

Original Article**A PROSPECTIVE STUDY OF ARTHROSCOPIC PRIMARY ACL RECONSTRUCTION WITH IPSILATERAL PERONEUS LONGUS TENDON GRAFT****JAGDEEP SINGH REHNCY, AMANDEEP SINGH BAKSHI, RITANSHU MANGOCH, GIRISH SAHNI, HARRY MEHTA, AKSHAY SETH, HARSH KUMAR, ARVIND KUMAR***

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ABSTRACT**Objective:** To evaluate the functional viability of PLT for ACL reconstruction while assessing potential impacts on ankle function from the donor site.**Methods:** It was a prospective study which included 40 patients with ACL tears who presented to the outpatient department (OPD) and emergency department of Government Medical College, Patiala. All participants underwent ACL reconstruction surgery utilizing a peroneus longus tendon (PLT) autograft via an arthroscopic single-bundle technique. Functional evaluation was done by International Knee Documentation Committee (IKDC) score.**Results:** The study involved 40 patients with ACL tears, predominantly young males (mean age 27.85 ± 7.65 y), with 82.50% affected on the right side. The majority of injuries were due to roadside accidents (42.50%) and sports (37.50%). Significant differences in knee flexion were observed between affected ($121.27 \pm 3.93^\circ$) and unaffected sides ($124.92 \pm 3.51^\circ$, $p < 0.0001$). Pre-operative VAS scores reflecting severe pain (7.02 ± 0.92) decreased substantially post-operation to 1.90 ± 0.90 ($p < 0.00001$). Functional outcomes showed significant improvement over time, with no significant difference in ankle eversion between the sides ($p = 0.34$).**Conclusion:** The PLT emerges as a promising autograft option for ACL reconstruction, particularly in multi-ligament injuries and revision cases, delivering excellent clinical outcomes comparable to traditional grafts. The PLT graft effectively restores knee stability while preserving range of motion along with muscle strength in the ipsilateral ankle, highlighting its viability as a suitable alternative with minimal complications and donor site morbidity.**Keywords:** Anterior cruciate ligament, Peroneus longus tendon, VAS scores, American Orthopaedic Foot and Ankle Society (AOFAS) Ankle-Hindfoot Scale, ACL reconstruction

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INTRODUCTION

Anterior cruciate ligament (ACL) is frequently injured in various sports, primarily due to non-contact mechanisms during pivoting movements, though direct impacts can also lead to injury [1, 2]. Athletes, particularly soccer players, skiers, and basketball players, are at high risk, with football players facing more contact-related injuries [3, 4]. Acute ACL tears often coincide with lateral meniscus injuries, while chronic injuries are linked to medial meniscus involvement. Long-term ACL insufficiency can result in serious complications, including chondral injuries and irreparable meniscal tears [5].

Research indicates that while age and gender do not solely determine ACL injury risk, women may be more susceptible due to anatomical and biomechanical factors. They often experience ACL tears at a younger age and frequently during supporting leg activity [6]. Factors such as greater valgus angulation during landing, reduced hip and knee flexion, and less fatigue resistance contribute to this increased risk [7, 8]. Additional anatomical considerations include higher body mass index and prior ACL injuries, with specific sports like soccer and basketball showing heightened susceptibility, especially among athletes, respectively [5].

ACL arthroscopic reconstruction has been performed for over 30 y, utilizing various surgical techniques, graft materials, and fixation methods [9]. The peroneus longus and peroneus brevis tendons demonstrate synergistic properties, which allow for the potential use of the peroneus longus tendon (PLT) as an autograft. This approach has gained popularity in orthopedic procedures, particularly for ligament reconstruction in the knee and foot, with several studies reporting favorable clinical outcomes and low complication rates at the donor site [10].

Despite the advantages, there remains ongoing debate regarding donor site morbidity from using PLT. Biomechanical analysis indicates

that the tensile strength of PLT is on par with that of hamstring tendons, suggesting it is a viable graft option for ACL reconstruction. This method may be particularly beneficial for athletes who require hamstring strength as well as individuals who kneel frequently for cultural or religious reasons [11, 12]. The study aims to evaluate the functional viability of PLT as a graft for ACL reconstruction while ensuring that ankle function at the donor site is not compromised.

MATERIALS AND METHODS**Study design:** A single-center, prospective study.**Source of data:** This study included 40 patients with ACL tears who presented to the outpatient department (OPD) and emergency department of Government Medical College, Patiala.**Inclusion criteria**

1. Adult patients aged between 18 and 45 y old.
2. ACL tears confirmed clinically and radiologically with an MRI scan.
3. Patients undergoing primary ACLR surgery.

Exclusion criteria

1. Associated other knee ligamentous injuries e. g. posterior cruciate ligament, that would require surgical reconstruction simultaneously with ACLR surgery.
2. Revision ACLR surgery.
3. Patient with septic arthritis.
4. Acute knee injury occurring simultaneously on the opposite side.

Patient recruitment

Patients with knee injuries were evaluated in the outpatient clinic,

and those diagnosed with ACL tears who met specific inclusion and exclusion criteria were invited to participate in the study at the end of their initial appointment. Each participant received a comprehensive explanation of the study's objectives and was informed that their involvement was voluntary. They were assured that their choice to participate or withdraw would not impact the quality of their medical care.

Surgical technique

All participants underwent ACL reconstruction surgery utilizing a peroneus longus tendon (PLT) autograft via an arthroscopic single-bundle technique. The femoral tunnel was created using an anteromedial portal approach. Tendon grafts were secured with an Endobutton suspensory device on the femoral side and interference screws on the tibial side. A standardized rehabilitation protocol was followed, allowing weight-bearing with crutches starting on the first postoperative day, without the use of splints or braces. Patients were discharged on the same day or the following day, with an early focus on isometric and open-chain proprioceptive exercises, particularly aimed at restoring full knee range of motion, especially knee extension.

Assessment of ankle-hindfoot status

The clinical evaluation of ankle-hindfoot status was conducted using the American Orthopaedic Foot and Ankle Society (AOFAS) Ankle-Hindfoot Scale, which includes three subscales: pain, function, and alignment, totaling nine items. Scores on this scale range from 0

(indicating severe impairment and pain) to 100 (indicating no impairment), encompassing both subjective patient-reported outcomes and objective physician assessments of alignment, with joint completion of the functional assessments.

Data collection

A pre-structured proforma was employed across all cases to standardize data collection. The gathered information was systematically compiled and tabulated to enable the analysis of valid outcomes.

All statistical calculations were done using (Statistical Package for the Social Science) SPSS 21.0 version (SPSS Inc., Chicago, IL, USA) statistical program for Microsoft Windows.

RESULTS

The study included a sample of 40 patients with ACL tears. The study involved 40 patients with a mean age of 27.85 ± 7.65 y, predominantly within the 21-30 y age group (62.50%) (table 1). Among the participants, 82.50% were male, and the mean body mass index (BMI) was 27.34 ± 3.20 kg/m², with 52.50% classified as overweight. Most patients (92.50%) were right-dominant, and injuries were predominantly on the right side (72.50%). Exclusive ACL tears were noted in 67.50% of patients; some also had meniscus (32.5%) tears. The primary causes of injury included road traffic accidents (42.50%), sports injuries (37.50%), and falls from height (20%). The majority (62.50%) experienced injuries lasting less than six months.

Table 1: Mean age distribution of our patients

Age	Frequency	Percentage
≤20 y	4	10%
21-30 y	25	62.50%
31-40 y	7	17.50%
>40 y	4	10%
Total	40	100%
Range	18-45 y	
mean Age± SD	27.85±7.65	

Regarding knee flexion, mean values were $121.27 \pm 3.93^\circ$ on the affected side and $124.92 \pm 3.51^\circ$ on the unaffected side, with a significant difference noted ($p < 0.0001$). All patients tested positive for Lachmann, Anterior drawer, and Pivot shift tests, while joint line tenderness was present in 25% of patients on the medial side. Surgical parameters revealed a mean graft diameter of 8.30 ± 0.77 mm and a graft length of 237.25 ± 23.83 mm. IKDC and AOFAS scores were used

to assess the functional outcome, showing significant improvement at six months, nine months, and eighteen months post-operation ($p < 0.0001$) (table 2 and 3). Pre-operative VAS scores indicated severe pain (mean score of 7.02 ± 0.92), which substantially decreased post-operatively to a mean score of 1.90 ± 0.90 ($p < 0.00001$). Finally, no significant difference in mean ankle eversion was observed between affected and unaffected sides ($p = 0.34$).

Table 2: International Knee Documentation Committee (IKDC) score in our post-operative patients

Timepoints	IDKC mean (±SD)	Range
Pre-operative	50.64 ± 2.51	47.1-56.32
Month 6	73.95 ± 2.33	70.1-79.31
Month 9	80.39 ± 3.16	65.05-85.05
Month 18	90.81 ± 2.15	86.20-93.10
p-Value	<0.00001 (HS)	

Table 3: AOFAS Score in our post-operative patients

Timepoints	AOFAS (affected side)	AOFAS (unaffected side)	Inter-group p-value
Pre-operative	99.72 ± 0.45 (99-100)	99.90 ± 0.30	0.0455
Month 6	92.82 ± 3.50 (85-97)	(99-100)	<0.00001
Month 9	96.97 ± 2.16 (92-100)		<0.00001
Month 18	98.77 ± 1.25 (95-100)		<0.00001
Intra-group p-value	<0.00001	-	

DISCUSSION

The study's findings indicate a mean patient age of 27.85 y, predominantly within the 21-30 y age range, aligning with previous

research such as Hossain GMJ *et al.* (2023) [13] and Kumar R *et al.* (2023) [14], which reported mean ages of 27.10 y and 27.73 y, respectively. These findings contrast with Goyal T *et al.* (2023) [15], who noted a higher mean age of 32.9 y, suggesting variances in

demographic characteristics across different cohorts. The gender distribution, with a significant male predominance (82.50%), corresponds with literature suggesting that males are more likely to engage in high-intensity activities, potentially leading to a higher incidence of knee injuries, as seen in the studies by Hossain GMJ *et al.* (2023) [13] and Sadi SM *et al.* (2023) [16], which reported male prevalences of 79.27% and 90%, respectively.

The body mass index (BMI) results revealed that over half of the participants were overweight, with a mean BMI of 27.34 kg/m², consistent with Kumar R *et al.* (2023) [14], who reported a mean BMI of 27.47 kg/m². In contrast, Sahoo PK *et al.* (2023) [17] indicated a lower mean BMI of 24.27 kg/m², highlighting the variation in BMI profiles among different populations. The laterality of injuries showed a strong right-side dominance (72.5%), corroborating findings by Hijas Ismail DS *et al.* (2024) [18] and Sahoo PK *et al.* (2023) [17], which noted variations in sides of injury but still leaned towards right-sided dominance.

In terms of diagnosis, 67.50% of patients were diagnosed with ACL tears, while some had concurrent meniscus or PCL injuries. This aligns with Hijas Ismail DS *et al.* (2024) [18], who indicated that isolated ACL injuries were prevalent but with varying complexities; for example, 56% had isolated ACL injuries and others presented with various meniscal tears. The modes of injury reported, primarily from road traffic accidents (42.50%) and sports-related injuries (37.50%), echo findings from Goyal T *et al.* (2023) [15], who noted a similar distribution, although Hossain GMJ *et al.* (2023) [13] highlighted sports injuries as the most common cause.

The duration since injury showed that most patients presented within six months, which is critical for timely intervention, aligning with other studies such as Goyal T *et al.* (2023) [15], who reported a mean duration of 7.8 w. Knee flexion assessments demonstrated a statistically significant difference between affected and unaffected sides, with mean flexion measured at 121.27° on the affected side, in line with findings from Goyal T *et al.* (2023) [15], who reported slight variations in flexion that also indicated impairment.

All patients tested positive for Lachmann, Anterior Drawer, and Pivot Shift tests, supporting the reliability of these diagnostic tools, though results varied among studies, with Hossain GMJ *et al.* (2023) [13] noting a positive Lachmann test in 92.46% of cases. Functional outcomes, as measured by IKDC and AOFAS scores, showed significant improvements over time (IKDC scores: pre-operative mean of 50.64, rising to 90.81 at 18 mo), notably supported by studies indicating similar patterns of improvement post-surgery (e.g., Hossain GMJ *et al.* found IKDC scores improving from 57.6 to 91.8 over two years) [13]. The substantial reduction in VAS scores post-operatively from 7.02 to 1.90 underscores the procedure's success in alleviating pain, corroborating findings by Goyal T *et al.* (2023) [15] and Anghthong C *et al.* (2015) [19], who observed similar trends in pain reduction.

Lastly, the analysis of ankle eversion strength revealed a non-significant difference ($p = 0.34$) between affected (4.29 kg) and unaffected sides (4.48 kg), aligning with Goyal T *et al.* (2023) [15], who reported similar strength metrics. Overall, these comparative results not only validate the current study's findings but also contribute to the growing body of evidence supporting the use of PLT in ACL reconstruction, emphasizing its effectiveness while advocating for continued research into optimizing surgical techniques and rehabilitation protocols for improved patient outcomes.

CONCLUSION

In conclusion, using peroneus longus tendon (PLT) as an autograft for ACL reconstruction shows great potential, especially for multi-ligament knee injuries and revision surgeries. The existing body of evidence suggests that the PLT graft yields excellent clinical outcomes comparable to established graft options, thereby supporting its inclusion in the repertoire of graft choices for ACL reconstruction.

This graft not only facilitates effective restoration of knee stability but also maintains functional characteristics that include a preserved range of motion and muscle strength that are congruent with the contralateral ankle. These findings underscore peroneus

longus tendon's viability as a suitable autograft alternative, presenting minimal complications and functional morbidity at the donor site.

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AUTHORS CONTRIBUTIONS

All authors have contributed equally

CONFLICTS OF INTERESTS

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