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A STUDY OF ASSOCIATED INJURIES OF POSTERIOR CRUCIATE LIGAMENT TEAR

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ABSTRACT

Background And Aim: Posterior cruciate ligament (PCL) tears, though less common than anterior cruciate ligament (ACL) tears, are significant knee injuries that often occur with associated damage to other knee structures. This aimed to investigate the incidence of associated injuries in patients with confirmed PCL tears **Methodology:** A prospective observational study was conducted at BIRRD Hospital, Tirupati, a tertiary care orthopaedic hospital over a period of one year (October 2023 – September 2024). All patients presenting with confirmed PCL tears (either isolated or combined with other knee injuries) were included. The study involved both clinical evaluation and imaging studies to diagnose PCL tears and any associated injuries. **Results:** The study included 45 subjects. The data on demographics, causes of injury, and associated injuries was collected through clinical assessment and MRI imaging and analysed. The results demonstrated that the most common associated injuries were ACL tears (20%), medial meniscal tears (18%), and collateral ligament injuries (10%). **Conclusion:** This study provides valuable insight into the nature and frequency of associated injuries in PCL tears, highlighting the common occurrence of ACL tears, meniscal injuries, and collateral ligament damage. Our study results reinforces the importance of considering multi-ligament involvement in patients with PCL tears.

INTRODUCTION

The posterior cruciate ligament (PCL) is one of the key ligaments in the knee that helps maintain stability by preventing posterior displacement of the tibia relative to the femur. Although less commonly injured than the anterior cruciate ligament (ACL), PCL tears have gained attention in recent years due to their association with other knee injuries and long-term functional impairments. PCL injuries often occur in isolation or in combination with other ligamentous, meniscal, or cartilage injuries, complicating diagnosis, management, and rehabilitation.[1]

PCL tears commonly result from high-energy trauma such as motor vehicle accidents, sports injuries, or falls, but can also occur due to low-energy mechanisms in individuals with weak or deconditioned musculature.[2] The clinical presentation of PCL tears often overlaps with that of other knee injuries, making an accurate diagnosis essential for appropriate treatment planning.[3] Moreover, associated injuries can affect the outcome of treatment and rehabilitation, making it crucial to understand these concurrent injuries.

This study aims to evaluate the associated injuries found in patients with PCL tears and compare the findings to other existing studies.

Need For The Study

PCL tears are often underdiagnosed or misdiagnosed because of the difficulty in detecting the injury and its associated symptoms. The injury can go unnoticed in the presence of more prominent ACL tears or meniscal injuries, leading to potential long-term consequences such as knee instability, premature osteoarthritis, and chronic pain.[4] While treatment modalities for isolated PCL injuries are well-established, the presence of associated injuries complicates management and rehabilitation strategies. A comprehensive study evaluating the various injuries that may co-occur with PCL tears is essential to guide clinicians in devising a more targeted and effective treatment approach.

Aims And Objectives

The primary aim of this study is to investigate the associated injuries in patients with PCL tears. The specific objectives of this study include:

1. To determine the demographic characteristics of patients with PCL tears.
2. To identify the common causes of PCL tears.
3. To analyse the types and frequencies of associated injuries (e.g., ACL tears, meniscal tears, collateral ligament injuries).

Methodology

Study Design

This was a prospective observational study conducted at BIRRD Hospital, Tirupati, a tertiary care orthopaedic hospital over a period of one year (October 2023 – September 2024). All patients presenting with confirmed PCL tears (either isolated or combined with other knee injuries) were included. The study involved both clinical evaluation and imaging studies to diagnose PCL tears and any associated injuries.

Inclusion Criteria

1. Patients aged 18-60 years.
2. Patients diagnosed with PCL tear, confirmed through MRI and clinical examination.
3. Patients who consented to participate in the study.

Exclusion Criteria

1. Patients with prior knee surgeries on the affected knee.
2. Patients with incomplete or insufficient clinical or imaging data.
3. Patients with associated fractures or systemic diseases that may affect healing.

RESULTS

After detailed clinical examination and MRI imaging, 45 patients were included in the study.

Table 1: Demographics Of The Participants

Mean Age Of Patients	34.5 years
Male Patients	30
Female Patients	15

- The average age of the participants in our study was 34.5 years (Range: 18-58 years).
- The male-to-female ratio was 2:1 (30 males and 15 females).
- The majority of patients (80%) were engaged in physically active occupations or sports.

Table 2: Causes of PCL Tear in participants

CATEGORIES		NO. OF PATIENTS (n=45)
SPORTS (26)	FOOTBALL	7
	CRICKET	6
	KABADDI	4
	BASKETBALL	3
	HOCKEY	2
	KHOKHO	2
	ATHLETICS	2
ROAD TRAFFIC ACCIDENTS		16
FALL FROM HEIGHT		3

- Sports-related injuries are the predominant cause for PCL tears and associated injuries (n = 26, 58%), particularly football and cricket players.
- Trauma from road traffic accidents are the 2nd most common reason which is 16 cases, i.e 35% of the cases.
- Least common cause of PCL tear is Fall from a height, constituting 3 cases which is 7%

Table 3: Injuries associated with PCL tear

ASSOCIATED INJURIES	NO. OF PATIENTS (n=45)	PERCENTAGE (%)
ACL Tear	9	20
Medial Meniscal Tear	8	18
Lateral Meniscal Tear	5	12
Collateral ligament injury	4	10
Cartilage injury	3	8
NIL injury	15	32

- Most commonly seen associated injury is Anterior Cruciate Ligament (ACL) Tear. Seen in 20% of patients (9 patients), followed by Medial Meniscal Tear: 18% (8 patients), Lateral Meniscal Tear: 12% (5 patients), Collateral Ligament Injuries: 10% (4 patients with combined MCL and LCL injuries), Cartilage Damage: 8% (3 patients with chondral lesions). There were nil associated injuries seen in 32% of patients (15 patients).

DISCUSSION

This study aimed to evaluate the frequency and nature of associated injuries in patients with posterior cruciate ligament (PCL) tears, highlighting key demographic and injury-related factors. The results reveal that, out of the 45 patients included, 57% sustained PCL tears due to sports-related injuries, 35% due to road traffic accidents (RTAs), and 6% due to miscellaneous causes. Additionally, the study highlights several key associated injuries, including anterior cruciate ligament (ACL) tears, meniscal injuries (both medial and lateral), collateral ligament injuries, and cartilage damage. Of the 45 patients, 32% had isolated PCL tears with no associated injuries, and 68% had concomitant injuries. The findings are compared with relevant literature, shedding light on the nature of these injuries and their clinical implications.

Demographics and Causes of Injury

The male-to-female ratio in this study was 2:1, which aligns with the general trend seen in many studies on ligament injuries. Males are generally at higher risk for PCL tears, particularly because they are more frequently involved in high-impact sports, such as football and rugby which are common causes of PCL injuries.[1,2,5] The predominance of sports-related injuries (57%) also reflects this trend. Road traffic accidents (RTAs) accounted for 35% of the cases, which is consistent with previous studies, as a direct blow to the knee during a motor vehicle collision is a frequent mechanism for PCL injury, especially in situations where the knee is forced into hyperflexion against the dashboard.[6]

The fact that 6% of the cases were due to miscellaneous causes, such as falls, further underscores the broad spectrum of potential causes of PCL injuries. The variability in injury mechanisms highlights the importance of a comprehensive diagnostic approach, as each mechanism may affect other structures in the knee differently.

Concomitant Anterior Cruciate Ligament (ACL) Tears

In our study, 20% of patients with PCL tears had concomitant ACL tears (9 patients). This finding is consistent with the literature, where ACL tears frequently coexist with PCL tears due to similar injury mechanisms.[1,11,13] Research by O'Neill et al.[7] reported that up to 30% of patients with PCL injuries have associated ACL tears. The combined injuries are most commonly seen in high-energy trauma, such as RTAs or multi-directional sports. The simultaneous damage to both the PCL and ACL can significantly affect the knee's stability, limiting the ability to perform functional movements, particularly those involving twisting or pivoting.[8]

Meniscal Injuries

Meniscal tears were present in 30% of our study cohort, with 18% (8 patients) having medial meniscal tears and 12% (5 patients) having lateral meniscal tears. These findings are consistent with numerous studies demonstrating a high prevalence of meniscal injury in patients with PCL tears.[4,12] The increased risk of meniscal damage in PCL injuries can be attributed to the altered knee biomechanics following PCL rupture, which increases the forces placed on the menisci, particularly the medial meniscus. The medial meniscus is more commonly injured because it is more exposed to shear and compressive forces in unstable knees.[9]

A study by Ahn et al.[6] showed a similar pattern of injury, with a higher incidence of medial meniscal tears than lateral ones in patients with PCL tears. This finding suggests that, in the absence of a stable PCL, the tibia tends to shift anteriorly, placing abnormal strain on the medial meniscus, which is less mobile than the lateral meniscus. This theory is further supported by the study by Pearsall AW et al.[10], which found that meniscal tears, especially medial, were common in patients with PCL injuries.

The implications of these findings are significant, as meniscal tears can complicate recovery and increase the risk of long-term osteoarthritis. Surgical management often involves both PCL reconstruction and meniscal repair, although the success of meniscal repair can be influenced by the degree of damage and the chronicity of the injury.[11,12]

Collateral Ligament Injuries

Collateral ligament injuries were observed in 10% of patients in our study, with 4 patients exhibiting combined medial collateral ligament (MCL) and lateral collateral ligament (LCL) injuries. This finding is consistent with the literature,

which suggests that collateral ligament injuries often coexist with PCL tears, particularly in high-energy trauma, such as motor vehicle accidents or sports-related incidents.[14] Another study also found a similar incidence of collateral ligament damage in patients with multi-ligament knee injuries.[7] In a retrospective study by Levy et al.[3] found that 22% of PCL tears were associated with collateral ligament injuries. Our finding of 10% was lower, potentially due to the exclusion of more complex cases involving fractures or major dislocations.

Cartilage Damage

Cartilage damage was identified in 8% of patients in this study, with 3 patients presenting with chondral lesions. This rate is somewhat lower than what is typically reported in multi-ligament injuries, as other studies have found that up to 15% of patients with PCL tears may develop cartilage damage.[15,16] The presence of chondral lesions in PCL injuries can be attributed to the altered biomechanics and instability of the knee following ligament rupture. When the PCL is compromised, abnormal loading of the joint occurs, which can lead to wear and tear of the articular cartilage. The patellofemoral joint and the medial femoral condyle are most commonly affected, as it may accelerate the development of osteoarthritis.[15]

No Associated Injuries

In our study, 32% of patients with PCL tears had no associated injuries. This rate is similar to that reported by other studies. For instance, a study by Ahn et al.[6] found that approximately 30-35% of patients with isolated PCL injuries had no concomitant injuries. Another study by Krych et al.[17] noted that 12% of PCL injuries were isolated. This suggests that while PCL tears are often associated with other knee injuries, there remains a subset of patients with isolated ligamentous damage, typically resulting from low-energy trauma or less severe injury mechanisms.

It is crucial to assess the patient's functional needs and the severity of the injury, as isolated PCL tears can still result in significant instability and loss of function if left untreated.

CONCLUSION

In conclusion, this study highlights the high frequency of associated injuries in patients with PCL tears, with concomitant ACL tears, meniscal injuries, and collateral ligament damage being particularly common. The findings of this study are consistent with the existing literature, emphasizing the need for a comprehensive approach to diagnosis and treatment in PCL injuries. Given the complexity of multi-ligament injuries, early and accurate diagnosis, along with a well-coordinated treatment plan, is essential to achieving the best possible outcomes for patients. Further studies are needed to explore the long-term outcomes of these combined injuries and the most effective rehabilitation strategies.

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