

Comparison of Functional Outcomes of Peroneus Longus Tendon Autograft versus Hamstring Tendon Autograft in Anterior Cruciate Ligament Reconstruction

Shaik Qurrath-ul-ain¹, Bodigadla Akhil¹, Sivakumar Mamilapalli²

¹Junior Residents, Department of Orthopaedics, Katuri Medical College and Hospital, Guntur, India. ²Senior Consultant, Department of Orthopaedics, Katuri Medical College and Hospital, Guntur, India

Abstract

Background: Anterior cruciate ligament (ACL) rupture is a common injury in young and active individuals. Hamstring autografts remain the conventional choice for ACL reconstruction; however variable graft quality has prompted evaluation of alternative grafts. The peroneus longus tendon has recently emerged as a potential option due to its favorable biomechanical properties and minimal functional deficit at the donor site. The objective is to compare functional outcomes, graft stability, and donor site morbidity between peroneus longus tendon and hamstring tendon autografts in arthroscopic ACL reconstruction. **Material and Methods:** This prospective comparative study included 20 patients (12 males, 8 females; mean age 27.6 years) who underwent arthroscopic ACL reconstruction between December 2022 and December 2023. Patients were divided into two groups: peroneus longus (n=10) and hamstring tendon (n=10) autografts. Functional outcomes were assessed using the International Knee Documentation Committee (IKDC) and Lysholm scores. Donor site morbidity was evaluated using ankle range of motion (ROM), Foot and Ankle Disability Index (FADI), and American Orthopedic Foot and Ankle Society (AOFA) scores. Statistical analysis was performed using Student's t-test. **Results:** Both groups showed significant postoperative improvement in IKDC and Lysholm scores, with no statistical difference between peroneus longus and hamstring groups at final follow-up. Donor site ankle ROM was preserved in the peroneus longus group with a mean AOFA score of 93.42 ± 1.7 and FADI score of 97%. Knee stability outcomes were comparable, with no graft re-tears reported. **Conclusion:** Peroneus longus tendon autograft offers excellent functional outcomes and knee stability comparable to hamstring autografts, with minimal donor site morbidity. It represents a reliable and safe alternative graft option for ACL reconstruction.

Keywords: Anterior cruciate ligament, Peroneus longus tendon, Hamstring tendon, Arthroscopic reconstruction, Functional outcomes, Donor site morbidity.

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INTRODUCTION

Anterior cruciate ligament (ACL) injury is among the most frequent ligamentous injuries of the knee, particularly affecting young and physically active individuals. The ACL is essential for maintaining anteroposterior and rotational stability, and its rupture can lead to recurrent instability, functional limitation, and predisposition to early-onset osteoarthritis if left untreated.^[1] Arthroscopic ACL reconstruction has evolved as the standard of care, with autografts being the preferred choice due to superior biological incorporation and reduced risk of immune rejection compared with allografts or synthetic substitutes.^[2] Hamstring tendon autografts are conventionally employed owing to their favorable biomechanical strength and ease of harvest. However, they are not without drawbacks, such as unpredictable graft diameter, potential weakening of knee flexor strength.^[3] To overcome these limitations, the peroneus longus tendon has gained increasing attention. It provides adequate length, consistent diameter, and high tensile strength, while donor site morbidity remains minimal due to compensatory function of the peroneus brevis muscle.^[4] Recent clinical and comparative studies

have demonstrated that peroneus longus tendon autografts achieve functional outcomes comparable to hamstring autografts in ACL reconstruction, further supporting its role as a viable and effective alternative.^[5]

Despite these promising reports, limited prospective comparative data are available evaluating functional outcomes, graft stability, and donor site morbidity between peroneus longus and hamstring autografts. This study was therefore undertaken to assess the clinical efficacy of peroneus longus tendon autografts in comparison with hamstring tendon autografts in arthroscopic ACL reconstruction, with an emphasis on functional outcomes and donor site morbidity.

Address for correspondence: Dr. Shaik Qurrath-ul-ain,
Junior Residents, Department of Orthopaedics, Katuri Medical College and Hospital,
Guntur, India
E-mail: qurrathshaik1994@gmail.com

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MATERIALS AND METHODS

Study Design and Setting: This prospective comparative study was carried out in the Department of Orthopaedics, katuri medical college and hospital(KMCH), Guntur, from December 2022 to December 2023. Approval was obtained from the Institutional Ethics Committee prior to initiation, and written informed consent was secured from all participants.

Study Population: Twenty patients with anterior cruciate ligament (ACL) rupture confirmed by clinical examination and magnetic resonance imaging (MRI) were enrolled. They were divided into two groups: Peroneus Longus autograft group (n = 10) and Hamstring autograft group (n = 10).

Inclusion criteria

Patients aged 18–50 years

Isolated ACL rupture confirmed by Lachman, anterior drawer test and pivot shift tests and MRI

Exclusion criteria

Multiligamentous knee injuries

Chondral lesions grade III or higher

Previous surgery on the affected knee

Revision ACL reconstruction cases

Generalized joint hypermobility

Presence of ankle joint pathology

Surgical Technique

All surgeries were performed arthroscopically under spinal or general anesthesia with the patient in the supine position and a tourniquet applied on the thigh. Standard anterior portals were created, followed by diagnostic arthroscopy. Graft harvesting was performed using either semitendinosus ± gracilis (hamstring group) or peroneus longus tendon (peroneus group). Concomitant procedures such as meniscal repair or partial meniscectomy were performed when indicated. The graft was prepared and fixed with endobutton and interference screws in both femoral and tibial tunnels.

Postoperative Rehabilitation: A uniform rehabilitation protocol was followed in both groups. Early mobilization with quadriceps strengthening exercises was initiated, and partial weight-bearing was permitted from the second postoperative day, progressing to full weight-bearing as tolerated.

Outcome Measures: Knee function: International Knee Documentation Committee (IKDC) score and Lysholm score were recorded preoperatively and at 12-month follow-up.

Donor site morbidity: In the peroneus longus group, ankle range of motion (dorsiflexion, plantarflexion, inversion, eversion), Foot and Ankle Disability Index (FADI), and American Orthopedic Foot and Ankle Society (AOFA) scores were documented.

Knee stability: Lachman, anterior drawer test and pivot shift tests were repeated at follow-up.

Statistical Analysis: Data analysis was performed using SPSS version 25.0. Continuous variables were expressed as mean ± standard deviation (SD). Comparison of means between groups was done using the independent Student's t-test. A p-value < 0.05 was considered statistically

significant.

Ethical Considerations: Ethical clearance was obtained from the Institutional Ethics Committee of katuri medical college Hospital (KMCH), Guntur, prior to patient enrollment. All participants were informed in detail about the study objectives, surgical procedures, potential risks, and benefits. Written informed consent was obtained from each patient before inclusion. Patient confidentiality was maintained throughout the study by anonymizing data, and participation was entirely voluntary with the right to withdraw at any stage without affecting standard medical care.

RESULTS

A total of 20 patients were included in this prospective comparative study. The majority were males (60%), with females accounting for 40%. The age distribution showed that most patients were in the younger age groups, particularly 26–30 years (35%) and 18–25 years (25%). Sports-related trauma was the most frequent cause of ACL injury (55%), followed by road traffic accidents (30%) and other causes (15%) [Table 1].

Radiographic Assessment: Preoperative radiographs demonstrated loss of continuity of the ACL with associated instability in both groups. In the Peroneus Longus Tendon group, preoperative knee radiographs highlighted the ACL-deficient joint [Figure 1A],



Figure 1A: Preoperative Radiographs of the Knee Joint Showing ACL Injury – Peroneus Longus Tendon Graft Group

Whereas postoperative images confirmed appropriate graft fixation with well-aligned tunnels and interference screw placement [Figure 1B].



Figure 1B: Postoperative Radiographs of the Knee Joint Following ACL Reconstruction with Peroneus Longus Tendon Autograft

Similarly, in the Hamstring Tendon group, preoperative radiographs revealed characteristic features of ACL injury [Figure 2A]

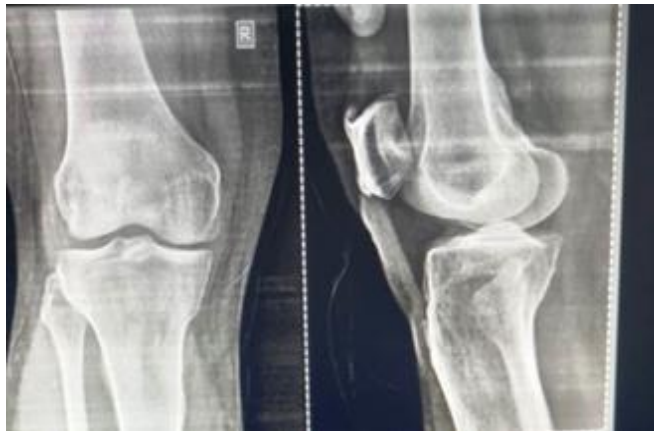


Figure 2A: Preoperative radiographs of the knee joint in the Hamstring Tendon group

While postoperative radiographs showed successful tunnel

positioning and secure graft fixation without complications [Figure 2B].

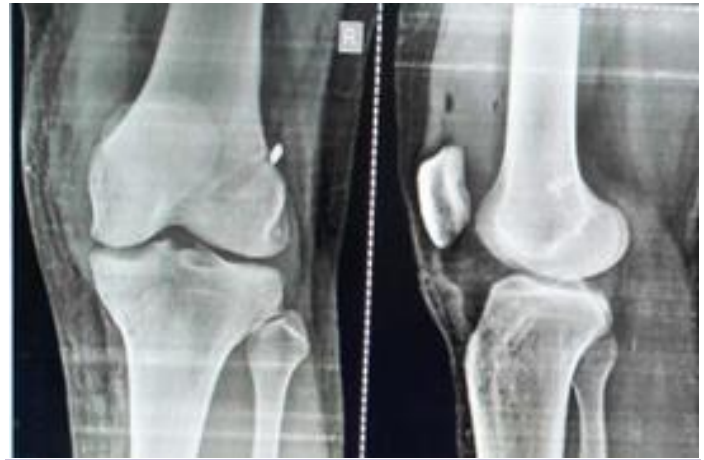


Figure 2B: Postoperative radiographs of the knee joint in the Hamstring Tendon group

Table 1: Demographic and Injury Profile of Patients (N = 20)

Variable	Category	No. of Patients	Percentage (%)
Gender	Male	12	60.0
	Female	8	40.0
Age (Years)	18–25	5	25.0
	26–30	7	35.0
	31–35	4	20.0
	36–40	2	10.0
	41–45	1	5.0
Mode of Injury	Sports	11	55.0
	Road Traffic Accidents	6	30.0
	Other causes	3	15.0

These findings confirm that both grafting techniques provided stable fixation radiographically.

Donor Site Morbidity (Peroneus Longus Group)

Assessment of donor site morbidity in the peroneus longus group revealed no significant restriction of ankle motion

compared with the contralateral side. Mean dorsiflexion, plantarflexion, inversion, and eversion were preserved ($p > 0.05$ for all), indicating functional compensation by the peroneus brevis muscle [Table 2].

Table 2: Comparison of Ankle Range of Motion in Peroneus Longus Harvested vs. Contralateral Side

Motion (degree)	Peroneus Longus Harvested (Mean ± SD)	Contralateral Side (Mean ± SD)	P-value
Dorsiflexion	21.1 ± 5.2	20.5 ± 5.1	0.812
Plantarflexion	37.2 ± 8.1	36.8 ± 7.5	0.564
Inversion	30.7 ± 4.5	31.0 ± 4.8	0.423
Eversion	25.2 ± 6.0	25.6 ± 5.7	0.498

Functional scoring also demonstrated excellent donor ankle outcomes. The AOFA score averaged 93.42 ± 1.7 , and the FADI score was 97% at the donor side, compared with

98.91 ± 0.62 on the contralateral ankle, a difference that was statistically significant but clinically negligible [Table 3].

Table 3: Donor Site Functional Scores (Peroneus Longus Group)

Parameter	Group	Mean ± SD	Range	P Value
AOFA Score	Donor's Ankle	93.42 ± 1.7	84–100	–
FADI Score	Donor's Ankle	97%	–	–
FADI Score	Contralateral Side	98.91 ± 0.62	94–102	>0.0001

Knee Functional Outcomes: Both groups achieved significant improvement in functional scores. Preoperative IKDC and Lysholm scores were comparable between peroneus longus and hamstring groups. At final follow-up, IKDC improved to 92.6 ± 4.2 in the peroneus group and

93.2 ± 4.1 in the hamstring group ($p = 0.578$). Lysholm scores improved to 95.0 ± 3.5 and 94.8 ± 3.7 , respectively ($p = 0.615$), with no significant intergroup difference [Table 4].

Table 4: Functional Outcomes and Knee Stability in Peroneus Longus vs. Hamstring Groups

Outcome	Peroneus Longus Group (Mean ± SD)	Hamstring Group (Mean ± SD)	P-value
IKDC (Preoperative)	55.1 ± 2.3	54.8 ± 2.4	0.932
IKDC (Last Follow-Up)	92.6 ± 4.2	93.2 ± 4.1	0.578
Lysholm (Preoperative)	63.2 ± 5.1	62.8 ± 5.0	0.885
Lysholm (Last Follow-Up)	95.0 ± 3.5	94.8 ± 3.7	0.615
Stability Outcome	Stable (n=9), Mild laxity (n=1)	Stable (n=9), Mild laxity (n=1)	No re-tears

DISCUSSION

The present study compared peroneus longus and hamstring tendon autografts in anterior cruciate ligament (ACL) reconstruction and demonstrated that both groups achieved significant postoperative improvements in IKDC and Lysholm scores at one-year follow-up, with no significant difference in knee stability. These findings corroborate recent systematic reviews and meta-analyses reporting comparable functional outcomes between peroneus longus and hamstring autografts.^[6]

In long-term assessments, Butt et al. observed equivalent graft survival and knee function at five years between peroneus longus and hamstring tendon reconstructions, underscoring the durability of the peroneus longus graft.^[7] Gandhi et al. also reported similar short-term functional results, reinforcing the safety and efficacy of peroneus longus tendon as an alternative graft.^[8] While most available evidence focuses on ACL reconstruction, a meta-analysis by Yousif Mohamed et al. demonstrated favorable outcomes of peroneus longus autografts in posterior cruciate ligament reconstruction, further supporting its versatility as a graft option.^[9]

Donor site morbidity remains an important concern in graft selection. In our series, ankle function was preserved following peroneus longus harvest, a finding consistent with Saoji et al., who found only minimal differences in ankle functional outcomes after peroneus longus harvest in their meta-analysis.^[10] Similarly, Punnoose et al. reported that peroneus longus autografts not only provided superior graft diameter but were also associated with less morbidity and enhanced muscle recuperation compared with hamstring grafts.^[11] These advantages may contribute to faster rehabilitation and better early functional recovery.

Our observations are further supported by a randomized controlled trial conducted by Asif et al., which showed comparable knee stability and functional results between the two graft options, reinforcing that peroneus longus tendon can be safely employed as a substitute when hamstring quality or availability is inadequate.^[12]

Overall, accumulating evidence from recent clinical studies and systematic reviews supports our findings that peroneus longus tendon autografts provide outcomes equivalent to hamstring autografts in ACL reconstruction while minimizing donor site morbidity.

CONCLUSION

This prospective comparative study demonstrates that the peroneus longus tendon autograft provides functional outcomes equivalent to the hamstring tendon autograft in arthroscopic ACL reconstruction. Both groups achieved significant postoperative improvement in IKDC and

Lysholm scores, with comparable graft stability and no re-tears during follow-up. Importantly, harvesting the peroneus longus tendon was associated with minimal donor site morbidity, as ankle range of motion and functional scores remained preserved. These findings highlight the peroneus longus tendon as a safe and reliable alternative autograft, especially when hamstring tendons are unsuitable. Larger multicenter trials with longer follow-up are warranted to validate these results further.

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Conflicts of interest

There are no conflicts of interest.

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