

TRANSIENT OSTEOPOROSIS OF KNEE: A COMMON CONDITION FOR NON-INDICATED TKR

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ABSTRACT: BACKGROUND: This article reports a case of transient osteoporosis involving both tibial and femoral condyle in 30 patients, reviews the existing literature, discusses disease pathology and discusses the treatment options. **SUBJECTS & METHODS:** 30 patients with a 1-8 weeks history of knee pain and on the verge of planning a TKR 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 TKR at later time. **CONCLUSION:** Early differentiation of transient osteoporosis from early Osteoarthritis of knee will avoid unnecessary surgical intervention and ensure appropriate treatment.

KEY WORDS: Transient Osteoporosis, knee pain, pregnancy, elderly population, TKR, Bone marrow edema syndrome, transient bone demineralization.

INTRODUCTION: Transient osteoporosis is an uncommon, self-limiting disease, first reported in 1959. The term idiopathic transient osteoporosis of the hip was designated by Laquesne¹ 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 30 patients, reviews the existing literature, discusses disease pathology, and discusses the treatment options.

SUBJECTS & METHODS: 30 patients with a 1-8 weeks history of knee pain. The pain was most apparent during walking, and had increased to the point of preventing weight bearing in few. The patient reported no recent trauma to the joint and had no history of knee injury or disease. The patient 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 minor osteoarthritic changes (Fig 1). Laboratory values were within normal limits, including those associated with infection. Initial management was investigating 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

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marrow edema and edema to the adjacent soft tissues (Fig 2) which were managed conservatively with relative non weight-bearing and analgesics.

At the 3-week follow-up their symptoms had improved minimally and at 1-month follow-up, symptoms had improved, and weight bearing was improved. The patient progressively increased weight bearing as tolerated during the subsequent 4—6 weeks period. At 12-week follow-up, symptoms had completely resolved. At 6 month follow-up, the patient showed no signs or symptoms of disease. Specific to the knee, 1 case of regional migratory osteoporosis to other joint have been reported.



Fig. 1

Radiograph showing early osteoarthritis changes involving all the compartments of knee.



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. 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. 4

X ray showing changes of transient osteoporosis involving the medial femoral condyle in antero-posterior view and lateral x-ray.



Fig. 5



Fig. 6

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. 7

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

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RESULTS: Few patients have undergone total knee replacement for the same condition which was diagnosed to be an early osteoarthritis cases in other centers. And few of which were diagnosed of early OA and advised TKR had come for second opinion to our center and were diagnosed of transient osteoporosis and managed conservatively as above and were included in the study. Few of them had some relief due decompression achieved during Total knee replacement, where it was not an absolute indication which would have been even managed without surgery by conservative methods as described above. Most of the patients had completely relieved of the symptoms within a period of 8-12 wks when managed as above.

DEMOGRAPHIC CATEGORY	CONSERVATIVE MANAGEMENT	REPLACEMENT (TKR)	TOTAL
GENDER			
Females	17	3	20
Males	9	1	10
AGE			
>40 yrs	18	4	22
<40 yrs	8	0	8
PRESENTATION			
UNILATERAL	24	4	28
BILATERAL	2	0	2

TABLE

DISCUSSION:

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 during the fourth to seventh decades of life and may involve any age group.

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

Fertakos³ et al and Wambeek⁴ al both described cases in which transient osteoporosis presented initially in the medial femoral condyle and subsequently migrated to the lateral condyle. Parker⁵ 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 Falkenberg⁶ 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.

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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 a 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.

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 dystrophy⁸. However, as noted by Banas⁹ 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 knee¹⁰), 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. Miyanishi¹¹ 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 trauma¹². Also, Rodriguez et al supported the hypothesis that regional transient osteoporosis may be associated with vitamin C deficiency¹³. 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. McCarthy¹⁴ 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.

Treatment: Treatment typically consists of 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 with pain control. No evidence indicates adverse effects of weight bearing as tolerated on outcomes.

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Several additional forms of treatment have been described, including corticosteroids, bisphosphonates, and calcitonin. Carmona-Ortells¹⁵ et al reported 2 patients completely pain free between 2 and 4 weeks after treatment with deflazacort. Studies by Carthy et al and Varenna¹⁶ 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.^{17,18}

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 Steinberg¹⁹ considered decompression unnecessarily aggressive for a condition of uniformly good prognosis.

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.

CONCLUSION: Undeniably, early differentiation of transient osteoporosis from early Osteoarthritis of knee will avoid unnecessary surgical intervention and ensure appropriate treatment.

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