

STUDY OF LIGAMENT AND MENISCAL INJURIES FOLLOWING KNEE TRAUMA AND THEIR RADIOLOGICAL DIAGNOSIS

Charushila Vaibhav Bhingardeve¹, Vaibhav S. Bhingardeve², Sanjay Desai³,
Abhijeet Patil⁴

¹Assistant Professor, Department of Anatomy, GMC, Miraj, India.

²Assistant Professor, Department of Radiodiagnosis, GMC Miraj, India.

³Associate Professor, Department of Radiodiagnosis, RCSM Government Medical College,
Kolhapur, India.

⁴Assistant Professor, Department of Radiodiagnosis, GMC, Miraj, India.

Received Date: 05/01/2024

Acceptance Date: 13/02/2024

Corresponding Author:

Dr Charushila Vaibhav Bhingardeve, Shahunagar, North of Railway Bridge, Vijaynagar-
Kupwad Road, PO Wanlesswadi, Tal Miraj, Dist Sangli Maharashtra, 416414, India.

Email: drsharucharu@gmail.com

Abstract

Background: 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. It is also being used for pre and post operative evaluation. Present study was aimed to study ligament and meniscal injuries following knee trauma and their radiological diagnosis. **Material and Methods:** Present study was single-center, prospective, observational study, conducted in patients with clinically suspected internal derangement of knee following trauma to knee, underwent MRI study at our hospital. **Results:** In present, among 97 patients, majority were from 21-30 years age group (31.96 %) followed by 31-40 years age group (23.71 %). Mean age was 32.31 ± 10.15 years.. Male (61.85 %) outnumbered female (38.15 %). In present study ACL tear was noted in 36 patients (37.11 %), majority had complete ACL tear (72.22 %). PCL tear was noted in 3 patients (66.67 %), majority had partial PCL tear (66.67 %). In present study MCL tear was noted in 25 patients (25.77 %), majority had grade I tear (64 %). LCL tear was noted in 10 patients (10.3 %), majority had grade I tear (60 %). MM tear was noted in 58 patients (59.79 %), majority had grade III tear (51.73 %). LM tear was noted in 10 patients (10.3 %), majority had grade II/III tear (40 %). Joint effusion was present in 57 cases (58.76 %). In present study osseous or other injuries were noted in 48 patients (49.48 %). Arthroscopy was done in 23 patients (23.71 %). MRI Arthroscopy correlation was noted in 19 patients out of 23 patients (82.60 %). **Conclusion:** MRI is valuable diagnostic tool for evaluation of pathology of knee joint and is recommended investigation to make decision for further management of patient. Additional to ligamentous injuries, bony injuries can be evaluated simultaneously.

Keywords: MRI, knee joint, ligamentous injuries, knee trauma

Introduction

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. It is also being used for pre and post operative evaluation. Complete evaluation of all the internal structures of the knee was not possible with other modalities like conventional radiography, arthrography, ultrasonography and computed tomography.^{1,2}

Even with arthroscopy, lesions such as peripheral meniscal tears, inferior surface tears and osteochondritis desiccans without articular cartilage damage are most often not detected. Multiplanar MR images provide significance. Suspicion of ligament injuries is one of the chief indications of MRI of the knee. Several authors have reported the usefulness of MRI imaging in detecting ligament tears in patients with trauma.^{3,4}

MRI has emerged as an preferred modality in non-invasive evaluation of osseous and soft tissue structures around knee. Khanda *et al.*,⁵ evaluated MRI by comparing with arthroscopic findings. Anterior cruciate ligament resulted in 86.67% sensitivity and 91.43% specificity with 88% accuracy, posterior cruciate ligament resulted in 100% sensitivity and 95.83% specificity with 96% accuracy. Present study was aimed to study ligament and meniscal injuries following knee trauma and their radiological diagnosis.

Material And Methods

Present study was single-center, prospective, observational study, conducted in department of radiodiagnosis, at Saraswati Medical Foundation And Research Centre, Kolhapur, Maharashtra, India. Study duration was of 16 months (Sept 2014– Dec 2015). Study approval was obtained from institutional ethical committee.

Study was explained to patients in local language & written consent was taken for participation & study. Patients referred with clinically suspected internal derangement of knee following trauma to knee, underwent MRI study at our hospital, willing to participate in present study were included. While patients with ferromagnetic implants, pacemakers, and aneurysm clips, with major injuries like liver/ splenic rupture and flail chest and patients with unstable vital parameters especially in the setting of trauma were excluded.

Baseline data such as demographic details, clinical complaints, medical history, physical examination findings were collected & entered in case record proforma. All patients were subjected to MR imaging and followed by arthroscopy in selected cases. Patients underwent MRI under Siemens Magnetom Symphony Maestroclass 1.5 Tesla. Whole- body MR scanner machine.

MRI were evaluated for joint effusion, anterior cruciate ligament tear, posterior cruciate ligament tear, medial collateral ligament tear, lateral collateral ligament tear, medial meniscal tear, lateral meniscal tear & osseous/osteochondral lesions. Arthroscopy/ knee surgery was carried out by orthopedic surgeon in selected cases where indicated for diagnostic or therapeutic purposes.

Data was collected and compiled using Microsoft Excel, analysed using SPSS 23.0 version. Frequency, percentage, means and standard deviations (SD) was calculated for the continuous variables, while ratios and proportions were calculated for the categorical variables. Difference of proportions between qualitative variables were tested using chi-square test or Fisher exact test as applicable. P value less than 0.5 was considered as statistically significant.

Results

In present, among 97 patients, majority were from 21-30 years age group (31.96 %) followed by 31-40 years age group (23.71 %). Mean age was 32.31 ± 10.15 years. Male (61.85 %) outnumbered female (38.15 %).

Table 1: General characteristics

Characteristics	No. of patients (n=97)	Percentage
Age group (years)		
≤ 20 years	17	17.53
21 -30 years	31	31.96
31 -40 years	23	23.71
>40 years	26	26.80
Mean age (mean ± SD)	32.31 ± 10.15	
Gender		
Male	60	61.85
Female	37	38.15

In present study ACL tear was noted in 36 patients (37.11 %), majority had complete ACL tear (72.22 %). PCL tear was noted in 3 patients (66.67 %), majority had partial PCL tear (66.67 %).

Table 2: Distribution of cases according to ACL tear

	ACL tear (%)	PCL tear (%)
Yes	36 (37.11 %)	3 (3.10 %)
• Partial	10 (27.78 %)	2 (66.67 %)
• Complete	26 (72.22 %)	1 (33.33 %)
No	61 (62.89 %)	94 (96.90 %)

In present study MCL tear was noted in 25 patients (25.77 %), majority had grade I tear (64 %). LCL tear was noted in 10 patients (10.3 %), majority had grade I tear (60 %). MM tear was noted in 58 patients (59.79 %), majority had grade III tear (51.73 %). LM tear was noted in 10 patients (10.3 %), majority had grade II/III tear (40 %).

Table 3: Distribution of cases according to MCL,LCL, MM & LM tear

	MCL tear (%)	LCL tear (%)	MM tear (%)	LM tear (%)
Yes	25 (25.77 %)	10 (10.3 %)	58 (59.79 %)	10 (10 %)
Grade I	16 (64 %)	6 (60 %)	10 (17.24 %)	2 (20 %)
Grade II	4 (16 %)	2 (20 %)	18 (31.03 %)	4 (40 %)
Grade III	5 (20 %)	2 (20 %)	30 (51.73 %)	4 (40 %)
No	72 (74.23 %)	87 (89 %)	39 (40.21 %)	87 (89.7 %)

Joint effusion was present in 57 cases (58.76 %). In present study osseous or other injuries were noted in 48 patients (49.48 %). Arthroscopy was done in 23 patients (23.71 %). MRI Arthroscopy correlation was noted in 19 patients out of 23 patients (82.60 %).

Table 4: Other characteristics

Characteristics	No. of patients	Percentage
Joint effusion	57	58.76
Osseous or other injuries	48	49.48
Arthroscopy done	23	23.71
MRI Arthroscopy correlation		
Yes	19	82.60
No	4	17.40

Discussion

Knee joint being the largest and most complex weight bearing joint of the body is subject to damage because of its inherent structural complexity and the various type's forces it is subjected to. Magnetic resonance imaging has emerged as the frontline investigation for evaluation of internal derangements of the knee joint. It is noninvasive, does not involve ionizing radiation and has multiplanar capability with excellent soft tissue demonstration. Arthroscopy gives excellent visualization of the interior of the joint, but is invasive and can evaluate only the surface abnormalities.^{6,7}

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. It is also being used for pre and post operative evaluation. Complete evaluation of all the internal structures of the knee was not possible with other modalities like conventional radiography, arthrography, ultrasonography and computed tomography.

Even with arthroscopy, lesions such as peripheral meniscal tears, inferior surface tears and osteochondritis desiccans without articular cartilage damage are most often not detected. Multiplanar MR images provide significant improvement in assessing these structures.

In our study joint effusions were the most common finding affecting 57 patients (58.76%). Among the ligamentous and meniscal injuries, Medial Meniscal injuries seen in 58 patients (59.79%) with grade 3 type injuries being commonest in Medial Meniscal injuries seen in 30 patients (51.73%) to be followed by the ACL injuries seen in 36 patients (37.11%)

In our study, MCL tears were found in 25 patients (25.77%) to be more common than the LCL tear were found in 10 patients (10.30%). All these cases had history of trauma and were associated with multiple injuries. This suggests presence of a single injury should prompt the examiner to look for other subtle associated injuries, which was further confirmed by Mink JH *et al.*,⁸ They observed on MRI and arthroscopy of 11 patients who had tear of ACL, 7 patients had tear of MCL, 4 patients had tear of lateral meniscus and 1 patient had tear of medial meniscus.

In our study grade I tear (64 %) of MCL were more common and followed by grade III tear (20 %).

There is preponderance of MM tears over LM tears in our study which is well correlated with the study done by Singh JP *et al.*,⁹ in a series of 173 cases of MM was seen in 57 (32.95%) patients, Grade 2 in 16 (9.25%) patients & 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 & Grade I in 14(8.1%) patients. which they found 57 (38.23%) patients showed MM tear and 28 (29.41%) patients showed LM tear.¹⁰

In our study, MM tears were found in 58 (59.79%) with Grade I tear in 10 patients (17.24 %), Grade II tear in 18 patients (31.03%) and Grade 3 in 30 patients (51.73%) and LM tear in 10 (10.30%) with Grade I tear in 2 patients (20 %) Grade 2 and 3 tears in 4 patients each (40 %). Grade III tears were the more common in Medial meniscus. Grade II and III both are common in LM. One case of coronary ligament tear was noted.

The cystic lesions encountered were meniscal cyst, parameniscal cyst and popliteal cyst (Baker's cyst). Baker's cyst was found in 6 patients, parameniscal cysts were found in 5 patients and synovial cyst was present in 1 patient. These findings were correlated with findings described by Thomas H. Berquist.¹¹

In our study Osseous/Osteochondral and other lesions were seen in 48 patients (49.48%). Most of these were bony contusions involving the femoral and tibial condyles. Osteochondral lesions are seen in six patients. In our study, we found one case of fracture of tibia, fibula and femur. These findings were correlated with findings described by Thomas H. Berquist¹¹.

In our study we also saw a case of osteochondroma of lower end of femur, which is

well depicted on magnetic resonance imaging earlier than radiographic appearance. The finding of lipohaemarthrosis was associated in a case with fracture of tibia, fibula and femur. These findings were correlated with findings described by Thomas H. Berquist¹¹. In our study, a correlation of MRI findings with arthroscopic / surgical findings was performed in 23 patients (23.71 %). Among which in 19 patients (80.41%) MRI findings are well correlated with arthroscopic findings.

The present study revealed the ability of magnetic resonance imaging in evaluation of the various internal derangements, including their detection, localization, characterization and assessment of extent of damage and the strength of correlation between MRI and arthroscopic findings confirms the value of MRI in assessing internal knee structures.

Limitations of present study were limited sample size of patients & arthroscopy was not done in all cases. As sample size is 97 patients the results of our study cannot be applied to general population.

MRI is noninvasive technique for evaluation of ligament tears. MRI of knee joint is objectively and precisely recommended to study the severity of trauma to knee ligaments and whenever needed. In suspected cases of ligament tears arthroscopic evaluation is gold standard for diagnostic as well as therapeutic purpose.

Conclusion

MRI is valuable diagnostic tool for evaluation of pathology of knee joint and is recommended investigation to make decision for further management of patient. Additional to ligamentous injuries, bony injuries can be evaluated simultaneously. For all patients having significant knee trauma with clinical suspicion of ligament injury MRI should be preferably done unless contraindicated.

Conflict of Interest: None to declare

Source of funding: Nil

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