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Dr. Sujit kumar Vakti R
Mamata Academy of Medical Sciences, Bollaram Industrial Area, Hyderabad, Telangana, India

Dr. Anirudh Reddy Bethi
Mamata Academy of Medical Sciences, Bollaram Industrial Area, Hyderabad, Telangana, India

Dr. Vishwanath Mahadvuni
Mamata Academy of Medical Sciences, Bollaram Industrial Area, Hyderabad, Telangana, India

Dr. Sahetya Mohan Rao
Mamata Academy of Medical Sciences, Bollaram Industrial Area, Hyderabad, Telangana, India

Dr. Mothiki Soujanya Katyayani
Mamata Academy of Medical Sciences, Bollaram Industrial Area, Hyderabad, Telangana, India

Corresponding Author:
Dr. Sujit kumar Vakti R
Mamata Academy of Medical Sciences, Bollaram Industrial Area, Hyderabad, Telangana, India

Study of correlation between MRI and arthroscopic findings in anterior cruciate ligament and meniscal injuries of the knee joint

Dr. Sujit Kumar Vakti R, Dr. Anirudh Reddy Bethi, Dr. Vishwanath Mahadvuni, Dr. Sahetya Mohan Rao and Dr. Mothiki Soujanya Katyayani

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Abstract
Introduction: Meniscal or ligamentous injuries of knee joint are common and result in pain, instability and restriction of movement. MRI is used as a screening tool to diagnose or support clinical diagnosis for these injuries prior to offering patients with arthroscopic treatment. However, the sensitivity of MRI for the detection of meniscal injury is not 100%.
Arthroscopy of knee joint can be used for both diagnostic and therapeutic purposes. It is regarded as the gold standard among the investigative modalities. Aim of our study was to correlate radiological and arthroscopic findings of meniscal injuries of knee.
Materials and Methods: Cross-sectional study of 20 patients with history of suspected internal derangement of knee, evaluated with MRI (1.5 T) and correlated with arthroscopy in Mamata Academy of Medical Sciences from May 2019 to November 2020.
Results: The Sensitivity, PPV, Accuracy of MRI scan in detecting ACL injury in our study were 95%, 100% & 95% respectively. Whereas Sensitivity, specificity, PPV, NPV, Accuracy of MRI scan in detecting medial meniscal injury in our study were 77.7%, 81.8%, 81.8%,77.7 & 80.0% respectively. Most common lesions found were ACL and Medial Meniscal tears.
Summary and Conclusion: MRI is a useful non-invasive modality in diagnosing cruciate ligament and meniscal injuries. MRI should be considered as the first line of investigation in all patients with suspected internal derangements of knee. MRI is useful as a pre-operative screening modality, improves the quality of diagnostic and therapeutic arthroscopies and further reduces the morbidity.
Arthroscopy is the standard diagnosing tool in all patients with suspected internal derangements of knee should be performed for cases where intervention is required.

Keywords: MRI, knee joint, anterior crucial ligament, meniscus, arthroscopy

Introduction
The knee joint is most commonly involved due to road traffic accidents, and sports activities [1]. The stability and normal mechanics of the knee joint is affected by the injury to the ligaments and meniscus which leads to the instability of the joint, impairing the person's daily activities. Therefore, early diagnosis and appropriate treatment should be given to decrease the morbidity. The knee joint is the largest synovial joint in the body containing various ligaments. The most important of them are anterior cruciate ligament (ACL), posterior cruciate ligament (PCL), medial meniscus (MM) and lateral meniscus (LM) which are responsible for the stability of the joint [2].
Various imaging modalities used to evaluate the knee include radiography, CT scans for fractures [3] and MRI for soft tissue injuries in the knee joint [4]. Arthroscopy of the joint can be used for both diagnostic and therapeutic purposes [5].
MRI being a non-invasive modality is increasingly being used in evaluation of cases of internal derangement of knee and is also being used in pre and post op evaluation of meniscal and ligamentous pathologies. It has high spatial and contrast resolution and can detect most of the pathologies of the knee with high accuracy [6]. Arthroscopy is regarded as the gold standard among the investigative modalities [7-9].

Materials and Methods

A cross-sectional study was conducted in Mamata Academy of Medical Sciences, Hyderabad in the Department of Orthopaedics. This study was done for a period of duration from May 2019 to November 2020 on 20 patients with suspicion of traumatic ligament or meniscal injuries of the knee joint.

Inclusion criteria were the patients of age group 18-45 years with traumatic knee injury and those willing to be a part of the study. Patients with degenerative changes of the knee joint, associated fractures around the knee joint and patients contraindicated for MRI scan were excluded.

Initially, proper history of the patient was taken and thorough clinical examination was performed by a qualified orthopaedic surgeon. Plain radiographs of the involved knee joint were taken to rule out degenerative changes, loose bodies and fractures around the knee joint. MRI of 1.5 Tesla was done on the involved knee joint. After the pre-anesthetic check-up and consent, diagnostic arthroscopy of the involved knee was done by an experienced and qualified orthopaedic surgeon. Findings of the MRI and arthroscopy are noted down and compared.

Results

This study included 20 patients with age ranging from 18 to 45 years with a mean age of 27.7 years at the time of admission. 14 (70%) of them were males and 6 (30%) were females.

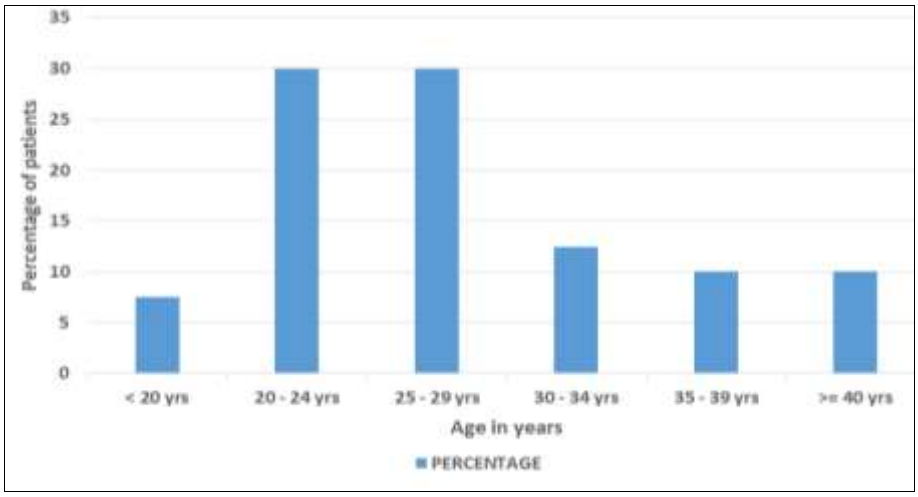

Fig 1: Age wise distribution of all patients (N = 20)

On MRI all 20 patients showed ACL tear. Comparison between MRI and arthroscopy findings for ACL tear showed 19 patients being true positive and one patient being false positive. The Sensitivity, PPV, Accuracy of MRI scan in detecting ACL injury in our study were 95%,100% & 95% respectively. Fisher exact test was employed to calculate the statistical significance and p value. Here the p value for ACL tear is 1, which is statistically not significant.

Table 1: Comparison between MRI and arthroscopic findings for ACL tear

	Arthroscopically positive	Arthroscopically negative	Total
MRI positive	19	1	20
MRI negative	0	0	0
			20

Table 2: ACL findings

Test	ACL (%)
Sensitivity	100%
Specificity	-
Positive predictive value(PPV)	95%
Negative predictive value(NPV)	-
Accuracy	95%

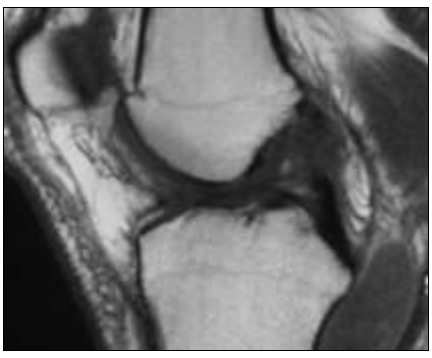

Fig 2: MRI view of complete tear of ACL **Fig 3:** Arthroscopic view of complete tear of ACL

MRI showed medial meniscus tear in all 11 patients. Comparison between MRI and arthroscopy findings for ACL tear showed 9 patients being true positive, 2 patients being false positive, 2 patients being false negative and 7 patients being true negative. The Sensitivity, specificity, PPV, NPV, Accuracy of MRI scan in detecting medial meniscal injury in our study were 77.7%, 81.8%, 81.8%, 77.7 & 80.0% respectively. Here the p value for medial meniscal tear is 0.0216 and is significant.

Table 3: Comparison between MRI and arthroscopic findings for medial meniscus tear

	Arthroscopically positive	Arthroscopically negative	Total
MRI positive	9	2	11
MRI negative	2	7	9
			20

Table 4 - Medial meniscus findings

Test	Medial meniscus (%)
Sensitivity	81.8%
Specificity	77.7%
Positive predictive value(PPV)	81.8%
Negative predictive value(NPV)	77.7%
Accuracy	80%

Fig 4: MRI view of medial meniscal bucket Handle fragment in the intercondylar notch (white of arrow)

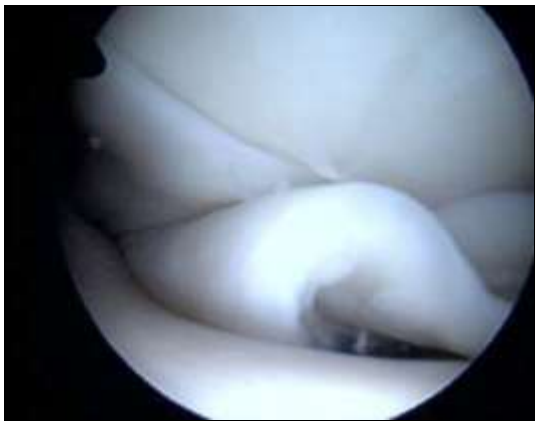

Fig 5: Arthroscopic view of bucket handle tear medial meniscus

Five patients showed lateral meniscus tear on MRI. Comparison between MRI and arthroscopy findings for ACL tear showed 4 patients being true positive, 1 patients being false positive, 3 patients being false negative and 12 patients being true negative. The Sensitivity, specificity, PPV,NPV, Accuracy of MRI scan in detecting lateral meniscal injury in our study were 57.1%,92.3%,80.0%,80.0% &80.0% respectively. Here the p value for lateral meniscal tear is 0.0307, which is statistically significant.

Table 5: Comparison between MRI and arthroscopy findings for lateral meniscus tear

	Arthroscopically positive	Arthroscopically negative	Total
MRI positive	4	1	5
MRI negative	3	12	15
			20

Table 6: Lateral meniscus findings

Test	Lateral meniscus (%)
Sensitivity	57.1%
Specificity	92.3%
Positive predictive Value(PPV)	80%
Negative predictive value(NPV)	80%
Accuracy	80%

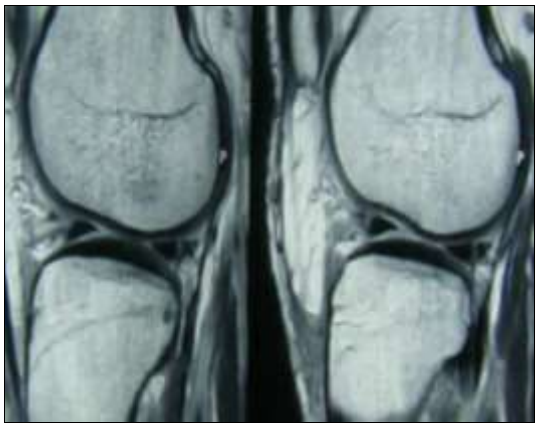

Fig 6: MRI view of longitudinal tear of posterior horn of lateral meniscus

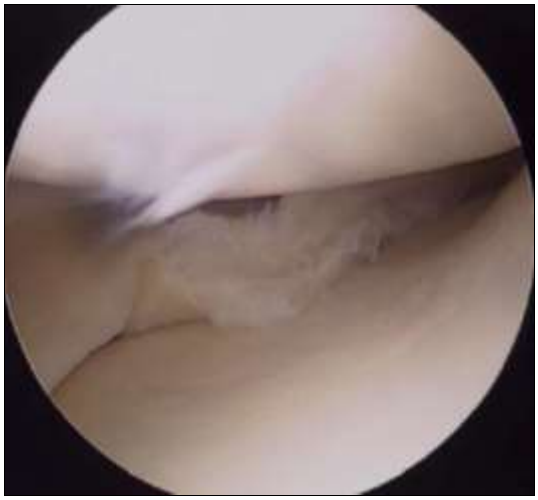

Fig 7: Arthroscopic view of posterior horn tear of lateral meniscus

Discussion

Our study spanned over a 18 months period. Prospective evaluation of 20 patients with suspected internal derangements of knee with MRI and subsequently arthroscopy was done. The anterior cruciate ligament and menisci were studied on both the modalities and comparisons were drawn. Arthroscopy was considered as gold standard and the sensitivity, specificity and accuracy of MRI were calculated. Of the 20 patients studied, there were 20 ACL tears, 11 medial meniscal tears and 5 lateral meniscal tears on MRI.

A large percentage of knee pain or disability is caused by pathological condition of menisci. One study reported it to be the cause of two-thirds of all the internal derangements of the knee joint [10]. Likewise, disruption of the anterior cruciate ligament, a major stabilizer of the knee, leads to the loss of stability of the knee and potentially significant dysfunction [11]. Although ACL is the most frequently torn ligament of the knee, the ACL tear has remained clinically elusive. These injuries account for a large number of referral to hospitals. The evaluation of these lesions remains a difficult clinical problem. The MRI is the frequently used diagnostic modality for these internal derangements because of being non-invasive, painless and unassociated with risk of radiation [12].

The accuracy, sensitivity and specificity values for knee lesions vary widely in literature. Rubin *et al*. [13] reported 93% sensitivity for diagnosing isolated ACL tears. Similarly several prospective studies have shown a sensitivity of 92-100% and a specificity of 93-100% for the MR imaging diagnosis of ACL tears [13, 14, 15]. The sensitivity for diagnosing isolated meniscal tears in Rubin's series was 98% and it decreased when other structures were also injured. The specificity in isolated lesion was 90%. In a muticentric analysis Fischer [16] reported an accuracy of 78-98% for the chronic anterior cruciate ligament and 64-95% for the meniscal tears.

The sensitivity and specificity of MRI in detecting meniscal tears exceeds 90%. Ryan *et al*. [17] in a prospective comparison of clinical examination, MRI, bone SPECT and arthroscopy to detect meniscal tear reported high diagnostic ability of MRI along with bone SPECT to detect meniscal tears with sensitivity and specificity of 80% and 91% respectively.

In the present study, the sensitivity and specificity of MR imaging for knee for medial meniscal lesion was 81.8% and 77.7% respectively. The sensitivity and specificity of MR imaging for knee for lateral meniscal lesion was 57.1% and 92.3% respectively. Therefore MRI has a high accuracy in diagnosing ACL than lateral meniscus and medial meniscus injury. However MRI is statistically significant in case of meniscal tears but not significant in case of ACL tear in present study.

Conclusion

In conclusion, the present study supports that MRI is very helpful in diagnosing meniscal and cruciate ligament injuries, but in a countable number of patients MRI reports were with false results. Now-a-days patient's expectations are maximal and taking into account that MRI false or misleading results can be as high as15% to 20% in specific knee pathologies. So it is concluded that arthroscopy still remains the gold standard in diagnosing the internal knee lesions and is highly useful in patients with persistent symptoms or in case of strong clinical suspicion in spite of normal MRI. However further studies with larger study population and meta-analysis of these studies is required to arrive at a concrete conclusion.

References

1. Kaplan PA, Walker CW, Kilcoyne RF, Brown DE, Tusek D, Dussault RG. Occult fracture patterns of the knee associated with anterior cruciate ligament tears: assessment with MR imaging. Radiology 1992;183(3):835-8.
2. Abd Razak HR, Sayampanathan AA, Koh TH, Tan HC. Diagnosis of ligamentous and meniscal pathologies in patients with anterior cruciate ligament injury: comparison of magnetic resonance imaging and arthroscopic findings. Annals of translational medicine 2015, 3(17).
3. Crawford R, Walley G, Bridgman S, Maffulli N. Magnetic resonance imaging versus arthroscopy in the diagnosis of knee pathology, concentrating on meniscal lesions and ACL tears: a systematic review. British medical bulletin 2007;84(1):5-23.
4. Schurz M, Erdoes JT, Platzer P, Petras N, Hausmann JT, Vecsei V. The value of clinical examination and MRI versus intraoperative findings in the diagnosis of meniscal tears. Scripta Medica (BRNO) 2008;12;81(1):3-12.
5. Vaz CE, Camargo OP, Santana PJ, Valezi AC. Accuracy of magnetic resonance in identifying traumatic intraarticular knee lesions. Clinics 2005;60(6):445-50.
6. 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. International Journal of Advances in Medicine 2018;5(6):1407.
7. Kim SJ, Shin SJ, Koo TY. Arch type pathologic suprapatellar plica. Arthroscopy: The Journal of Arthroscopic & Related Surgery 2001;17(5):536-8.
8. Coumas JM, Palmer WE. Knee arthrography: evolution and current status. Radiologic Clinics of North America 1998;36(4):703-28.
9. Khan Z, Faruqui Z, Ogyunbiyi O, Rosset G, Iqbal J. Ultrasound assessment of internal derangement of the knee. Acta Orthop Belg 2006;72(1):72-6.
10. Bui-Mansfield LT, Youngberg RA, Warme W, Pitcher JD, Nguyen PL. Potential cost savings of MR imaging obtained before arthroscopy of the knee: evaluation of 50 consecutive patients. AJR. American journal of roentgenology 1997;168(4):913-8.
11. Tait GR, Maginn P, Macey AC, Beverland DE, Mollan RA. Unnecessary arthroscopies. Injury 1992;23(8):555-6.
12. Shahriarree M, O'Connor RD. Arthroscopic surgery. O'Connor's Text Book. Lippincott, Philadelphia, London, Mexico City, New York, St. Louis, Sao Paulo, Sydney 1984.
13. Rubin DA, Kettering JM, Towers JD, Britton CA. MR imaging of knees having isolated and combined ligament injuries. AJR. American journal of Roentgenology 1998;170(5):1207-13.
14. Lee JK, Yao L, Phelps CT, Wirth CR, Czajka JO, Lozman JE. Anterior cruciate ligament tears: MR imaging compared with arthroscopy and clinical tests. Radiology 1988;166(3):861-4.
15. Mink JH, Levy T, Crues 3rd JV. Tears of the anterior cruciate ligament and menisci of the knee: MR imaging evaluation. Radiology 1988;167(3):769-74.
16. Fischer SP, Fox JM, Del Pizzo W, Friedman MJ, Snyder SJ, Ferkel RD. Accuracy of diagnoses from magnetic resonance imaging of the knee. A multi-center analysis of one thousand and fourteen patients. JBJS 1991;73(1):2-10.
17. Ryan PJ, Reddy K, Fleetcroft J. A prospective comparison of clinical examination, MRI, bone SPECT, and arthroscopy to detect meniscal tears. Clinical nuclear medicine 1998;23(12):803-6.