

# Correlation of magnetic resonance imaging and arthroscopic findings in meniscal and anterior cruciate ligament injuries

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## Abstract

**Background:** The number of patients with complaints of painful knee joint is quite significant and many imaging modalities are used to diagnose the injuries. An accurate diagnosis regarding the injuries is essential for the management of patient by operative or non-operative treatment. Here in this study we compared MRI and Arthroscopy for knee injuries. **Aim and Objective:** To compare and correlate clinical, magnetic resonance imaging (MRI), and arthroscopic findings in cases of meniscal tear and anterior cruciate ligament (ACL) injuries. **Methodology:** In the present study, 50 patients with knee joint injury, referred for magnetic resonance imaging of the knee joint were evaluated by both MRI and arthroscopy. **Results:** Most common injury was ACL tear (84%) of which complete tears (72%) were more common. Posterior cruciate ligament tears were less common. Among the meniscal injuries medial meniscal tears are more common (54%) than lateral meniscus (40%) and grade 3 tears are more common in both. Good co-relation was seen between MRI findings and Arthroscopic findings.

**Key words:** magnetic resonance imaging.

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## INTRODUCTION

Normal knee joint is essential for day to day life. Knee injury is a common event throughout life often affecting people during their most productive years. Knee joint is one of the most commonly injured joints because of its anatomical structure, its exposures to external forces and the functional demands placed on it. The term “Internal Derangement of Knee” (IDK) was originally coined by William Hey. Anterior cruciate ligament (ACL) is commonly injured ligament in knee and usually

associated with Meniscal injuries<sup>1</sup>. MRI is a noninvasive, radiation free modality with a better ability to assess soft tissues<sup>2</sup>. The accuracy of MRI is very high in diagnosing knee lesions and has a sensitivity of 80% to 100%<sup>3</sup>. In the setting of trauma, limited range of motion and mechanical knee symptoms MRI is generally considered a valuable diagnostic tool and it is good enough to appropriately identify patients who require arthroscopic therapy. Arthroscopy of the knee has been used since 1970's as a diagnostic and therapeutic tool in the management of acute, subacute and chronic knee complaints. Arthroscopy of the knee is an invasive procedure with associated risk and leading to discomfort for the patient. Therefore number of non therapeutic arthroscopies should be limited. Injuries to the intra-articular structure like menisci and cruciate ligaments are diagnosed with high sensitivity and specificity by MRI as compared with arthroscopy which is still regarded as the reference standard. The purpose of our study was correlate MRI and arthroscopy in evaluation of knee injuries.

## MATERIAL AND METHODS

50 cases with suspected IDK who underwent MR imaging of knee in the Radiology department of SDMMCH, Dharwad, served as the subjects for this study. Study was undertaken from June 2016 to June 2017.

### Inclusion Criteria

1. Patients of all ages and both sexes with history of injury to the knee.
2. Patients with clinically suspected tears.
3. Patients in whom clinical data and arthroscopy findings are available for correlation.

### Exclusion Criteria

1. Patients with known pre-existing knee joint pathologies of all the age groups.
2. Post operative cases.
3. Patients with cardiac pacemakers and metallic implants

All patients were subjected to MR imaging and followed by arthroscopy. Equipment used for MRI was GE 1.5 T, channel Whole- body MR scanner.

## RESULTS

Males (76%) were more commonly affected than females (24%). In our study right knee (56%) was more commonly involved than left (44%). Majority of the patients were from age group of 21-30 (44%) yrs followed by 31-40 yrs(20%). Mean age of the patient was 32.9+/-11.5 yrs Majority of the patients (42%) had 1-6 months duration of injuries. In our study joint effusions were the most common finding affecting 46 patients (92%). Among the ligamentous and meniscal injuries, ACL tear is most common, seen in 43 patients (86%), to be followed by the Medial Meniscal injuries seen in 27 patients (54%) with grade 3 type injury being commonest.

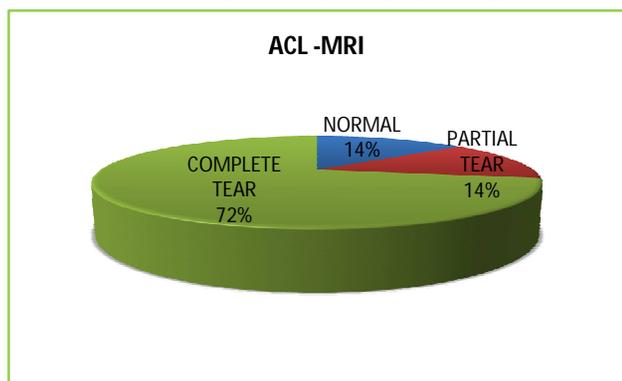


Figure 1: Pie diagram of ACL tear (MRI) in patients studied

Table 1: MRI grading of medial meniscal tear

Grading	Frequency	Percentage
NORMAL	11	22%
GRADE 1	4	8%
GRADE 2	8	16%
GRADE 3/TEAR	27	54%
<b>Total</b>	<b>50</b>	<b>100%</b>

Table 2: MRI grading of Lateral meniscal tear

Grading	Frequency	Percentage
NORMAL	25	50%
GRADE 1	2	4%
GRADE 2	3	6%
GRADE 3/TEAR	20	40%
<b>Total</b>	<b>50</b>	<b>100%</b>

Table 4: Diagnostic values of clinical examination (Mc Murray test and Lachman/Anterior drawer test) using arthroscopic finding as the reference data

	Medial meniscal tear	Lateral meniscal tear	ACL Tear
Sensitivity	81%	42.9%	91.1%
Specificity	79.3%	65.5%	80%
Accuracy	80%	72%	90%
Positive Predictive value	73.9%	63%	97.6%
Negative Predictive value	82.6%	82.6%	50%

Table 5: Diagnostic values of MRI findings, using arthroscopic findings as the reference data

	Medial meniscal tear	Lateral meniscal tear	ACL Tear
Sensitivity	81%	64.3%	95.6%
Specificity	65.5%	90.9%	100%
Accuracy	72%	76%	96%
Positive Predictive value	63%	90%	100%
Negative Predictive value	82.6%	66.7%	71.4%

Table 6: Correlation b/w mri and scopy for meniscal and lig. injury

Complete correlation	Number	Percentage
Yes	31	62%
No	19	38%
<b>Total</b>	<b>50</b>	<b>100%</b>

Table 7: Disparity in findings

	ACL injury	PCL injury	MM injury	LM injury
Mri Findings	Complete tear- 2	Partial Tear- 1	Tear-6	Tear-1
Arthroscopy Findings	Partial tear- 2	Partial Tear- 2	Tear-1	Tear-8
<b>Total</b>	<b>2</b>	<b>1</b>	<b>7</b>	<b>9</b>

## DISCUSSION

In our study, MRI showed ACL tear in 43 patients (86%), among these 34 cases had complete tear (68%) and 9 (18%) cases had partial tear. Out of 7 (14%) normal ACL diagnosed on MRI, 5 (71.5%) cases showed no tear on arthroscopy, the remaining 2 (28.5%) cases showed

partial tear. However Singh JP *et al*, in their series of 173 patients, 78 patients (45.08%) showed ACL tears, among these 52 (66.67%) are partial, 16 (20.51%) are complete and 10 (12.82%) cases showed non visualization of ACL. The authors concluded that ACL tears are more common than other ligamentous injuries with partial tears being commoner.<sup>4</sup> Posterior cruciate ligament injuries were found to be relatively uncommon in our study, out of 50 cases, 2 (4%) cases showed evidence of tear on arthroscopy, where as only 1 (2%) case was shown to have evidence of tear on MRI, but the other case was not detected to have tear on MRI. Sonnin *et al*, found the incidence of PCL tear to be 3%, in a series of study analyzing 350 case of knee injury only 10 patients had PCL tear.<sup>5</sup> In a study by Grover *et al* where they analyzed findings of 510 consecutive MRI of knee joints with an emphasis on PCL tear; 11 (2%) patients had different grades of tear on MRI which was confirmed correctly by arthroscopy.<sup>6</sup> In our study, MCL tears (8%) were found to be more common than the LCL tear (4 %). Similar findings observed by Mink JH *et al*.<sup>7</sup> They observed on MRI and arthroscopy of 11 patients who had tear of LCL, 7 patients had tear of MCL, 4 patients had tear of lateral meniscus and 1 patient had tear of medial meniscus. ACL injury diagnosis using clinical examination and MRI scan, there was marginal difference in sensitivity (91.1% and 95.6%, respectively), specificity (80% and 100%), positive predictive value (97.6% and 100%), negative predictive value (50% and 71%), and diagnostic accuracy (90% and 96%). F. Rayan *et al*,<sup>8</sup> showed ACL injury diagnosis using clinical examination and MRI scan, there was marginal difference in sensitivity (77% and 81%, respectively), specificity (100% and 96% ), positive predictive value (100% and 81%), negative predictive value (95% and 95%), and diagnostic accuracy (93% and 96%). 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.<sup>9</sup> Mohan *et al*,<sup>10</sup> in their retrospective series of 130 patients, diagnostic accuracy of clinical examination was 88% for medial meniscal tears and 92% for lateral meniscal tears; they concluded that 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.<sup>11</sup> On the contrary, in a prospective series by Abdon *et al*, clinical examination had only 61% accuracy for meniscal tears.<sup>12</sup> There is preponderance of MM tears over LM tears in our study which is well correlated with the study done by Singh *et al*, in a series of 173 cases of which they found 57 (38.23%) patients showed MM tear and 28(29.41%) patients showed LM tear.<sup>4</sup> In our study, one meniscal cyst was found to be associated with tear of

the lateral meniscus and one parameniscal cyst was seen with tear of medial meniscus. These findings were correlated with findings described by Thomas H. Berquist.<sup>13</sup> In our study Osseous/Osteochondral lesions were seen in 32 patients (64%). Most of these were bony contusions involving the femoral and tibial condyles. These findings were correlated with findings described by Thomas H. Berquist.<sup>13</sup>The finding of haemarthrosis and lipohemarthrosis was associated in two cases with presence of intercondylar fractures. These findings were correlated with findings described by Thomas H. Berquist.<sup>13</sup> In our study, the predominant pattern of combined injury is ACL tear and MM tears (24); followed by ACL tear and LM tear (17), which is well correlated with a study by Ali Akbar Esmaili Jah *et al*.<sup>14</sup>

## CONCLUSION

MRI is an excellent, non-invasive, radiation free imaging modality with multilane capabilities and excellent soft tissue delineation. It can accurately detect, localize and characterize various internal derangements of the knee joint and help in arriving at a correct anatomical diagnosis thereby guiding further management of the patient.

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