

Original Research Article

**Title: Magnetic resonance imaging evaluation of meniscal injuries of knee joint with clinical profile**

**Authors: Dr. Pradeep Ahirwar<sup>1</sup> (3<sup>rd</sup> Year Resident), Dr. Sheetal Singh<sup>2</sup> (Professor and HOD), Dr. Amlendu Nagar<sup>3</sup> (Professor) & Dr. Naman Saxena<sup>4</sup> (3<sup>rd</sup> Year Resident)**

Dept. of Radio diagnosis, Index Medical College Hospital and Research Centre, Indore, M.P.<sup>1,2,3&4</sup>

Corresponding Author: Dr. Naman Saxena

**Abstract:**

**Background & Method:** The aim of present study is to study Magnetic resonance imaging evaluation of meniscal injuries of knee joint with clinical profile. The number of knee pain or injury cases attending the outpatient and inpatient department of orthopaedics have not yet been estimated. So we took convenient sample size of 60 patients of knee pain or injury through random selection from the patients attending outpatient and inpatient department of orthopaedics.

**Result:** The above table shows distribution of study population according to history of acute trauma. It was observed that majority of patients were present with acute trauma (80%) and absent among 20 % patients. Among the study population, 43 (71 %) had anterior cruciate ligament tear, 6 (10%) had posterior cruciate ligament tear, 12 (20 %) had lateral cruciate ligament tear, among 7 (11%) had medial cruciate ligament tear.

**Conclusion:** MRI examination is a non-invasive and precise diagnostic technique to evaluate ligamentous and other soft tissue structures around the knee. Appropriate sequences and analysis of images in all three planes increases the diagnostic yield. Most of the injuries to ligaments and menisci can be diagnosed with increased level of confidence. Anatomical variants, artifacts and other pitfalls of imaging should be cautiously interpreted and differentiated from pathological entities. It was observed that majority of patients were having Anterior cruciate ligament tear (71 %) followed by Posterior cruciate ligament tear (10%).

**Keywords:** morphology, abnormal, menisci, trauma or injury.

**Study Designed:** Hospital based Descriptive Observational Cross-sectional study.

## 1. INTRODUCTION

The knee joint is a compound type of synovial joint and due to the lack of bony support, stability of the joint is highly dependent on its supporting ligamentous structures, and therefore injuries of ligaments and menisci are extremely common.

Knee injuries sustained due to RTA and various sports activities commonly involve menisci, out of which medial meniscus is more involved than the lateral one<sup>[1-4]</sup>.

Pain and swelling over knee joint is the common clinical presentation, though clinical evaluation is important in diagnosis, it can at times be misleading wasting a lot of time of

both the patient and the treating doctor, thus such cases are further investigated with MRI or arthroscopic evaluation <sup>[5,6]</sup>.

The knee menisci are fibro-cartilaginous structures that are located within the knee joint, deepening the tibia-femoral articulation. They function to improve stability, aid in shock absorption and load transmission through the knee. An abnormal meniscus can lead to premature degeneration of knee. Mostly meniscal injuries require surgical correction. MRI is considered a gold standard for diagnosis of meniscal injuries and deformations <sup>[7]</sup>.

Menisci are fibro-cartilaginous structures and have very low water content and thus they display low signal intensities on all MRI sequences. Traumatic or degenerative changes of menisci show high signal on MR imaging. Diagnosis of meniscal injuries is to be done on MRI imaging after reviewing images in all the planes <sup>[8]</sup>.

Kean and Moon were the first to highlight the potential of MRI in assessing the knee joint in 1983. Since then MRI imaging has revolutionized the way meniscal injuries are diagnosed and better understood. Knee coil has increased the usage of MRI for more and more knee trauma diagnosis. MRI has conveniently provided as a safe non-invasive method of diagnosis and largely replaced arthroscopy <sup>[3]</sup>.

Intra articular structures like menisci and cruciate ligament injuries and pathologies are better diagnosed with MRI which has sensitivity and specificity at par with the other standard technique - arthroscopy.

## 2. MATERIAL & METHOD

Study was conducted in the Department of Radio diagnosis in collaboration with the Department of Orthopedics, Index Medical College Hospital and Research Centre, Indore.

**STUDY POPULATION:** The study was conducted on patients of any age group of either sex, with history of knee injury and pain, refer to Index Medical College Hospital and Research Centre, Indore, for MRI of knee after taking a written, informed consent. All the patients admit with knee injury and pain, history was taken carefully from the patient and/or attendants to reveal the mechanism of injury and the severity of trauma.

The number of knee pain or injury cases attending the outpatient and inpatient department of orthopaedics have not yet been estimated. So we took convenient sample size of 60 patients of knee pain or injury through random selection from the patients attending outpatient and inpatient department of orthopaedics. The participants were enrolled after informed and written consent and the study protocol was in agreement with the guidelines of the institutional ethics committee.

### **INCLUSION CRITERIA:**

1. The study will include patients presenting with acute or chronic injury of knee.
2. Patients with acute or chronic knee pain
3. Patients with knee joint Infections
4. Patients of all age groups and both sexes.

### **EXCLUSION CRITERIA:**

1. Patients having Post-operative knee.
2. Patients who was not be giving consent
3. Those patients who was lost in follow-up
4. Patient having history of claustrophobia.

**3. RESULTS**

**Table 1: Descriptive analysis for age in study population (N=60)**

<b>Parameters</b>	<b>(mean ± SD)</b>	<b>Median</b>	<b>Min - Max</b>	<b>95 % Confidence Intervals</b>
Age (Years)	48.6 ± 10	50	20-68	45.9 – 51.7

The mean age was 48.6 ± 10 years in the study population. The minimum age was 20 and maximum age was 68 in the study population (95% CI = 45.9 – 51.7).

**Table 2: Distribution of study population according to history of acute trauma:**

<b>History of Acute trauma</b>	<b>Frequency</b>	<b>Percentage</b>
Present	48	80 %
Absent	12	20 %

The above table shows distribution of study population according to history of acute trauma. It was observed that majority of patients were present with acute trauma (80%) and absent among 20 % patients.

**Table 3: Distribution of joint effusion in study population (n=60)**

<b>Joint Effusion</b>	<b>Frequency</b>	<b>Percentage</b>
Present	25	41.6 %
Absent	35	58.3 %

**Table 4: Descriptive analysis of ligament injury involved in study population**

Ligament involved	Frequency	Percentage
Anterior cruciate ligament tear	43	71 %
Posterior cruciate ligament tear	6	10 %
Lateral cruciate ligament tear	12	20 %
Medial cruciate ligament tear	7	11 %

Among the study population, 43 (71 %) had anterior cruciate ligament tear, 6 (10%) had posterior cruciate ligament tear, 12 (20 %) had lateral cruciate ligament tear, among 7 (11%) had medial cruciate ligament tear.

#### 4. DISCUSSION

The Knee joint is considered as one of the most important and strongest joints in human body<sup>[9]</sup>. Injury to knee joint is a very common day to day occurrence due to extensive use and more prone to injury<sup>[10]</sup>. Various diagnostic modalities play an important role in the management of knee injury and diseases. MRI, with its ability to generate a high contrast and high spatial resolution images of the joints, muscles, ligaments, cartilage, synovium and soft tissue without the use of ionizing radiation has an important role in the radiological evaluation of knee joint injury<sup>[11]</sup>. Multiple imaging modalities are currently used to evaluate pathological conditions of the knee. Over the past several years, the role of MRI in knee imaging has steadily increased and is often the main or the only imaging tool for evaluation of suspected internal derangements. Complete evaluation of the capsule, collateral ligaments, menisci and tendons about the knee has been difficult with conventional and CT arthrography<sup>[9]</sup>. Multiplanar MRI images provide a significant improvement in assessing various structures of knee joint in injury and disease<sup>[12]</sup>.

The present study was a cross sectional, hospital-based observational study conducted on 60 patients with clinically suspected traumatic injuries of knee joint referred for MRI to the Department of Radiodiagnosis, Index Medical College and Research Center, Indore (MP) over a period of 18 months from January 2021 to August 2022 after obtaining Ethical

Clearance from the Institute Ethical Committee (IEC), Index Medical College and Research Center, Indore (MP). Tear involving the ligaments of the knee joint as assessed by MRI was considered a primary outcome variable.

Among the study population, 43 (71.00 %) had an anterior cruciate ligament tear, among the study population, 6 (10 %) had a posterior cruciate ligament tear, 12 (20 %) had a lateral cruciate ligament tear, among 7 (11.00 %) had a medial cruciate ligament tear. In present study, the positioning knee with 5 – 10° of flexion & 15 – 20° of external rotation was found optimal. If ACL was incompletely seen repeat oblique images were obtained. T2WI & PDW FS images were preferable as acute lesions were seen as the high signal intensity with a great degree of accuracy.

## 5. CONCLUSION

MRI examination is a non-invasive and precise diagnostic technique to evaluate ligamentous and other soft tissue structures around the knee. Appropriate sequences and analysis of images in all three planes increases the diagnostic yield. Most of the injuries to ligaments and menisci can be diagnosed with increased level of confidence. Anatomical variants, artifacts and other pitfalls of imaging should be cautiously interpreted and differentiated from pathological entities. It was observed that majority of patients were having Anterior cruciate ligament tear (71 %) followed by Posterior cruciate ligament tear (10%).

## 6. REFERENCES

1. Thornton DD, Rubin DA. Magnetic resonance imaging of the knee menisci. *Semin Roentgenol* 2000;35:217–30.
2. Ahmad M, Ayub Z, Hadi N. Prevalence of various types of intra-articular injuries detected by Magnetic resonance imaging in trauma to the knee joint. *J Med Sci* 2005;13:136–9.
3. Shetty DS, Lakhkar BN, Krishna GK. Magnetic Resonance Imaging in Pathological Conditions of Knee. *Ind J Radiol Imag* 2002;12:375–87.
4. Koski JA, Ibarra C, Rodeo SA. Meniscal injury and repair: clinical status. *Orthop Clin North Am* 2000;31:419–36.
5. Bin SI, Kim JM, Shin SJ. Radial tears of the posterior horn of the medial meniscus. *Arthroscopy*. 2004;20:373–8.
6. Kocabey Y, Tetik O, Isbell WM, Atay OA, Johnson DL. The value of clinical examination versus magnetic resonance imaging in the diagnosis of meniscal tears and anterior cruciate ligament rupture. *Arthroscopy* 2004;20:696–700.
7. Ofli F, Chaudhry R, Kurillo G, Vidal R, Bajcsy R. Sequence of the most informative joints (smij): A new representation for human skeletal action recognition. *Journal of Visual Communication and Image Representation*. 2014 Jan 1;25(1):24–38.
8. Alessio-Mazzola M, Formica M, Coviello M, Basso M, Felli L. Conservative treatment of meniscal tears in anterior cruciate ligament reconstruction. *The Knee*. 2016 Aug 1;23(4):642–6.
9. McKay GM, Cox LA, Long BW. Imaging juvenile idiopathic arthritis: assessing the modalities. *Radiologic Technology*. 2010 Mar 1;81(4):318–27.
10. Berg VB, Lecouvet F, Poilvache P, Maldague B, Malghem J. Spiral CT arthrography of the knee: technique and value in the assessment of internal derangement of the knee. *European radiology*. 2002 Jul;12(7):1800–10.
11. Guermazi A, Hayashi D, Roemer FW, Felson DT. Osteoarthritis: a review of strengths and weaknesses of different imaging options. *Rheumatic Disease Clinics*. 2013 Aug 1;39(3):567–91.

12. Wang Y, Wluka AE, Jones G, Ding C, Cicuttini FM. Use magnetic resonance imaging to assess articular cartilage. *Therapeutic advances in musculoskeletal disease*. 2012 Apr;4(2):77-97.