



# International Journal of Orthopaedics Sciences

ISSN: 2395-1958  
IJOS 2016; 2(4): 307-310  
© 2016 IJOS  
www.orthopaper.com  
Received: 19-08-2016  
Accepted: 20-09-2016

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## Arthroplasty in early osteoarthritis? - Evaluate transient osteoporosis

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DOI: <http://dx.doi.org/10.22271/ortho.2016.v2.i4e.49>

### Abstract

**Background and Objectives:** Osteoarthritis is degenerative joint disease common in the hands, feet and the large weight bearing joints-knees, hips, ankles or spine. It is slowly progressive disease with the symptoms developing gradually during the years. Basic pathology process in osteoarthritis is degeneration of the cartilage in a joint. It is typically caused when the cartilage covering the ends of the bones begins to wear away, loses its structure, and releases enzymes which deconstruct it. This article reports a case of transient osteoporosis involving both tibial and femoral condyle in 40 patients, reviews the existing literature and discusses disease pathology.

**Methodology:** This is a study of 40 patients with a 2-8 weeks history of knee pain and on the verge of planning an Arthroplasty were further investigated and differentiated as Transient osteoporosis.

**Results:** All patients were managed with observation, protected weight bearing, and pain-control. Non-weight bearing status often is required during the initial 1 to 2 weeks of treatment to assist conservative management. Only few required arthroplasty at later time.

**Conclusion:** Early differentiation of transient osteoporosis from early Osteoarthritis of knee will avoid unnecessary surgical intervention and ensure appropriate treatment.

**Keywords:** Transient osteoporosis, knee pain, pregnancy, elderly population, arthroplasty, bone marrow edema syndrome, transient bone demineralization

### 1. Introduction

Osteoarthritis is degenerative joint disease common in the hands, feet and the large weight bearing joints-knees, hips, ankles or spine. It can occur in any joint of the body. Osteoarthritis, discarthrosis and spondylosis (located on the spinal vertebrae), generalized osteoarthritis is all another name for osteoarthritis. It is slowly progressive disease with the symptoms developing gradually during the years.

Transient osteoporosis is an uncommon, self-limiting disease, first reported in 1959. The term idiopathic transient osteoporosis of the hip was designated by Laquesne [1]. In his writings discussing 30 cases of transient osteoporosis of the hip. Unfortunately, reporting of the disease has suffered because of inconsistencies in the terminology.

Bone marrow edema syndrome, transient bone demineralization, knee algodystrophy, regional migratory osteoporosis, and even reflex sympathetic dystrophy all are terms that have been used to describe the condition.

This article reports case of transient osteoporosis involving both tibial and femoral condyles in 40 patients, reviews the existing literature, discusses disease pathology, and discusses the treatment options.

### 2. Material and Methods

40 patients with a 2-8 weeks history of knee pain. The pain was most apparent during walking, and had increased to the point of preventing weight bearing in few. Our patient reported no recent trauma to the joint and had no history of knee injury or disease. They did not use alcohol excessively and had not been treated with systemic or local corticosteroids.

On knee examination, a minimal effusion and joint line tenderness was noted. Knee joint's range of motion was full. No signs of ligamentous instability were observed. Radiographs revealed grade I osteoarthritic changes (Fig 1). Laboratory values were within normal limits, including those associated with infection. Initially patients were investigated with Magnetic resonance imaging (MRI) which showed decreased signal intensity on T1-weighted images

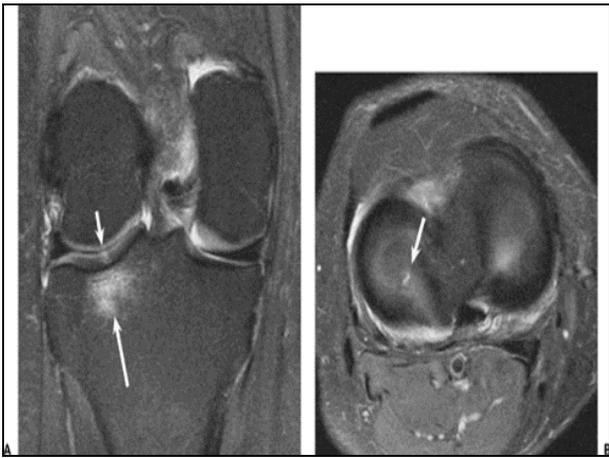
within the tibial or femoral condyles and corresponding increased signal intensity on T2-weighted images, consistent with bone marrow edema and soft tissue changes which were treated conservatively, gradual mobilization and occasional analgesics.



**Fig 1 :** Radiograph showing early osteoarthritis changes involving all the compartments of knee



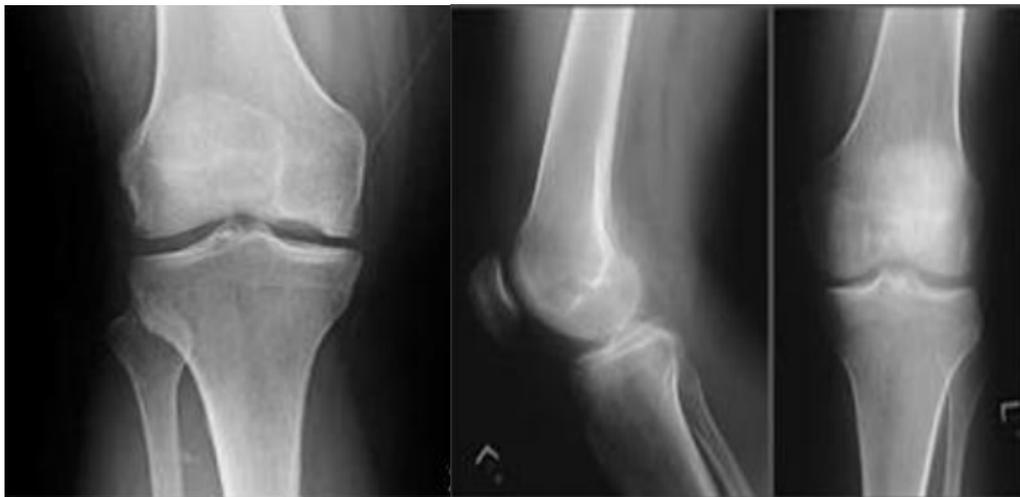
**Fig 3 :** MRI T2 weighted image weighted sagittal magnetic resonance image of the right knee, showing areas of increased signal intensity outlining the lesions of the medial femoral condyle with light shadow in lateral tibial condyle.



**Fig 2:** MRI -showing increased signal intensity on T2-weighted images, consistent with bone marrow edema pattern in the lateral tibial condyle and mild effusion of the knee joint.



**Fig 4:** X ray showing changes of transient osteoporosis involving the medial femoral condyle in anteroposterior view and lateral x-ray.



**Fig 5:** X ray changes depicting transient osteoporotic feature in lateral femoral condyle in a 62 yr old women with few early osteoarthritic change in the knee.



**Fig 6:** MRI- T1 and T2 images showing edematous pattern in lateral femoral condyle with mild joint effusion pattern in a 62 years old patient.

### 3. Results

All patients who were diagnosed of early OA in our Centre and patients who were advised arthroplasty by some other orthopaedic surgeons had come for second opinion to our center and were diagnosed of transient osteoporosis and managed conservatively, gradual mobilization and occasional analgesics, were included in the study. Most of the patients had completely relieved of the symptoms within a period of 8-12 weeks when managed conservatively, gradual mobilization and occasional analgesics.

**Table 1:** Gender, Age and Side distribution

Demographic Category	Conservative Management	Arthroplasty	Total
<b>GENDER</b>			
Female	14	4	18
Male	19	3	22
<b>AGE</b>			
>40	20	3	23
<40	12	5	17
<b>Presentation</b>			
Unilateral	22	06	28
Bilateral	08	04	12

### 4. Discussion

**4.1 Epidemiology:** Transient osteoporosis is predominately a disease of the lower extremity. The hip is most commonly affected, followed by the knee, foot, and ankle. Although original reports are documented in pregnant women, two-thirds of cases occur in men. The disease typically presents between 35 to 50 years of life.

Transient osteoporosis can affect the same joint at different locations, or affect several joints over a continuous time interval. Transient osteoporosis affecting multiple joints often is described in the literature as regional migratory osteoporosis. Usually the joint nearest the diseased one is the next to be affected [2].

Fertakos [3], *et al.* and Wambeek [4], *et al.* both described cases in which transient osteoporosis presented initially in the medial femoral condyle and subsequently migrated to the lateral condyle. Parker [5], *et al.* reported a case in which transient osteoporosis initially presented laterally and then migrated to the medial condyle. Two remaining cases of interest include cases involving pregnant females. Stamp *et al.* reported a case of bilateral knee transient osteoporosis in a woman during the third trimester of pregnancy [5]. Finally Ma and Falkenberg [6], Documented a case of regional migratory osteoporosis in a pregnant female, also in the third trimester. The patient's disease first presented in the hip, but migrated to

all major lower extremity joints. The condition resolved spontaneously in the usual manner 6-10-months postpartum.

**4.2 Presentation:** Clinically, the condition manifests as gradual or sudden onset of pain around a joint, typically without a history of significant trauma. Pain can range from mild to debilitating, depending on the stage of disease. On examination, an effusion may be appreciated. Tenderness to palpation is present at the femoral condyle, tibial condyle and tibiofemoral joint. This finding often leads to suspicion of meniscal or articular surface injury or early osteoarthritis feature. Range of motion typically is full with limp or antalgic gait.

Radiographic imaging results vary depending on the phase of disease. Plain radiographs often show normal findings initially. As the disease progresses, osteopenia can be observed. Radionuclide bone scan can demonstrate increased uptake in all phases.

Magnetic resonance imaging is essential for a definite early diagnosis and shows a so-called bone marrow edema pattern of high intensity on T2-weighted images and low intensity on T1-weighted images. The presence of a crescentic area of increased signal intensity in the posterior portion of the lateral femoral condyle, bordered by a faint rim of low signal intensity on T1-weighted images and more well-defined area of low signal intensity on T2-weighted images. This area is reminiscent of the "class C" (fluid-like) changes described in osteonecrosis by Mitchell *et al.*

**4.3 Etiology:** The etiology of this condition remains obscure. Curtiss and Kincaid proposed a neurogenic compression hypothesis. Several authors have suggested that it is a form of reflex sympathetic dystrophy [8]. However, as noted by Banas [9], *et al.*, there are distinct differences. Reflex sympathetic dystrophy usually is preceded by trauma, infrequently migrates, commonly involves the upper extremities (rarely involves the hip-and knee) [10], and often has a poor prognosis with long term sequelae such as skin atrophy, contractures, and circulatory changes. Regional migratory osteoporosis is a self-limiting condition without long-term sequelae. Rosen proposed the obstruction of venous return with localized hyperemia. Other authors have suggested that this condition may be due to an ischemic injury to bone marrow resulting in the death of fat and hematopoietic cells but not osteocytes.

In recent years, subchondral fractures often have been reported when age-related osteoporosis is in a morbid state. Miyanishi [11] *et al.* reported that a subchondral fracture could be the cause of transient osteoporosis. The presence of such a fracture raises the possibility of a traumatic etiology for the bone marrow edema, despite the minor nature of the trauma [12]. Also, Rodriguez *et al.* supported the hypothesis that regional transient osteoporosis may be associated with vitamin C deficiency [13]. These theories remain unclear, and further investigation of the patho-mechanism is needed.

Although the histologic findings of the disease are characteristic, they are not consistently found. McCarthy [14] reported the presence of edema and reactive bone formation in the marrow spaces. They found no evidence of fat necrosis or bone necrosis, although lipid cysts are sometimes found in the marrow spaces. The usefulness of the biopsy for definite diagnosis of this condition often is limited because of its uncertainty and invasiveness.

**4.4 Treatment:** Treatment typically consists of observation, protected weight bearing, and pain control. Non-weight

bearing status often is required -during the initial 1 to weeks of treatment to assist with pain control. No evidence indicates adverse effects of weight bearing as tolerated on outcomes. Several additional forms of treatment have been described, including corticosteroids, bisphosphonates, and calcitonin. Carmona-Ortells <sup>[15]</sup>, *et al.* reported 2 patients completely pain free between 2 and 4 weeks after treatment with deflazacort. Studies by Carthy *et al.* and Varenna <sup>[16]</sup>, *et al.* have demonstrated rapid response to pamidronate. Follow-up with MRI ranged from 2 weeks to 6 months post therapy and showed significant reduction or full resolution of the bone edema. No side effects have been reported from the administration of these medicines.

Sympathectomy or sympathetic nerve blockage has been used in transient osteoporosis and in the migratory form as a treatment option. Although sympathectomy provides pain relief, it does not accelerate recovery, confirmed by edema persistence in-MRI <sup>[17, 18]</sup>.

Core decompression is an additional treatment option for transient osteoporosis. Decompression provides immediate pain relief. Magnetic resonance imaging signal abnormalities have been returned to normal 3 months post intervention. The technique has been used in treatment of the hip and knee joints. Guerra and Steinberg <sup>[19]</sup>. Considered decompression unnecessarily aggressive for a condition of uniformly good prognosis.

**4.5 Differential Diagnosis:** Differential diagnosis of transient osteoporosis includes stress fractures, septic arthritis, soft-tissue injury, malignancy, tuberculosis, and avascular necrosis. A detailed history, clinical examination, and special investigations will not confirm the diagnosis unless an MRI is performed.

Differentiation from avascular necrosis is sometimes difficult but has prognostic and therapeutic significance. On repeated MRI, the crescent sign in transient osteoporosis cases resolves. Moreover, other authors believe that transient osteoporosis represents an early reversible stage of - non-traumatic avascular necrosis, but with a diffuse-pattern, distinct from the usual focal pattern of osteonecrosis. According to the latter concept, bone marrow changes in transient osteoporosis of the hip correspond to changes of stage 1 and 2 of avascular necrosis with the additional presence of abundant new bone formation. New bone formation in transient osteoporosis results in repair that inhibits the progression to avascular necrosis.

Increased awareness and more careful analysis of MRI data are needed to prevent the misdiagnosis of transient osteoporosis as avascular necrosis, particularly in men. In a study by Balakrishnan *et al.* it was shown that from 196 patients, 10 men (12 hips) between the ages of 32 and 55 years who were initially diagnosed with avascular necrosis were eventually determined to have transient osteoporosis of the hip. Undeniably, early differentiation of transient osteoporosis from avascular necrosis will avoid unnecessary surgical intervention and ensure appropriate treatment.

## 5. Conclusion

Patients who are presenting with grade I Osteoarthritis changes needs further evaluation to rule out transient osteoporosis which is a self-limiting condition and if treated conservatively can delay future arthroplasty procedure.

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