



MRI EVALUATION OF KNEE JOINT INJURIES AND ASSOCIATION OF MENISCAL TEARS AND ITS PATTERNS WITH ANTERIOR CRUCIATE LIGAMENT TEARS

Radio-Diagnosis

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ABSTRACT

Background: Knee joint injuries are common, particularly following trauma, and often involve ligamentous and meniscal damage. MRI is the preferred imaging modality for evaluating soft tissue structures of the knee due to its excellent contrast resolution and multiplanar imaging capability. **Aim:** To determine the spectrum of internal derangements of the knee joint on MRI and to evaluate the association and patterns of meniscal injuries with anterior cruciate ligament (ACL) tears. **Methods:** This cross-sectional study was conducted between November 2022 and November 2023 on 40 patients (age 15–35 years) with a history of knee injury. MRI was performed using a 1.5 Tesla Siemens scanner with multiple pulse sequences (PDW, STIR, T2, T1 in sagittal, coronal, and axial planes). Data were analyzed descriptively. **Results:** ACL tears were the most common injury (90%), with 30% partial and 60% complete tears. Medial meniscus (MM) tears occurred in 55% and lateral meniscus (LM) tears in 30% of patients, with grade II tears most common. Bucket handle tears predominated in MM (32.1%), while radial tears were most frequent in LM (41.6%). Posterior cruciate ligament injuries occurred in 12.5%. Combined injuries were present in 85% of cases, most often ACL + MM tear. **Conclusion:** MRI is an excellent non-invasive tool for evaluating ligamentous and meniscal injuries of the knee. ACL tears are the most frequent finding and are commonly associated with medial meniscus tears. Recognition of specific injury patterns can aid in surgical planning and improve prognosis.

KEYWORDS

INTRODUCTION

The knee joint is highly susceptible to injury, particularly among active young adults engaged in sports and physical activities. Ligamentous injuries, especially of the anterior cruciate ligament (ACL), are frequently associated with meniscal tears. Accurate diagnosis is essential for effective treatment planning and prognosis.

MRI has revolutionized musculoskeletal imaging by offering superior soft tissue contrast, multiplanar capabilities, and absence of radiation exposure. It not only detects and characterizes ligamentous and meniscal injuries but also helps determine patterns that influence management strategies.

This study aims to evaluate the internal derangements of the knee joint using MRI and to analyze the association and tear patterns of the menisci in patients with ACL injuries.

Objective

To assess the spectrum of ligamentous and meniscal injuries in the knee joint on MRI and evaluate the association between meniscal tear patterns and ACL injuries.

MATERIALS AND METHODS

Study Design: Cross-sectional observational study.

Study Period: November 2022 – November 2023

Sample Size: 40 patients

Inclusion Criteria

- Age between 15–35 year.
- History of knee injury.
- Referred for MRI evaluation.

Exclusion Criteria:

- Previous Knee Surgery.
- Contraindications to MRI.

MRI Protocol:

All examinations were performed on a 1.5 Tesla Siemens Magnetom Avento scanner using:

- PDW sagittal, axial, coronal
- STIR sagittal, coronal
- T2 coronal, sagittal
- T1 coronal, axial

Data Analysis

Data were entered into Microsoft Excel 2007 and analyzed using Epi Info 3.4.1. Descriptive statistics (mean, proportions, percentages) were used.

RESULTS

Demographics:

- 75% male (n=30)
- 25% female (n=10)

MRI Findings:

- ACL tear: 36 patients (90%) — 12 partial (30%), 24 complete (60%)
- Posterior cruciate ligament tear: 5 patients (12.5%)
- Medial collateral ligament tear: 2 patients (5%)
- Lateral collateral ligament tear: 1 patient (2.5%)

Meniscal Injuries:

- **Medial Meniscus:** 22 patients (55%) — Grade II: 18 (45%), Grade III: 4 (10%)
- **Bucket Handle Tears:** 32.1%
- **Lateral Meniscus:** 12 patients (30%) — Grade II: 9 (22.5%), Grade III: 3 (7.5%)
- **Radial Tears:** 41.6%

Associated Injuries:

- Combined injuries: 34 patients (85%)
- Most common: ACL + MM tear (22 patients), ACL + LM tear (12 patients)

MRI findings	Positive findings (n=40)	%
ACL tear	36	90
PCL tear	5	12.5
MM tear	22	55
LM tear	12	30
MCL tear	2	5
LCL tear	1	2.5
Joint effusion	23	57.5
Femur lesion	15	37.5
Tibia lesion	10	25



PDFS sag-Complete ACL tear



PDFS sag-Avulsion Tear of PCL



PDFS sag-Grade II Tear of Posterior Horn of Medial Meniscus

DISCUSSION

Our study shows that ACL tears are the most common ligamentous injury in knee trauma, with a higher proportion of complete tears compared to earlier reports. The medial meniscus was more frequently injured than the lateral meniscus, and specific tear patterns were noted — bucket handle tears predominating in the MM and radial tears in the LM.

These findings align with biomechanical studies indicating that different loading patterns predispose the medial and lateral menisci to distinct tear morphologies. The high rate of combined injuries

underlines the importance of thorough MRI evaluation before surgical intervention.

CONCLUSION

MRI is a powerful, non-invasive modality for detecting and characterizing ligamentous and meniscal injuries. ACL tears are the most common finding and are frequently associated with medial meniscus damage. Recognizing injury patterns assists in surgical planning and improves patient outcomes.

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