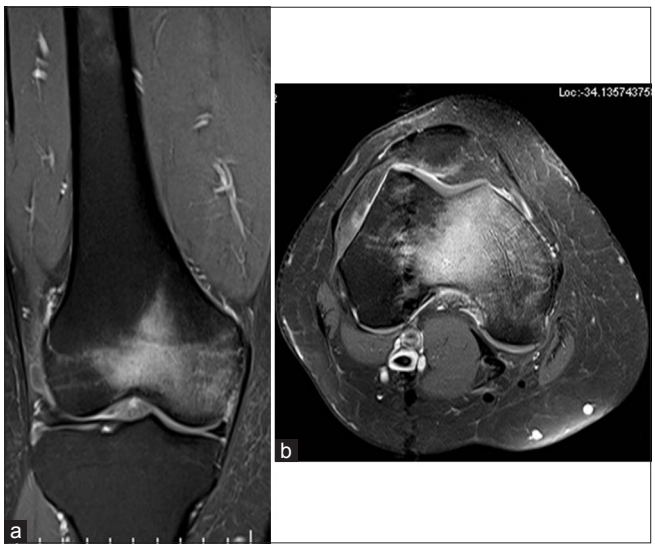


**Figure 3:** PDFS coronal (a) and axial (b) shows hyperintense signal changes in medial femoral condyle and intercondylar region. As compared to Figure 1, signal changes in medial condylar have reduced and increased in intercondylar region. PDFS = Proton density fat-saturated

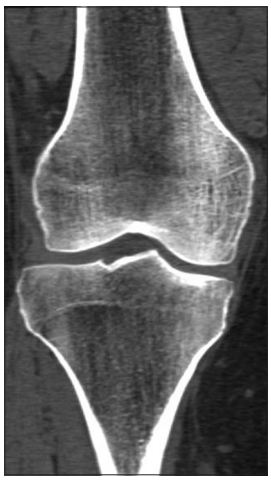

**Figure 2:** Reconstructed CT coronal image showing minimal sclerosis in medial femoral condyle. No obvious erosion noted. CT = Computed tomography

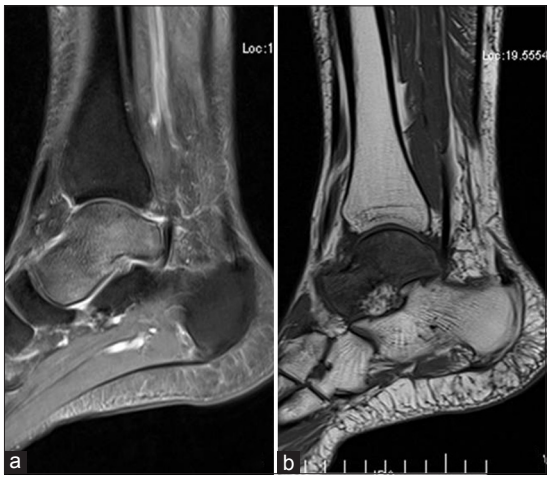


**Figure 4:** (a) PDFS sagittal and (b) T1W sagittal images showing hyperintense signal changes in talus on PDFS and hypointense on T1W

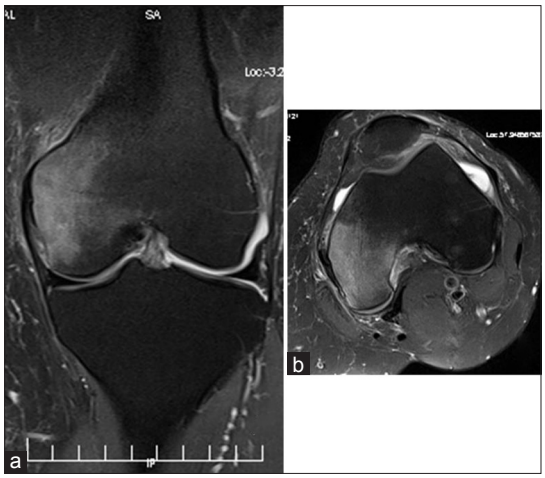


**Figure 5:** PDFS coronal (a) and axial (b) showing hyperintense signal changes in medial femoral condyle. As compared to Figure 3, the signals from intercondylar region have resolved

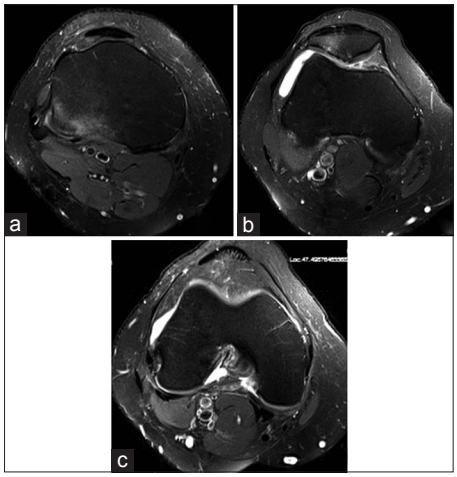


**Figure 6:** PDFS axial images showing hyperintense signal changes in lateral posterior tibial condyle (a) and patella (b), and no signal changes in femoral condyles (c)

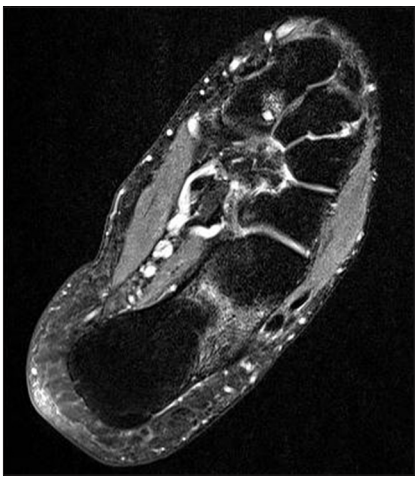

**Figure 7:** PDFS coronal image showing hyperintensity in calcaneum and medial cuneiform

The etiology of this condition is unknown. Various theories are described like neurogenic compression theory,[2] localized hyperemia due to venous return obstruction,[12] bone marrow edema due to ischemia,[13] ischemic vasculopathy,[14] reflex sympathetic dystrophy,[15] and subchondral fracture or trauma.[16,17] Recent authors have stressed the association of RMO with systemic osteoporosis.[18,19] One theory is that noxious stimuli such as trauma causes trabecular disruption leading to the exaggerated activation of regional acceleratory phenomena which causes increase in perfusion, metabolism, and cell turnover leading to osteoporosis and subchondral fractures;[1,20] which may cause marrow edema seen on MRI and increase uptake on scintigraphy.[21]

Histopathological studies show bone edema with reactive bone formation without bone necrosis which is nonspecific.[22]

Radiographs are normal in early phase, however, can show focal osteoporosis.[14] MRI show high signals on T2W and low signal on T1W similar to bone marrow edema.[23,24] Early avascular necrosis may appear similar to RMO on imaging.[25] Radionuclide scan shows increase uptake.[26]

The main differential diagnosis can be inflammatory, infectious, degenerative, or crystal arthritis.[27,28] Normal laboratory findings, clinical history, and imaging features should suggest diagnosis of RMO.

We describe a case of RMO followed over months affecting right medial femoral condyle at first, then spreading to intercondylar region followed by talus of left ankle, and again right medial femoral condyle. Later, affecting lateral tibial condyle and foot bones with complete resolution of edema of medial femoral condyle and talus. Our case is unique as it showed features of classical RMO affecting multiple joints in same patient with all the patterns of migration described earlier in the literature. Initially medial femoral condyle was involved, which later resolved and then recurred at same location; which to our knowledge was not described earlier.

RMO should be diagnosed based on the typical radiological appearance when other causes have been excluded. Careful analysis of the MRI findings is necessary to recognize this disease and avoid invasive investigations since it is self-limiting and has no long-term complications.

The purpose of this article is to increase awareness of this rare condition and report the findings seen on the serial imaging.

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