



MRI EVALUATION OF NON TRAUMATIC KNEE PAIN

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ABSTRACT

Background and objectives: Pain in knee joint constitutes a major source of morbidity. Osteoarthritis, infectious process and tumors arising from synovium, bone and soft tissue are the common causes of non traumatic knee pain. The role of MRI in imaging of knee has steadily increased over years. MRI with its excellent soft tissue contrast, multi-planar imaging capabilities, non-invasive nature and lack of ionizing radiation has overcome the limitation of other imaging modalities.

Method and Material: Total of 26 patients with symptoms of non traumatic knee pain were selected over a period of one year and assessed with MRI knee for imaging findings and etiology of knee pain.

Results: Imaging with MRI, in our study, helped in formulating a cause and provided a recommendation for proper evaluation, optimum and efficacious treatment of patients with knee pain and also investigated the incidence and coexistence of multiple knee joint pathologies and the distribution of knee joint pathologies according to age and sex. In patients without history of trauma, infective arthritis is the most common finding. Osteochondritis dessicans and bone tumors are other common findings in non-traumatic knee pain.

KEYWORDS : MRI, Knee pain , arthritis, osteochondritis dessicans

INTRODUCTION

The knee is one of the important weight bearing joints capable of performing complex and extensive movements. It is therefore most frequently affected by traumatic and degenerative conditions. Pain in knee joint constitutes a major source of morbidity in patients attending orthopedic outpatients department. Degenerative conditions, trauma and infection are the common causes.

Osteoarthritis (OA) of knee joint is a common disease of aged population and one of the leading causes of disability. Infectious process can also involve knee joint, leading to septic arthritis. Many tumors arising from synovium, bone and soft tissue are also seen in and around knee joint. The various imaging modalities currently used to evaluate pathological conditions of the knee include conventional radiography, sonography, computed tomography, Magnetic resonance imaging (MRI) and arthroscopy.

The role of MRI in imaging of knee has steadily increased over years. MRI with its excellent soft tissue contrast, multi-planar imaging capabilities, non-invasive nature and lack of ionizing radiation has overcome the limitation of other imaging modalities. With the development of new sequences, improved signal to noise ratio, high resolution, reduced artifacts and shorter imaging times, the role of MRI in the diagnosis of patients with knee complaints has increased many folds. MRI provides superior anatomical and pathological definition of soft tissues, ligaments, fibrocartilage & articular cartilage, bone contusions and marrow changes. MRI is non-invasive, free from known morbidity and is safer and less expensive than arthroscopy.

MATERIAL AND METHODS

This prospective study was carried out over the span of one year. This study was carried on 26 patients having knee pain who presented without history of trauma. MRI knee was done and assessed for imaging findings and etiology of knee pain.

OBSERVATIONS

The age of patients ranged between 6 years to 85 years with the mean age of 34 years. Among 26 patients studied, 17 were females (65%) and 9 were males (35%).

Out of 26 patients, 11 patients had infective arthritis of knee joint (42.3%). Out of these, three patients had tubercular arthritis (11.5%). One patient (3.8%) had rheumatoid arthritis with involvement of knee joint.

Two patients had osteoarthritis (7.6%). Parameniscal cyst was seen in four patients (15.3%). Parameniscal cysts were associated horizontal meniscal tear. One patient had ACL ganglion cyst (3.8%). Incidentally noted cystic lesion was Baker's cyst. Size of Baker's cyst ranged from 2.2cm to 6 cm. Mean size was 4.2cm.

Five patients (19.2%) had osteochondral defect of femur. Grading was done according to International cartilage repair society grading system.

Table 1. Showing characteristics of osteochondral defect.

Age	Sex	Site of OCD	ICRS Grade
42	Male	Medial aspect of medial femoral condyle	4
12	Female	Lateral aspect of medial femoral condyle	2
20	Male	Lateral aspect of medial femoral condyle	3
40	Female	Lateral aspect of medial femoral condyle	1
45	Female	Lateral aspect of medial femoral condyle	2

Five patients (19.2%) out of the 26 patients without trauma had bone tumors.

Table 2. Showing types of tumor.

Type of tumor	Number of Patients	Site of tumor
Osteosarcoma	1	Distal femur - metaphysis
GCT	1	Proximal tibia - epiphysis

Enchondroma	1	Distal femur - metaphysis
Osteochondroma	2	Distal femur - metaphysis and proximal tibia - metaphysis

ILLUSTRATED CASES



Image 1. Osteoarthritis: Coronal T1W image showing degenerative changes in form of osteophyte formation and subchondral sclerosis.



Image 2. Rheumatoid arthritis knee: Sagittal T1 post contrast image showing knee joint effusion, irregular thickening and enhancement of synovium and popliteal cyst.

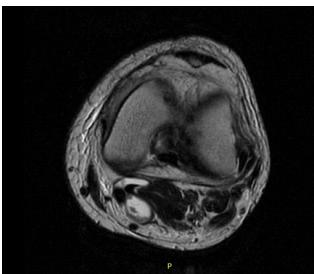


Image 3. Baker's cyst: Axial T2W image showing Baker's cyst between the medial head of gastrocnemius and semimembranosus.

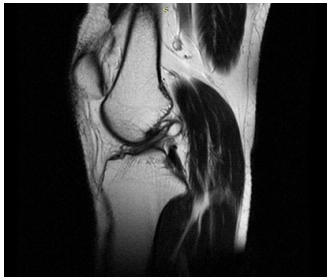


Image 4. ACL ganglion cyst: Sagittal T2W image showing mucinous degeneration of ACL with ganglion cyst.



Image 5. Osteochondritis dissecans: Coronal PDFS image showing high-signal interface between osteochondritic fragment and femur, indicating unstable lesion.

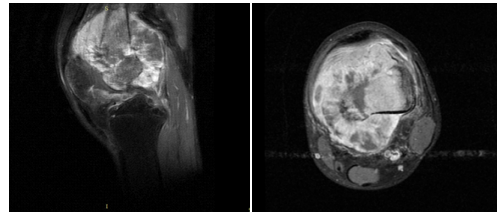


Image 6. Osteosarcoma distal femur: Sagittal and axial T1W post contrast images showing a large heterogeneously enhancing mass arising from distal femoral metaphysis with associated soft tissue component and intra-articular extension.

DISCUSSION

Multiple imaging modalities are currently used to evaluate pathological conditions of the knee. Over the past several years, the role of MRI in knee imaging has steadily increased and is often the main or only imaging tool for evaluation of suspected internal derangements. Complete evaluation of the capsule, collateral ligaments, menisci and tendons around the knee has been difficult with conventional imaging modalities. Multiplanar MR images provide significant improvement in assessing these structures.

In our study 11 patients had infective arthritis. Among these 3 patients had tubercular arthritis and 8 patients had septic (pyogenic) arthritis. In patients with pyogenic arthritis common findings were synovial enhancement, perisynovial edema, joint effusions and synovial thickening. The marrow showed abnormal T2 signal and abnormal gadolinium enhancement. Associated osteomyelitis was also seen. These findings were similar to those reported by Karchevsky et al.² In patients with tubercular arthritis common findings were T2 hypointense synovial thickening, post Gadolinium synovial enhancement, joint effusion, and soft tissue abscesses. These findings were also described by Sanghvi et al³ and Hong et al⁴. We had only two patients of osteoarthritis (Image 1). Despite of its common occurrence, such low number of patients could be because of the fact that MRI is not required for the diagnosis of osteoarthritis. Plain radiography is the primary modality of imaging for osteoarthritis. We observed that the advantage of MRI over radiography is in depicting cartilage defects, bone marrow edema and meniscal degeneration. Other findings like osteophytes, subchondral cysts, subchondral sclerosis, joint effusion and synovitis were also depicted well by MRI. Hayes et al¹ concluded from their study that MR imaging parameters of defects of cartilage, BME, osteophytes, subchondral sclerosis, meniscal abnormalities, joint effusion, and synovitis have a strong correlation with radiographic severity measurements of osteoarthritis of the knee and pain.

The cystic lesions encountered in our study were parameniscal cyst, ganglion cyst and popliteal cyst. Meniscal cysts are divided into intra-meniscal and parameniscal cysts. We had four cases of parameniscal cysts which were seen to communicate with the horizontal degenerative tear in the meniscus. Similar MR appearance was reported by Burk et al⁵. This was clearly seen on coronal T2W and STIR images. Cystic degeneration of the ACL has been attributed to mucinous degeneration of connective tissue^{6,7} or considered as intra-substance ACL tear. On MR imaging, cystic degeneration can manifest as well-defined ganglion cysts arising from the ACL which occur in about 1% of patients⁸. We had encountered one case of ganglion cyst within the substance of ACL demonstrated on Sagittal T2W1.

The popliteal (Baker's) cyst is by far the most common cyst in the knee, seen in up to 40% of MRI examinations^{9,10}. It represents a communication between the posterior joint capsule and the normally occurring gastrocnemius-

semimembranosus bursa/recess. This connection can have a "ball-valve" like mechanism, which is typically opened during knee flexion and closed during extension¹⁰. We found Baker's cyst in seven patients (7%) out of the 100 knee examined (Image 3). The relation of popliteal cyst to the muscle and its communication with joint was clearly demonstrated on axial images.

Osteochondritis dissecans is a poorly understood entity with multiple proposed causes, including repetitive microtrauma, ischemia and genetic causes¹¹. Osteochondritis dissecans most commonly occurs about the knee, affecting the lateral aspect of the medial femoral condyle, followed by the weightbearing surface of the lateral femoral condyle, and less commonly may affect the inferomedial pole of the patella and trochlear fossa. Osteochondritis dissecans is best delineated by MRI (Image 5). Radiography may be helpful for identifying these lesions but provides little information regarding prognosis and the potential need for orthopedic intervention. MRI features that suggest instability and therefore may be indications for orthopedic intervention include the presence of intraarticular loose bodies, overlying articular cartilage thinning, fluid insinuation between the fragment and parent bone, and junctional cysts between the fragment and parent bone¹².

We had five patients of osteochondritis dissecans in our study (19.2%). Lateral aspect of medial femoral condyle was the most common site involved. MRI examination helped in grading the patient according to the ICRS system, which further helps in determining the mode of treatment and prognostication of the patient.

We found five cases (5%) of bone tumor in our study. One case each of osteosarcoma (Image 6), GCT, enchondroma were seen. Two patients of osteochondroma were studied. Shetty et al¹³ did a study on 115 patients of knee pain and found bone tumors in five patients (4.3%). In our study, we found that MRI helps in delineation of tumor and its extent in bone and soft tissues with high contrast resolution. MRI is an excellent modality to demonstrate marrow involvement by the tumor, involvement of neurovascular bundle and joint invasion. MRI is also helpful in staging, therapeutic planning and follow-up of bone tumors. These observations are similar to those of Baweja et al¹⁴ and Nascimento et al¹⁵.

CONCLUSION

Assessment of the patient presenting with knee pain is a common problem in clinical practice. MRI plays an invaluable role in the evaluation of patients with knee pain. Imaging with MRI, in our study, helped in formulating a cause and provided a recommendation for proper evaluation, optimum and efficacious treatment of patients with knee pain and also investigated the incidence and coexistence of multiple knee joint pathologies and the distribution of knee joint pathologies according to age and sex. In patients without history of trauma, infective arthritis is the most common finding. Osteochondritis dissecans and bone tumors are other common findings in non-traumatic knee pain.

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