ORIGINAL RESEARCH PAPER
Volume - 11 | Issue - 01 | January - 2022 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

ROLE OF MRI IN ASSESSMENT OF PATIENTS WITH PAINFUL KNEE JOINT

Radio-Diagnosis

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ABSTRACT

MRI has revolutionized diagnostic imaging of the knee. It has become the investigation of choice in the assessment of internal joint structures of the knee joint like menisci, cruciate ligaments and articular cartilage. **PURPOSE:** The objective of this study is assessing the role of MRI to identify and describe various etiologies of painful knee joint. **MATERIALS AND METHODS:** Our study was a hospital based descriptive study conducted at S.M.S. Medical College and Hospital, Jaipur (Raj). Total 50 patients with painful knee joint were included. Patients referred from orthopedic department for MRI evaluation of painful knee joint were included in the study and post operative cases were excluded from the study. All the MRI scans were performed using 3.0 TESLA MRI Philips Ingenia Machine. Results were analysed by a descriptive analysis and specific findings were compiled. **RESULTS:** Out of 50 patients MR images were normal in 2 patients. Most common knee pathology was meniscus injury in 32 (64%) patients and involved medial meniscus in 22 patients. In ligament tears ACL injury was more common than PCL injury. Other chronic causes of painful knee joint were chondromalacia patellae, osteoarthritis and cystic lesion. **CONCLUSION:** MRI evaluation in patients with painful knee is of vital importance, as MRI can demonstrate the exact nature and extent of bony as well as soft tissue abnormality. MR imaging is the best non-invasive modality for the diagnosis of meniscal and ligament tears.

KEYWORDS

Knee joint, MRI, meniscal injury.

INTRODUCTION

Knee joint is one of the largest joints in the human body with complex articulation characterized by the presence of ligamentous and meniscal structures that play an important role in the stability and mobility. This articulation is subject of very high mechanical stresses[1].

Disease processes and injuries that disrupt ligaments, menisci, articular cartilage and other structures of the knee cause painful knee resulting in significant morbidity and disability. The number of patients with complaints of painful knee joint is quite significant and therefore magnetic resonance imaging (MRI) of the knee is of great value to understand and diagnose the varied pathologies causing painful knee.

Number of imaging modalities are currently used to evaluate knee abnormalities including standard radiography, Computed Tomography (CT), planar tomography and arthrography[1,2].

Magnetic Resonance imaging (MRI) has revolutionized diagnostic imaging of the knee joint. This innovative technology provides excellent soft tissue contrast and is capable of evaluating the soft tissue and bony structures in multiple imaging planes which provides a significant advantage for MRI over other imaging technique in evaluation of knee joint pathologies[3].

The developments and advancements in MRI and the introduction of high-resolution coils have provided a non-invasive, cost-effective radiation-free technique that provides access to a real "lesional mapping" to diagnose knee pathology.

MRI plays a crucial role in the diagnosis and monitoring of traumatic and nontraumatic pathologies. It has also been demonstrated as a cost-effective technique by reducing unnecessary surgical interventions[3].

MATERIAL AND METHODS

Our study was a hospital based descriptive study conducted at S.M.S. Medical College and Hospital, Jaipur (Raj). Total 50 patients with painful knee joint were included. After approval from Institutional ethical committee, patients referred from orthopedic department for MRI evaluation of painful knee joint were included in the study and post operative cases were excluded from the study. All the MRI scans were performed using 3.0 TESLA MRI Philips Ingenia Machine.

The following MRI protocols were used:

- The sequences obtained were T1 and T2 weighted sequences in sagittal planes, Proton Density (PD) weighted sequences in axial, coronal and sagittal planes and fat suppressed T2 or STIR sequences wherever indicated.
- Patients were examined in supine position with knee extension and slight external rotation (10-15 degree) in an extremity coil for optimization of signal to the noise ratio.

Results were analysed by a descriptive analysis and specific findings were compiled.

RESULTS

In our study group which comprised of a total number of 50 patients, only 2 patients (4%) were having normal MRI findings and 48 patients (96%) were having abnormal MRI findings.

Age and sex wise distribution of patients:

The age at presentation with knee pain ranged from 18 to 66 years. The maximum number of affected patients are in the age group of 21- 40 years (n=27) forming 54% of the study population. Out of 50 patients, 27 (54%) were males and 23(46%) were females. Male predominance noted. (Chart-1)

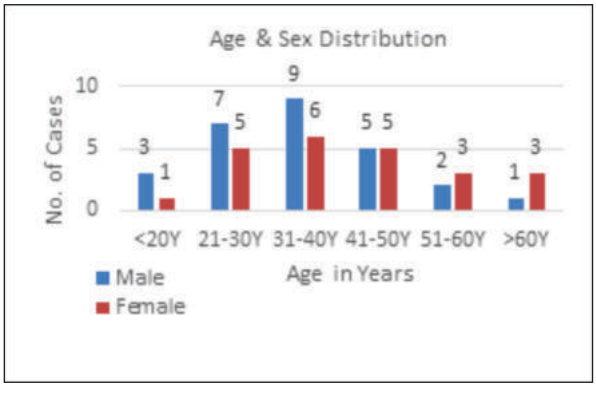

Chart 1: Column diagram showing age and sex wise distribution of cases.

Distribution of patients according to knee pathology: shown in table-1

Table – 1

Pathology	No. of cases	Percentage (%)
Meniscal pathology	32	64
ACL	24	48

PCL	5	10
Collateral Ligaments	10	20
Osteoarthritis	9	18
Chondromalacia patellae	15	30
Cystic lesion	6	12

Distribution of cases according to meniscus signal abnormality:
Out of 50 patients, 32 (64%) patients were diagnosed to have meniscal signal abnormality. These 32 patients had 36 meniscal signal abnormalities, out of these 32 patients 22 (68.75 %) patients involved the medial meniscus alone, 6 (18.75%) involved the lateral meniscus and 4 (12.5 %) involved the medial as well as lateral menisci.

These were further classified as grade I, grade II and grade III signal abnormality. Out of 36 meniscus signal abnormality, 26 were medial meniscus and 10 lateral menisci. In 36 meniscus abnormalities 5 were grade I signal, 15 were grade II signal and 16 were grade III signal.

Grade III signals (tear) in meniscus were further classified as complex tear, bucket handle tear, horizontal tear, vertical tear and oblique tear. Out of 16 patients having tears (grade III) in meniscus, 7 had complex tear, 4 had bucket handle tear (one case shown in image-1), 2 had horizontal tear, 2 had vertical tear and 1 had oblique tear.

Ligament Pathologies
Cruciate ligament injury: Out of 50 patients, 29 were diagnosed to have cruciate ligament injury. Out of 29 having cruciate ligament injury, 24 were diagnosed to have ACL injury and 5 were diagnosed to have PCL injury. These were further classified as mucoid degeneration (MD), interstitial edema (IE), partial tear (PT) and full thickness tear (FTT). Out of 29 patients having cruciate ligament injury 4 had MD, 7 had IE, 8 had PT and 10 had FTT.

Collateral ligament injury: Out of 50 patients, 10 were diagnosed to have collateral ligament injury. Out of 10 having collateral ligament injury, 6 were diagnosed to have MCL injury and 4 were diagnosed to have LCL injury. These were further classified as grade I, II and III. Out of 10 patients having CL injuries, 3 had grade I, 5 had grade II and 2 had grade III injury.

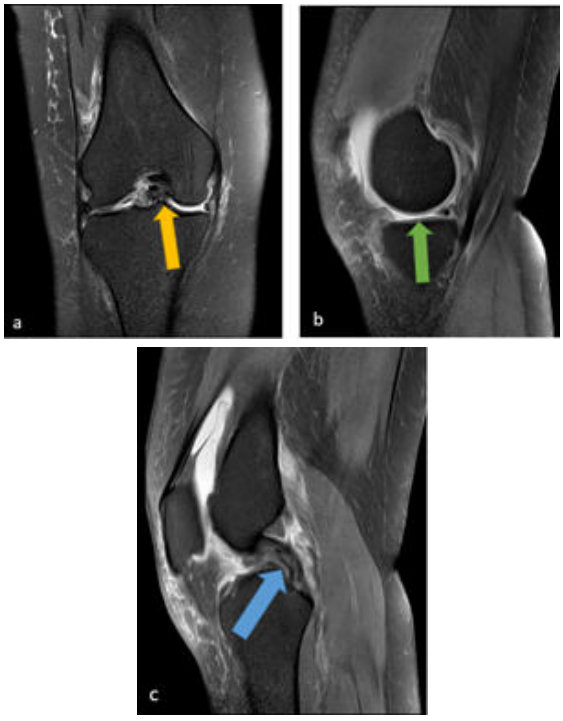

Image 1: (a) PDFS coronal MR image showing meniscal fragment in intercondylar notch (yellow arrow). (b) PDFS sagittal image showing absent bow-tie sign (green arrow) and (c) sagittal image showing double PCL sign (blue arrow) findings are suggestive of Bucket Handle tear of medial meniscus.

Osseous / Osteochondral Pathologies
Bone contusion: Out of 50 patients, 9 patients were diagnosed to have bone contusions. These 9 patients had 12 bone contusions, 7 involved femur and 5 involved tibia. Bone contusions were more common in the femur (7 contusions) than tibia (5 contusions), contusions in the lateral femoral condyle (6 contusions) being more common than in the medial femoral condyle (1 contusion).

Chondromalacia Patellae:
Out of 50 patients, 15 were diagnosed to have chondromalacia patellae. These were further classified as grade I, II, II and IV. Out of 15 patients having chondromalacia patellae 2 had grade I, 4 had grade II, 3 had grade III and 6 had grade IV chondromalacia patellae.

Cystic lesions:
In our study 6 patients have a total of 7 cysts. Baker's cyst was seen in 2 patients, para-meniscal cyst in 2 patients and ganglion cysts in 3 patients.

Osteoarthritis:
MRI changes suggestive of osteoarthritis were found in 9 patients, out of which 4 had involvement of medial compartment, 2 of the lateral compartments and in 3 patients both compartments are involved.

DISCUSSION
Our study included 50 patients who had history of painful knee joint and underwent MRI of the knee joint. In this study, we found that the most patients were in the age group of 21- 40 years (n=27) forming 54% of study population with a male dominance. Out of 50 patients, 28 were right sided painful knee joint and 22 were left sided painful knee joint. Our results are in concordance with those of Rajpal Yadav et al[4]., who described a mean age of 36.70±14 years and male preponderance in their study.

4% of our study population had a normal MRI. This is in contrast to a previously reported (17%) rate of normal MRI in sports related knee injuries. This might be due to the fact that we included patients with a painful knee rather than just traumatic knee injury.

Meniscal tears were the commonest soft tissue abnormality found in our study. Tears involved posterior horn of the medial meniscus more commonly. The results are in concordance with the previously reported literature. Grade-3 was the commonest meniscal tear in our study which is concordance with the results by Arumugam et al[6]., who reported grade-3 as the commonest grade of meniscal tear.

All the vertical tears in our study were associated with a history of trauma. Reported literature also describes vertical tears as being traumatic in nature[8]. Three patients in our study had a bucket-handle tear involving the medial meniscus. Literature also reports that most of the bucket-handle tears involve the medial meniscus[5].

Tear was the commonest pathology affecting the ACL, most being acute in nature. The incidence of PCL pathology in our study was 10%, which is comparable to the 5.78% incidence reported by Singh JP et al[7].

Tibia was more commonly involved than femur by contusions and lateral femoral condyle was involved more frequently than its medial counterpart. Our results are in agreement with the existing literature.

Out of 50 patients, 15 were diagnosed to have chondromalacia patellae. These were further classified in grade I, II, II and IV. Grade IV chondromalacia patellae was found in 6 patients. Study by McCauley et al.[9] showed that 52 patients who had MR examination of the knee chondromalacia patellae were documented in 29 patients and normal cartilage was documented in 23 patients.

CONCLUSIONS
Evaluation of patients presenting with painful knee joint is essential in clinical practice. MR imaging plays a pivotal role in the evaluation of patients with painful knee joint. Magnetic resonance imaging is a reliable, non-invasive technique for examination of the soft tissue and osseous structures of the knee. In the setting of traumatic knee injuries, MR imaging is the best noninvasive modality for the diagnosis of meniscal and ligament tears. MR has high spatial resolution, excellent inherent soft tissue contrast, multiplanar imaging capability and lack of ionizing radiation, MR imaging has emerged as a versatile tool in the evaluation of these patients. We found that MRI is non-invasive, painless and well tolerated by patients.

The combination of different sequences as T1W, T2W, PD and PDFS sequences in various planes provides most of the details necessary for accurate evaluation of knee. MR is highly valuable in the diagnosis of

meniscal tears as well as in the evaluation of ACL

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