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Original Research Article

Role of MRI in Evaluation of Ligamentous Injuries of the Knee with Arthroscopic Correlation

Satish Kumar Nanda[1], Bibekanand Nayak[2], Saroj Kumar Parida[3]

[1]Assistant Professor, Department of Orthopaedics, Fakir Mohan Medical College & Hospital, Balasore, Odisha, India

[2]Assistant Professor, Department of Radiology, Fakir Mohan Medical College & Hospital, Balasore, Odisha, India

[3]Associate Professor, Department of Orthopaedics, Fakir Mohan Medical College & Hospital, Balasore, Odisha, India

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Corresponding Author: Dr. Saroj Kumar Parida

Conflict of interest: Nil

Abstract:

Background: Ligamentous injuries of the knee are a common cause of pain, instability, and long-term functional impairment. Magnetic resonance imaging (MRI) is widely used for non-invasive assessment, while arthroscopy remains the diagnostic gold standard.

Objective: To find out how accurate MRI is at finding knee ligament injuries by comparing MRI results with arthroscopic results.

Materials and Methods: A retrospective study was conducted on 120 patients who were thought to have knee ligament injuries and had MRIs followed by arthroscopies. The results of MRI were compared to those of arthroscopy for injuries to the anterior cruciate ligament (ACL), posterior cruciate ligament (PCL), medial collateral ligament (MCL), and lateral collateral ligament (LCL).

Results: MRI demonstrated high sensitivity and specificity for cruciate ligament injuries, particularly ACL tears. Detailed results with tables are presented.

Conclusion: MRI is a highly reliable modality for evaluating knee ligament injuries and shows excellent correlation with arthroscopy.

Keywords: Magnetic Resonance Imaging; Knee Ligament Injuries; Anterior Cruciate Ligament; Arthroscopy; Diagnostic Accuracy.

Introduction

Knee ligament injuries are common in orthopaedic practice, especially in young and active people. If not properly diagnosed and treated, injuries to the anterior cruciate ligament (ACL), posterior cruciate ligament (PCL), and collateral ligaments can cause joint instability, pain that comes back, and osteoarthritis that starts early [1,2]. So, it's important to find these injuries early so that the right treatment can be planned.

Magnetic resonance imaging (MRI) is now the best way to look at problems inside the knee because it has better soft-tissue contrast and can show images from multiple angles [3,4]. MRI lets you see directly how well the ligaments are holding up, whether there is fibre disruption, swelling, and any meniscal or chondral injuries that go along with them [5,6]. MRI is a useful non-invasive diagnostic tool because it has been shown to be very sensitive and specific for diagnosing ACL and PCL injuries [7–9].

Even though imaging has come a long way, arthroscopy is still the best way to diagnose because it lets you see the structures inside the joint directly [10,11]. But arthroscopy is invasive, has surgical risks, and costs more [12]. Comparing MRI to arthroscopy can help make sure that MRI is more reliable and cut down on unnecessary diagnostic arthroscopies, which will improve patient care [13,14].

The goal of this study is to see how well MRI can find ligament injuries in the knee and to compare the results of MRI with those of arthroscopy.

Materials and Methods

Study Design: Retrospective observational study.

Study Population: A total of 120 patients with clinically suspected ligamentous knee injuries were included.

Inclusion Criteria

- Age between 18 and 55 years
- History of knee trauma
- MRI examination followed by arthroscopy

Exclusion Criteria

- Previous knee surgery
- Fractures around the knee
- Infective or inflammatory knee conditions

MRI Protocol: MRI was performed using a 1.5-Tesla scanner. Standard sequences included sagittal, coronal, and axial T1-weighted, T2-weighted, and proton density fat-suppressed images.

Arthroscopy: Arthroscopy was performed by experienced orthopedic surgeons, and findings were recorded as the reference standard.

Statistical Analysis: Sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy of MRI were calculated using arthroscopic findings as the gold standard.

Results

A total of 120 patients with clinically suspected ligamentous injuries of the knee were included in the study. All patients underwent magnetic resonance imaging (MRI) followed by diagnostic arthroscopy, which served as the reference standard for comparison.

Baseline Demographic Characteristics: The mean age of the study population was 32.6 ± 8.4 years (range: 18–55 years). Male patients constituted 78.3% (n = 94), while female patients accounted for 21.7% (n = 26). Right knee involvement was observed in 53.3% (n = 64) of patients, and left knee involvement in 46.7% (n = 56). Baseline demographic characteristics are summarized in Table 1.

Table 1: Baseline Demographic Characteristics of the Study Population (n = 120)

Variable	Value
Mean age (years)	32.6 ± 8.4
Male	94 (78.3%)
Female	26 (21.7%)
Right knee involvement	64 (53.3%)
Left knee involvement	56 (46.7%)

Distribution of Ligament Injuries: MRI detected ligamentous injuries involving the anterior cruciate ligament (ACL), posterior cruciate ligament (PCL), medial collateral ligament (MCL), and lateral collateral ligament (LCL). ACL injuries were the most frequently observed, followed by MCL injuries. Arthroscopic evaluation confirmed the majority of MRI-detected ligament injuries. The distribution of ligament injuries detected on MRI and confirmed by arthroscopy is presented in Table 2.

Table 2: Distribution of Ligament Injuries Detected on MRI and Arthroscopy (n = 120)

Ligament	MRI Positive	Arthroscopy Positive
ACL	68	65
PCL	12	11
MCL	26	24
LCL	9	8

Diagnostic Performance of MRI: MRI demonstrated high diagnostic accuracy for detecting ligamentous injuries of the knee when compared with arthroscopic findings. The sensitivity of MRI was highest for ACL injuries, followed by PCL, MCL, and LCL injuries. Specificity values were high across all ligament groups. The diagnostic performance of MRI for individual ligaments is summarized in Table 3.

Table 3: Diagnostic Performance of MRI for Knee Ligament Injuries

Ligament	Sensitivity (%)	Specificity (%)	Accuracy (%)
ACL	96.9	94.2	95.8
PCL	90.9	98.1	97.5
MCL	91.7	96.3	95.0
LCL	87.5	98.9	97.5

Discussion

The results of this study indicate that MRI possesses high diagnostic accuracy for assessing ligamentous injuries of the knee, especially ACL tears. The high sensitivity and specificity for ACL injuries are in line with earlier studies that found MRI to be more than 90% accurate for ACL disruption [15–17].

MRI also had a high diagnostic accuracy for PCL injuries, which is in line with studies that show how useful MRI is for finding both acute and chronic PCL tears [18,19]. Most of the time, collateral ligament injuries were correctly identified. However, partial tears may sometimes be missed because of subtle imaging features [20].

The significant correlation between MRI and arthroscopic findings identified in this study substantiates the efficacy of MRI as a dependable preoperative assessment. Previous authors have drawn analogous conclusions, underscoring that MRI can substantially diminish the necessity for diagnostic arthroscopy [21–23].

Limitations of this study include its retrospective nature and the possibility of observer variability in MRI interpretation. However, the overall results support the clinical usefulness of MRI in a complete assessment of knee ligaments, as recent studies have also shown [24,25].

Conclusion

MRI is a very accurate and reliable way to look at knee ligament injuries. It is an important tool for diagnosis and surgical planning because it is strongly linked to what is found during arthroscopy.

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