

# Functional Study of Knee Function and Donor Site Morbidity in ACL Using Peroneus Longus-A Prospective Study

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## ABSTRACT

**Introduction:** Anterior cruciate ligament (ACL) reconstruction requires a graft that can restore knee stability while limiting donorsite morbidity. Peroneus longus tendon (PLT) autograft has gained attention because it provides a consistent soft-tissue graft and avoids harvest from the hamstring mechanism.

**Aim:** To evaluate knee functional outcome and donor ankle morbidity after arthroscopic ACL reconstruction using PLT autograft.

**Materials and Methods:** This prospective study was conducted in the Department of Orthopaedics, Adichunchanagiri Institute of Medical Sciences, B.G. Nagara, Mandya district, Karnataka, India, from August 2024 to February 2026. The peroneus longus arm comprised 25 patients aged 18-50 years who underwent arthroscopic single-bundle ACL reconstruction and completed follow-up at 6 weeks, 3 months and 6 months. Knee function was assessed using Lysholm Knee Score and International Knee Documentation Committee (IKDC) score. Donor ankle morbidity was assessed using American Orthopaedic Foot and Ankle Society (AOFAS) score and Medical Research Council (MRC) grading for ankle eversion strength. Data were summarised as mean±standard deviation and number (percentage). Chi-square test and t-test were used wherever applicable, and p<0.05 was considered statistically significant.

**Results:** The mean age was 30.28±8.00 years, and 22 (88.0%) patients were males. Self-fall was the commonest injury mechanism, reported in 16 (64.0%) patients. The mean graft diameter was 8.78±0.95 mm, and the mean return to daily activities was 10.3±0.8 weeks. Mean Lysholm score improved from 52.3±4.4 preoperatively to 91.0±3.6 at 6 months. Mean IKDC score improved from 47.9±4.9

preoperatively to 64.5±2.7 at 3 months and 92.8±3.6 at 6 months. At 6 months, 24 (96.0%) patients had good-to-excellent Lysholm grades, and all patients had normal or nearly normal IKDC grades. Mean AOFAS score decreased from 100.0±0.0 to 95.2±2.2 at 6 months (p=0.0001), but remained in the excellent range. Full ankle eversion strength was retained by 21 (84.0%) patients.

**Conclusion:** PLT autograft provided excellent short-term knee functional recovery after ACL reconstruction, with minimal clinically relevant donor ankle morbidity. The graft showed favourable diameter and early return to daily activity, supporting its practical role as an alternative autograft in appropriately selected patients.

**Keywords:** Anterior Cruciate Ligament Reconstruction; Autografts; Knee Joint; Orthopaedic Procedures; Treatment Outcome

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## 1. INTRODUCTION

Anterior cruciate ligament (ACL) injury is a clinically important cause of symptomatic knee instability in young and active adults. The ligament contributes to restraint against anterior tibial translation and also participates in rotational stability, so untreated functional instability may interfere with work, sports,

stair climbing, squatting and culturally common floor-level activities in Indian settings [1]. Arthroscopic ACL reconstruction has therefore become a standard operative strategy when instability persists or when a patient wishes to return to higher activity demands [2].

Graft choice remains one of the most debated decisions in ACL reconstruction. Bone-patellar tendon-bone,

hamstring tendon, quadriceps tendon and allograft options have all been used, but an ideal graft should combine adequate strength, reproducible diameter, biological incorporation and low donor-site morbidity [3]. Hamstring autografts are widely used because of their familiar harvest and avoidance of anterior knee pain associated with patellar tendon harvest. Yet their use can be limited by variable diameter, hamstring strength deficit, thigh hypotrophy and symptoms around the harvest site [4]. These concerns are relevant in patients who depend on squatting, kneeling and rapid return to day-to-day mobility. The peroneus longus tendon has emerged as a useful soft-tissue autograft for ACL reconstruction. It can be harvested through a small incision around the posterolateral ankle, usually provides a sufficient length and diameter, and has shown encouraging biomechanical and clinical behaviour [5,6]. The principal caution, understandably, is donor ankle morbidity. Since peroneus longus contributes to eversion and first-ray plantar flexion, any clinically meaningful weakness could affect gait, balance, occupational activity and sports performance. Published clinical series have generally reported preserved ankle function when meticulous harvest and distal tenodesis are performed [7].

Recent comparative evidence has also suggested that peroneus longus autograft may provide knee functional outcomes comparable with hamstring tendon autograft, while offering a larger graft diameter and lower donor-site symptoms in selected patients [8]. Still, local prospective data remain useful because injury pattern, rehabilitation adherence, postoperative occupational demands and the expectation of return to routine activities vary substantially across Indian tertiary care practice. This study was undertaken to evaluate knee function and donor ankle morbidity after ACL reconstruction using peroneus longus tendon autograft, with particular emphasis on six-month functional recovery.

## 2. MATERIALS AND METHODS

**Study design and setting:** This prospective study was conducted in the Department of Orthopaedics, Adichunchanagiri Institute of Medical Sciences, B.G. Nagara, Mandya district, Karnataka, India. The study period was 18 months, from August 2024 to February 2026. The present article focuses on patients who underwent ACL reconstruction using peroneus longus tendon autograft.

**Study population:** Patients attending the Orthopaedics outpatient department or emergency department with clinically and radiologically diagnosed ACL tear were screened. The peroneus longus arm comprised 25 patients who underwent arthroscopic single-bundle ACL reconstruction using PLT autograft and completed follow-up at 6 weeks, 3 months and 6 months.

**Inclusion criteria:** Patients aged above 18 years and below 50 years, isolated ACL injuries or ACL injuries associated with grade 1 or grade 2 meniscal injuries,

medical fitness for surgery and no previous knee surgery were included.

**Exclusion criteria:** Patients aged below 18 years or above 50 years, associated avulsion or intra-articular condylar fractures, meniscal injuries requiring total meniscectomy, multiligament injuries, preexisting congenital, developmental, degenerative or collagen disorders, infected knee or ankle joint and polytrauma were excluded. For the PLT group, the planned donor ankle was also clinically screened before graft harvest; patients with symptomatic ankle pathology, ankle instability, restricted ankle movement, or reduced preoperative ankle eversion strength were not considered suitable for PLT harvest.

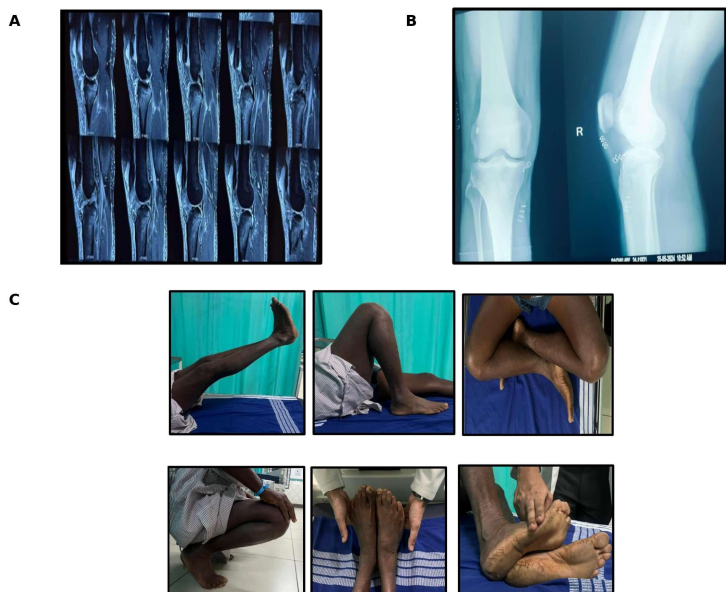
**Clinical assessment:** A detailed history, orthopaedic examination, general physical examination, radiographs and magnetic resonance imaging were performed. Lachman test, anterior drawer test and pivot-shift test were used for ACL assessment. Associated meniscal and collateral ligament injuries were evaluated clinically and radiologically. Baseline demographic and injury variables included age, sex, mode of injury, side involved, time since injury and associated meniscal injury.

**Operative procedure:** All patients underwent arthroscopic ACL reconstruction. In the PLT group, a longitudinal incision was placed over the posterolateral aspect of the distal leg, just posterior to the lateral malleolus. The peroneus longus and peroneus brevis tendons were identified and protected. Distal tenodesis was performed using nonabsorbable braided polyester suture. The peroneus longus tendon was whip-stitched, transected distally and harvested using an open tendon stripper while avoiding advancement into the proximal one-third of the leg. The harvested tendon was folded longitudinally to create a two-strand graft, and both ends were whip-stitched using No. 2 polyester suture. Femoral and tibial tunnels were prepared arthroscopically, the graft was passed and femoral fixation was achieved with an endobutton; tibial fixation was performed using an interference screw or tibial base plate as appropriate.

**Postoperative rehabilitation and follow-up:** The knee was initially immobilised in a brace, with early quadriceps activation, straight leg raising, ankle pumps and progressive range-of-motion exercises. Partial weight-bearing was advanced as tolerated. Patients were reviewed at 6 weeks, 3 months and 6 months. Knee function was assessed using Lysholm Knee Score and IKDC subjective score. Donor ankle morbidity was evaluated using AOFAS ankle-hindfoot score and MRC grading for ankle eversion strength. Return to daily activities and postoperative complications were recorded.

Representative preoperative magnetic resonance imaging, immediate postoperative radiographs and six-month clinical range-of-motion documentation for a

patient treated with peroneus longus tendon autograft are shown in Table/Fig 1.

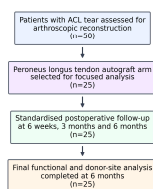


**Table/Fig 1: Representative radiological and six-month clinical documentation after anterior cruciate ligament reconstruction using peroneus longus tendon autograft.**

*A: Preoperative magnetic resonance imaging showing anterior cruciate ligament tear; B: postoperative anteroposterior and lateral knee radiographs; C: six-month follow-up clinical photographs showing knee range of motion and donor ankle movements. ACL: anterior cruciate ligament; PLT: peroneus longus tendon.*

**Outcome measures:** Primary outcome measures were six-month Lysholm and IKDC scores. Secondary measures included graft diameter, return to daily activities, AOFAS score, MRC ankle eversion grade and postoperative complications.

**Ethical considerations:** The study was approved by the Institutional Ethics Committee of Adichunchanagiri Institute of Medical Sciences, B.G. Nagara. Written informed consent was obtained from all participants, and confidentiality was maintained throughout. **Statistical analysis:** Data were entered in Microsoft Excel 2016. Continuous variables were expressed as mean±standard deviation, and categorical variables as number and percentage. Independent ttest and Chi-square test were used where applicable in the parent cohort, and available within-group comparisons for donor ankle morbidity were retained. A p-value <0.05 was considered statistically significant.



**Table/Fig 2: Participant flow for the peroneus longus tendon autograft analysis.**

*ACL: anterior cruciate ligament. The flow chart shows completion of scheduled six-month follow-up in the focused PLT arm.*

were analysed. All patients completed scheduled follow-up at 6 weeks, 3 months and 6 months, as shown in Table/Fig 2.

**3. RESULTS**

A total of 25 patients who underwent ACL reconstruction using peroneus longus tendon autograft

**Table/Fig 3: Baseline demographic and injury profile of the PLT group (n=25).**

Variable	Number (%) / Mean±SD
Age (years)	30.28±8.00
Male	22 (88.0%)

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Variable	Number (%) / Mean±SD
Female	3 (12.0%)
Self-fall	16 (64.0%)
Road traffic accident	9 (36.0%)
Right-sided ACL tear	14 (56.0%)
Left-sided ACL tear	11 (44.0%)
Isolated ACL tear	15 (60.0%)

ACL tear with grade 1 or 2 meniscal injury 10 (40.0%)

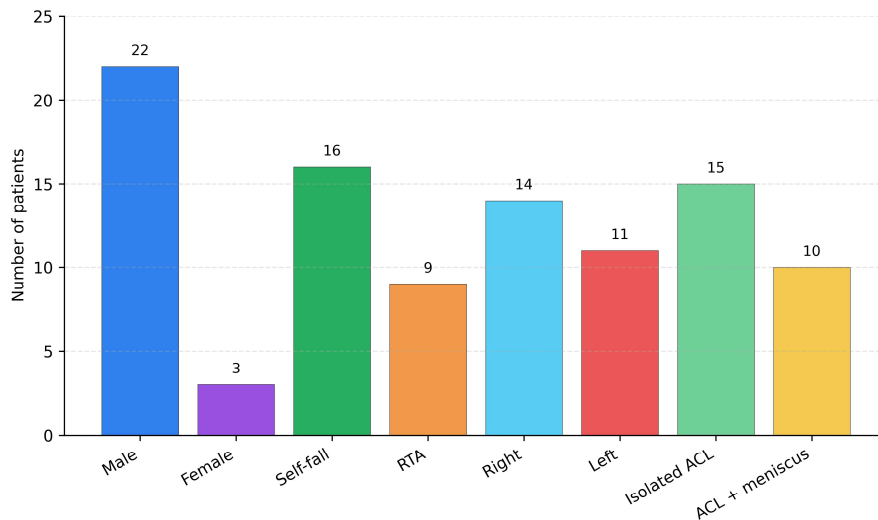
Surgery within 3 months of injury 18 (72.0%)

Surgery after 3 months of injury 7 (28.0%)

ACL: anterior cruciate ligament; PLT: peroneus longus tendon; SD: standard deviation.

The mean age of patients was 30.28±8.00 years. Male predominance was observed, with 22 (88.0%) males and 3 (12.0%) females. Selffall was the most common mode of injury in 16 (64.0%) patients, followed by road traffic

accident in 9 (36.0%). Right-sided ACL tear was observed in 14 (56.0%) patients. Isolated ACL tear was present in 15 (60.0%), while ACL tear with grade 1 or 2 meniscal injury was present in 10 (40.0%), as summarised in Table/Fig 3 and visually represented in Table/Fig 4.



**Table/Fig 4: Visual summary of baseline patient and injury characteristics in the PLT group.**

RTA: road traffic accident; ACL: anterior cruciate ligament; PLT: peroneus longus tendon. Values above bars indicate patient counts.

**Table/Fig 5: Operative and early recovery parameters in the PLT group.**

Parameter	Value
Mean graft diameter (mm)	8.78±0.95
Mean time to return to daily activities (weeks)	10.3±0.8
Range for return to daily activities (weeks)	9-12

PLT: peroneus longus tendon.

The mean graft diameter was 8.78±0.95 mm. Patients returned to daily activities at a mean of 10.3±0.8 weeks, with an observed range of 9-12 weeks (Table/Fig 5).

**Table/Fig 6: Knee functional score trajectory after ACL reconstruction using PLT autograft.**

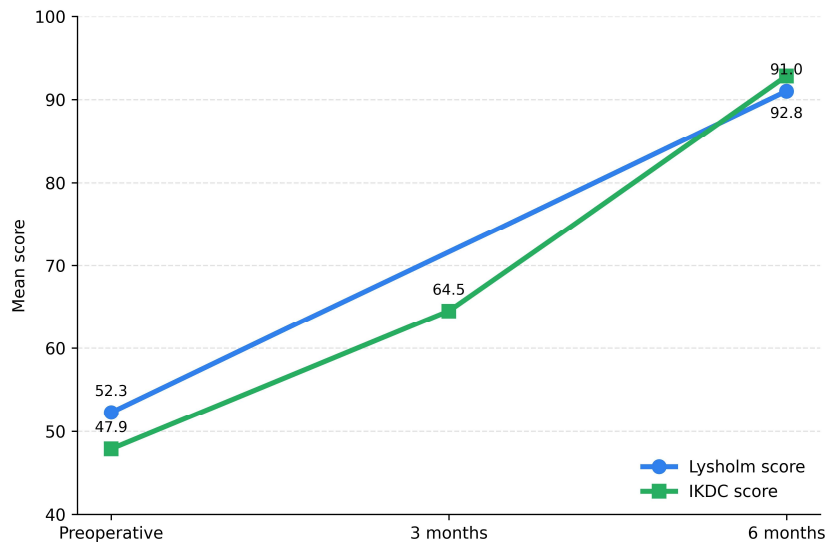
Functional score Preoperative	3 months	6 months
Lysholm Knee Score	52.3±4.4	91.0±3.6
IKDC Subjective Knee Score	47.9±4.9	64.5±2.7 92.8±3.6

ACL: anterior cruciate ligament; IKDC: International Knee Documentation Committee; PLT: peroneus longus tendon.

Knee functional recovery was substantial by 6 months. The mean Lysholm Knee Score increased from 52.3±4.4 preoperatively to

91.0±3.6 at 6 months. The mean IKDC score increased from 47.9±4.9 preoperatively to 64.5±2.7 at 3 months and 92.8±3.6 at 6

months (Table/Fig 6 and Table/Fig 7).



**Table/Fig 7: Mean Lysholm and IKDC score trajectories following ACL reconstruction using PLT autograft.**

IKDC: International Knee Documentation Committee; tendon. Values indicate mean scores at each follow-up ACL: anterior cruciate ligament; PLT: peroneus longus point.

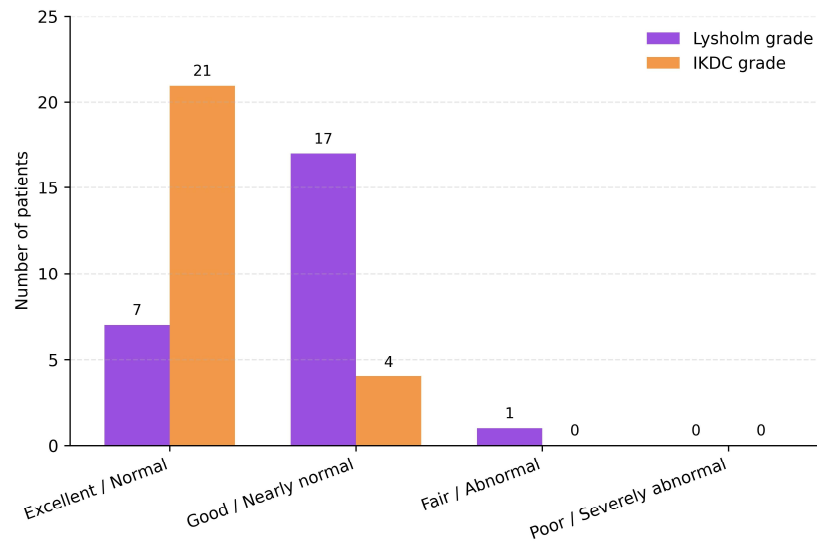
**Table/Fig 8: Six-month functional grades after ACL reconstruction using PLT autograft.**

Functional grading system	Grade	Score range	Score range Number (%)
Lysholm	Excellent	95-100	7 (28.0%)
Lysholm	Good	84-94	17 (68.0%)
Lysholm	Fair	65-83	1 (4.0%)
Lysholm	Poor	<65	0 (0%)
IKDC	Normal	90-100	21 (84.0%)
IKDC	Nearly normal	80-89	4 (16.0%)
IKDC	Abnormal	70-79	0 (0%)
IKDC	Severely abnormal	<70	0 (0%)

IKDC: International Knee Documentation Committee; ACL: anterior cruciate ligament; PLT: peroneus longus tendon.

At 6 months, 24 (96.0%) patients achieved good or excellent Lysholm grades, while 1 (4.0%) patient had a fair grade and none had a poor grade. According to IKDC grading, 21 (84.0%) patients were normal and 4 (16.0%) were nearly normal; no patient was graded abnormal or severely abnormal. These grade distributions are shown in Table/Fig 8 and Table/Fig 9.

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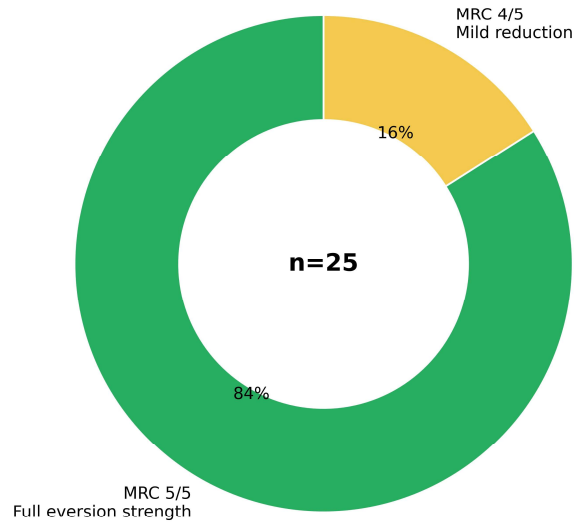
**Table/Fig 9: Distribution of six-month Lysholm and IKDC functional grades.**

IKDC: International Knee Documentation Committee. Bars show the number of patients in each corresponding grade category. **Table/Fig 20: Donor ankle morbidity assessment after PLT graft harvest.**

Parameter	Preoperative 6 months / postoperative	p-value
AOFAS score 100.0±0.0	95.2±2.2	0.0001
MRC grade 5/5 25 (100%)	21 (84.0%)	0.125
MRC grade 4/5 0 (0%)	4 (16.0%)	0.125

AOFAS: American Orthopaedic Foot and Ankle Society; MRC: Medical Research Council; PLT: peroneus longus tendon.

Donor ankle morbidity was limited. The mean AOFAS score decreased from 100.0±0.0 preoperatively to 95.2±2.2 at 6 months ( $p=0.0001$ ), but the postoperative score remained within the excellent functional range. Full ankle eversion strength, graded MRC 5/5, was retained by 21 (84.0%) patients; 4 (16.0%) patients had MRC grade 4/5 (Table/Fig 20 and Table/Fig 21).



**Table/Fig 21: Donor ankle eversion strength at six months after PLT harvest.**

MRC: Medical Research Council; PLT: peroneus longus tendon. The chart shows the proportion of patients retaining full or mildly reduced ankle eversion strength.

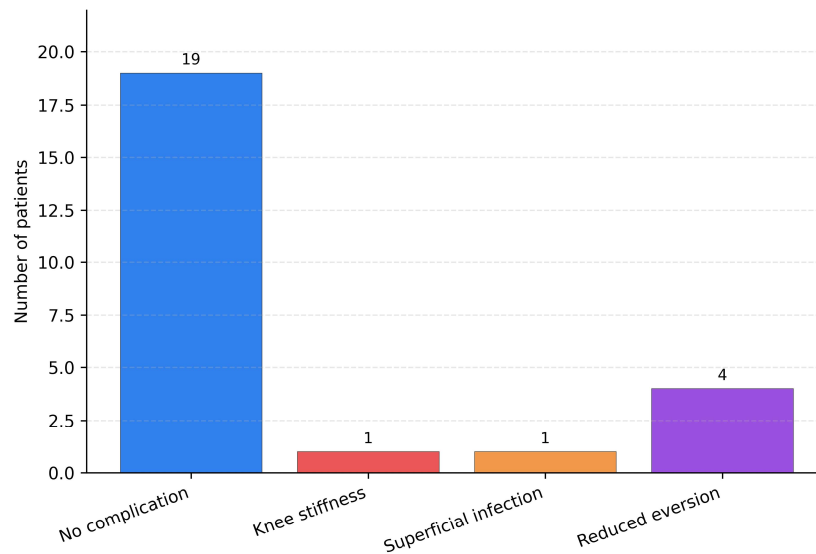
**Table/Fig 22: Postoperative complications in the PLT group.**

Complication profile	Number (%)
No postoperative complication	19 (76.0%)
Knee stiffness	1 (4.0%)
Superficial infection	1 (4.0%)
Reduced ankle eversion	4 (16.0%)

PLT: peroneus longus tendon. Reduced ankle eversion corresponded to MRC grade 4/5.

Most patients had an uncomplicated postoperative recovery. No complication was recorded in 19 (76.0%) patients. Knee stiffness and superficial infection were each observed in 1 (4.0%) patient, while reduced ankle eversion was recorded in 4 (16.0%) patients (Table/Fig 22 and Table/Fig 23).

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**Table/Fig 23: Postoperative complication profile in the PLT group.**

PLT: peroneus longus tendon. Values above bars indicate patient counts.

#### 4. DISCUSSION

This prospective study found that arthroscopic ACL reconstruction using peroneus longus tendon autograft produced excellent short-term knee functional recovery. The mean Lysholm score reached  $91.0 \pm 3.6$  at 6 months, and 96.0% of patients achieved good or excellent Lysholm grades. The IKDC profile was similarly reassuring, with a six-month mean of  $92.8 \pm 3.6$  and all patients falling into normal or nearly normal categories. In practical terms, these scores suggest that symptoms such as instability, pain, swelling and difficulty with routine mobility had largely settled by the six-month assessment.

The functional gains observed here are consistent with the wider clinical literature on PLT autograft. Keyhani et al. reported comparable knee outcomes between PLT and hamstring autografts, while noting faster extension recovery and lower thigh morbidity in the PLT group [9]. Agarwal et al. also found favourable knee stability and functional outcomes when PLT was used as an alternative to hamstring tendon graft [10]. The pattern is not that PLT is universally superior in every patient; rather, it appears to provide reliable knee function while preserving the hamstring complex. That distinction matters in patients with occupational or cultural demands involving squatting, climbing and prolonged standing.

Graft diameter was another useful finding. The mean PLT graft diameter was  $8.78 \pm 0.95$  mm, suggesting that this tendon usually provides a graft of acceptable calibre for ACL reconstruction. Larger graft diameter has been viewed as one of the practical advantages of PLT harvest, and several studies have reported similar findings [11,12]. In the present study, the mean return to daily activities was  $10.3 \pm 0.8$  weeks, which supports the feasibility of early functional rehabilitation when knee

stability, wound healing and range of motion progress appropriately.

The donor ankle findings require careful reading. The AOFAS score decreased from  $100.0 \pm 0.0$  to  $95.2 \pm 2.2$ , and this change was statistically significant. However, a statistically detectable reduction is not automatically a clinically disabling deficit. Most patients retained full eversion strength, and even those with MRC grade 4/5 represented mild weakness rather than frank ankle instability. Anghong et al. reported acceptable donor ankle function after PLT harvest, and Shi et al. similarly described PLT autograft as a safe and effective alternative in ACL reconstruction [6,7]. The findings here are aligned with that experience.

Recent systematic reviews have broadly supported the same interpretation. He et al. concluded that PLT autograft provides functional outcomes comparable with hamstring tendon autograft [8]. A later systematic review by Quinn et al. described PLT as a viable alternative, while emphasising the need for more high-quality long-term evidence [13]. Kumar et al. also reported similar knee functional outcomes between PLT and hamstring grafts, with advantages for PLT in graft diameter and donor-site morbidity in comparative studies [14]. This is also consistent with the broader graft-selection principle described by Dhammi et al., where graft choice is expected to balance biological incorporation, mechanical adequacy, donor-site morbidity and patient-specific functional demands [15]. So the present findings sit within an emerging evidence base rather than standing alone.

The postoperative complication profile was acceptable. Most patients had no complication, while one case each of knee stiffness and superficial infection was recorded. Reduced eversion was documented in four patients, matching the MRC findings. These events highlight why PLT harvest should not be treated as a trivial

procedure. Surgical technique, nerve protection, avoidance of proximal stripper advancement and a disciplined rehabilitation programme remain essential. The graft is promising, but it is not morbidity-free.

This study has limitations. The analysis was focused on 25 patients from a single centre and follow-up was limited to 6 months. Sport-specific return, objective instrumented laxity, isokinetic ankle testing and long-term graft survivorship were not assessed. The results therefore support early functional safety and recovery, but cannot establish long-term superiority over other grafts. Larger multicentre studies with longer follow-up and objective ankle strength testing would add useful evidence, especially for high-demand athletes and labour-intensive occupations.

## 5. CONCLUSION

Peroneus longus tendon autograft produced excellent six-month knee functional outcomes after arthroscopic ACL reconstruction, with high Lysholm and IKDC scores. Donor ankle morbidity was minimal in clinical terms, although mild reduction in eversion strength was observed in a small proportion of patients. The graft showed favourable diameter and supported return to daily activities by about 10 weeks, making it a practical alternative autograft in appropriately selected patients. **Source of Funding** None declared. **Conflict of Interest** None declared.

## 6. ACKNOWLEDGEMENT

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