

**Role of Magnetic Resonance Imaging in evaluation of meniscal and ligamentous injuries of traumatic knee joint**

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**Conflicts of Interest:** Nil

**Abstract:**

**Background:** The knee is the largest joint in the body and comprises three compartments-the medial and lateral tibiofemoral compartments and the patellofemoral compartment. The joint capsule encloses the articular surfaces, menisci and cruciate ligaments. The collateral ligaments and tendons are extra-articular, apart from the popliteus tendon, which has an intra-articular portion. The bony articular surfaces alone are inherently unstable, so these soft-tissue supporting structures are vital to the joint stability and are prone to injury.

**Aims and objectives:** To assess the role of magnetic resonance imaging in evaluation of meniscal and ligamentous injuries of traumatic knee joint

**Materials and methods:** This study is an observational study conducted on 71 patients using 1.5 Tesla SIEMENS MRI machine in department of radio-diagnosis in Alluri Sitarama Raju Academy of Medical Sciences referred with history of knee trauma over a period of 12 months (1<sup>st</sup> October 2020 to 30<sup>th</sup> September 2021).

**Results:** Out of 71 cases studied, male: female ratio is 5.4:1. Anterior cruciate ligament tears (61.9%), tears in posterior horn of medial meniscus (36.6%), tears in posterior horn of lateral meniscus (29.5%) are the commonest injuries detected in this study.

**Conclusion:** Magnetic Resonance Imaging is the excellent non-invasive investigation tool for knee injury due to excellent soft tissue contrast resolution and multiplanar imaging capabilities which provides the most detailed evaluation in cases of various soft tissue injuries of knee joint.

**Keywords:**Anterior cruciate ligament, knee injury, lateral collateral ligament, lateral meniscus, medial collateral ligament, medial meniscus, posterior cruciate ligament.

### Introduction

The knee is the largest joint in the body and comprises three compartments-the medial and lateral tibiofemoral compartments and the patellofemoral compartment. The joint capsule encloses the articular surfaces, menisci and cruciate ligaments. The collateral ligaments and tendons are extra-articular, apart from the popliteus tendon, which has an intra-articular portion. The bony articular surfaces alone are inherently unstable, so these soft-tissue supporting structures are vital to the joint stability and are prone to injury<sup>1</sup>.The frequency, diversity and severity of ligament and meniscus injuries occur especially in the young and sportsmen, associated with significant morbidity, frequently need surgical treatment and extensive rest. In cases of knee joint trauma, clinical examination along with radiographs and even CT scan is not enough to diagnose many internal derangements of this joint. MRI of the knee has been shown to be accurate in the assessment of menisci, ligaments and

articular cartilage, i.e. excellent modality for assessment of soft tissue and knee joint derangements<sup>2</sup>

### Aims and objectives

To assess the role of magnetic resonance imaging in evaluation of meniscal and ligamentous injuries of traumatic knee joint.

### Materials & Methods

A total number of 71 patients referred with history of knee injury were imaged with 1.5 Tesla MRI scanner, Siemens Magnetom avento Syngo (MR D-13) 16 channel machine in the department of radio-diagnosis over a period of 12 months (1<sup>st</sup> October 2020 to 30<sup>th</sup> September 2021). It was an observational study and a total of 71 patients fulfilling the selection criteria were studied.

### Source of data

Patients referred from outpatient department of tertiary care centres with history of knee injury.

### Selection criteria

#### Inclusion criteria

Patients referred with history of knee injury.

#### Exclusion criteria

- All patients who did not give consent to be a part of the study.
- Patients with ferromagnetic implants, pacemakers, cochlear implants and aneurysmal clips.
- Degenerative arthritis, infection, neoplasm and any previous surgery to the knee

### Results

A total of 71 patients with history of injury to knee joint referred for MRI scan of knee joint were studied. Majority of the patients were male i.e., 84.5% and 15.49% patients were female, with the male to female ratio is 5.4:1. The commonest age group was 21 to 40 years for both males and females.

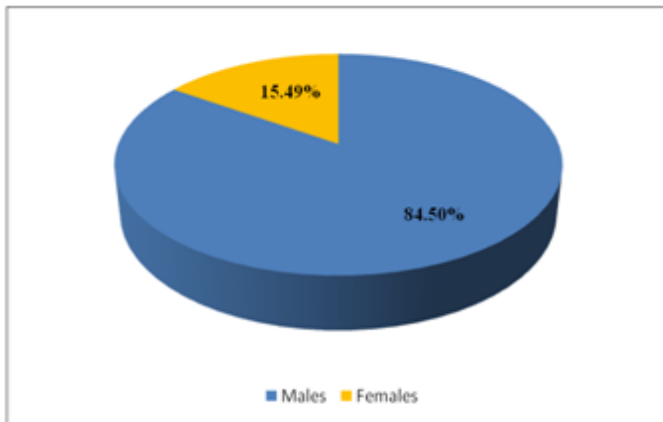


Figure 1: Gender distribution.

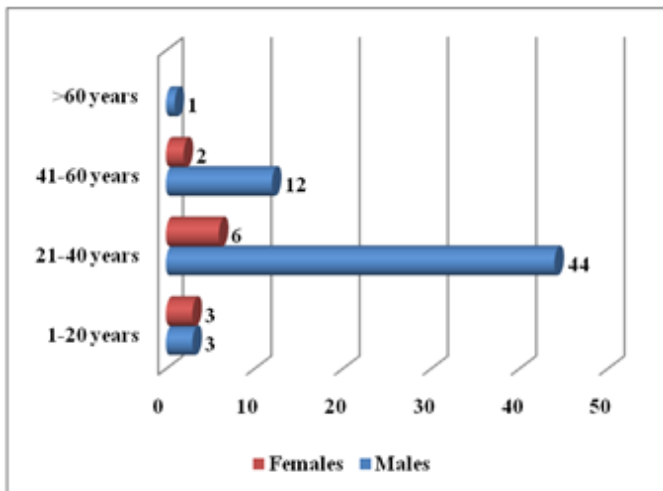


Figure 2: Distribution of patients according to the ages and sexes.

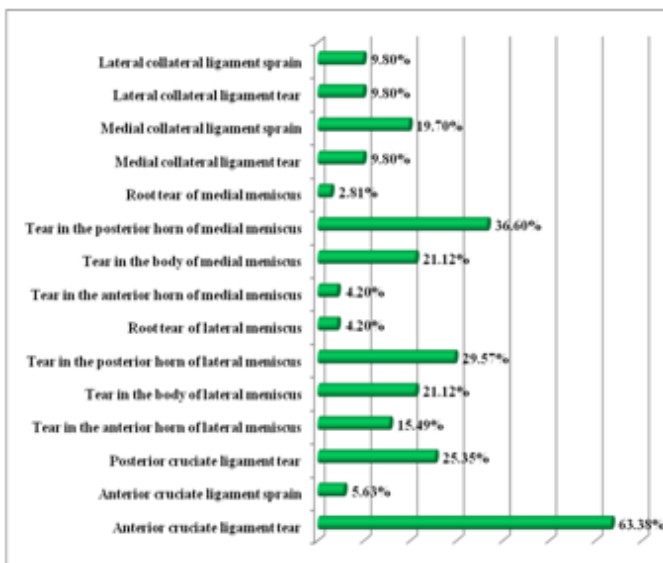


Figure 3: Distribution of meniscal and ligamentous injuries.

Among the meniscal and ligamentous injuries, the most commonly injured structure was lateral meniscus(70.4%) followed by anterior cruciate ligament(69.01%), medial meniscus(64.7%),medial collateral ligament(29.5%),posterior cruciate ligament(25.3%) and lateral collateral ligament(19.7%).

Among the meniscal and ligamentous injuries, the most common injury was anterior cruciate ligament tears (63.38%) followed by tears in posterior horn of medial meniscus(36.6%),tears in posterior horn of lateral meniscus(29.5%),posterior cruciate ligament tears (25.35%),tears in body of lateral meniscus(21.12%),tears in body of medial meniscus(21.12%),sprain involving medial collateral ligament(19.7%),tears in anterior horn of lateral meniscus(15.49%),medial collateral ligament tears(9.8%),lateral collateral ligament tears(9.8%),sprain involving lateral collateral ligament (9.8%), sprain involving anterior cruciate ligament(5.63%), tears in the anterior horn of medial meniscus(4.2%), root tears of lateral meniscus(4.2%), and root tears of medial meniscus(2.8%).

Out of total 49 ACL injuries, partial ACL tear was commonest (57.14%) followed by complete tear (34.69%) and sprain (8.16%). The most common location of complete tear was mid substance (55.5%), followed by femoral attachment (37.7%) and tibial attachment (6.6%).

Out of 96 meniscal injuries, commonest location of tear in menisci was posterior horn of medial meniscus (27.08%) followed by posterior horn of lateral meniscus (21.87%), body of lateral meniscus (15.62%), body of medial meniscus (15.62%), anterior horn of lateral meniscus (11.45%), anterior horn of medial meniscus (3.12%), root tears of lateral meniscus (3.12%) and root tears of medial meniscus (2.08%).

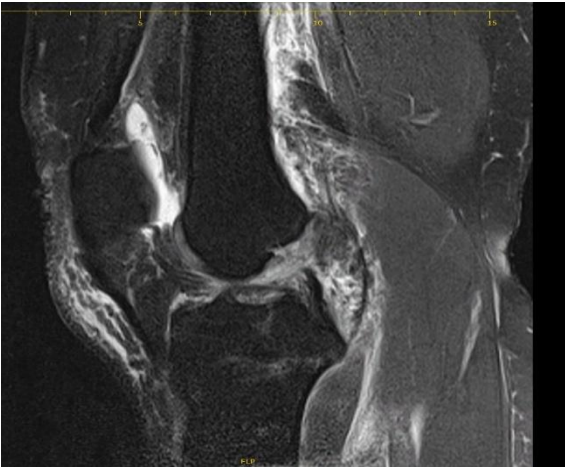


Figure 4: Partial tear of ACL at midsubstance

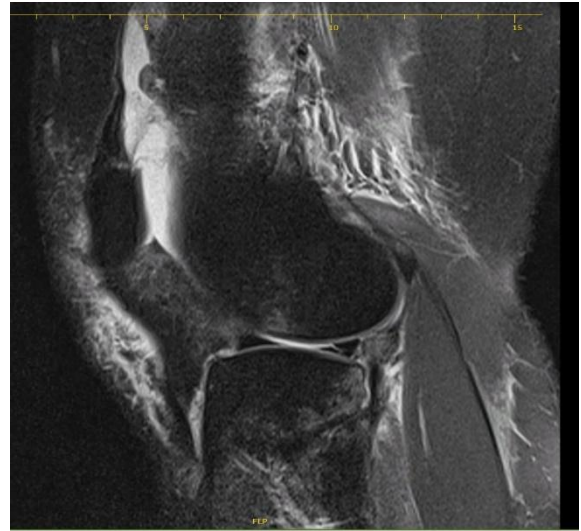


Figure 7: Tear in posterior horn of lateral meniscus



Figure 5: Full thickness tear of PCL at midsubstance

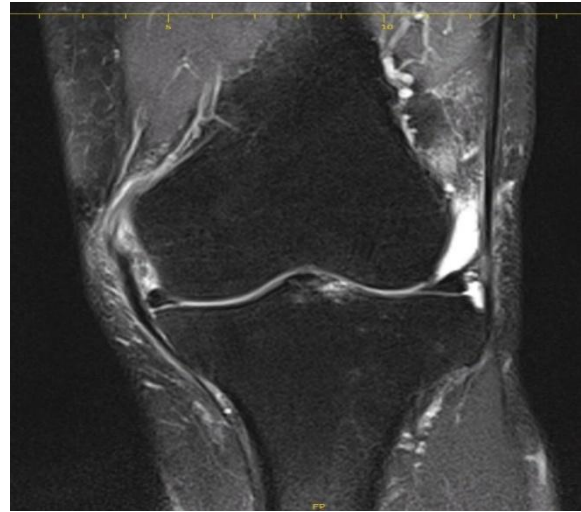


Figure 8: Near total tear of MCL at femoral attachment.

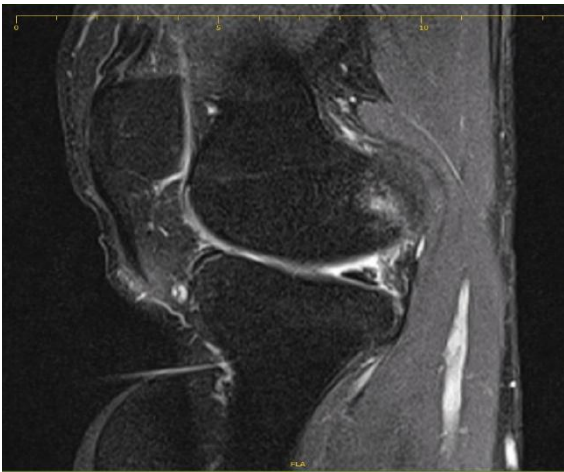


Figure 6: Grade III tear of posterior horn of medial meniscus



Figure 9: Near total thickness tear of LCL at fibular attachment.

## Discussion

- According to V Arumugam et al<sup>3</sup>, patients in the age group 20-30years accounted for 55% of cases followed by 31-40 years (33%) and 41-50 years (12%)
- According to Stevens et al<sup>4</sup>, anterior cruciate ligament (ACL) tears are a commonly sustained injury, often occurring in association with meniscal tears and trauma to other ligamentous structures around the knee
- According to Umap et al<sup>5</sup>, out of total 76 ACL injuries, partial ACL tear was commonest which accounts for 68.4%, followed by complete tear which accounts for 25%. The most common location of complete tear was mid substance (47.4%), followed by femoral attachment (42.1%) and tibial attachment (10.5%)
- According to M Majewski et al<sup>6</sup>, MCL injury (7.9%) is more common than LCL injury (1.1%)

## Conclusion

Magnetic Resonance Imaging is the excellent non-invasive investigation tool for knee injury due to excellent soft tissue contrast resolution and multiplanar imaging capabilities. MRI can accurately diagnose the ligament injuries of knee joint, which is an ideal technique in the diagnosis of ligament injuries of knee joint, and should be used as a routine examining method. Commonest injuries detected in our study are anterior cruciate ligament tears followed by tears in posterior horn of medial meniscus and tears in posterior horn of lateral meniscus.

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