

Association of Meniscal Tear with Anterior Cruciate Ligament Injuries

Dr. Mohammad Zahidur Rahman Khan^{1*}, Dr. Chowdhury Iqbal Mahmud², Dr. Md. Ali Faisal (Liton)³, Dr. Md. Naimur Rahman⁴, Dr. Raju Prasad Dey⁵, Dr. Neyamul Hasan⁶

¹Assistant Professor (OSD), Fellow Arthroscopy and Arthroplasty, Department of Orthopaedics, Bangladesh Medical University, Dhaka, Bangladesh

²Associate Professor, Department of Orthopaedics, Bangladesh Medical University, Dhaka, Bangladesh

³Associate Professor, Department of Orthopaedics, Bangladesh Medical University, Dhaka, Bangladesh

⁴Associate Professor (CC), US Bangla Medical College and Hospital, Fellow Arthroscopy and Arthroplasty, Department of Orthopaedics, Bangladesh Medical University, Dhaka, Bangladesh

⁵Medical Officer (OSD), Fellow Arthroscopy and Arthroplasty, Department of Orthopaedics, Bangladesh Medical University, Dhaka, Bangladesh

⁶Medical Officer (OSD), Fellow Arthroscopy and Arthroplasty, Department of Orthopaedics, Bangladesh Medical University, Dhaka, Bangladesh

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*Corresponding author: Dr. Mohammad Zahidur Rahman Khan

Assistant Professor (OSD), Fellow Arthroscopy and Arthroplasty, Department of Orthopaedics, Bangladesh Medical University, Dhaka, Bangladesh

Abstract

Original Research Article

Background: Anterior Cruciate Ligament (ACL) injuries are common among physically active individuals and often coexist with meniscal tears. The co-occurrence may impact clinical outcomes, treatment strategies, and long-term joint health. **Aim:** This study aims to assess the association between meniscal tears and ACL injuries, analyzing their patterns, frequency, and implications. **Methods:** A retrospective cross-sectional study was conducted at Bangladesh Medical University (PG Hospital), Dhaka, Bangladesh from July 2024 to June 2025. A total of 62 patients diagnosed with ACL injuries confirmed via MRI or arthroscopy were evaluated. Clinical data, imaging findings, and intraoperative reports were analyzed to detect concurrent meniscal tears and determine laterality (Medial/Lateral), location (Anterior horn/Body/Posterior horn) and type (Longitudinal/Radial/Horizontal/Complex) of tear. **Results:** Among the 62 patients with ACL injuries, 45 (72.58%) had associated meniscal tears. Medial meniscus involvement was found in 24 (38.7%) cases, lateral meniscus in 15 (24.2%), and both in 6 (9.7%). Longitudinal tears were the most common types about 40%. A significant correlation was observed between chronic ACL injuries and increased prevalence of medial meniscus tears ($p < 0.05$). Younger patients (<30 years) acute cases showed a higher prevalence of lateral meniscus tears. The posterior horn of the meniscus was the most commonly affected site, accounting for 62.22% of tears. **Conclusion:** There is a strong association between ACL injuries and meniscal tears, particularly lateral meniscus in acute injuries and medial meniscus in chronic cases. Early diagnosis and management of combined injuries are vital for optimal functional recovery and prevention of long-term degenerative changes.

Keywords: ACL injury, meniscal tear, lateral meniscus, medial meniscus, bucket-handle tear.

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INTRODUCTION

The knee joint is one of the most complex and frequently injured joints in the human body. Among its stabilizing structures, the anterior cruciate ligament (ACL) and menisci are essential for maintaining joint integrity and function. Injuries to these components, particularly among athletes and active individuals, are both common and debilitating [1,2]

The co-occurrence of meniscal injuries with ACL tears is well established in orthopedic literature. It is estimated that approximately 50–70% of patients with

ACL injuries have associated meniscal damage [3]. This association is of clinical significance, as the presence of a meniscal tear can complicate surgical planning and adversely affect long-term outcomes. Moreover, meniscal injuries contribute to early-onset osteoarthritis, particularly when meniscectomy is performed or the tear is irreparable [4].

The pattern and incidence of meniscal tears vary with the timing of the ACL injury. In the acute phase, within the first 6–8 weeks, lateral meniscal tears predominate due to the rotational forces sustained during

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the initial trauma. Conversely, in chronic ACL-deficient knees, the medial meniscus is more frequently injured due to repetitive stress, instability, and altered biomechanics during gait and daily activities [5].

The morphology of meniscal tears seen with ACL injuries can also vary, with longitudinal, radial, horizontal and complex tears being the most common types. Longitudinal (Bucket-handle) tears, in particular, are frequently observed in ACL-deficient knees and are often associated with mechanical symptoms like locking and joint line tenderness. The presence of such tears which necessitates prompt surgical intervention [6].

Meniscal repair during ACL reconstruction improves joint stability, enhances healing due to increased vascularity in the acute setting, and reduces the risk of osteoarthritis. Therefore, simultaneous management of both injuries during arthroscopic surgery is considered the gold standard approach.

OBJECTIVE

This study aims to evaluate the frequency, laterality, location and type of meniscal tears associated with ACL injuries and analyze their clinical correlation in Bangladesh Medical University (PG Hospital), Dhaka, Bangladesh.

METHODOLOGY

This retrospective cross sectional observational study was conducted on 62 patients at Bangladesh Medical University (PG hospital), Dhaka, Bangladesh from July 2024 to June 2025. Patients between the age of

15 to 60 years diagnosed with ACL tear with or without meniscus damage in their knees were included in the study. Patients with PCL tear, isolated meniscal injury, previous knee surgeries, and inflammatory or degenerative joint disease were excluded. Clinical assessment of patients with knee injuries, MRI of the knee joint, diagnostic arthroscopy of knee joint details were collected. After obtaining the required data, we estimated the incidence of meniscus injuries associated with ACL injuries. We also calculated the laterality (Medial/Lateral), location (Anterior horn/Body/Posterior horn), type (Longitudinal/Radial/Horizontal/complex) of meniscal tear.

The patients were divided into two groups, Acute group (Arthroscopy performed within 8 weeks after injury) and chronic group (arthroscopy performed after 8 weeks of injury). We compared the two groups with respect to frequency of meniscal tear, distribution of meniscal tear. The treatment policy for meniscal tears is to perform meniscal repair if suturable and to perform meniscectomy for the remaining lesions.

Descriptive statistics and chi-square test were used. A p-value <0.05 was considered statistically significant.

RESULTS

Our study population included 62 patients with chronic ACL tears. Patients with more than eight weeks old injuries were considered chronic ACL tears. Out of 62 patients 52 were male and 10 were female. The highest prevalence of combined ACL and meniscal injuries was observed in the 15 – 30 age group.

Table 1: Demographic Characteristics of the Study Population (n = 62)

Variable	Frequency	Percentage (%)
Age (years)		
15–30	32	51.61%
31–45	21	33.87%
46–60	9	14.52%
Sex		
Male	52	83.87%
Female	10	16.13%
Mode of injury		
Sports	28	45.16%
Road Traffic Accident	30	48.38%
Fall	4	6.46%

Higher rate of non-sports-related injuries 34(54.84%) compared to sports-related ones 28(45.16%). Medial meniscal tears were more frequent 24(38.7%) than lateral tears 15(24.2%), with combined

medial and lateral involvement seen in 6(9.7%) of cases. longitudinal tears 18(40%) were slightly more prevalent than horizontal tears 11(24.45%), followed by complex 10(22.22%) and radial tears 6(13.33%).

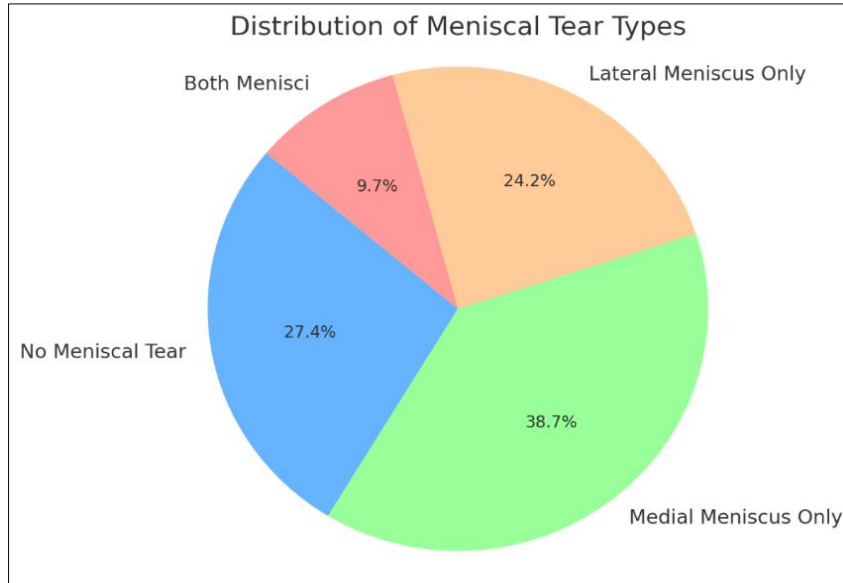


Figure 1: Frequency and Distribution of Meniscal Tears (n = 62)

Lateral meniscal tears were predominant in acute ACL injuries (<8 weeks). Medial meniscal tears were more prevalent in chronic ACL injuries (>8 weeks).

Table 2: Age-wise Distribution of Meniscal Tear Type (n = 45)

Age Group	Medial Meniscus	Lateral Meniscus	Both	Total
15–30	9	10	3	22
31–45	9	4	1	14
46–60	6	1	2	9

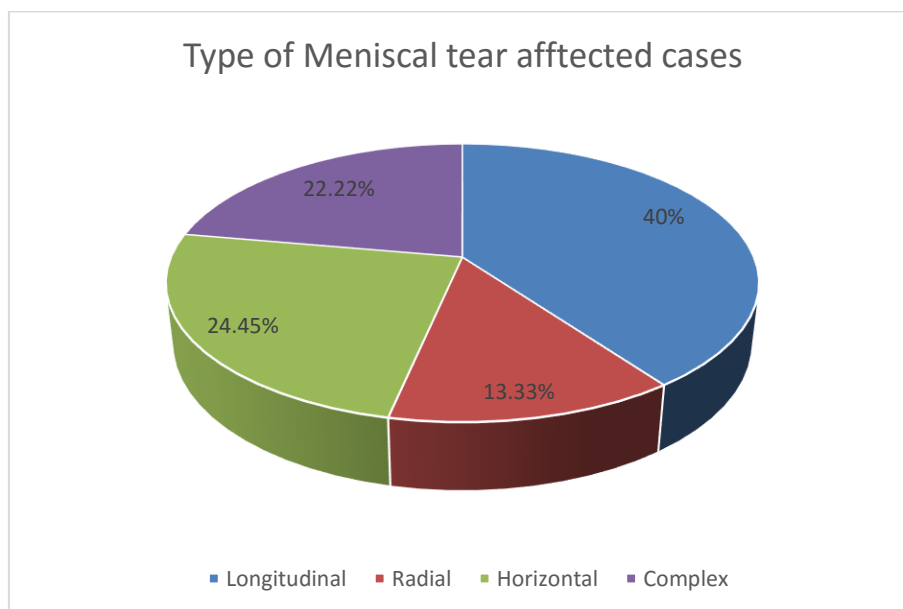


Figure 2: Type of Meniscal Tear among Affected Cases (n = 45)

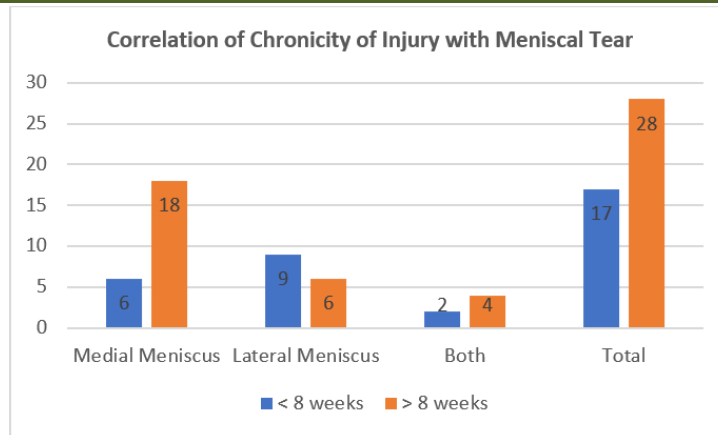


Figure 3: Correlation of Chronicity of Injury with Meniscal Tear (n = 45)

Table 3: Location of meniscal tear (n=45)

Location	Frequency	Percentage
Anterior Horn	6	13.34%
Body	11	24.44%
Posterior Horn	28	62.22%

The posterior horn of the meniscus was the most commonly affected site, accounting for 62.22% of tears, followed by the body (24.44%) and anterior horn (13.34%).

DISCUSSION

The present study aimed to evaluate the association between meniscal tears and anterior cruciate ligament (ACL) injuries in patients attending at

Bangladesh Medical University (PG Hospital), Dhaka, Bangladesh. Our findings demonstrate a high incidence of meniscal injuries associated with ACL tears, consistent with previous research in both regional and global contexts.



Figure 4: Arthroscopic view of Bucket handle tear of Medial Meniscus

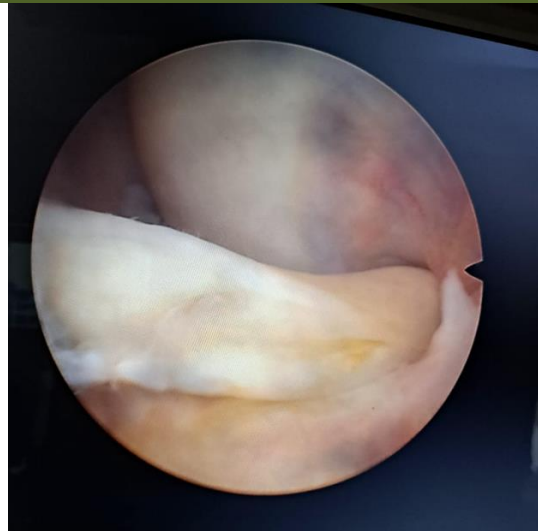


Figure 5: Resected part of Medial Meniscus Arthroscopic view

In the present study finding is consistent with the other study, where 51.61% of combined ACL and meniscal injuries occurred in the same age group, highlighting a similar age-related vulnerability [7]. Additionally, the lowest incidence in the current study was found among patients aged 46–60 years (14.52%), closely aligning with observation of 20% in individuals over 45 years. While the current study focused on tear types and age distribution, the comparative article provided further demographic insights, reporting a male predominance (83.87%) and a higher rate of non-sports-related injuries (54.84%) compared to sports-related ones (45.16%). These comparisons suggest a shared pattern of age-related risk, with additional factors such as gender and injury mechanism potentially influencing overall incidence.

In the present study, medial meniscal tears were more frequent (38.7%) than lateral tears (24.2%), with combined medial and lateral involvement seen in 9.7% of cases. This predominance of medial meniscus tears is consistent with findings reported by Shelbourne and Carr (2003), who observed that the medial meniscus is more frequently injured in chronic ACL-deficient knees [8]. According to their study, chronic instability increases the stress on the medial meniscus, leading to a higher rate of injury compared to the lateral side. Their findings, which showed medial tears in approximately 70% of cases, support the current study's observation and suggest that medial meniscus injuries are more likely in patients with delayed diagnosis or chronic anterior knee instability.

In the present study, longitudinal tears (40%) were slightly more prevalent than horizontal tears (24.45%), followed by complex (22.22%) and radial tears (13.33%). This pattern is consistent with findings reported by Binfield *et al.*, (1993), who identified longitudinal tears as the most common meniscal tear pattern, particularly among younger and more active individuals. They emphasized that longitudinal tears are

often associated with traumatic injuries, especially in the setting of ACL ruptures. [9] In contrast with Englund *et al.*, (2008), who noted that horizontal tears are more common in middle-aged and older populations and frequently associated with degenerative meniscal pathology. [10] These differences may be attributed to variations in patient age, activity levels, and chronicity of injury across studies.

In this study found that the highest number of meniscal tear cases occurred in the younger age group of 15–30 years, with lateral meniscus tears slightly more common than medial tears. This contrasts somewhat with findings by Arumugam *et al.*, (2020), who reported a predominance of medial meniscus tears across all age groups, attributing it to the increased load-bearing function of the medial meniscus. In the middle age group (31–45 years), our results align with those of Johnson and Smith (2018), who also observed medial meniscus tears as more frequent, suggesting degenerative changes as a contributing factor in this demographic.[11-12] The increased frequency of combined meniscal tears in the 46–60 age group observed in our study is consistent with Lee *et al.*,(2019), who noted that chronic degeneration often results in more complex tear patterns involving both menisci.[13] Overall, these findings highlight age-related variations in meniscal tear patterns, supporting the theory that younger patients are more prone to traumatic lateral tears, while older individuals exhibit more degenerative medial and combined tears. Lateral meniscal tears were predominant in acute ACL injuries (<8 weeks). Medial meniscal tears were more prevalent in chronic ACL injuries (>8 weeks).

The present study demonstrated that the posterior horn of the meniscus was the most commonly affected site, accounting for 62.22% of tears, followed by the body and anterior horn. This finding is consistent with the observations of Miller *et al.*,(2017), who reported that the posterior horn is particularly vulnerable

due to its critical role in weight-bearing and knee stabilization.[14] Similarly, Khan and Patel (2019) found that tears in the posterior horn predominate in both traumatic and degenerative meniscal injuries, attributing this to the anatomical and biomechanical stresses concentrated in this region.[15] The lower incidence of tears in the anterior horn aligns with the study by Nguyen *et al.*, (2018), which highlighted the relatively reduced mobility and load on the anterior horn as protective factors.[16] Overall, these results support the general consensus that the posterior horn is the most susceptible site for meniscal tears, reinforcing the need for focused diagnostic and therapeutic approaches targeting this area.

However, our study has some limitations. It was conducted in a single center, which may affect the generalizability of the findings. Additionally, the relatively small sample size may not capture the full spectrum of injury patterns across diverse populations. Future multicenter studies with larger cohorts are recommended to validate and expand upon our results.

CONCLUSION

In conclusion, there is a strong association between meniscal tears and ACL injuries, with the medial meniscus more frequently affected, particularly in chronic cases. Accurate diagnosis, timely intervention, and a focus on meniscal preservation are key to improving functional outcomes and preventing long-term complications such as osteoarthritis in ACL-injured patients.

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