MRI AND ARTHROSCOPY- CO-RELATION IN MENISCAL AND LIGAMENTOUS KNEE INJURIES

Satyajeet Jagtap1, Siddharth Gupta2, Vinit Yadav3, Tania Barla4, Avinash Turankar5

1Associate Professor, Department of Orthopaedics, GMCH, Nagpur, Maharashtra.
2Junior Resident, Department of Orthopaedics, GMCH, Nagpur, Maharashtra.
3Consultant, Department of Orthopaedics, IMS-BHU, Varanasi, Uttar Pradesh.
4DMRD, Department of Radiology, GMCH, Nagpur, Maharashtra.
5Associate Professor, Department of Pharmacology, GMCH, Nagpur, Maharashtra.

ABSTRACT

BACKGROUND
MRI use for primary diagnosis of traumatic knee intra-articular lesion. The purpose of this investigation was to correlate MR and arthroscopic findings in a setup of knee injury.

MATERIALS AND METHODS
A descriptive study of 111 patients who underwent MRI for the diagnosis of soft tissue injury in knee over a period of last 2 years in GMC Hospital, Nagpur. A combination of T1-, T2- and T2-weighted sequences is most commonly used.

RESULTS
Commonest lesion detected in our study was ACL tear followed by meniscal tear. These lesions were further collaborated with arthroscopic findings and further treatment was done in GMC Hospital, Nagpur. Sensitivity, specificity, positive predictive value and negative predictive value was calculated of MRI with respect to Arthroscopy.

CONCLUSION
MRI knee in case of cruciate ligament tear is a definite indicator for diagnostic arthroscopy followed by subsequent arthroscopic reconstruction surgery. Whereas in suspected meniscal injury, it is advisable to undergo an arthroscopic confirmation after an MRI evaluation.

KEY WORDS
MRI Knee, Arthroscopy, Cruciate, Meniscus.


BACKGROUND
The knee joint is the common site of injury due to trauma, repetitive activities and sports activities. The history gives vital clue like hyperextension with an audible pop suggestive of ACL injury, a direct blow from front can cause PCL injury and ascent from a squat or twisting may cause a meniscus injury. Clinical tests may be sometimes confusing, MRI being non-invasive, diagnostic modality is helpful in traumatic knee injuries.

Zairul-Nizam et al[1] proposed that MRI examination is an effective first line investigation for patients with suspected internal derangement of knee joint, especially meniscal injuries allowing arthroscopy to be reserved in whom surgery is truly indicated.

A correlative study of MRI and arthroscopy in twisting injuries of knee joint done by JP Singh et al[2] substantiated that MRI is superior to Arthroscopy in the diagnosis of meniscal and cruciate ligament injuries. MRI is unique in its ability to evaluate the internal structure as well as the surface of the meniscus. MRI is advantageous in conditions where arthroscopy is not useful like peripheral meniscal tears and inferior surface tears. MRI is more sensitive in detection of multiple meniscal tears that may be overlooked on arthroscopy. MR is more sensitive than arthroscopy in detection of grade I and II intrasubstance degeneration, precursors to formation of meniscal tears. MR is less sensitive than arthroscopy in detecting partial ACL tears. A study by Mahmoud Karimi-Mobarake et al[3] done in 2005 showed that MRI is safe and useful adjunct to the clinical examination of the injured knee and an aid to efficient preoperative planning.

According to Keith Winters et al,[4] the study of MRI for traumatic injury of the knee the diagnostic accuracy was 90% for medial meniscus, 82% for lateral meniscus, 94% for ACL and 96% for PCL. The specificity was 87% for medial meniscus, 46% for lateral meniscus, 92% for ACL and 80% for PCL. The specificity was relatively high at 92%, 91%, 94% and 97% respectively. In 2007, Ruth Crawford et al[5] reviewed all the co-relational studies of MRI and arthroscopy of meniscal lesions and ACL tears and noted that the study design characteristics should also be taken into account during a study on MRI assessing its diagnostic performance is designed.

So the study of MRI and arthroscopic correlation was done in our institute for traumatic knee injuries. We assessed the need of MRI as well as arthroscopy need in traumatic knee injuries. Arthroscopy is the gold standard to diagnose the intra-articular knee pathology, but it is an invasive procedure and can cause complications. Hence, Magnetic resonance imaging (MRI) is increasingly being used for diagnosis over the past decade. MRI has now been accepted.
as the best imaging modality for non-invasive evaluation of knee injuries.\textsuperscript{[4]} Since its introduction for clinical use in the mid-1980s, the role of MRI in the diagnosis of knee lesions has been well established. The ability of MRI to predict intra-articular knee pathology have been compared with the findings of arthroscopic results of previous reports.\textsuperscript{[6]} The accuracy and sensitivity and specificity vary in different studies. This variety reflects the rapid changes in the MRI technology, different imaging sequences, radiologist's expertise, diagnostic criteria, location and composition of structure analysed and the kind of knee injury. As a result of this variability, this study is undertaken to determine the correlation between arthroscopy and MRI findings of knee joint injuries.

**Purpose of the Study**
To use MRI for primary diagnosis of traumatic knee intra-articular lesion. To correlate MR and arthroscopic findings while managing knee injury.

**MATERIALS AND METHODS**

This is a descriptive study conducted in Government Medical College and Hospital in Nagpur for a duration of 2 years (August 2015 to September 2017). The sample size was taken to be 111 patients. The age group was from 21 to 48 years. The type of study was observational prospective study. Clinical assessment was done in the form of history taking, joint line tenderness, McMurray test, Lachman Test, anterior drawer test and pivot shift test. The MRI machine was 1.5 T Philips MR Achieva. Following protocol T1, T2 and PD, FFE sagittal sequences, STIR and PD coronal sequence and SPAIR sagittal with FFE axial sequences were recorded. The inclusion criterion was injury to knee with symptoms. The exclusion criteria were patients having pacemakers, ferromagnetic implants and aneurysm clips. Patients having neoplastic, inflammatory and infectious condition of knee joints were also excluded.

Following Arthroscopy True Positive, True Negative, False Positive and False Negative were calculated

**True Positive**
Patients in whom MRI suggested meniscus and/ or cruciate ligament injury and was proved the same on arthroscopy.

**True Negative**
Patients in whom MRI suggested no meniscus and/ or cruciate ligament injury and was proved the same on arthroscopy.

**False Positive**
Patients in whom MRI suggested meniscus and/ or cruciate ligament injury, but was not so on arthroscopy.

**False Negative**
Patients in whom MRI did not suggest meniscus and/ or cruciate ligament injury, but on arthroscopy had meniscus and/ or cruciate ligament injury.

**Statistical Analysis**
Was used to calculate the sensitivity, specificity, positive predictive value (PPV), the negative predictive value (NPV) and accuracy. Patients were divided into 3 groups. Group A and B patients had definite symptoms and signs. Group A patients had MRI suggestive of either meniscal or cruciate ligament tear. Group B patients had combination of meniscal or cruciate ligament tear. Group C patients were clinically symptomatic, but no definite signs.

**RESULTS**
Group A consisted of 44 patients. Medial meniscus tear was noted on MRI in 18 patients and subsequently arthroscopy was confirmed in 16 patients. Lateral meniscus tear was noted on MRI in 10 patients and subsequently arthroscopy was confirmed in 8 patients. Anterior cruciate ligament tear was noted on MRI in 13 patients and subsequently arthroscopy was confirmed in 12 patients. While posterior cruciate ligament tear was noted on MRI in 3 patients and subsequently arthroscopy was confirmed in all patients.

Group B consisted of 17 patients. Medial meniscus with anterior cruciate ligament tear was noted on MRI in 8 patients and subsequently arthroscopy was confirmed in 6 with medial meniscus tear and 7 with anterior cruciate ligament tear. Medial meniscus with lateral meniscus tear was noted on MRI in 5 patients and subsequently arthroscopy was confirmed in 4 with medial meniscus tear and 3 with lateral meniscus. Anterior cruciate ligament tear with lateral meniscus tear was noted on MRI in 2 patients and subsequently arthroscopy was confirmed in 2 with anterior cruciate ligament tear and 1 with lateral meniscus tear. While anterior cruciate ligament tear with medial and lateral meniscus tear was noted on MRI in 2 patients and subsequently arthroscopy was confirmed in 2 patients having anterior cruciate ligament tear and 1 with medial meniscus tear.

Group C consisted of 49 patients. Medial meniscus tear was noted on MRI in 18 patients and subsequently arthroscopy was confirmed in 12 patients. Lateral meniscus tear was noted on MRI in 12 patients and subsequently arthroscopy was confirmed in 5 patients. 12 patients with normal report on MRI had medial meniscus tear in 2 patients and lateral meniscus tear in 1 patient after arthroscopy. Articular cartilage damage was found in 5 patients and anterior cruciate ligament mucoid degeneration in 2 patients.

![Figure 1(a)](image-url) Lateral Meniscus shows Double Delta Sign in Bucket Handle Meniscal Tear with Posterior Horn Empty suggestive of Ghost Meniscus. Figure 1(b) Displaced Meniscal showing Flipped Meniscus Sign.
He suggested controversy management. So we used it as a -
-cal injuries of the knee as suggested by 7 9
ligament injury (Accuracy= 96%)
ligament and in some extent lateral meniscus injuries more
meniscus injury is close to 90%, lateral meniscus
Value= 60
more in comparison to meniscus injury (Positive Predictive
ligament injury as compared to meniscus injury.
that MRI can truly detect patient
whereas for meniscus injury was around 60
patients.
good tool for screening in suspected traumatic knee injury
MRI and 39 on arthroscopy.
lateral meniscus
was found in 25 patients on MRI and 23 on arthroscopy,
in
Sensitivity of the study to diagnose meniscus and cruciate
was close to 95%, suggestive that MRI is a
good tool for screening in suspected traumatic knee injury
patients. Specificity of cruciate ligament was above 90%,
whereas for meniscus injury was around 60%, suggestive
that MRI can truly detect patients who are not having cruciate
ligament injury as compared to meniscus injury. The
probability of diagnosing truly on MRI with patients having
cruciate ligament injury (Positive Predictive Value= 92%) is
more in comparison to meniscus injury (Positive Predictive
Value= 60% - 75%). The negative predictive value for medial
meniscus injury is close to 90%, lateral meniscus to 95% and
anterior cruciate ligament tear to 100%, making MRI
effectively diagnose patients without anterior cruciate
ligament and in some extent lateral meniscus injuries more
effectively. The potency of MRI for detecting anterior cruciate
ligament injury (Accuracy= 96%) on MRI is superior than
those detecting meniscus injury (Accuracy= 72% - 80%).

DISCUSSION
Chang et al studied on 148 patients. Their study showed
92% for sensitivity and 87% for specificity for meniscal tears.
The conclusion was that MRI is a reliable diagnostic tool for
displaced meniscal tears. It was also the same in our study.
MRI complements the physical examination in cases of
ligament and meniscal injuries of the knee as suggested by
Severino et al with sensitivity/ specificity values - ACL,
medial meniscus and lateral meniscus of respectively 82%
and 96%, 96% and 66%, and 87% and 88% compared to
arthroscopy. It was similar in our study.
Yousef et al in their study concluded that MRI was an
appropriate examination for diagnosing meniscal and
ligament injuries of the knee and would be the preferred
examination in cases in which the physical examination was
inconclusive.

As suggested in literature by Rose NE and Gold SM with
to regard to arthroscopy, there is a risk of approx. 8% in
relation to the surgical procedure. So we used it as a
diagnostic as well as therapeutic method. In addition,
arthroscopy used only for diagnosis is an invasive tool and it
is slower and more expensive than MRI.
Valles-Figueroa et al was more emphasising
contraindicating routine requests for MRI examinations for
evaluating knee injuries. These authors stated that physical
examination was sufficient for diagnosing meniscus and
ligament injuries of this joint.
Yan et al stated that MRI had greater accuracy,
sensitivity and negative predictive value than clinical
manoeuvres in cases of meniscal injuries. They recommended
that MRI should be routinely requested for detecting this type
of injury.
Heave et al found that there was no significant
difference between the accuracy of clinical examination and
MRI with reported clinical accuracies of 72% for medial
meniscal injuries. This is further confirmed by Brooks et al who
demonstrated 79% agreement between clinical
diagnosis and arthroscopic findings, but 77% agreement
between MRI and arthroscopic finding. Their negative
arthroscopy rate was 4% and this was not reduced by MRI
scanning pre-arthroscopy. Our results also show that with a
proper history and examination, clinical diagnosis can be as
good as the MRI.

Miller in his prospective study of 57 knees demonstrated
an overall accuracy of 80.70% for clinical diagnosis, while the
corresponding accuracy for MRI was 73.7%. He suggested that
blind reliance on the MRI to determine while authors like
Boden demonstrated that when a clinical examination
supports the diagnosis of meniscus damage, MRI will not
change treatment decisions. The controversy management
mainly depends on magnitude of damage, which can be
addressed by MRI. Bridgman et al reported that MRI did not
reduce arthroscopy rates. In this era, arthroscopy has become
both diagnostic as well as therapeutic modality in the
treatment of knee injuries.

CONCLUSION
MRI is non-invasive, safer and less expensive. MRI is a good
tool for screening in suspected traumatic knee injury
patients. A normal MRI will not be a sufficient evidence to
deny an arthroscopy, particularly in individuals with
symptomatic knee injury. The use of MRI is an essential
supplemental tool for clinical decision-making. Arthroscopy is now an established procedure for simultaneous diagnosis and therapeutic management of symptomatic knee injury.

REFERENCES


