

A Study on Anterior Cruciate Ligament Tear

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Abstract—This paper describes issues concerning tears in the Anterior Cruciate Ligament (ACL). The knee is the largest and most complex joint in the human body. The principal intra-articular structures in the knee are two menisci, two cruciate ligaments (anterior and posterior), and two collateral ligaments. The Anterior Cruciate Ligament is attached anteriorly to the non-articulating portion of upper tibial surface and is in front of the intercondylar eminence, located at anterior attachment of the lateral meniscus. It is directed upward and backward to attach itself to the posterior surface of the inner aspect of the femur. It is invested by Synovium. The function of ACL is to prevent hyperextension and rotation of tibia over femur. Furthermore, it restrains anterior displacement of Tibia over Femur. Tears in ACL can be detected clinically by Anterior Drawer Sign, Lachman's test, Pivot shift test and also by MRI.

Keywords: Knee, Anterior Cruciate Ligament, Posterior Cruciate Ligament, Medial Meniscus Tear, Lateral Meniscus.

MATERIALS AND METHODS

In the summer of 2017, I interned at the Trauma Centre in Banaras Hindu University. In the internship, I witnessed a total of 30 ACL cases. The initial process of this study was carried out by interacting with specialized doctors working in this field as well as many patients. I researched under the guidance of Dr. Saurabh Singh, Associate Professor, Orthopaedic Surgery at Sir Sundarlal Hospital, Banaras Hindu University.

Data was collected from MRI centre after consent from patients under treatment at BHU Trauma Centre. All the data collected was analysed statistically and conclusion was drawn which is discussed in the paper.

INTRODUCTION

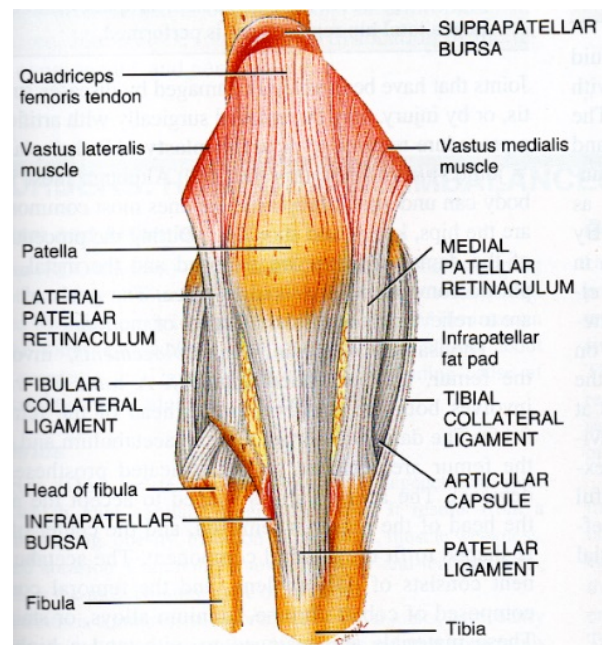
The Anterior Cruciate Ligament provides 90% stability to the knee joint. Injuries to this ligament are excessively common among active individuals, namely those engaged in professional sports. However, a new trend has been brought to light in the recent years.

Tears of this ligament are seen in rural India as well. Their prevalence has surged in this past decade due to better reporting of the cases. Yet most cases go unreported due to a lack of awareness.

ACL tears are detected with the help of arthroscopy.

Arthroscopic examination is a procedure in which the surgeon makes a small incision through which a lens is inserted whose lighting system helps to view and magnify structures inside the joint.

Since this is an invasive procedure, Magnetic Resonance Imaging (MRI) is also used and has become a popular method among orthopedicians.



Derrickson, Bryan, and Gerard Tortora. Wiley's Principles of Anatomy and Physiology 11th Edition. Page 283, Figure 9.15 (a)

DISCUSSION

The Anterior Cruciate Ligament injury is caused by sudden slow down and changing direction, pivoting with foot firmly planted. Receiving direct blow to knee or collision such as football tackle.

- A. ACL tear symptoms are pain, popping sensation in knee, feeling of giving way with weight bearing.
- B. ACL tear is commonly associated with meniscal injuries.
- C. ACL repair is mostly done by Arthroscopy using Tendon Graft (most commonly hamstring tendon).

CASE RECORDS OF CRUCIATE LIGAMENT INJURY

CASE NO	AGE	SEX	MRI FINDINGS
1	41	M	Complete ACL Tear
2	35	F	Not Tear
3	21	M	Complete ACL Tear
4	25	M	Complete ACL Tear
5	36	M	Complete ACL Tear
6	36	M	Complete ACL Tear
7	40	M	Complete ACL Tear
8	40	M	Complete ACL Tear
9	47	M	Complete ACL Tear
10	28	M	Partial Thickness Tear Of ACL
11	28	M	Complete ACL Tear
12	18	M	Complete ACL Tear
13	18	F	Complete ACL Tear
14	45	M	Not Tear
15	21	M	Complete ACL Tear
16	43	M	Complete ACL Tear
17	34	M	Complete ACL Tear
18	20	M	Complete ACL Tear
19	32	M	Complete ACL Tear
20	17	M	Complete ACL Tear
21	28	M	Complete ACL Tear
22	25	M	Complete ACL Tear
23	19	M	Complete ACL Tear
24	42	M	Complete ACL Tear
25	22	M	Complete ACL Tear
26	27	M	Complete ACL Tear
27	30	M	Complete ACL Tear
28	18	M	Partial Thickness ACL Tear
29	15	M	Complete ACL Tear
30	15	M	Complete ACL Tear

CASE RECORDS OF MENISCUS INJURY

CASE NO	AGE	SEX	MRI FINDINGS
1	41	M	No Tear
2	35	F	Grade 2 Linear Horizontal Tear of Medial Meniscus Body
3	21	M	No Tear
4	25	M	No Tear
5	36	M	No Tear
6	40	M	No Tear
7	40	M	No Tear
8	47	M	Tear of Posterior Horn of Medial Meniscus

9	28	M	Grade 3 Tear of Body and Posterior Horn of Medial Meniscus
10	28	M	No Tear
11	18	M	Grade 2 Tear of Body and Posterior Horn of Medial Meniscus
12	18	M	No Tear
13	45	F	No Tear
14	21	M	No Tear
15	34	M	Grade 2 Tear of Posterior Horn of Medial Meniscus
16	20	M	No Tear
17	43	M	Oblique Tear of Posterior Horn of Lateral Meniscus
18	34	M	Grade 3 Tear of Body and Posterior Horn of Medial Meniscus
19	20	M	No Tear
20	32	M	No Tear
21	17	M	No Tear
22	28	M	Grade 4 Tear at Body and Posterior Horn of Lateral Meniscus Grade 2 Tear of Posterior Horn of Medial Meniscus
23	19	M	Grade 4 Tear at Body and Posterior Horn of Lateral Meniscus Grade 2 Tear of Posterior Horn of Medial Meniscus
24	42	M	No Tear
25	22	M	No Tear
26	27	M	Grade 2 Tear of Posterior Horn of Medial Meniscus
27	30	M	No Tear
29	45	M	No Tear
30	15	M	Grade 3 Tear of Body of Medial Meniscus

TOTAL NUMBER OF PATIENTS	AGE GROUP	MEAN AGE
30	15-47	29.87

SEX	NO OF PATIENTS	PERCENTAGE
M	28	93.33
F	2	6.66
TOTAL	30	100

DIAGNOSTIC VALUE OF MRI

a.

All values in Percentage

MRI Diagnostic	Sensitivity	Specificity	Predictive Value	
			Positive	Negative
ACL Tear	95.2	42.2	74.1	66.7

b.

All values in Percentage

MRI Diagnostic	Sensitivity	Specificity	Predictive Value	
			Positive	Negative
Medial Meniscus Tear	87.5	85.1	63.6	95.8
Lateral Meniscus Tear	100	96.4	60	100

c.

All values in Percentage

MRI Diagnostic	Accuracy
Cruciate Ligament Injury	73.3
Meniscal Injury	85.71

IMPORTANT FACTS OBSERVED DURING STUDY

- In Twenty patients with complete Anterior Cruciate Ligament Tear on MRI, Arthroscopic finding is congruence.
- Five patients who were reported with complete Anterior Cruciate Ligament Tear on MRI had partial tear on Arthroscopy suggested by laxity during probing.
- One patient who had normal Anterior Cruciate Ligament Tear on MRI had complete tear on Arthroscopy.
- One patient who had diagnosed normal Anterior Cruciate Ligament had partial tear on Arthroscopy.
- In Four patients with grade 2 tear of body and posterior horn of Meniscus, no tear was found in Arthroscopy.
- The MRI finding of all cases of grade 3 and 4 Meniscal Tear were in congruence in Arthroscopic finding.
- Eighteen patients with Normal Meniscal finding on MRI, Arthroscopy could not detect any tear (i.e. MRI has high Negative Predictive Value for Meniscal Injuries).

CONCLUSION

Anterior cruciate ligament is an important dynamic stabilizer of the knee joint. It is injured commonly in contact sports like football and basketball and also road traffic accidents, the common mechanism being torsion of knee over fixed ankle.

History and clinical examination is the cornerstone for making a diagnosis of anterior cruciate ligament tears. MRI is used as an adjunct to confirm the diagnosis and to look for associated soft tissue injuries.

In my study the MRI has a high sensitivity but low specificity (95% and 42% respectively) in regard to ACL injuries, but have shown higher sensitivity and specificity (about 87 % and 85% respectively) for meniscal injuries

Arthroscopy is the preferred method for both confirmation of diagnosis as well as repair and reconstruction of ligaments and associated structures like menisci.

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