

A Cross Sectional Study to Evaluate Role of Magnetic Resonance Imaging in Ligament Injuries of Knee Joint in a Tertiary Healthcare Institute

Patil Prakash¹, Adke Shrishail², Shaha Pramod³, Bhoite Amol⁴, Kumar Snehil⁵

ABSTRACT

Introduction: Ligaments being the most important supporting structures injuries of ligaments and menisci are extremely common especially in active individuals like athletes. However ligament injury of knee in young due to trauma could lead to morbidity. It is an important reason for undergoing MR evaluation and assist in further arthroscopy and management. The present study was conducted among referred cases of acute painful knee for radiological evaluation, in order to study their MRI findings and its correlation with clinical presentations.

Material and methods: The present study was conducted among 135 cases of acute knee injury, referred for radiological evaluation in the Department of Radiology at Krishna Medical College, KIMS, Karad. All the cases of acute knee injury consenting to participate in the study were included in the present study. These cases of acute knee injuries referred for radiological evaluation were assessed, examined and posted for MRI examination for diagnostic workup of the case. The data was collected using case record proforma.

Results: In the present study we evaluated the referred cases of acute knee injury using magnetic resonance imaging technique to find out the exact pathology. We found 41.18% cases presented with anterior cruciate ligament tears followed by medial meniscus injury among 37.77% cases.

Conclusion: MRI has been evolved as a diagnostic modality of choice in diagnosing various conditions causing acute painful knee such as ligament tears and meniscal tears etc.

Keywords: Acute Knee Injury, Sports Injury, ACL, PCL, Meniscus Injury

INTRODUCTION

The knee joint is a large compound type of synovial joint and weight bearing joint in which bones does not interlock. Due to lack of bony support, stability of the joint is highly dependent on ligaments, tendons, capsule and menisci. Ligaments being the most important supporting structures injuries of ligaments and menisci are extremely common especially in active individuals like athletes, military recruits and soldiers followed by older age population due to degenerative changes¹. However ligament injury of knee in young due to trauma could lead to morbidity. It is an important reason for undergoing MR evaluation and assist in further arthroscopy and management.

The anterior cruciate ligament (ACL) and posterior cruciate ligament (PCL) are intracapsular, extrasynovial ligaments of the knee. They are important stabilizers of the knee. They are named by the location of their tibial attachments. The ACL

is straight and runs parallel to the roof of the intercondylar notch (Blumensaat's line). It is attached proximally at the posteromedial aspect of the lateral femoral condyle and inserts distally to the anterior intercondylar region of tibia. It is composed of the anteromedial and the posterolateral bundles, named according to their relative sites of tibial insertion. The ACL provides primary restraint to anterior translation of the tibia and offers secondary stabilization in response to internal tibial rotation and to varus and valgus angulation.

The PCL has a curved configuration, originates from the medial side of the intercondylar notch of the femur and inserts onto the mid posterior tibial plateau. The PCL provides the primary restraint to posterior translation of the tibia on the femur, with a secondary role in limiting rotatory motion⁽²⁾. Medial and lateral collateral ligaments, popliteal ligaments and menisci are the other supportive structures for the knee joint^{3,2}. The Anterior Cruciate Ligament (ACL) is one of four major ligaments of the knee joint that coordinate function and promote stability of the knee joint. In an adult knee, the ACL prevents forward movement of the tibia. It also provides roughly 90% of stability in the knee joint. The majority of ACL injuries (70%) occur while playing agility sports and trauma. Approximately 50% of ACL injuries occur with injuries to other structures in the knee¹.

Following trauma next category of cases are of knee degenerative changes associated with ligament injury. Sports-related knee injuries are common, with contact sports and sports involving twisting movements being the most frequent causes. Sports injuries may affect any of the knee structures including ligaments, menisci, bones, cartilages and periarticular soft tissues².

Medial collateral ligament (MCL) injury, is one of the most common ligament injuries of the knee. This injury mostly

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results from a valgus force in sport events, motor vehicle accidents or fall from height⁴. A diagnosis of posterolateral instability can usually be attained by a careful interpretation of specific clinical examination techniques and can be supplemented by direct visualization with arthroscopy in those patients in whom a diagnosis is still in doubt⁵. Pain and guarding are often associated with an acute injury and can mask clinical examination findings. Interpretation of examination findings can also be difficult when posterolateral knee injuries occur in the setting of a multiple ligament injuries. Because of the difficulty of obtaining an accurate clinical examination in the acute setting, the incidence of such injuries is not well understood, and these injuries may go unrecognized until they present as a chronic problem. Chronic grade III posterolateral knee injuries in the context of multiple ligament injuries can cause a significant loss of function and contribute to cruciate ligament reconstruction graft failure. The information obtained from conventional skiagrams, ultrasound or computed tomography of the knee is limited. Since its introduction to musculoskeletal imaging in the early 1980s, magnetic resonance imaging (MRI) has revolutionized diagnostic imaging of the knee⁵.

The Lateral collateral ligament acts as a primary restraints to varus stress and internal rotation of the tibia, and secondary restraint to external rotation, anterior and posterior tibial translations. The posterolateral structures are complex with considerable anatomical variation. The major constituents are the iliotibial band, biceps femoris tendon, fibular collateral ligament or lateral collateral ligament proper arcuate ligament, popliteal tendon, popliteofibular ligament, lateral gastrocnemius tendon and lateral joint capsule. Posterolateral corner injuries are often associated with injury to the cruciate ligaments. Hyperextensionvarus injury is the commonest mechanism for posterolateral corner injuries⁶.

Early treatment of these injuries is associated with improved objective, subjective and functional outcomes. Recently, new diagnostic protocols have been developed to improve the diagnosis of posterolateral knee injuries with high-resolution magnetic resonance imaging (MRI) scans⁷. The accuracy of MRI is very high in diagnosing knee lesions and has a sensitivity of 80-100%. MRI of the knee is currently the diagnostic procedure of choice for the diagnosis of injuries to the menisci, ligaments, and tendons as well as bone bruises and occult fractures in the knee, and in most centers, it has replaced arthrography and diagnostic arthroscopy⁸.

The present study was conducted among referred cases of acute painful knee for radiological evaluation, in order to study their MRI findings and its correlation with clinical presentations.

MATERIAL AND METHODS

The present study was conducted among 135 cases of acute knee injury, referred for radiological evaluation in the Department of Radiology at Krishna Medical College, KIMS, Karad. All the cases of acute knee injury consenting to participate in the study were included in the present study. These cases of acute knee injuries referred for radiological

evaluation were assessed, examined and posted for MRI examination for diagnostic workup of the case. The data was collected using case record proforma.

All the MRI of the knee in this study was performed using 1.5 Tesla Siemens Magnetom Avanto, A Tim+Dot System MR machine with knee coil. MR contrast agent was not given to any of the patients. The following sequences were employed in all patients with standard protocol-PDFS axial, sagittal and coronal, T2 sagittal and axial, T1 sagittal, coronal short tau inversion recovery with a slice thickness of 3.5 mm and interslice gap of 1 mm. The collected data was entered using MS-Excel software and analyzed using SPSS statistical package version.

STATISTICAL ANALYSIS

Data was represented in the forms of tabular and graphical formats which demonstrated descriptive statistics.

RESULTS

The present study was conducted in Department of Radiology among the referred cases of acute knee injury in Krishna Medical College, KIMS, Karad during the period of six months from November 2017 to April 2018.

The present study observes that majority of cases presenting with knee injury were males (72.59%) whereas 27.4% were females (Table 1) (Figure 1). We assessed age distribution of our study participants and found that majority of the cases of acute knee injury belonged to age group of 21-40 years followed by 41-50 years (Table 1).

We assessed clinical presentations of acute knee injury

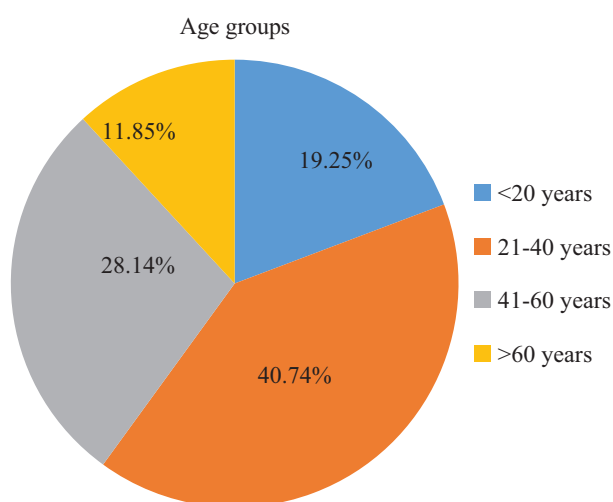


Figure-1: Distribution of cases according to their age groups

Demographic characteristics		Number of cases	Percentages
Gender	Males	98	72.59%
	Females	37	27.4%
Age groups	<20 years	26	19.25%
	21-40 years	55	40.74%
	41-60 years	38	28.14%
	>60 years	16	11.85%

Table-1: Distribution of study subjects according to their demographic characteristics

Variables		Number of cases	Percentages
Clinical presentation	Joint pain	131	97.03%
	Inability to move	126	93.33%
	Swelling	94	69.62%
Side affected	Right	98	72.58
	Left	37	27.4%
MRI Findings	ACL tear	56	41.48%
	Medial meniscus injuries	51	37.77%
	PCL tears	15	11.11%
	Lateral meniscus tears	3	2.22%
	Composite injuries	10	7.4%
	Joint effusion	95	70.37%
	Fractures	4	2.9%
	Medial Collateral ligament	37	27.4%
Lateral collateral ligament	2	1.48%	

Table-2: Distribution of study subjects according to their clinical presentations

	Grading	No of patients	%
ACL injuries	Grade I	12	21.42%
	Grade II	29	59.78%
	Grade III	15	26.78%
PCL injuries	Grade I	12	80%
	Grade II	2	13.33%
	Grade III	1	6.66%

Table-3: Distribution of study subjects according to grading of ACL and PCL injuries

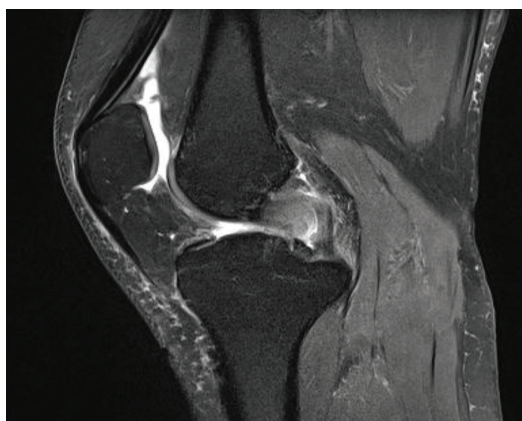


Image-1: PDFS Sagittal image showing Grade-II PCL injury.



Image-2: PDFS coronal image showing Grade-II PCL injury



Image-3: PDFS Sagittal image showing Grade-II ACL Injury.

cases, almost all the cases presented with joint pain, whereas majority of the cases presented with inability to move the knee joint followed by swelling of the knee joint (Table 2). In the present study we evaluated the referred cases of acute knee injury using magnetic resonance imaging technique to find out the exact pathology. We found 41.18% cases presented with anterior cruciate ligament tears followed by medial meniscus injury among 37.77% cases. Other findings were PCL tears, Lateral meniscus injuries, joint effusions and fractures (Table 2).

We also evaluated the study cases for grading of various injuries. Majority of the cases presented with grade-II ACL injury (60%) and among PCL injuries, majority of the cases presented with grade-I injuries (80%) (Table 3).

Images 1 and 2 shows MR images of PCL injury, whereas

images 3 & 4 shows MR images of ACL of varying grades.

DISCUSSION

This study was conducted among referred cases of acute knee injury to evaluate and correlate clinical features of acute knee injury and MRI findings of knee joints.

Knee injury cases are mostly associated with outdoor sports or occupational injuries. Hence prevalence of knee injury cases occurs more among youths and adults. Similar finding was observed in the current study. We observed that majority of cases were males and belonged to 21-40 years of age

group. Similar findings were noted by Yadav R et al in their study⁹. They found that majority of cases of acute painful knee belonged to 20-40 years of age group. Ganesan P et al also reported that 80% cases of acute knee injury were males⁵. Halawar R S et al in their study observed similar trend of age distribution¹. They found that majority of cases of acute knee belonged to 21 to 30 years of age group.

Majority of the cases of acute knee injury presented with pain and inability to move the joint followed by knee joint swelling. We subjected all the cases for magnetic resonance imaging in order to find and locate exact pathology involved. Among 41% cases discontinuation and abnormal contour of anterior cruciate ligaments were observed suggesting ACL tears, followed by 38% cases with evidence of blunted tip of the inner free meniscal edges of the meniscus, displaced portion of the meniscus and interrupted appearance of the meniscus suggestive of meniscal tears.

Chaudhari S et al in their study observed similar findings like our study, they observed 51% ACL tears followed by 48% medial meniscus injuries and joint effusions among 75% cases¹⁰. Whereas Ganesan P et al in their research reported 64% cases with ACL tears followed by medial meniscus tears in 56% cases and composite injuries among 56% cases⁵. Vincken PW et al in their study concluded that MRI, when used in patients with high clinical suspicion of intra-articular knee pathology, instead of direct arthroscopy can reduce the need for arthroscopy in up to 42% of patients¹¹. They also added that MRI is the most appropriate screening tool before arthroscopy. MRI has also helped in pre-operative planning providing a road map for the surgeons.

Our study also observed similar findings. Due to improved superior soft tissue details with multiplanar imaging capability that provide accurate evaluation of the intra and extra articular structure of the knee diagnostic accuracy of MRI is improved. It is an accurate, non-invasive technique for evaluating all the structures of the knee joint, bone marrow space, synovium and periarticular soft tissue. It is a good non-invasive diagnostic modality in diagnosing meniscal tear and ligament (ACL) tears followed by invasive arthroscopy.

CONCLUSION

Knee joint is one of the most important joint in the body, which allows locomotion. There are numerous causes of painful knee joint in any age group. Accurate non-invasive diagnosis of various pathological conditions is of paramount importance in order to reduce unnecessary orthopedic procedures and hence to reduce DALYs (Disability associated life years).

MRI has been evolved as a diagnostic modality of choice in diagnosing various conditions causing acute painful knee such as ligament tears and meniscal tears etc.

And hence it will guide planning of line of management of the painful knee cases.

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