



MRI IN EVALUATION OF KNEE JOINT-A SERIES OF 150 PATIENTS

Radiodiagnosis

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ABSTRACT

Since its introduction to musculoskeletal imaging in early 1980's, MRI has revolutionized diagnostic imaging of knee. This innovative technology allows superior soft tissue detail with multiplanar imaging capability that provides accurate evaluation of intra and extra articular structures of knee not demonstrated on other modalities

OBJECTIVE: The objective of this study is to describe:

1. MRI features in various types of traumatic and non traumatic lesions causing painful knee joint.
2. To identify common lesions seen in knee joint.
3. To analyse the types of knee joint abnormalities detected by MRI which will aid in making a proper diagnosis

MATERIALS AND METHODS: A descriptive MR study was undertaken in 150 patients with complaints of pain, trauma and swelling over knee joint in ASRAMS to evaluate knee joint. All MRI scans in this study were performed using 1.5T MRI (SIEMENS MAGNETOM AVANTO)

DURATION OF STUDY: The study was carried over a period of one year from April 2016 to March 2017.

KEYWORDS

MRI: magnetic resonance imaging, MCL: medial collateral ligament, LCL: lateral collateral ligament, PCL: posterior cruciate ligament, ACL: anterior cruciate ligament

INTRODUCTION:

Normal knee joint is essential for day to day life and in many popular sports. The number of patients with complaints of painful knee joint is quite significant and therefore magnetic resonance imaging (MRI) of knee is of great value to understand and diagnose various pathologies causing painful knee joint. MRI is well tolerated by patients, widely accepted by evaluating physicians and assist in distinguishing pathologic knee conditions that may have similar signs and symptoms. MRI has proven to be accurate for the diagnosis of intra and peri articular pathology, especially for meniscal pathology (accounting for 86% of the indications for arthroscopy) and modality of choice for nearly all clinical indications concerning the knee. The acutely injured knee is readily imaged for the detection of meniscal and ligamentous injury. In the evaluation of chronic knee pain, MRI can obviate the need for multiple imaging procedures simultaneously evaluating the structures of knee, marrow space, synovium and periarticular soft tissues concerning the knee.

MR ACCURACY¹

MRI has been proved by numerous studies as a non invasive modality of choice for the evaluation of knee pathology. Compared with arthroscopy, the sensitivity of MR imaging of meniscal tears has been reported to be between 80% and 100%. With fast 3D MR imaging, there is 95% concurrence between MR imaging and arthroscopy in the detection of meniscal tears and 100% correlation for meniscal derangement. MR is particularly useful in cases of multiple or complex knee lesions, in which the accuracy of clinical knee examination drops from 72% for a single lesion to 30%. The possibility of an associated meniscal tear in the presence of clinically deficient ACL knee or an existing MCL tear is a clinical indication for MR referral. Variations in accuracy rates of MR compared with those of arthroscopy may be due to the following factors—differences in experience of radiologists in interpreting MR signal intensities, false interpretation of areas of fibrillation and fraying as meniscal tear and inability of arthroscopy to detect intra substance degenerative cleavage tears and variability in MRI equipment and surface coils at a variety of field strengths

SELECTION OF PATIENTS:

INCLUSION CRITERIA:

All patients with complaints of pain, swelling and trauma to knee joint who were clinically referred for MRI of knee joint and were detected to have any of the following.

1. Meniscal tears
2. Collateral ligament tears
3. Cruciate ligament tears
4. Fractures and Subluxations around knee joints

5. Cystic lesions
6. Tumours

EXCLUSION CRITERIA:

1. Patients subjected to MRI with no knee joint complaints
2. Patients with implants
3. Post operative knee
4. Claustrophobic patients

Once, the patient satisfied the inclusion criteria for this study, he or she was briefed about the procedure. The noise due to gradient coils (heard once the patient was inside the bore of magnet) and the need to restrict body movements during the scan time was explained to the patient. All the MRI scans of knee in this study were performed using SIEMENS SOMATOM 1.5T MRI field strength with permanent magnet in a closed coupled extremity knee coil

RESULTS:

This study comprised of a total number of 150 patients, the age at presentation with knee pain ranged from 8 to 65 years. Of the 150 patients studied, 114 were males and 34 were females

MALE	FEMALE
114	36

The maximum number of patients affected (42%) belong to age group of 21-30 years.

This study also showed male preponderance for knee pain accounting for 76% of case load.

MENISCAL TEARS^{2,3,4}

Of the 150 patients evaluated with MRI of knee for evaluating painful knee joint, 116 patients had trauma. Out of 116 patients, 59 patients (50.8%) had meniscal tears. Of the 59 patients 35 (59.4%) involved the medial meniscus alone, 12 (20.3%) involved lateral meniscus alone and 12 (20.3%) involved the medial as well as lateral meniscus. Medial meniscal tears: Of the 47 medial meniscal tears, 34 could be graded. 9 were grade 1 tears, 10 were grade 2 tears, 13 were grade 3 tears and 2 were grade 4 tears. Tears of medial meniscus involved posterior horn in 100% cases.

Types of medial meniscus tears:

Among 47 medial meniscus tears 29 were horizontal tears, 3 were vertical tears, 1 was radial tear, 2 were complex tears, 10 were bucket handle tears and 3 were extrusion of medial meniscus. 73.4% cases involving the lateral meniscus involved the posterior horn and 26.6% involve the anterior horn.

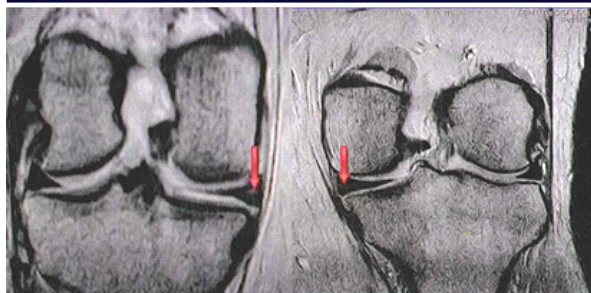


FIG1: MCL TEAR

Lateral meniscus: Of 24 lateral meniscus tears 15 could be graded.7 were grade 1 tears, 5 were grade 2, 3 were grade 3 and 0 grade 4 tears.

4 of them (26.6%) of them involved anterior horn and 11(73.4%) involved posterior horn. Bucket handle tears were 7 and the lateral meniscus extrusions were 2.

TYPES OF LATERAL MENISCUS TEARS:

Of the 24 meniscal tears, 0 were vertical tears, 15 were having horizontal tears. 7 were having bucket handle tears, and 2 having extrusion.

Among the 17 patients with bucket handle tears, 10 (59%) had tears involving the medial meniscus and 7 (41%) had tears involving the lateral meniscus.

CRUCIATE LIGAMENT TEARS:

ACL TEARS^{5,6}:

Of the 91 patients with ACL^{9,10} tear, 34 (37%) patients had acute complete tear, 40(44%) had acute partial tear, 13(14.2%) had chronic tears and 4(4%) had avulsion tear

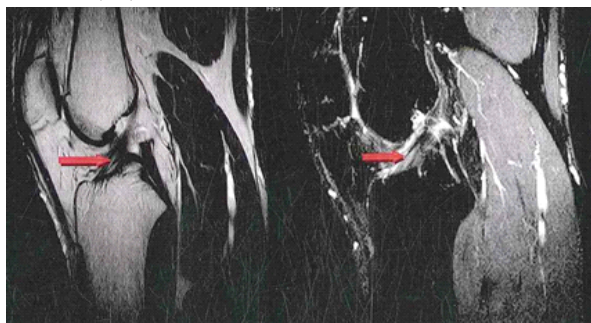


FIG2: ACUTE PARTIAL TEAR ACL

PCL TEARS:^{7,8}

Of 10 patients with PCL tear 2(20%) patients had acute complete tear, 5(30%) had acute partial tear, 0 patients with chronic tear and 3(30%) had avulsion tear.

The PCL being a stronger ligament therefore has low incidence of tears

COLLATERAL LIGAMENT TEARS:

MCL tears were seen in 17 patients. of the 17, 2(11.7%) had grade 1 tear, 11(64.7%) had grade 2 tear and (23.6%) had grade 3 tears

This study found that maximum number of patients with knee pain who had MCL tear belonged to grade 2.

LCL tears were seen in 13% patients with 4 tears belonging to grade 1, 8 tears belonging to grade 2 and 1 tear belonging to grade 3.

FRACTURES AND SUBLUXATIONS AROUND KNEE:

14 patients had fractures involving tibia. 5 among them were comminuted fractures, 3 were simple fractures, 5 were avulsion fractures and 1 was second fracture.

9 patients had subluxation of knee joint. of then 4 cases were lateral subluxation of patella and 5 were subluxation of femur over tibia.

CYSTIC LESIONS OF KNEE: Of 150 patients, 22 had cystic lesions

of knee on evaluation of their knee MR images which was the cause of knee pain. Of these 22, 18 patients had popliteal cyst of which 1 was popliteal cyst with hemorrhage in it and 1 with calcified loose bodies in the cyst. the prevalence of popliteal cyst in this study was 1.2 % . 4(45%) were associated with degenerative changes in knee joint.

Meniscal cyst was seen in 3 patients of which 2 of them involved lateral meniscus and 1 involved medial meniscus. Of these 2 were associated with horizontal grade III tears of posterior horns and 1 was associated with bucket handle tear. 1 patient had intramuscular cyst in the lateral head of gastrocnemius.

NEOPLASTIC LESIONS: On evaluation of 150 knee MR images, features of neoplastic lesion were found in 5 patients. Benign lesions- osteochondroma was seen in 2 patients, giant cell tumor was seen in 1 patient and fibrous dysplasia was seen in 1 patient. Malignant lesion- osteosarcoma was found in 1 patient.

Features of **osteomyelitis** were seen in 2 patients and their ages were 11 and 12 years respectively. There was subperiosteal abscess in both the cases, with marrow inflammation and adjacent soft tissue inflammation.

Non specific marrow changes were noted in 1 patient of age 45 years.

Infrapatellar bursitis was present in 1 patient with complaints of pain in knee joint with swelling and no history of trauma.

ARTHRITIS: Features of arthritis were seen in 15 patients of total 150 patients included in the study. Osteoarthritis was seen in 13(8.6%) patients. It occurs mostly in patients above the age of 35 years. In this study all the patients with osteoarthritis were over the age of 35 years, 5 were female patients and 8 were male. 6 patients had geodes (subchondral cysts). 1 patient had marginal articular erosions, joint space narrowing, joint effusion, and was diagnosed as tuberculosis of knee joint,. 1 patient had bilateral symmetrical articular erosions and was diagnosed as inflammatory arthritis.

JOINT EFFUSION: Lipohaemarthrosis was noted in 3 patients with trauma and all the 3 cases were associated with fracture tibia extending to articular surface. Moderate joint effusion was present in all patients with meniscal tears. Joint effusion was seen in even non traumatic cases and had no significant association.

LOOSE BODIES: Intra articular loose bodies were present in 3 cases. There were bone intensities in all sequences and all were associated with degenerative changes in the knee joint, hence concluded as detached osteophytes. 1 case had popliteal cyst with bony loose bodies in it.

EXTENSOR TENDONS AND POPLITEAL TENDONS:

Extensor mechanism of knee include quadriceps muscles and its tendon and patellar tendon. Quadriceps tendon tear was found in 3 patients of trauma to knee joint, patellar tendon tear was found in 1 patient and popliteal tendon tear was found in 1 patient.

Of 150 patients included in the study, osteochondritis dissecans was found to be the cause of the knee pain in 1 female 23 year old patient, and the lesions were classified as unstable based on MRI characteristics. There were no loose bodies.

DISCUSSION AND CONCLUSION:

This study has shown that patients presenting with pain in knee joint included males more commonly and the common age group was 21-30 years. Causes for pain and swelling around knee joint were both traumatic and non traumatic causes and MRI was useful in diagnosing these conditions.

Trauma included bone and ligament injuries in knee. Tears involved medial meniscus in 60%, lateral meniscus in 20% and both menisci in 20%. grade 3 tears were more common in medial meniscus and all tears involved posterior horn. Grade 1 tears were more common in lateral meniscus. 73% tears involved posterior horn and 27% involved anterior horn of lateral meniscus. ACL tears were more common than PCL tears. In ACL acute partial tears were more common (44%). 11% of ACL tears were associated with fracture tibia. PCL tears included acute complete (20%), acute partial (30%) and avulsion tears (30%). Grade 2 tears were more common in MCL and LCL.

14% of the patients had cystic lesions around knee joint. The prevalence of bakers cyst was 12% and 45% of them are associated with degenerative changes in knee joint.

Hence, it can be concluded that magnetic resonance imaging is an accurate, non-invasive technique for examination of soft tissue and osseous structures of knee. In the setting of traumatic knee injuries, MR imaging is the best non-invasive modality for the diagnosis of meniscal and ligament tears. MR imaging of knee is considered efficacious especially in the setting of indeterminate clinical findings and can stratify patients, guiding further surgical management. This study also demonstrates a valuable role of MR imaging in the examination of wide spectrum of knee abnormalities not associated with acute trauma. Its accuracy in diagnosis of meniscal tears is high as well as in evaluation of ACL.

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