

MRI EVALUATION OF PATTERN OF ANTEROLATERAL LIGAMENT AND POSTEROLATERAL CORNER INJURY ASSOCIATED WITH ANTERIOR CRUCIATE LIGAMENT TEAR WITH IT'S CLINICAL CORRELATION.

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Abstract: *Background: Understanding the RELATION between anterior cruciate ligament and postero lateral corner TRAUMA with antero-lateral ligament of knee with it's clinical diagnosis would help us better understand the pattern of injury and to take proper treatment action .Objectives :To find the correlation between pattern of injury of anterolateralligament , anterior cruciate ligament and posterolateral corner injury on MRI with it's clinical correlation and associated findings. Methodology: A cross-sectional study will be done at Acharya Vinoba Bhave Rural Hospital, Sawangi, involving52 patients who present with knee trauma for MRI. The sample will be selected and involvement of Anterior cruciate ligament ,postero lateral corner injury and antero-lateral ligament with associated findings will be evaluated using T1, T2 and PD MRI sequences. These will be compared and there association will be calculated which can be used for better planning of treatment. Results: After appropriate statistical analysis, we expect to find association between anterolateral ligament and anterior cruciate ligament tear with posterolateral corner injury and this will be considered for reconstruction. Conclusion: In this observational study, we expect associations between injured ligaments with aid of clinical findings . We also expect to find a positive association between anterolateral ligament with posterolateral corner injury and anterior cruciate ligament tear.*

Keywords: *MRI , anterolateral ligament , posterolateral corner injury ,anterior cruciate ligament.*

Introduction:

Lateral corner of the knee is stabilized mainly by posterolateral corner complex, anterior cruciate ligament and in recent studies another structure that was found to be contributing to

the stability of lateral aspect of knee is antero lateral ligament. In early 80's Paulsgond identified avulsion fracture of proximo-lateral tibia, but role of anterolateral ligament was not mentioned anywhere. Later on Class et al concluded that anterolateral ligament was attached to the exact location mentioned in second fracture⁽¹⁾ regarding the relationship between anterior cruciate ligament, posterolateral corner injury and anterolateral ligament injury, from surgical point of view following points were found to be of importance (a) insufficiency of posterolateral corner structures result in persistent knee instability and increased load on the grafts used for the cruciate ligament reconstruction⁽²⁾ (b) despite reconstructing the ACL rupture completely some instability still persisted, which on studies was found that better stability was possible when anterolateral ligament was also reconstructed simultaneously. Current evidences show that anterolateral ligament function mainly as an important internal rotatory stabilizer of knee between 30 to 90 degrees of flexion.⁽³⁾ Lateral corner is a complicated structure which plays an important role in resisting varus angulation and to prevent anterior and posterior translation during early phase of flexion that is from 0 to 30 degree.^(4,5) So, for obtaining complete stability of the knee anterolateral ligament repair must be done with anterior cruciate ligament and posterolateral corner injuries

Background/rationale: By studying the pattern of the posterolateral corner injury with ACL tear and its incidence and characterisation with anterolateral ligament, the association of these structure can be studied on basis of MRI findings with aid of clinical diagnosis. If a significant association is present between these injuries on radiology and there clinical diagnosis, the outcome of knee reconstruction following anterior cruciate ligament tear with posterolateral corner injury can be improved when anterolateral ligament tear is also repaired.

Objectives:

- 1) To find relationship between anterior cruciate ligament tear and anterolateral ligament injury.
- 2) To find relationship between posterolateral corner injury and anterolateral ligament injury.
- 3) To evaluate pattern of posterolateral corner injury (grade and ligaments involved) and its association with lateral meniscal tear, bony contusions, fracture, synovial effusion.
- 4) To correlate the clinical findings with radiological findings.

Methods:

Study design: Cross-sectional study

Setting: Jawaharlal Nehru Medical College, Sawangi.

Source of Data: Patients from Acharya Vinoba Bhave Rural Hospital, Sawangi attached to Datta Meghe Institute Of Medical Science. The patients are taken from both IPD and OPD basis.

Participants:

INCLUSION CRITERIA

- 1) Patients clinically diagnosed with anterior cruciate ligament injury
- 2) Patients clinically diagnosed with posterolateral corner injury

- 3) Patients having anterior cruciate ligament injury on MRI
- 4) Patients having posterolateral corner injury on MRI
- 5) Patients having anterolateral ligament injury on MRI

EXCLUSION CRITERIA

- 1) Patients not having anterior cruciate ligament injury on MRI
- 2) Patients not having posterolateral corner injury on MRI.

Bias: Intra-observer variability will be minimized by taking the average of 3 readings of each dimension.

Study size: 51 patients with posterolateral corner injury associated with anterior cruciate ligament injury referred to Acharya Vinoba Bhave Rural Hospital, Sawangi (Meghe) will be included

Formula for sample size calculation

$$N = \frac{\chi^2 * N * p(1-p)}{C^2(N-1) + \chi^2 p(1-p)}$$

Total population = N=60 patients of ACL with PLC during 2 years in Radiology Department

$\chi^2 =$ Chi square value for 1 degrees at some desired probability level. This is 3.84 at 5% level of significance.

P=50% proportion

Q=100-p

=50

C= Confidence interval of the one choice(95% CI)

=0.05

N=3.84*60*0.5*0.5

$(0.05)^2 * 59 + 3.84 * (0.5 * 0.5)$

=51

Total sample needed in the study will be 51

Research Methodology:

MRI will be performed on GE Brivo MR 355, 1.5 T scanner using a standard knee coil, after patients have been diagnosed clinically for the injury, by positioning the knee in the knee coil and immobilising it with cushions and center the laser beam localiser over the lower border of patella.

Scanning protocol for obtaining axial, sagittal, coronal planes includes as follow:

	FOV	THICKNESS	TR	TE	FREQUENCY	PHASE	NEX
Sag T2	22	3 mm	4500	110	320	256	3
Sag T1	22	3 mm	500	Min.	320	256	3

Sag PD	22	3 mm	4000	47.2	320	288	2
STIR	22	3mm	5800	32.0	320	224	2
COR T2	22	3mm	4500	102	320	256	2
COR PD	22	3mm	4000	42	320	288	2
COR T2 * CART	22	3 mm	683	-	288	160	2
SAG T2 FSE ACL (thin)	22	1.5	4000	110	320	288	2

Expected Outcomes/Results:

Participants: patients will be examined with clinical tests first that is anterior drawer test , dial test, followed by MRI evaluation and patients having both anterior cruciate ligament tear and postero-lateral corner injury on MRI will be taken into study.

Descriptive data: participants irrespective of age group and gender will be taken into account.

Outcome data: proper analytical method will be used to calculate the outcome.

Discussion:

Despite repairing ACL, complete stability is not obtained. for complete stabilisation of knee, posterolateral corner repair with anterolateral ligament repair must be done. hence, early diagnosis is must.

clinical picture in knee injury cases is - the knee is a complex structure; its clinical evaluation requires detailed history of symptoms, mechanism of injury and local examination.

symptoms: commonly patients present with pain, local swelling and mechanical symptoms.
 pain: knee joint pain is most common symptom with as many as 54% of athletes and 20% of adults with arthritis will have some degree of pain. rapid onset of pain is usually of traumatic origin whereas arthritic patients will complain of insidious onset of dull aching pain. identification of point of tenderness helps in localization of pain to a specific affected structure as --- a) in lesions of medial collateral ligament tenderness is characteristically present at its femoral attachment. b) sprain of deep fibers of the medial collateral ligament and injury to the medial semilunar ligament cartilage is suspected when there is tenderness at the attachment of ligament without any tenderness at its bony attachment. c) injury to anterior horn of medial meniscus is suspected when there is tenderness mid way between ligamentum patellae and medial collateral ligament . d) tear in posterior horn of medial meniscus is suspected when there is tenderness posterior to tibial collateral ligament

local swelling: commonly joint swelling is due to the effusion. rapid onset of tense swelling indicated injury to acl or tibial plateau fracture associated with hemarthrosis , whereas late onset (24 to 36 hours) e effusion is suggestive of meniscal injury or sprain. in meniscal injury recurrent effusion is seen .

mechanical symptoms: a) intermediate locking of knee while walking suggests meniscal injury. b) a popping sensation at the time of injury suggests ligamentous injury, mostly

complete rupture of ligament (third degree tear). c) episodes of giving way are consistent with some degree of knee instability and may indicate patellar subluxation or ligamentous rupture.

Mechanism of injury: details about mechanism of injury give clue about severity of injury and structure possibly affected. a direct blow to the knee can cause severe injury. anterior force applied to the proximal tibia with knee in flexion can cause injury to the posterior cruciate ligament (e.g. when the knee hits the dashboard in an automobile accident). the medial collateral ligament injury is seen when there is a direct lateral force and a direct medial blow to the knee that creates a varus load leading to injury of lateral collateral ligament. deceleration forces can cause sprain or rupture anterior cruciate ligament. hyperextension leads to injury of cruciate ligaments. sudden twisting or pivoting motions can injure the meniscus. multiple injuries are common with combination of forces. medical history: patient may have history of previous knee injuries, surgery or any of medical diseases of knee joint as gout, pseudo gout, and rheumatoid arthritis.

Trauma to meniscus –

Injury to meniscus occurs commonly in sports, as in footballers and in coal miners. medial meniscus is more commonly damaged than lateral. young physically active males are more commonly affected by injury to meniscus usually due to single traumatic event. menisci are damaged when there is rotation of tibia on femur in flexed knee .medial rotation of knee causes injury to medial meniscus and lateral rotation of knee causes injury to lateral meniscus. these traumatized menisci are prone to re-tear during repair phase with minor trauma. grossly tear pattern in meniscus following trauma is in vertical plane and may be longitudinal, flap or radial type. trauma to ligaments --- the type of injury and position of the knee joint with respect to the body as whole at the time of injury determines the ligament/s injured. an trauma over lateral side of the knee during weight bearing will stress the medial collateral ligament. if only few fibres are torn due to weak force it is known as simple sprain . When the trauma is severe, it will cause rupture of whole of ligament . an injury over medial side of knee causes injury to the lateral collateral ligament but is rare . pcl injury ois seen when a backward thrust is given over anterior aspect of tibia with flexed knee such as in dash board injury. injury to the acl is rare and most often occur with forced valgus and external rotation but also can occur with external rotation with hyperextension, internal rotation with extension and forward displacement of the tibia. up to 70% of patients have other intraarticular injuries, most often the mcl and/or the posterior-medial meniscus (o'donoghue's triad). Related articles were reported ^{6,7,8}.

Accordingly grading of ligament and meniscus tear is done , based on location and degree of involvement of fibres using MRI axial , sagittal and coronal sections with t1wi, t2wi and pd fat saturation imaging.

Limitations:

No clinical test is considered for assessment of antero lateral ligament injury ,so diagnosis is based completely on MRI.

Interpretation:

The association between ACL , posterolateral corner and anterolateral ligament will be studied and its effect on better surgical planning during knee reconstruction will considered.

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