



## EVALUATION OF ANTERIOR CRUCIATE LIGAMENT TEARS BY MRI AND ARTHROSCOPIC CORRELATION

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### INTRODUCTION:-

Anterior cruciate ligament injury is the most commonly injured knee ligaments. Injuries occur commonly in both athletes and nonathletes. In US the prevalence of ACL injury is about 1 in 2000, and approximately 1, 50,000 injuries occur every year. Quick assessment of full extent of ligamentous damage is essential for appropriate management.

Due to its intraarticular location, the ACL has poor healing potential. The ruptured ACL does not form a scar after complete interruption. The prognosis for a partially torn ACL is favorable, if the synovial envelope remains intact. Without treatment complete ACL injury can result in increasing symptomatic knee instability and osteoarthritis.

Meniscal injury occurs in relation with 50% of acute ACL tears, and it increases to 90% in chronic ACL deficient knees. The incidence of articular cartilage lesions increases from 30% in acute ACL injuries to approximately 60% of knees with chronic ACL instability. The element of diagnosing and treating ACL injury is to prevent future meniscal tears and associated joint damage.

ACL injury diagnosed in majority of patients by history and clinical examination. The clinical diagnosis is difficulty in acute cases. Partial tears are difficult to diagnose and the associated injuries could not be completely evaluated by clinical examination.

Arthroscopy is the standards for definitive diagnosis but are invasive and costly. MRI is a recent modality for evaluation of ACL and knee joint. Imaging Includes sequences sagittal, axial and coronal planes using T1, T2 and STIR using the quadrature knee coil.

The study includes evaluation of ACL injury with its associated injuries using MRI and comparing with arthroscopic results. Primary and secondary signs of ACL tear are also analyzed by MR and their usefulness assessed in comparison with arthroscopic findings.

### Aims And Objectives:-

1. To assess the accuracy and usefulness of MRI in diagnosing ACL tears using arthroscopy as gold standard.
2. To evaluate the usefulness of primary and secondary signs in diagnosing ACL tear.

### Materials And Methods:-

A prospective study of 55 patients with history of knee trauma and pain referred from orthopedic OPD was done in SMT.KASHIBAI NAVALE MEDICAL COLLEGE PUNE .All 55 patients were subjected to MRI examination .MRI knee was performed using GE Signa Creator 1.5 Tesla MRI machine , using quadrature knee coil.

### Method

Patient was placed in supine position with knee placed in 5-10 degree of external rotation and extension.

### Mr Technique Used

A scout axial view obtained to plan for sagittal and coronal sections (perpendicular and parallel to posterior femoral condylar line). If needed oblique sagittal sections for ACL were performed using coronal slice which shows the oblique course of ACL.

### Sequences

Axial – T2 Coronal  
Coronal – T1 Sagittal PDFS  
Sagittal - T2 Axial

3D MERG

### Inclusion Criteria

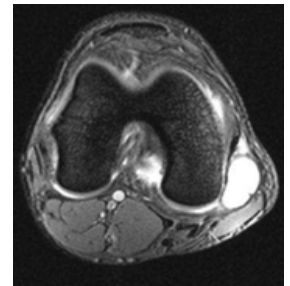
Patients were referred from orthopedic department with history of knee trauma and knee pain with follow up arthroscopy were included in the study.

### Exclusion Criteria

- Prior H/O surgery, arthroscopy
- Patients with MR incompatible devices or implants
- Patients on life support systems.



Complete ACL Tear T2w Sag



Partial ACL Tear Gre Axial



Midsubstance ACL Tear On Arthroscopy

### DISCUSSION

MRI knee joint was performed on 55 patients who were referred from orthopedic department with history of knee trauma and knee pain for the evaluation of ACL tear and its associated injuries.

Out of 55 patients, 41 (72%) were male patients and 14(26%) were female patients. 32(78%) of 41 male patients had tears and 6(34%) of 14 female patients had tears. Male preponderance is due to more sports participation and more usage of vehicles. In this study population a male patient with knee injury was two times more likely to have a torn ACL. Patient's age group ranging from 15 to 60 years. Out of 55 patients, 34 (60%) were in the age group 20-40 years.

55 patients underwent clinical examination for ACL tear. Anterior drawer and Lachman test were done. By clinical examination 32 were classified as ACL tear and 23 as normal.

The positive predictive value for detecting complete tear was 92.5%. However out of 23 clinically reported normal ACLs 3 turned out to be complete tear. The sensitivity for detection of ACL tear was 77.9% and for complete tear was 88.8%. 2 patients with clinically missed ACL complete tear had bucket handle medial meniscal tears. Clinical examination also missed 4 partial tears out of 5 arthroscopically

confirmed ACL partial tear.

History with knee pain and knee trauma were subjected to MR knee joint. ACL evaluation was done by taking sagittal, axial and coronal sections. Using sagittal images tibial and midsubstance of ACL was evaluated and also the alignment to femoral intercondylar line noted. Axial and coronal images were used to visualize the femoral attachment of ACL. A diagnosis of complete tear of ACL was based on the presence of the following primary findings: a) abnormal high signal intensity within ACL b) abnormal axis/ angle c) non visualization of ACL. d) discontinuity of the fibers. Whereas in partial tears direct signs seen such as a) ligament enlargement b) focal increase in signal intensity.

## RESULTS

The ability of MRI and clinical examination to diagnose ACL injury was compared with arthroscopy and the results were analyzed using statistical tests. Primary and secondary signs for ACL tear in MRI were also studied in detail in correlation with arthroscopy.

The final arthroscopic findings after evaluation with MR imaging were accepted as reference standard against which the MR findings were compared.

The sensitivity, specificity, positive predictive value, were calculated for clinical and MR imaging in diagnosing ACL tears in correlation with arthroscopy. The sensitivity, specificity, positive predictive value, calculated for the primary and secondary signs of ACL tear in MRI.

### 1. Comparison Between Mri Diagnosis And Arthroscopic Diagnosis For Acl Tear

MRI	Arthroscopy			Total
	Normal	Complete tear	Partial tear	
Normal	14	0	1	15
Complete Tear	1	32	0	33
Partial tear	3	1	3	7
Total	18	33	4	55

### 2. Location Of Acl Tear

	COMPLETE TEAR	PARTIAL TEAR	TOTAL
FEMORAL ATTACHMENT	1	1	2
MIDSUBSTANCE	22	2	24
BOTH FEMORAL & MIDSUBSTANCE	8	1	9
TIBIAL	0	2	2
TOTAL	31	6	37

### 3. Distribution Of Primary Signs For Complete Acl Tear

	NORMAL	COMPLETE TEAR
ABNORMAL ANGLE / AXIS	1	27
INCREASED SIGNAL INTENSITY	4	27
NONVISUALIZATION	0	16
DISCONTINUITY	0	2

## CONCLUSION

In this study, male patient with knee injury was two times more likely to have torn ACL. Most common location of tear is Midsubstance of the ACL.

Primary findings of ACL tears are visualized in almost all complete tears. MRI showed associated ligament and other meniscal injuries, which helped in early surgical reconstruction of ACL. Most common associated injury is medial meniscus tear in our study. So pre arthroscopic MRI helped in planning the surgery in a considerable number of patients in our study. Anterior translation of tibia and bone contusion were the most useful secondary signs in predicting ACL status.

Finally we conclude that High resolution MR imaging is very much accurate for the detection of complete ACL tears along with arthroscopic correlation and is therefore an ideal for preoperative imaging.

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