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Diagnostic Accuracy of Magnetic Resonance Imaging Compared with Arthroscopy in Knee Injuries Among Paramilitary Personnel at a Tertiary Care Center

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ABSTRACT

Introduction: Accurate diagnosis of intra-articular knee injuries is essential to guide management and prevent long-term complications. Arthroscopy is the diagnostic gold standard but is invasive, whereas Magnetic Resonance Imaging (MRI) offers a non-invasive alternative. The objective of this study is to assess the diagnostic accuracy of MRI in detecting ligamentous, meniscal, and chondral injuries of the knee by correlating findings with arthroscopy.

Methods: Paramilitary personnel with clinically suspected knee injuries who underwent both MRI and arthroscopy were included. MRI findings were compared with arthroscopy, the reference standard, and diagnostic performance indices were calculated.

Results: MRI demonstrated high sensitivity and specificity for anterior cruciate ligament, posterior cruciate ligament, and meniscal tears, with relatively lower accuracy for chondral injuries.

Conclusions: MRI is a reliable, non-invasive tool for diagnosing major intra-articular knee injuries. Correlation with arthroscopy highlights its strengths and limitations, supporting its role in preoperative evaluation and surgical planning.

Keywords: *Arthroscopy, Knee Injury, Magnetic resonance imaging*

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INTRODUCTION

Knee injuries, being common in high-demand physical activities, [1] require accurate diagnosis for appropriate treatment planning, as untreated or misdiagnosed tears can lead to knee instability, increased risk of additional injuries, and early onset osteoarthritis. [2]

Arthroscopy remains the gold standard in the diagnosis of these injuries as it provides direct visualization of these injuries. However, it is invasive and typically reserved for surgical treatment rather than for routine diagnostic purposes. [3] MRI is the non-invasive imaging modality of choice for diagnosing ligamentous and meniscal injuries, and injuries of other intra-articular structures, and thus can be used for initial diagnosis. However, there remains variability in diagnostic accuracy due to factors like imaging quality and interpretation-expertise. [4,5] Furthermore its diagnostic reliability compared with arthroscopy requires further evaluation to ensure accurate and reliable diagnoses, especially for partial and complex tears. [6]

The objective of our study is to assess the diagnostic accuracy of MRI in anterior cruciate ligament (ACL), posterior cruciate ligament (PCL), medial meniscus (MM), lateral meniscus (LM), and chondral injuries of knee by correlating findings with arthroscopic results, potentially enhancing the precision of preoperative evaluations and decision-making.

METHODS

This was a retrospective cross-sectional observational study carried out in in the department of Radiology and Department of Orthopedics and Trauma Surgery of Nepal APF Hospital. This study was done in paramilitary personnel who underwent diagnostic or therapeutic arthroscopy for a duration of 2 years, from December 2022 to December 2024 in the hospital. Ethical approval was obtained from the Institutional Review Committee of Nepal APF Hospital (Ref no 021/2024). Patients of age 15-49 years who underwent MRI and subsequent arthroscopic procedures in the hospital were taken for the study. Patients who had undergone previous arthroscopic surgery and those with complex bony fractures were excluded from the study. We used a consecutive sampling method, including all patients who underwent arthroscopy and knee MRI in the

given time frame and who met the inclusion criteria. Data was collected in the specific proforma, entered into Microsoft Excel sheets, and data analysis was done on SPSS version 23.

RESULTS

The total number of patients evaluated in the study was 86. Out of the patients, 84.9% (n=73) were males and the rest were females. The patient age ranged from 18 years to 49 years, with a mean age of 31.36 (SD= 7.03) and a median age of 30 years.

Out of the patients evaluated, 70.9% patients (n=61) had an ACL tear on MRI, while 68.6 % patients had an ACL tear on arthroscopy (n=59). 3.5% of patients (n=3) had a tear of the PCL on MRI, with 4.7% (n=4) of patients showing a PCL tear on arthroscopy.

Medial meniscus tear on MRI was seen in 53.5 % patients (n=46), while it was seen in arthroscopy in 51.2 % patients (n=44). Similarly, lateral meniscal tear was seen in MRI in 22.1% (n=19), while on arthroscopy 31.4% (n=27) had a lateral meniscal tear. MRI identified chondral lesions in only 3.5 % (n=3) patients while on arthroscopy 15.1% (n=13) had chondral lesions.

The sensitivity, specificity, PPV and NPV of MRI for diagnosis of ACL, PCL, Medial, and lateral meniscal, and chondral injury were found as mentioned in Table 1.

Table 1: Sensitivity, Specificity, PPV and NPV of ACL, PCL, Meniscal and chondral injuries

Parameter	Sensitivity (%)	Specificity (%)	Positive Predictive value (%)	Negative Predictive value (%)	Accuracy (%)
ACL	94.9	81.5	91.8	88.0	90.7
PCL	75.0	100	100	98.8	98.8
Medial meniscus	93.2	88.1	89.1	92.5	90.7
Lateral meniscus	66.7	98.3	94.7	86.5	88.3
Chondral lesions	15.4	98.6	66.7	86.8	86.0

The study shows the highest sensitivity of MRI for the diagnosis of ACL and medial meniscal lesions, while the the lowest sensitivity was seen for the diagnosis of chondral injuries followed by the lateral meniscus. Specificity of MRI is highest for PCL followed by chondral injuries, while it is least for ACL injuries.

DISCUSSION

ACL Injury:

Diagnosis of ACL tears is made when there is visualization of high signal intensity or edema in the body, bundles or attachment sites of ACL, or non-visualization of ACL. [7]

Isolated ACL tear accounts for almost two-third of all knee disturbances. [8] Our study showed the preponderance of ACL tears being present in 70.9% patients followed by MM tear (53.5% patients) and LM tears (22.1% patients). Similar findings of preponderance of ACL tear were found in the existing literature. [6,8,9,10,11] The sensitivity, specificity, PPV and NPV of ACL tear detection via MRI in our study were found to be 94.9%, 81.5%, 91.8% and 88% respectively. The findings are almost similar to existing literature where the sensitivity of ACL tear detection ranged from 90-96.3%. [8,10,12] The accuracy of ACL tear detection in our study was found to be 90.7%. The sensitivity of ACL tear detection in other studies was found to be 90-94%. [7,9,10,12,13,14] ACL is a discrete structure in the intercondylar notch easily visualized on all sequences. ACL tears are usually large and high-grade tears, easily identified and moreover radiologists are also highly trained to look for ACL tears. These are all reasons for higher sensitivity and specificity of ACL on MRI. [15]

PCL Injury:

In MRI, PCL is visualized as a homogeneously low signal, continuous structure. Thus, any changes in signal or structural discontinuity are easily identified, making MRI highly accurate in diagnosing PCL injury. [7] The sensitivity and accuracy of PCL injury detection by MRI in our study were found to be 75% and 98.84% respectively. A similar study by Sahni G et al showed the sensitivity and accuracy of PCL tear to be 75% and 94% respectively. [10] Studies have shown the sensitivity of PCL tear detection by MRI ranging from 92.8% to 100%. [7,9,11,12,13] Similarly, the accuracy of PCL injury detection was found to range from 95% to 100%. [7,9,11,12] These statistics show the high accuracy rate of MRI for the detection of PCL injury.

MM Injury:

The sensitivity, specificity and overall accuracy of MM tear in our study was 93.2%, 88.1% and 90.7% respectively. Sensitivity of MM tears in other literature was found to range from 93.54-100%.

[3,6,7,11,12,16,17,18,19] Three studies in Nepal showed the sensitivity of MM tear to be 85.7% (13), 88.46% (9) and 92.3% (20).The overall accuracy of MM tear detection in other studies ranged from 90%-92.7%. [3,6,11,12,16,17,18] Similar studies in Nepal showed the overall accuracy to be 92%, 87.5% and 95.1%. [7,13,20]

LM Injury:

The sensitivity, specificity and overall accuracy of MRI in detecting LM injury in our study was 66.7%, 98.3% and 88.37% respectively. Similar studies from Nepal showed the sensitivity to be 77.7%, 84.61%, 83.3% and 84.6% (20). [7,9,13,20] Similarly, the overall accuracy of LM injury in those studies were found to be 86%, 92.1%, 90% and 92.6% respectively. [7,9,13,20] Lower sensitivity of lateral meniscal tears on MRI are due to its more mobility leading to transient subluxations, complex root/meniscofemoral ligament anatomy which might cause the missing of subtle posterior horn and root tears. [21]

Chondral lesions:

The MRI is considered the most accurate non-invasive modality to study articular cartilage, providing information on the biochemical and physiological condition of Hyaline cartilage. [22] Identifying chondral lesions is important as it has several important clinical implications. Untreated cartilage damage worsens with activity and a small focal cartilage defect progresses to a larger lesion leading to early osteoarthritis. [23] Untreated chondral lesions are also a cause of persistent pain, limited range of motion and reduced physical performance, which is especially critical in athletes and our study population, the paramilitary personnel.

Our study showed low sensitivity for diagnosis of chondral lesions on MRI (15.4%), however the specificity of the same was 98.6%. Overall accuracy for the detection of chondral lesions in our study was 86.05%. A similar study by Gyawali et al showed sensitivity to be 22.2%, who found the specificity and overall accuracy to be 100% and 86% respectively. [7] Danielli et al have shown higher sensitivity for diagnosing chondral lesions on MRI to be 75% up to 88.2% depending upon various subsites of the articular surfaces. [24] In a study done in a large number of patients undergoing arthroscopy following MRI performed in 10 different centers in a 1.5 T scanner, sensitivity for

detection of chondral lesions was found to be dependent on the grade of cartilage lesions, ranging from 5% in grade I lesions to 92% in healthy cartilage. [25] Low sensitivity of chondral injury in our study might be due to low field strength of the scanner (1.5 Tesla), with patients having chondral lesions probably having lower grade lesions, which were not recorded in the arthroscopy notes. The diagnostic accuracy of MRI for identifying chondral lesions varies with the imaging technique and is particularly influenced by lesion size. Conventional MRI, even with cartilage-optimized protocols, has limited sensitivity for superficial fibrillation. Accuracy improves for deeper lesions, especially those with more than 50% cartilage loss, with reported rates ranging from 73% to 96%. Moreover, identification of chondral lesions is more accurate with higher field strengths (3T) as compared to 1.5T. [26.27]

CONCLUSIONS

MRI is a reliable, non-invasive tool for knee pathologies, with excellent accuracy for ACL, and medial meniscus tears, fair accuracy for PCL and lateral meniscus injuries, and limited sensitivity for cartilage lesions. Arthroscopy remains the gold standard, but in Nepalese tertiary care, MRI offers valuable preoperative information and reduces the need for diagnostic arthroscopy.

LIMITATIONS AND FUTURE DIRECTIONS

Our study has a few limitations. Being a single-center study, it may restrict the applicability of the findings. MRI scans were performed in a 1.5 Tesla scanner, which may overlook superficial cartilage lesions compared to scans performed in higher field strength scanners. Radiologists were not blinded to clinical details, introducing possible observer bias. MRI being a static study fails to identify the functional status of the structure being reviewed. Therefore, detailed clinical history and examination findings are necessary for improving the MRI reporting by the radiologists. Future studies with larger multicenter studies, use of 3 Tesla MRI with advanced cartilage sequences and interobserver reliability assessments are needed.

CONFLICT OF INTEREST

None

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None

REFERENCES

1. Prodromos CC, Han Y, Rogowski J, Joyce B, Shi K. A meta-analysis of the incidence of anterior cruciate ligament tears as a function of gender, sport, and a knee injury-reduction regimen. Arthroscopy. 2007 Dec;23(12):1320-1325.e6. [DOI, PMID]
2. 2. Gopinathan P. Fate of the untreated anterior cruciate ligament-injured knee. J Orthop. 2017 Jul 25;14(3):A1-A3. [DOI, PMID]
3. Khalid D, Iqbal J, Mustafa K, Altaf R, Fatima R. Diagnostic Accuracy of Magnetic Resonance Imaging in the Detection of Meniscal Injury in Patients With Knee Trauma: Keeping Arthroscopy as a Gold Standard. Cureus. 2024 Oct 24;16(10):e72343. [DOI, PMID]
4. Rosskopf AB, Dietrich TJ, Hirschmann A, Buck FM, Sutter R, Pfirrmann CW. Quality management in musculoskeletal imaging: form, content, and diagnosis of knee MRI reports and effectiveness of three different quality improvement measures. AJR Am J Roentgenol. 2015 May;204(5):1069-74. [DOI, PMID]
5. Bolog NV, Andreisek G. Reporting knee meniscal tears: technical aspects, typical pitfalls and how to avoid them. Insights Imaging. 2016 Jun;7(3):385-98. [DOI, PMID]
6. Bari AA, Kashikar SV, Lakhkar BN, Ahsan MS. Evaluation of MRI versus arthroscopy in anterior cruciate ligament and meniscal injuries. J Clin Diagn Res. 2014 Dec;8(12):RC14-8. [DOI, PMID]
7. Gyawali B, Joshi A, Kayastha N. Knee injuries: correlation of MRI with arthroscopic findings. J Patan Acad Health Sci. 2020;7(3):35-40. [DOI]
8. Bucha A, Dashottar S, Sharma S, Pany P, Suthar RB. A study to evaluate the accuracy of MRI in comparison to knee arthroscopy in diagnosing cruciate ligament tear and meniscal tears in organized sports and physical exercise related knee injuries in

armed forces personnel. Int J Adv Med. 2018;5(6):1407-11. [DOI]

9. Khadka T, Thapa P, Kayastha N, Sharma B, Mishra R. Correlation of magnetic resonance imaging and arthroscopy findings in cruciate ligaments and meniscus injury of knee in West Nepal. Nepal J Radiol. 2022;12(2):14-20. [DOI]
10. Sahni G, Kumar S, Rehncy JS, Aggarwal S. Diagnostic arthroscopy compared to magnetic resonance imaging in the evaluation of meniscal and ligament tears of the knee. Natl J Physiol Pharm Pharmacol. 2022; 12(2): 166-169. [Full Text]
11. Sanjay N, Shanthappa AH, Kurahatti A, Kumaar A. Comparison of Clinical, Magnetic Resonance Imaging (MRI) and Arthroscopic Findings in Assessment of Cartilage Defects and Internal Derangement of Knee. Cureus. 2023 Jun 8;15(6):e40110. [DOI, PMID]
12. Ahmad Mir R, Bhat MR, Salroo IN. Diagnostic accuracy of MRI in internal derangement of knee in comparison to arthroscopy. Int J Health Sci (Qassim). 2022;6:12383-402. [DOI]
13. Gupta MK, Rauniyar MK, Karn NK, Sah PL, Dhungel K, Ahmad K. MRI evaluation of knee injury with arthroscopic correlation. J Nepal Health Res Counc. 2014 Jan;12(26):63-7. [PMID]
14. Rayan F, Bhonsle S, Shukla DD. Clinical, MRI, and arthroscopic correlation in meniscal and anterior cruciate ligament injuries. Int Orthop. 2009 Feb;33(1):129-32. [DOI, PMID]
15. Hash TW 2nd. Magnetic resonance imaging of the knee. Sports Health. 2013 Jan;5(1):78-107. [DOI, PMID]
16. Sajjanshetty R, Ranjolkar R. MRI vs arthroscopy in the diagnosis of meniscal tears: a comparative study. Indian J Orthop Surg. 2024;10(2):135-9. [DOI, Full Text]
17. Kotian P, Nayak KRU, Annappa R, Joe CV, Sujir PR, Tripathi A, et al. Correlation between clinical examination, magnetic resonance imaging, and arthroscopy in meniscal injuries of the knee: a prospective

cohort study. J Arthrosc Joint Surg. 2024;11(1):12-7. [DOI]

18. Nethikoppula A, Dasaraju V, Tadivaka S, Gundamaraju M, Gollu H, Kandikanti P, et al. MRI evaluation of meniscal injuries of knee with arthroscopy correlation: a comparative study in a tertiary care hospital. J Med Allied Sci. 2022;12(1):22-7. [DOI]
19. Shetty C, Rathod G, Raut N, Borole P, Gawali V. Correlation between magnetic resonance imaging and arthroscopy findings in diagnosis of meniscus injuries based on location of the meniscus tear and radial position. Int Surg J. 2022;9(3):612-6. [DOI]
20. Sharma UK, Shrestha BK, Rijal S, Bijukachhe B, Barakoti R, Banskota B, Pradhan I, Banskota AK. Clinical, MRI and arthroscopic correlation in internal derangement of knee. Kathmandu Univ Med J (KUMJ). 2011 Jul-Sep;9(35):174-8. [DOI, PMID]
21. Chien A, Weaver JS, Kinne E, Omar I. Magnetic resonance imaging of the knee. Pol J Radiol. 2020 Sep 11;85:e509-e531. [DOI, PMID]
22. Rodrigues MB, Camanho GL. MRI Evaluation of Knee Cartilage. Rev Bras Ortop. 2015 Nov 17;45(4):340-6. [DOI, PMID]
23. Ochi M, Sumen Y, Kanda T, Ikuta Y, Itoh K. The diagnostic value and limitation of magnetic resonance imaging on chondral lesions in the knee joint. Arthroscopy. 1994 Apr;10(2):176-83. [DOI, PMID]
24. Danieli MV, Guerreiro JP, Queiroz Ad, Pereira Hd, Tagima S, Marini MG, Cataneo DC. Diagnosis and classification of chondral knee injuries: comparison between magnetic resonance imaging and arthroscopy. Knee Surg Sports Traumatol Arthrosc. 2016 May;24(5):1627-33. [DOI, PMID]
25. Krakowski P, Karpinski R, Jojczuk M, Nogalska A, Jonak J. Knee MRI underestimates the grade of cartilage lesions. Appl Sci. 2021;11(4):1-16. [DOI]
26. Perry J, Kuiper JH, McCarthy HS, Jermin P, Gallacher PD, Tins B, Roberts S. Comparison of Knee Articular Cartilage Defect Size Between Measurements

Obtained on Preoperative MRI Versus During Arthrotomy. Orthop J Sports Med. 2023 Sep 6;11(9):23259671231193380. [DOI, PMID]

27. Omoumi P, Michoux N, Thienpont E, Roemer FW, Vande Berg BC. Anatomical distribution of areas of preserved cartilage in advanced femorotibial osteoarthritis using CT arthrography (Part 1). Osteoarthritis Cartilage. 2015 Jan;23(1):83-7. [DOI, PMID].