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A study on arthroscopic correlation of MRI findings in meniscal tears

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Abstract
Aims and Objectives: The aim of this study is to identify how accurate MRI is in evaluating ligament injuries specifically meniscal injuries and thereby reliability of using MRI as a tool to identify those who do and don't require surgery for ligament injury.
Materials and Methods: it is a cross-sectional study among 21 patients who were willing and undergoing arthroscopic intervention for grade 2 and 3 meniscal tears following pre-operative MRI evaluation at Govt. Medical College, Thrissur from April 2021 to December 2021.
Results: The vast majority of patients belonged to male gender indicating that males being involved in more physical labour and also in physical contact sports. Among 21 cases, 19(90.47%) were males and 2(9.53%) were females. The most frequent cause of meniscus injury in the study population was due to contact sports (61.9%) like football and kabbadi. Road traffic accidents were associated with other multiple injuries over the body.
Conclusion: MRI is indeed a reliable investigation to determine the meniscal injuries in a patient with knee injury and clinical features suggestive of the same. Most of the patients did present early with the symptoms and that was pointing to how important a normally functioning meniscus is for daily routine of an individual. In the modern era of advanced technology, MRI is the single best investigation to diagnose a meniscal injury.

Keywords: Meniscus, MRI, arthroscopy

Introduction
Knee joint is a weight bearing joint and has mobility in a single plane mostly. Besides, flexion and extension, the leg has a small amount of rotation in the flexed position of the knee. In order to support the body weight and also to stabilize the joint while walking, there are multiple structures which help in the same.
With the advent of physical contact, sports and increase in road traffic accidents, there has been an increase in the incidence of ligament injuries of the knee joint. Cruciate and meniscal injuries are the most common and most debilitating ligament injuries of the knee joint.
A trivial trauma such as a good twist of the knee is enough to tear the meniscus. In some cases, a piece of the torn cartilage may break loose and get caught in the knee joint, causing it to lock up.
For an appropriate treatment, it is necessary to make an accurate diagnosis. A patient with a meniscal tear can be differentiated from other causes of knee pain by a detailed history and physical evaluation. Magnetic resonance imaging (MRI) scan is at present considered to be the gold standard method among non-invasive techniques to diagnose meniscal tears.

Objectives
The aim of this study is to identify how accurate MRI is in evaluating ligament injuries specifically meniscal injuries and thereby reliability of using MRI as a tool to identify those who do and don't require surgery for ligament injury.

Materials and Methods

This is a cross-sectional study among 21 patients who were willing and undergoing arthroscopic intervention for grade 2 and 3 meniscal tears following pre-operative MRI evaluation at Govt. Medical College, Thrissur from April 2021 to December 2021.

Inclusion Criteria: All patients aged 18- 55 years with Grade 2 and 3 meniscal tears on MRI attending the Orthopedics Department, Govt. Medical College, Thrissur was included in the study. Routine knee joint arthroscopies were taken as assessment methods for the study.

Exclusion criteria: All patients with Grade 1 meniscal injuries, other knee ligament injuries, open surgeries and others those who are not willing for surgery were excluded from the study.

The study was done concentrating on finding the sensitivity and specificity of the MRI to identify the meniscal injuries prior to arthroscopic intervention. Arthroscopic intervention although minimally invasive involves entry into the joint cavity and repair with non absorbable suture material. As per Lotysch *et al*., MR grades 2 and 3 alone requires arthroscopic intervention and only such patients were advised to opt surgical repair of the ligaments. The procedure carries the risks of anaesthesia related complications, foreign body reaction and dreaded though rare complication of septic arthritis. The pros and cons of surgical intervention with the risks were informed to patient and bystander prior to proceeding with arthroscopy. Those who were willing for surgery were admitted, worked up and underwent pre-anesthetic check up and if found fit, were taken up for surgery on a pre-determined date.

The patients were discharged after preliminary wound inspection and asked to review in OPD where suture removal was done between 10 to14 days and mobilization started with muscle strengthening exercises prior to ambulation

Self made questionnaire containing questions like age, gender, mode of acquiring ligament injury, co-morbidities were provided to these patients in-order to collect data and these patients were classified based on the MRI grading system for abnormal high meniscal signal intensity proposed by Lotysch *et al*. MR grades 1, 2 and 3 are used. Some Grade 2 abnormal meniscal signals were found to be associated with a meniscal tear on arthroscopy and for that reason, they were subdivided into 2a, 2b, and 2c.

- **Grade 1:** Small focal area of hyper intensity, no extension to the articular surface
- **Grade 2:** Linear areas of hyperintensity with no extension to the articular surface
- **2a:** Linear abnormal hyperintensity but with no extension to either of the articular surfaces in any image
- **2b:** Abnormal hyperintensity which reaches the articular surface but only on a single image
- **2c:** Globular wedge-shaped abnormal hyperintensity but with no extension to the articular surface
- **Grade 3:** Abnormal hyperintensity extends to at least one articular surface either superior or inferior, and is referred as a definite meniscal tear.

Association between Lotysch *et al* grades on MRI and arthroscopic findings was used for evaluation based on various statistical results. Data was described as percentages. Data entered into MS Excel and was analyzed. Qualitative variables analyzed using proportions.

Observation and Results

Out of the 21 patients taken up for this study, the majority of the group came under the age 18 to 30 as they were the most physically active group. The frequency decreases as the age advances probably with the decrease in physical labour.

The vast majority of patients belonged to male gender indicating that males being involved in more physical labour and also in physical contact sports. Among 21 cases, 19(90.47%) were males and 2(9.53%) were females.

The most frequent cause of meniscus injury in the study population was due to contact sports (61.9%) like football and kabbadi. Road traffic accidents were associated with other multiple injuries over the body.

Most of the patients have presented within 2 years of injury pointing to the fact that those warranting surgery have not delayed in consulting. This is an indicator as how difficult it is for the patient to cope up with the difficulty

The right side (61.9%) was more involved than the left side possible attributable to the conventional use of right limbs more than the left along with the preferred side among those engaged in sports.

As expected, due to the restricted mobility and the likelihood of direction of impact, medial meniscus is almost affected twice than the lateral meniscus. In a few cases, both were seen to be involved in MRI.

Table 1: Meniscus involved on MRI

Meniscus affected	Frequency	Percentage
Medial	12	57.14
Lateral	6	28.57
Both	3	14.29
Total	21	

As per the findings on arthroscopy, around 90% of cases were consistent with the findings on pre-operative MRI.

Table 2: Consistency of findings on Arthroscopy

Consistent on Arthroscopy	Frequency	Percentage
Yes	19	90.47
No	2	9.53
Total	21	

Discussion

Chang *et al*. studied findings of 148 patients with figures of 92% for sensitivity and 87% for specificity for meniscal tears [1]. De Smet and Graf analysed 400 records and concluded that sensitivity of MRI scans was reduced for meniscal tears in the presence of ACL injury. Reduction of sensitivity was shown to be from 94% to 69% for medial meniscal tears [2]. Jee *et al*. concluded that MRI in the presence of ACL tears has lower sensitivity for detecting meniscal tears due to missed lateral meniscal tear [3]. Lundberg *et al*. found sensitivity and specificity of 74% and 66%, respectively, for medial and 50% and 84% for lateral meniscus. They found that MRI could not replace arthroscopy in the diagnosis of acute knee injuries [4]. Barronian *et al*. found 100% sensitivity for medial meniscal tears and 73% for lateral thus finding MRI to be a reliable tool [5]. For Mohan *et al*., in their retrospective series of 130 patients, the diagnostic accuracy of clinical examination was 88% for medial meniscal tears and 92% for lateral meniscal tears; they concluded that the clinical diagnosis of meniscal tears is as reliable as the magnetic resonance imaging (MRI) scan. Rose *et al*. found better diagnostic accuracy clinically than with MRI scans in a series of 100 patients [7]. Cheung *et al*. interpreted a series of 293 patients finding 89% sensitivity

and 84% specificity for medial meniscus injuries. For lateral meniscus, the sensitivity was 72% and specificity 93% [8]. Rangger *et al*. studied 121 patients and concluded that MRI should be an essential diagnostic tool before the arthroscopy [9]. Kreitner *et al*. reevaluated discrepancies in MRI reports and arthroscopic findings. Insufficient arthroscopic evaluation was identified as a further cause for the discrepancy [10].

In this study, we have studied only 21 patients due to the limitations enforced by the government and health department in view of the Covid-19 outbreak during the study period. Elective procedures were put on hold till further orders.

Most of the patients who came with a knee injury and suspected meniscal injury were willing to get an MRI done and those who were having grade 1 tear and not willing for surgery were not considered as per the exclusion criteria.

All the 21 patients in this study underwent Arthroscopic surgery and 19 of them had findings consistent with the MRI report. Only 2 patients had MRI reports inconsistent with the arthroscopic findings.

A significant majority of the patients in this study were males and the study subjects were less in number as age advanced. This can be attributed to the more involvement in strenuous works and physical contact sports. The study showed a 90.5% sensitivity in detecting meniscal injuries with an MRI scan. This is similar to the result obtained by Chambers *et al*.

Conclusion

This study helps to understand MRI is indeed a reliable investigation to determine the meniscal injuries in a patient with a knee injury and clinical features suggestive of the same. The reliability of the MRI is however also dependent on the quality of the radiologist who is reporting the MRI.

The study as mentioned help to understand the gender and age groups more pre-disposed to meniscal and other ligament injuries. Most of the patients did present early with the symptoms and that was pointing to how important a normally functioning meniscus is for the daily routine of an individual.

Previous studies on the same topic have been mentioned even though limited in number and the findings of this study are consistent with those of the previous study. This goes to show that in the modern era of advanced technology, MRI is the single best investigation to diagnose a meniscal injury.

Declaration of competing interests

Zacharias VB, Jacob PJ, Subramanian V and Harikrishnan S declare that they have no conflicts of interest.

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Conflict of Interest

Not available

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