Section: Orthopaedics

Original Research Article

# A COMPARATIVE STUDY OF CONCOMITANT MEDIAL AND LATERAL MENISCAL INJURIES IN PATIENTS WITH ANTERIOR CRUCIATE LIGAMENT (ACL) INJURIES

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**ABSTRACT**

**Background:** Anterior cruciate ligament (ACL) is the major stabilizer of the knee. ACL injuries are frequently associated with meniscal injuries. Aim of this study is to compare the concomitant medial and lateral meniscal injuries in patients with anterior cruciate ligament (ACL) injuries.

**Materials and Methods**: A hospital based cross-sectional study conducted with 70 individuals aged 19 to 50 who had ACL injuries. Clinical examinations were performed to identify ACL and other soft tissue injuries of the knee joint, and positive results were further assessed and confirmed by MRI.

**Results**: 64.29% cases of ACL injury were associated with other concomitant soft tissue injuries. Medial meniscal injuries were the most frequent concurrent injury, occurring in 45.71% of cases, while lateral meniscus injuries were the second most prevalent, occurring in 37.14% of instances. It has been determined that there is a statistically significant correlation between the duration of time since trauma and the prevalence of medial meniscus injury. Concomitant injuries were shown to be statistically significantly associated with older age groups and patients who reported later after trauma.

**Conclusions**: Prevalence of concomitant injuries more in patients who presented late after trauma. Prevalence of concomitant medial meniscus injury increases with increasing duration since trauma. However lateral meniscus injury most commonly seen in acute cases.

**Key words:** ACL, meniscus, trauma, age.

## INTRODUCTION

The anterior cruciate ligament (ACL) is the primary stabilizer of the knee joint [1] and it is also constantly injured.[2] ACL injury commonly associated with damage to the menisci, other ligaments, articular cartilage, and subchondral bone.[3] The meniscus is the secondary stabilizer in the anterior-posterior direction and it becomes the main stabilizer of the knee joint when there is chronic ACL tear or loss of ACL function.[4]

It is estimated that almost every second or third ACL injury goes with additional meniscus injury.[6,7,8] In acute cases lateral meniscus is most frequently injured, while chronic lesions are connected most often with medial meniscus. Preservation of the meniscal tissue and function is paramount for long-term joint function.[6,7,8]

There are very few institutional studies in India which take into account the prevalence and distribution of the injuries associated to rupture of ACL. Aim of this study is to compare concomitant medial and lateral meniscal injuries in ACL injured patients with respect to age, sex and duration since injury.

## MATERIAL AND METHODS

A hospital based cross-sectional study conducted with 70 individuals aged 19 to 50 who had ACL injuries. After obtaining written informed consent from each patient and approval from Institutional Ethics Committee (H) approval, Assam Medical College & Hospital, Dibrugarh, Patients aged 19 to 50 years who had a history of knee joint trauma and were identified with an ACL tear clinically and radiologically, and who presented within a year of the incident, were included in the study. The study excluded patients with congenital malformations of the afflicted limb, hyperlaxity syndromes, concomitant ipsilateral limb fractures, and those who did not provide informed consent. The patient's major complaints, manner of injury, past medical history, comorbidities, and congenital anomalies were all thoroughly documented in the clinical history.

ACL injuries were identified using the Lachman test (Fig. 1), the Anterior drawer test (Fig. 2), and the Pivot Shift test. Meniscal injuries were identified using the Joint line tenderness test (Fig 3), the Apley grinding test (Fig.4) and the Mcmurray test (Fig. 5&6). Valgus stress test for the MCL, the Varus stress test for the LCL. Sag sign, the posterior drawer test, and the quadriceps active test for the PCL. To identify posterolateral corner injuries, three tests were used: the reverse pivot shift test, the dial test, and the external rotation recurvatum test.

**Figure 1: Lachman test**

**Figure 2: Anterior drawer twest test**

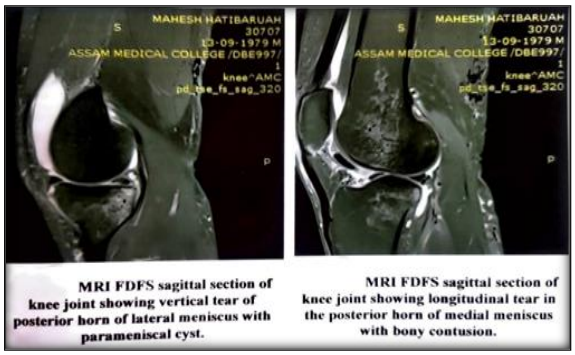
**Figure 3: Joint line tenderness**

**Figure 4: Apley grinding test**

**Figure 5: Mcmurray test (medial meniscus)**

**Figure 6: Mcmurray test (lateral meniscus)**

Every patient whose ACL injury was clinically identified had MRI and XRAY radiographic assessment.




MRI FDFS sagittal section of knee joint showing vertical tear of posterior horn of lateral meniscus with parameniscal cyst.

MRI FDFS sagittal section of knee joint showing longitudinal tear in the posterior horn of medial meniscus with bony contusion.

The x-ray revealed the following elements to be present: Notch
width index, any related fractures, bone bruising, and osteochondral or Segond fractures.

The Siemens Magnetom Avanto Fit A Tim+ Dot 1.5 Tesla Whole Body Magnetic Resonance Imaging System was utilized for magnetic resonance imaging (MRI) to confirm the diagnosis of an ACL tear and identify any related ailments near the knee joint.

**Statistical Analysis**

Microsoft Excel 2010 and the statistical software package Statistical Package for Social Sciences (SPSS for Windows, version 20.0. Chicago, SPSS Inc.) were used to analyse the data statistically. The Student's t-Test was used to compare the mean ± standard deviation of continuous measurement results. Fischer's exact test and the Chi square test were used to evaluate the discrete data, which were expressed as numbers (%) in cases where the cell counts were zero or less than five. The statistical significance was fixed at the 5% level (p value <0.05) for all analyses.

## RESULTS

The mean age was 29.10 +/- 7.72 years. It was discovered that the age group of 19 to 30 years old had the highest prevalence of ACL injuries, accounting for 39 cases [55.71%]. ACL damage was discovered to be more prevalent in women, who account for 55.71% of cases. The majority of instances (44.29%) showed up within 30 days after the accident, followed by 27 cases (38.57%) that showed up between 30 and 180 days, and 12 cases (17.14%) that showed up between 180 days and one year. [Table 1]

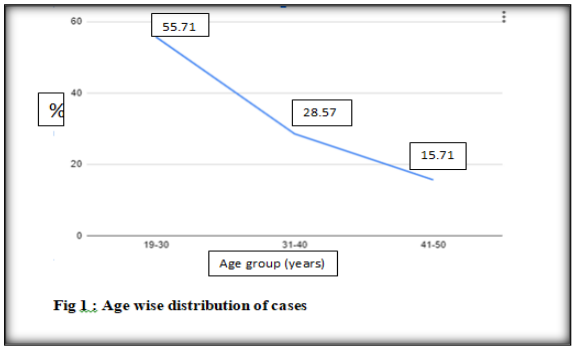



Fig 1.: Age wise distribution of cases

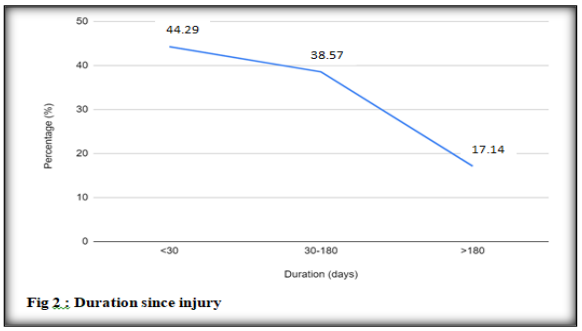



Fig 2.: Duration since injury

In our study, sports-related injuries accounted for 71.43% of ACL injuries, with traffic accidents coming in second with 15.71% of cases. Sports-related ACL injuries were primarily caused by non-contact mechanisms, accounting for 64% of cases. There were 64.29 cases of ACL injury associated with other concomitant soft tissue injuries.

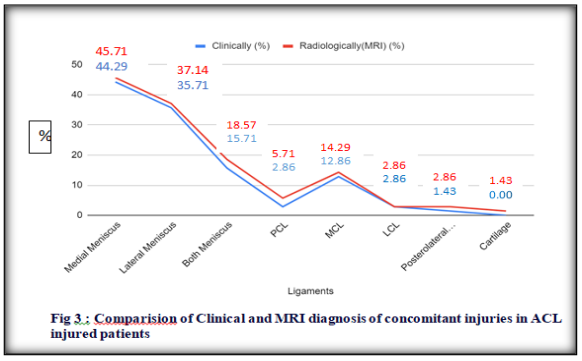



Fig 3.: Comparision of Clinical and MRI diagnosis of concomitant injuries in ACL injured patients

Concomitant injuries were more common in higher age groups and this association was shown to be statistically significant (p = 0.0264). In the age category of 41-50 years, 10 out of 11 patients, or 90.91% of the total, experienced a concomitant injury. Males experienced concomitant injuries more frequently, although this relationship was not determined to be statistically significant (p=0.5905). Patients who presented after trauma were more likely to have concomitant injuries, and this association was determined to be statistically significant (p = 0.0461). In 22.58% of cases that presented within 30 days, 55.56% of cases that presented during 30-180 days, and 83.33% of cases that presented later than 180 days, medial meniscus injuries were present. Prevalence of medial meniscus injury increases with increasing duration since trauma, and this correlation was shown to be statistically significant (p=0.0006). Relation between the length of time since trauma and the concomitant medial meniscus injury was shown to be statistically significant (p=0.0006). Lateral meniscus injuries does not tend to increase with increasing duration since trauma like medial meniscus injuries. Lateral meniscus injuries were present in 38.71% cases presented within 30 days, 37.04% cases presented between 30-180 days and in 33.33% cases presented after 180 days. Between the frequency of lateral meniscal tears and the amount

of time following trauma, there was no statistically significant difference detected. It was shown that the most frequent concurrent injury in acute cases that appeared before 30 days was lateral meniscus tear.

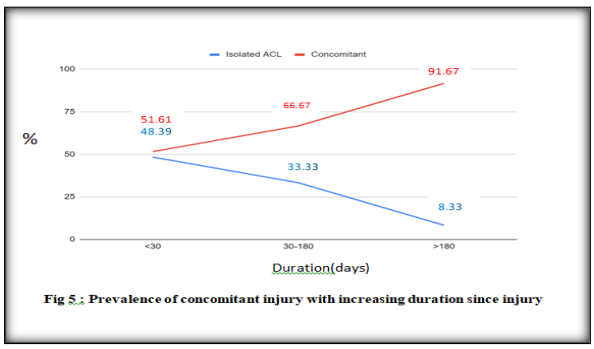



Fig 5 : Prevalence of concomitant injury with increasing duration since injury

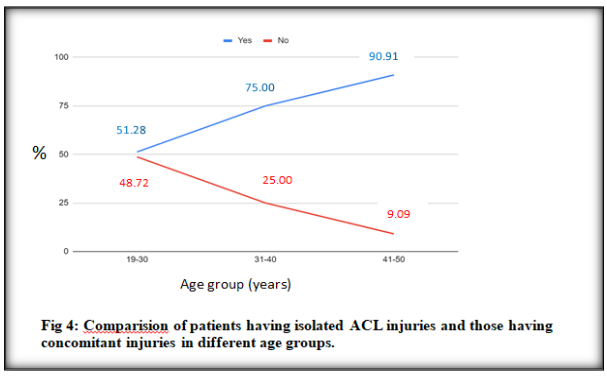



Fig 4: Comparision of patients having isolated ACL injuries and those having concomitant injuries in different age groups.

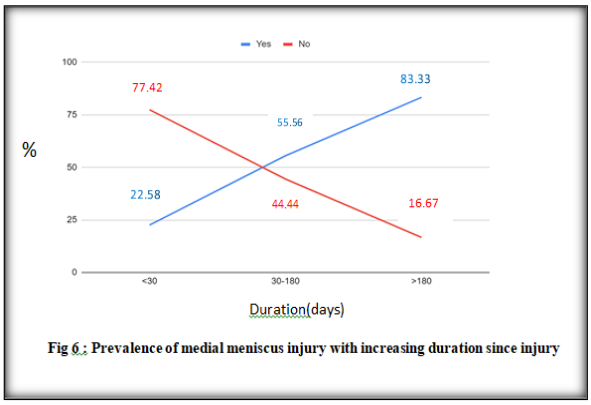



Fig 6 : Prevalence of medial meniscus injury with increasing duration since injury

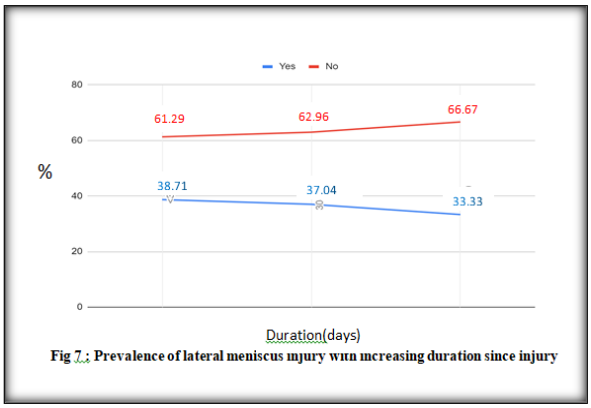



Fig 7 : Prevalence of lateral meniscus injury with increasing duration since injury

**Table 1: Age distribution**

| Age group ( years ) | Number | Percentage (%) |
|---|---|---|
| 19-30 | 39 | 55.71 |
| 31-40 | 20 | 28.57 |
| 41-50 | 11 | 15.71 |
| Total | 70 | 100.00 |
| Mean ± SD | 29.10 ± 7.72 years | |

**Table 2: Duration since injury**

| Duration (days) | Number | Percentage (%) |
|---|---|---|
| <30 | 31 | 44.29 |
| 30-180 | 27 | 38.57 |
| >180 | 12 | 17.14 |
| Total | 70 | 100.00 |
| Mean ± SD | 85.10 ± 89.26 days | |

**Table 3: Clinical and Radiological Diagnosis of Concomitant Injuries in ACL Injured Patients**

| Ligaments | Clinically | | Radiologically(MRI) | |
|---|---|---|---|---|
| | n | % | n | % |
| **Medial Meniscus** | 31 | 44.29 | 32 | 45.71 |
| **Lateral Meniscus** | 25 | 35.71 | 26 | 37.14 |
| **Both Meniscus** | 11 | 15.71 | 13 | 18.57 |
| **PCL** | 2 | 2.86 | 4 | 5.71 |
| **MCL** | 9 | 12.86 | 10 | 14.29 |
| **LCL** | 2 | 2.86 | 2 | 2.86 |
| **Posterolateral Corner** | 1 | 1.43 | 2 | 2.86 |
| **Cartilage** | 0 | 0 | 1 | 1.43 |

**Table 4: Association of concomitant injury in different age groups**

| Age group (Years) | Number (n) | ACL rupture with concomitant injury | | | | P value |
|---|---|---|---|---|---|---|
| | | Yes | | No | | |
| | | n | % | n | % | |
| 19-30 | 39 | 20 | 51.28 | 19 | 48.72 | |
| 31-40 | 20 | 15 | 75.00 | 5 | 25.00 | 0.0264 |
| 41-50 | 11 | 10 | 90.91 | 1 | 9.09 | |

**Table 5: Relation of duration since injury and prevalence of concomitant injury**

| Duration (days) | Number (n) | Isolated ACL | | Concomitant | | P value |
|---|---|---|---|---|---|---|
| | | n | % | n | % | |
| <30 | 31 | 15 | 48.39 | 16 | 51.61 | 0.0461 |
| 30-180 | 27 | 9 | 33.33 | 18 | 6.67 | |
| >180 | 12 | 1 | 8.33 | 11 | 91.67 | |

**Table 6: Association of medial meniscus tear with duration since injury**

| Duration (days) | Number (n) | Medial meniscus | | | | P value |
|---|---|---|---|---|---|---|
| | | Yes | | No | | |
| | | n | % | n | % | |
| <30 | 31 | 7 | 22.58 | 24 | 77.42 | 0.0006 |
| 30-180 | 27 | 15 | 55.56 | 12 | 44.44 | |
| >180 | 12 | 10 | 83.33 | 2 | 16.67 | |

**Table 7: Association of lateral meniscus tear with duration since injury**

| Duration (days) | Number (n) | Lateral meniscus | | | | P value |
|---|---|---|---|---|---|---|
| | | Yes | | No | | |
| | | n | % | n | % | |
| <30 | 31 | 12 | 38.71 | 19 | 61.29 | 0.9477 |
| 30-180 | 27 | 10 | 37.04 | 17 | 62.96 | |
| >180 | 12 | 4 | 38.71 | 8 | 66.67 | |

## DISCUSSION

The study was aimed to identify the concomitant soft tissue injuries with rupture of ACL and also to compare concomitant medial and lateral meniscal injuries in ACL injured patients with respect to age, sex and duration since injury.

Females were more in proportion in our study, probably because of variations in anatomy, hormones, biomechanics, and neuromuscular function.[9]

The most common mode of ACL injury in our study was observed to be due to sports (71.43%) followed by RTA (15.71%).Sports injuries most frequently resulted from noncontact mechanisms, such as landing, jumping, or sudden direction changes, accounting for 32 cases [64%], while contact mechanisms accounted for 18 cases [36%]. Biomechanical errors and inadequate neuromuscular control are the causes of non-contact injuries. The findings of our investigation align with those of studies carried out by Alsubaie et al,[7] D Schilaty et al,[8, 9,10] al, Millett et al, and Salem et al.[10,11,12]

All case in our study were confirmed to have an ACL tear in MRI with most patients (67.14%) having a complete tear. Patients in whom complete ACL tears are suspected may be referred more frequently for MRI than those with more stable partial tears which can also be missed clinically, thus biasing the imaged population.[13,14,15,16,17]

In our study, 43 patients [61.43%] had concomitant injuries associated with ACL. Results of our study are similar with the study conducted by Figueiredo et al , Tayebet al , Musahl,[13] et al.

The risk of concurrent ACL injuries increases with age. It is most likely due to the degenerative pathophysiology of osteoarthritis, meniscal lesions, and cartilage, which forces the body to adjust over time to abnormal mechanical stress. Additionally, aged people are more likely to sustain soft tissue injuries after trauma. The most common concomitant injury was medial meniscus tear (45.71%) followed by lateral meniscus injury (37.14%). 18.57% cases suffered both the meniscal injury. Our study's findings were comparable to those of research projects by **Figueiredo** et al.[14] and Ristic et al.[5]

The findings demonstrated that the percentage of intact medial meniscus decrease with time. Following a rupture of the ACL, the primary stabilizing ligament in the knee, redistribution of stresses overloads other joint components, resulting in direct physical contact between the meniscus and femoral condyles. In the first place, this causes degenerative damage to the articular cartilage and menisci. Whereas medial meniscus tears are more common when there is a longer recovery period from an ACL rupture, lateral meniscal tears occur more acutely and in a short period of time after the injury.

These findings may be explained by the location and anatomical features of the menisci, the connection between the medial and lateral meniscus and the anterior cruciate ligament, or other meniscus lesion processes. Our study's findings were similar with those of Mansori,[18,8,16] et al, Ristic et al, Hagino et al, Dumont et al, and Millett et al. However, our findings differ with the research by Michalitsis et al,[15] which found that the length of time since the injury did not significantly affect the likelihood of a meniscal lesion.

Limitation of our study were the small sample size and lack of specific information on injury features, such as the site of injury. The study was cross-sectional, which lends more credibility to the

findings of associations rather than the findings of causal relationships.

## CONCLUSION

Our study indicates that in order to use more suitable therapeutic techniques both before and after the surgery, it is imperative to look into any soft tissue injuries that may be nearby. To avoid the occurrence of secondary concurrent injuries, individuals with ACL injuries should receive treatment and diagnosis as soon as possible. Sportsperson should get education and training sessions should be modified to prevent ACL injuries, as they are more likely to occur. The present study highlights the importance of proper preoperative planning and patient counselling in order to rehabilitate early and effectively. This study will also provide a foundation for future investigations to further our understanding of soft tissue injuries surrounding the knee joint and the significance of prompt care for concurrent injuries in addition to ACL tears for the patient's overall long-term functional result.

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