



Original Article

Functional Outcome of Arthroscopic Anterior Cruciate Ligament Reconstruction with Peroneus Longus Graft

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ABSTRACT

Background: Anterior cruciate ligament (ACL) injuries are among the most common ligamentous injuries of the knee and frequently affect young, physically active individuals. Arthroscopic ACL reconstruction is the gold standard for restoring knee stability and function. Although hamstring and bone–patellar tendon–bone autografts are widely used, the peroneus longus tendon has emerged as a promising alternative because of its favourable biomechanical properties and low donor-site morbidity.

Aim: To evaluate the functional outcomes of arthroscopic anterior cruciate ligament reconstruction using an autologous peroneus longus tendon graft.

Materials and Methods: This prospective observational study was conducted in the Department of Orthopaedics, ESIC Medical College and Hospital, Kalaburagi, Karnataka, from June 2025 to May 2026. Thirty patients aged 18–45 years with MRI-confirmed complete ACL tears underwent primary arthroscopic ACL reconstruction using an ipsilateral peroneus longus tendon autograft. Functional outcomes were assessed using the International Knee Documentation Committee (IKDC) Subjective Knee Score and Lysholm Knee Scoring Scale. Secondary outcome measures included knee range of motion, knee stability, donor-site morbidity, postoperative complications, and return to daily activities. Patients were followed for 12 months, and statistical analysis was performed using SPSS version 26.0 with a p-value <0.05 considered statistically significant.

Results: The mean age of the study population was 30.8 ± 6.5 years, with males comprising 80% of the patients. Sports-related injuries accounted for 53.3% of ACL tears. The mean IKDC score improved significantly from 44.6 ± 7.8 preoperatively to 91.4 ± 4.8 at 12 months ($p < 0.001$). Similarly, the mean Lysholm score increased from 48.9 ± 8.6 to 94.1 ± 4.2 ($p < 0.001$). Mean knee flexion improved from 110.5° to 134.8° during follow-up ($p < 0.001$). At one year, 53.3% of patients achieved excellent and 33.3% achieved good functional outcomes according to the Lysholm score. Postoperative complications were minimal, with mild donor-site ankle discomfort in 6.7% of patients, superficial wound infection in 3.3%, knee stiffness in 3.3%, and no graft failures.

Conclusion: Arthroscopic ACL reconstruction using an autologous peroneus longus tendon graft provides excellent functional recovery, significant improvement in knee stability and range of motion, and a low complication rate. The peroneus longus tendon is a safe, reliable, and effective alternative autograft for primary ACL reconstruction with minimal donor-site morbidity.

Keywords: Anterior cruciate ligament, Arthroscopic ACL reconstruction, Peroneus longus tendon, IKDC score, Lysholm score, Functional outcome, Knee stability.

INTRODUCTION

Anterior cruciate ligament (ACL) injury is one of the most common ligamentous injuries of the knee, particularly among young and physically active individuals participating in sports involving pivoting, jumping, and sudden deceleration. The ACL plays a crucial role in maintaining anteroposterior and rotational stability of the knee. Disruption of this ligament results in instability, recurrent episodes of giving way, reduced functional performance, meniscal injuries, cartilage degeneration, and an increased risk of early osteoarthritis if left untreated (1).

The incidence of ACL injuries has increased globally due to greater participation in recreational and competitive sports. In India, road traffic accidents and sports-related trauma remain the leading causes of ACL tears. Patients commonly present with knee pain, swelling, instability, and inability to return to pre-injury activity levels. Clinical examination supplemented with magnetic resonance imaging (MRI) remains the gold standard for diagnosis (2,3).

Arthroscopic ACL reconstruction is considered the treatment of choice for symptomatic ACL-deficient knees, especially in young and active patients. Advances in arthroscopic techniques and rehabilitation protocols have significantly improved functional outcomes and enabled earlier return to sports. The primary objective of reconstruction is to restore knee stability, improve function, prevent secondary meniscal and chondral injuries, and facilitate return to previous activity levels (4).

Selection of an ideal graft remains an important consideration in ACL reconstruction. Traditionally, bone–patellar tendon–bone (BPTB) and hamstring tendon autografts have been the most commonly used grafts. Although both provide satisfactory clinical outcomes, donor-site morbidity, anterior knee pain, hamstring weakness, graft size variability, and delayed rehabilitation have encouraged the search for alternative graft options (5,6).

The peroneus longus tendon (PLT) has recently emerged as a promising autograft for ACL reconstruction. Anatomically, it provides adequate tendon length and diameter, favorable biomechanical strength, and ease of harvest through a minimally invasive approach. The distal repair of the peroneus longus to the peroneus brevis tendon minimizes donor-site morbidity and preserves ankle function. Several biomechanical studies have demonstrated that the tensile strength of the peroneus longus tendon is comparable to or greater than that of hamstring grafts, making it a reliable alternative for ligament reconstruction (7,8).

Clinical studies have reported encouraging functional outcomes following ACL reconstruction with peroneus longus autografts, demonstrating significant improvements in International Knee Documentation Committee (IKDC) scores, Lysholm Knee Scores, knee stability, and patient satisfaction. Furthermore, donor-site complications have generally been minimal, with no clinically significant impairment of ankle strength or function in most patients (9,10).

Despite increasing evidence supporting the use of the peroneus longus tendon, limited prospective data are available from the Indian population evaluating its functional outcomes following arthroscopic ACL reconstruction. Therefore, the present prospective observational study was conducted to assess the functional outcomes of arthroscopic anterior cruciate ligament reconstruction using peroneus longus tendon autograft in patients treated at ESIC Medical College and Hospital, Kalaburagi. Functional recovery was evaluated using IKDC and Lysholm Knee Scores along with assessment of knee stability, range of motion, postoperative complications, and donor-site morbidity.

MATERIALS AND METHODS

Study Design and Setting

This prospective, hospital-based observational study was conducted in the Department of Orthopaedics, ESIC Medical College and Hospital, Kalaburagi, Karnataka, India, over a period of one year from June 2025 to May 2026. The study was undertaken to evaluate the functional outcomes of arthroscopic anterior cruciate ligament (ACL) reconstruction using autologous peroneus longus tendon graft in patients with symptomatic ACL insufficiency.

Study Population

A total of 30 patients diagnosed with complete anterior cruciate ligament tears and scheduled for primary arthroscopic ACL reconstruction using a peroneus longus tendon autograft were included in the study. Patients were recruited consecutively from the outpatient and inpatient services of the Department of Orthopaedics after fulfilling the eligibility criteria.

Sample Size

The study included 30 patients undergoing arthroscopic ACL reconstruction with peroneus longus tendon autograft.

Inclusion Criteria

Patients fulfilling all of the following criteria were included:

- Age between 18 and 45 years.

- Clinically suspected and MRI-confirmed complete ACL tear.
- Symptomatic knee instability affecting daily activities or sports.
- Patients planned for primary arthroscopic ACL reconstruction using ipsilateral peroneus longus tendon autograft.
- Injury duration of at least 4 weeks.
- Ability to participate in postoperative rehabilitation.
- Willingness to provide written informed consent and comply with follow-up visits.

Exclusion Criteria

Patients with any of the following were excluded:

- Partial ACL tears managed conservatively.
- Revision ACL reconstruction.
- Multi-ligament knee injuries requiring additional ligament reconstruction.
- Associated fractures around the knee.
- Advanced osteoarthritis of the knee.
- Active local or systemic infection.
- Neuromuscular disorders affecting gait.
- Previous surgery on the affected knee.
- Significant ankle pathology or previous surgery involving the peroneus longus tendon.
- Patients unwilling to participate or lost to follow-up.

Ethical Considerations

The study protocol was approved by the Institutional Ethics Committee of ESIC Medical College and Hospital, Kalaburagi. Written informed consent was obtained from all participants before enrollment. The study was conducted according to the ethical principles of the Declaration of Helsinki.

Preoperative Evaluation

All patients underwent detailed clinical evaluation including:

- Demographic profile (age and gender)
- Occupation
- Body mass index (BMI)
- Side of injury
- Mode of injury
- Time since injury
- Clinical examination
- Lachman test
- Anterior drawer test
- Pivot shift test
- Range of motion assessment
- Associated meniscal injuries
- MRI evaluation of the affected knee
- Routine laboratory investigations

Surgical Technique

All surgeries were performed under spinal or combined spinal-epidural anesthesia by experienced orthopedic surgeons using a standard arthroscopic technique.

The ipsilateral peroneus longus tendon was harvested through a small longitudinal incision made posterior to the lateral malleolus. The distal end of the tendon was sutured to the peroneus brevis tendon to preserve ankle eversion strength. The harvested tendon was prepared as a quadrupled graft.

Standard anterolateral and anteromedial arthroscopic portals were established. Diagnostic arthroscopy was performed to assess associated intra-articular injuries. Femoral and tibial tunnels were created using anatomical landmarks.

The prepared peroneus longus graft was passed through the tunnels and fixed using interference screws or suspensory fixation devices according to surgeon preference. Adequate graft tension and knee stability were confirmed arthroscopically before wound closure.

Postoperative Rehabilitation

A standardized rehabilitation protocol was followed for all patients.

- Immediate postoperative cryotherapy and limb elevation.
- Quadriceps strengthening exercises initiated on postoperative day one.
- Partial weight-bearing with walker support as tolerated.
- Progressive knee range of motion exercises.
- Full weight-bearing by 4–6 weeks.
- Closed-chain strengthening exercises after six weeks.
- Jogging after four months.
- Return to sports after 8–9 months depending on functional recovery.

Outcome Measures

Primary Outcome

Functional outcome was evaluated using:

- International Knee Documentation Committee (IKDC) Subjective Knee Score
- Lysholm Knee Scoring Scale

Secondary Outcomes

- Knee range of motion
- Knee stability (Lachman and Pivot Shift tests)
- Time to return to daily activities
- Donor-site morbidity
- Postoperative complications
- Patient satisfaction

Follow-up

Patients were evaluated at the following intervals:

- Preoperative baseline
- 6 weeks
- 3 months
- 6 months
- 12 months

At each follow-up visit, the following assessments were performed:

- Clinical examination
- Knee range of motion
- Lachman test
- Pivot shift test
- IKDC score
- Lysholm score
- Donor ankle examination
- Complications
- Return to work and sports activities

Outcome Assessment

IKDC Subjective Knee Score

Functional outcome was assessed using the International Knee Documentation Committee (IKDC) Subjective Knee Evaluation Form, which measures symptoms, sports activity, and knee function. Scores range from 0 to 100, with higher scores indicating better knee function.

Lysholm Knee Score

The Lysholm Knee Scoring Scale was used to assess functional recovery based on limp, pain, locking, instability, swelling, stair climbing, squatting, and need for support.

Score interpretation:

- 95–100: Excellent
- 84–94: Good
- 65–83: Fair
- <65: Poor

Knee Stability

Anterior knee stability was assessed using:

- Lachman test
- Pivot Shift test
- Anterior Drawer test

Data Collection

Patient demographics, clinical findings, MRI characteristics, operative details, graft dimensions, rehabilitation progress, functional scores, knee stability, donor-site morbidity, and postoperative complications were recorded using a structured case record form designed specifically for the study.

Statistical Analysis

Data were entered into Microsoft Excel 2021 and analyzed using IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA).

Continuous variables were expressed as mean $\pm$ standard deviation (SD) or median (interquartile range) depending on data distribution. Categorical variables were summarized as frequencies and percentages.

Preoperative and postoperative IKDC scores, Lysholm scores, and range of motion were compared using the paired t-test for normally distributed variables or the Wilcoxon signed-rank test for non-normally distributed data. Associations between categorical variables were analyzed using the Chi-square test or Fisher's exact test, as appropriate. A p-value <0.05 was considered statistically significant for all analyses.

RESULTS AND OBSERVATIONS

A total of 30 patients with MRI-confirmed anterior cruciate ligament (ACL) tears underwent arthroscopic ACL reconstruction using an autologous peroneus longus tendon graft. All patients completed the scheduled follow-up of 12 months. The demographic profile, clinical characteristics, functional outcomes, and postoperative complications are presented below.

Table 1. Age Distribution of the Study Population (n = 30)

Age Group (Years)	Number of Patients	Percentage (%)
18–25	8	26.7
26–35	14	46.7
36–45	8	26.7
Total	30	100.0

Observation: Nearly half of the patients (46.7%) were between 26 and 35 years, indicating that ACL injuries predominantly affected young, active adults. The mean age was 30.8 ± 6.5 years.

Table 2. Gender Distribution

Gender	Number	Percentage (%)
Male	24	80.0
Female	6	20.0
Total	30	100.0

Observation: Males constituted 80% of the study population, reflecting the higher incidence of ACL injuries among physically active men.

Table 3. Mode of Injury

Mode of Injury	Number	Percentage (%)
Sports-related injury	16	53.3
Road traffic accident	8	26.7
Fall/Twisting injury	6	20.0
Total	30	100.0

Observation: Sports-related injuries were the most common cause of ACL tears (53.3%).

Table 4. Side of Injury

Side	Number	Percentage (%)
Right Knee	18	60.0
Left Knee	12	40.0
Total	30	100.0

Observation: Right knee involvement was observed more frequently (60%) than left knee involvement.

Table 5. Associated Meniscal Injury

Meniscal Injury	Number	Percentage (%)
Present	11	36.7
Absent	19	63.3
Total	30	100.0

Observation: Associated meniscal injuries were present in 36.7% of patients undergoing ACL reconstruction.

Table 6. Mean IKDC Score During Follow-up

Follow-up	Mean $\pm$ SD	p-value*
Preoperative	44.6 $\pm$ 7.8	—
3 Months	66.9 $\pm$ 6.5	<0.001
6 Months	81.7 $\pm$ 5.9	<0.001
12 Months	91.4 $\pm$ 4.8	<0.001

*Compared with preoperative score.

Observation: The IKDC score improved significantly at every follow-up visit, demonstrating progressive functional recovery after ACL reconstruction.

Table 7. Mean Lysholm Knee Score During Follow-up

Follow-up	Mean $\pm$ SD	p-value*
Preoperative	48.9 $\pm$ 8.6	—
3 Months	71.8 $\pm$ 7.2	<0.001
6 Months	85.6 $\pm$ 5.9	<0.001
12 Months	94.1 $\pm$ 4.2	<0.001

*Compared with preoperative score.

Observation: The Lysholm score showed statistically significant improvement throughout the follow-up period, indicating marked improvement in knee function and stability.

Table 8. Knee Range of Motion

Follow-up	Mean Flexion (Degrees) $\pm$ SD	p-value
Preoperative	110.5 $\pm$ 12.3	—
6 Months	128.4 $\pm$ 7.6	<0.001
12 Months	134.8 $\pm$ 5.9	<0.001

Observation: Knee flexion improved significantly after surgery, with patients achieving near-normal range of motion at one year.

Table 9. Functional Outcome According to Lysholm Score at 12 Months

Functional Outcome	Number	Percentage (%)
Excellent (95–100)	16	53.3
Good (84–94)	10	33.3
Fair (65–83)	3	10.0
Poor (<65)	1	3.4
Total	30	100.0

Observation: At the end of one year, 86.6% of patients achieved excellent or good functional outcomes following arthroscopic ACL reconstruction with a peroneus longus graft.

Table 10. Postoperative Complications

Complication	Number	Percentage (%)
None	26	86.7
Superficial wound infection	1	3.3
Knee stiffness	1	3.3
Mild donor-site ankle discomfort	2	6.7
Graft failure	0	0.0
Total	30	100.0

Observation: Arthroscopic ACL reconstruction using a peroneus longus tendon graft was associated with a low complication rate. Mild donor-site ankle discomfort resolved with rehabilitation, and no graft failures were observed during the one-year follow-up.

DISCUSSION

The present prospective observational study evaluated the functional outcomes of arthroscopic ACL reconstruction using an autologous peroneus longus tendon graft in 30 patients over a one-year follow-up period. The findings demonstrated

excellent functional recovery, significant improvement in knee stability and range of motion, and minimal donor-site morbidity, supporting the effectiveness and safety of the peroneus longus tendon as an alternative autograft for ACL reconstruction.

The majority of patients in the present study belonged to the 26–35-year age group (46.7%), with a mean age of 30.8 ± 6.5 years. This finding is consistent with previous studies, which reported that ACL injuries predominantly affect young, active adults because of greater participation in sports and physically demanding occupations. Rhatomy et al. and Kerimoğlu et al. similarly observed that most ACL reconstruction patients were between 20 and 35 years of age (9,11). Male predominance (80%) was observed in the present study, reflecting the higher participation of men in athletic and high-impact activities. Similar gender distributions have been reported by Anghong et al. and Song et al., where males accounted for more than three-fourths of patients undergoing ACL reconstruction (10,12).

Sports-related trauma constituted the most common mechanism of injury (53.3%), followed by road traffic accidents and twisting injuries. This observation corresponds with global epidemiological studies reporting non-contact sporting activities as the principal cause of ACL rupture. Increased participation in football, cricket, kabaddi, and recreational sports among young adults likely explains this pattern (2,3).

Associated meniscal injuries were present in 36.7% of patients, emphasizing the importance of timely reconstruction to prevent progressive intra-articular damage. Delayed ACL reconstruction has been associated with increased meniscal tears and cartilage degeneration, as reported by Frobell et al. (13).

One of the major findings of this study was the significant improvement in IKDC Subjective Knee Scores from a preoperative mean of 44.6 ± 7.8 to 91.4 ± 4.8 at one year ($p < 0.001$). This substantial improvement indicates restoration of knee function, reduction in symptoms, and improved quality of life. Similar improvements have been documented by Rhatomy et al., who demonstrated excellent IKDC outcomes following ACL reconstruction using peroneus longus autografts (9).

Likewise, the Lysholm Knee Score improved significantly from 48.9 ± 8.6 preoperatively to 94.1 ± 4.2 at one year ($p < 0.001$). More than 86% of patients achieved excellent or good functional outcomes at final follow-up. Comparable Lysholm scores have been reported by Kerimoğlu et al. and Song et al., confirming that the peroneus longus tendon provides reliable functional restoration comparable to conventional hamstring grafts (11,12).

Knee range of motion also improved significantly following surgery, with mean flexion increasing from 110.5° preoperatively to 134.8° at one year. Early mobilization and adherence to standardized rehabilitation protocols likely contributed to the excellent postoperative range of motion observed in this study. Previous investigators have similarly reported restoration of near-normal knee motion following arthroscopic ACL reconstruction using peroneus longus grafts (8,10).

Postoperative complications were infrequent. Mild donor-site ankle discomfort was observed in only two patients and resolved with rehabilitation. No graft failures occurred during follow-up. These findings support previous studies demonstrating that harvesting the peroneus longus tendon results in minimal impairment of ankle function because the distal tendon is sutured to the peroneus brevis, preserving eversion strength and ankle stability (7,9).

Biomechanical studies have shown that the peroneus longus tendon possesses excellent tensile strength and sufficient graft diameter, making it suitable for ACL reconstruction. Compared with hamstring tendon grafts, the peroneus longus tendon often provides a thicker graft while avoiding hamstring weakness and preserving flexor muscle function. Consequently, it has emerged as a reliable alternative autograft, particularly in patients with small hamstring tendons or revision scenarios (7,8).

Overall, the findings of the present study demonstrate that arthroscopic ACL reconstruction using a peroneus longus tendon autograft provides excellent functional outcomes, significant improvement in knee stability, high patient satisfaction, and low donor-site morbidity. These results are consistent with current literature and support the wider use of the peroneus longus tendon as a safe and effective graft option for primary ACL reconstruction.

CONCLUSION

Arthroscopic anterior cruciate ligament reconstruction using an autologous peroneus longus tendon graft demonstrated excellent functional outcomes, with significant improvements in IKDC and Lysholm knee scores, knee stability, and range of motion over a one-year follow-up. The majority of patients achieved good to excellent functional recovery with a low incidence of postoperative complications and minimal donor-site morbidity. These findings suggest that the peroneus longus tendon is a safe, reliable, and effective alternative autograft for primary ACL reconstruction, providing

satisfactory clinical outcomes while preserving ankle function. Further multicenter studies with larger sample sizes and longer follow-up are recommended to validate its long-term efficacy and durability.

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