Original Research Article

A cross sectional study of the spectrum of MRI appearances of internal derangement of knee at a tertiary health care centre

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Abstract

Background: The evaluation of the patient with traumatic knee injury starts with clinical examination, followed by imaging modalities. Complete evaluation of all the internal structures of the knee was not possible with other modalities like conventional radiography, arthrography, ultrasonography and computed tomography. The role of magnetic resonance imaging has steadily increased and now it has become the first line investigation for most of the lesions of knee. **Aim and objective:** To study the spectrum of MRI appearances of internal derangement of knee **Methodology:** Present study was a cross sectional study carried out on patients undergoing MR imaging of the knee on the advice of referring doctor on his suspicion of derangement of knee. All patients underwent MRI of knee joint. MRI were reported by the investigator. Data was analysed with appropriate statistical tests. **Results:** Most commonly observed knee injury was ACL tear. Medial meniscal tear (77%) were more common than lateral meniscal tear (50%).
Keywords: MRI, internal derangement of knee.

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INTRODUCTION

The knee is the largest joint in the body, with a complex anatomy. It is a modified hinge joint composed of three bones: the femur, tibia, and patella and has three articulations: one between the femur and patella, and two between the femoral condyles and tibial plateaus.[1] The supporting structures of the knee joint include the medial collateral ligament (MCL), the lateral collateral ligament (LCL), the anterior cruciate ligament (ACL), the posterior cruciate ligament (PCL), and the quadriceps femoris and patellar tendons.[2] The medial and lateral menisci are situated within the knee joint surface between the femoral condyles and the tibial plateau. These structures, together with the muscles and a wide and lax joint capsule, maintain and support knee stability.[3-5] The effective birth of the diagnostic medical imaging was marked by the discovery of X- rays in 1895. Since then there have been numerous refinements in imaging techniques and the development of entire new modalities including ultrasound, computed tomography, MRI and PET. The Lachamans, Pivot shift and anterior drawer, Mc Murray tests are clinical tests used to diagnose knee injury. The interpretation of clinical tests differ with the examiner often vary from examiner so accuracy is affected. Arthroscopy is another modality for diagnosis of painful knee joint. Arthroscopy of the knee has been used since 1970's as a diagnostic and therapeutic tool in the management of acute, subacute and chronic knee complaints. Disadvantage of arthroscopy is that it is invasive procedure. Non therapeutic arthroscopies can be

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avoided with modalities like MRI. Injuries to the intra-articular structure like menisci and cruciate ligaments are diagnosed with high sensitivity and specificity by MRI as compared with arthroscopy which is still regarded as the reference standard. The developments and advancements in MRI and the introduction of high-resolution coils have a non-invasive, non-operator dependent, cost effective means to diagnose knee pathology. Majority of the painful knee conditions have limited range of movements and mechanical symptoms. In such condition MRI is valuable investigation to identify patients who require arthroscopy. By use of MRI in all patients with painful knee joint, about 35% arthroscopies can be avoided. Advantages of MRI over the other imaging modalities include lack of radiation, lack of beam hardening artifacts, excellent soft tissue contrast and multiplanar imaging capabilities, non-invasive and do not require manipulation of the knees as in an arthrogram.[6]

Present study was conducted to study the spectrum of MRI appearances of internal derangement of knee joint.

Aim and objective: To study the spectrum of MRI appearances of internal derangement of knee

MATERIAL AND METHODS

Present study was a cross sectional study carried out in department of Radiology at a tertiary health care centre. Study population was patients undergoing MR imaging of the knee on the advice of referring doctor on his suspicion of derangement of knee.

Inclusion Criteria: 1. Patients undergoing MR imaging for derangement of knee 2. Patients of all ages and both sexes 3.

Exclusion Criteria: 1. Patients with known pre-existing knee joint pathologies of all the age groups are excluded. Patients with history of knee surgery

Study was approved by ethical committee of the institute. A valid written consent was taken from the patients after explaining study to them. Data was collected with pre tested questionnaire. Data collected was sociodemographic data like age, sex. Detailed clinical history, injury to knee, history of accident, past history of surgery, duration of symptoms were noted from the referring department records. All patients underwent MRI of knee joint. Hitachi Aperto 0.4 Tesla open MRI and Philips 1.5 Tesla, 32 Channel Whole- body MR scanner was used for MRI. T1and PDFS weighted sequences in sagittal and coronal planes and T2-weighted in axial, coronal and sagittal planes images were taken. MRI were reported by the investigator. All the data was entered in excel sheet and analysed with SPSS version 23.

RESULTS

In our study majority of the patients were from the age group of 21-30 years (45%) followed by 31-40 years (21%). Patients in the age group of 41-50 years were 16% and above 50 years were 11%. Patients below 20 years were 7%. Table 2 shows distribution of patients according to symptoms. In our study, majority of the patients had symptoms of painful knee since 1-6 months (41%) followed by more than 6 months (18%). 15% patients had symptoms since one week and 5% patients had symptoms since 1-2 weeks. In our study, 70% of the patients had complete ACL tear and 15% patients had partial ACL tear. 15% of the patients had no ACL tear. We found 96% of patients had PCL tear. Out of total 100 patients, 77 patients had medial meniscal tear. Out of these patients 53 patients had grade 3 tear and 15% patients had grade 2 tear. Grade 1 tear was found in 9% patients. In our study, 50% of patients had lateral meniscal tear. In patients with lateral meniscal tear 40% patients had grade 3 tear and 6% patients had 6%. Grade 1 patients were 4%. Table 6 shows MRI of MCL tear. Out of 100 patients 83 % patients had no MCL tear and 17% patients had MCL tear. Grade 1 MCL tear was found in 10% patients and grade 3 tear was seen in 7% patients. In our study, 6 % patients had LCL tear and 94% patients had no tear. In patients with LCL tear all were grade 1 LCL tear. (table 6)

Table 1: Distribution of patients according to age group

AGE IN YEAR	NUMBER	PERCENTAGE %
>20	07	07%
21-30	45	45%
31-40	21	21%
41-50	16	16%
>50	11	11%
Total	**100**	**100%**

Table 2: Distribution of patients according to duration of symptoms

Duration	Number	Percentage
Upto 1 week	15	15%
1-2 weeks	05	5%
2-3 weeks	03	6%
3-4 weeks	15	15%
1-6 months	41	41%
>6 months	18	18%
Total	**100**	**100%**

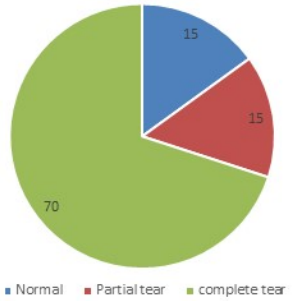

Figure 1: Distribution of patients according to MRI finding of ACL tear

Table 3: Distribution of patients according to MRI grading of medial meniscal tear

Grading	Frequency	Percentage
NORMAL	23	23%
GRADE 1	9	9%
GRADE 2	15	15%
GRADE 3/TEAR	53	53%
Total	**100**	**100%**

Table 4: Distribution of patients according toMRI grading of lateral meniscal tear

Grading	Frequency	Percentage
NORMAL	50	50%
GRADE 1	04	4%
GRADE 2	06	6%
GRADE 3/TEAR	40	40%
Total	**100**	**100%**

Table 5: Distribution of patients according to MRI of MCL tear

	Frequency	Percent
NORMAL	83	83%
GRADE 1	10	10%
GRADE 2	00	0%
GRADE 3/TEAR	07	7%
Total	**100**	**100%**

Table 6: Distribution of patients according to MRI of LCL tear

	Frequency	Percent
NORMAL	94	94%
GRADE 1	06	6%
GRADE 2	00	0%
GRADE 3/TEAR	00	0%
Total	50	**100%**

DISCUSSION

In our study majority of the patients were from the age group of 21-30 years (45%) followed by 31-40 years (21%). Patients in the age group of 41-50 years were 16% and above 50 years were 11%. Patients below 20 years were 7%. Table 2 shows distribution of patients according to symptoms. In our study, majority of the patients had symptoms of painful knee since 1-6 months (41%) followed by more than 6 months (18%). 15% patients had symptoms since one week and 5% patients had symptoms since 1-2 weeks. In our study, 70% of the patients had complete ACL tear and 15% patients had partial ACL tear. 15% of the patients had no ACL tear. We found 96% of patients had PCL tear. In a study by Singh JP *et al.*, in their series of 173 patients, 78 patients (45.08%) showed ACL tears, among these 52 (66.67%) are partial, 16 (20.51%) are complete and 10 (12.82%) cases showed non visualization of ACL. The authors concluded that ACL tears are more common than other ligamentous injuries with partial tears being commoner.[7] Sonnin *et al.*, found the incidence of PCL tear to be 3%, in a series of study analyzing 350 case of knee injury only 10 patients had PCL tear.[8] Out of total 100 patients, 77 patients had medial meniscal tear. Out of these patients 53 patients had grade 3 tear and 15% patients had grade 2 tear. Grade 1 tear was found in 9% patients. In our study, 50% of patients had lateral meniscal tear. In patients with lateral meniscal tear 40% patients had grade 3 tear. Medial meniscal tear were more common than lateral meniscal tear. In a study by Mink JH *et al.* [9]They observed on MRI and arthroscopy of 11 patients who had tear of LCL, 7 patients had tear of MCL, 4 patients had tear of lateral meniscus and 1 patient had tear of medial meniscus In our study, MRI of MCL tear. Out of 100 patients 83 % patients had no MCL tear and 17% patients had MCL tear. Grade 1 MCL tear was found in 10% patients and grade 3 tear was seen in 7% patients. In our study, 6 % patients had LCL tear and 94% patients had no tear. In patients with LCL tear all were grade 1 LCL tear. (table 7) There is preponderance of MM tears over LM tears in our study which is well correlated with the study done by Singh *et al.*, in a series of 173 cases of which they found 57 (38.23%) patients showed MM tear and 28(29.41%) patients showed LM tear. Out of 173 patients, grade 3 tear of MM was seen in 57(32.95%) patients, grade 2 in 16(9.25%) patients and grade 1 in 20(11.56%). In LM, grade 3 tears were seen in 28(16.18%) patients, grade 2 in 12 (6.94%) patients and grade I in 14(8.1%) patients.[7] In our study, the predominant pattern of combined injury is ACL tear and MM tears (24); followed by ACL tear and LM tear (17), which is well correlated with a study by Ali Akbar EsmailiJah *et al.*, in a series of 17 cases of concomitant injuries at MRI and arthroscopy. The predominant pattern was anterior cruciate ligament rupture and medial meniscus tear (5 patients), followed by anterior cruciate ligament and lateral meniscus (4patients), or anterior cruciate ligament + medial meniscus + lateral ligament (4 patients). [10]

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