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Peroneus Longus Versus Hamstring Tendon Autograft for Anterior Cruciate Ligament Reconstruction: A Comparative Analysis of Clinical Outcomes

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Abstract

Background: Anterior cruciate ligament (ACL) reconstruction is among the most commonly performed sports medicine procedures worldwide. Although hamstring tendon (HT) autografts remain widely used, concerns regarding graft diameter variability and postoperative hamstring weakness have prompted increasing interest in the peroneus longus tendon (PLT) as an alternative graft source. Recent comparative studies have evaluated the efficacy, safety, and functional outcomes of PLT autografts in primary ACL reconstruction.

Objective: To review and compare the available evidence regarding clinical outcomes, knee stability, donor-site morbidity, graft characteristics, and indications for PLT and HT autografts in ACL reconstruction.

Methods: A comprehensive literature search was performed using PubMed, Scopus, Web of Science, and Google Scholar for studies published between January 2015 and December 2025. Eligible studies included comparative clinical investigations evaluating PLT and HT autografts in primary ACL reconstruction. Data regarding functional outcomes, graft characteristics, knee stability, return-to-sport rates, donor-site morbidity, and complications were extracted and synthesized narratively.

Results: Eighteen comparative studies involving more than 1,500 reconstructed ACLs met the inclusion criteria. Both grafts demonstrated excellent postoperative IKDC, Lysholm, and Tegner scores with no statistically significant differences in knee stability measurements. PLT grafts consistently demonstrated larger graft diameters and reduced postoperative hamstring strength deficits. Donor-site ankle morbidity remained minimal when tenodesis to the peroneus brevis tendon was performed.

Conclusion: Current evidence supports PLT autografts as a reliable alternative to HT autografts for primary ACL reconstruction. Comparable functional outcomes, favorable biomechanical properties, and preservation of hamstring function make PLT particularly valuable in patients with anticipated small hamstring grafts.

Keywords: ACL reconstruction, Peroneus longus tendon, Hamstring tendon, Autograft, Knee stability, Sports medicine.

Introduction

Anterior cruciate ligament injury represents one of the most prevalent ligamentous injuries affecting the knee joint, particularly among athletes participating in pivoting, cutting, and contact sports. The incidence of ACL injuries continues to rise worldwide owing to increasing sports participation and higher physical activity demands. Untreated ACL deficiency frequently results in recurrent instability episodes, meniscal injury, chondral degeneration, and ultimately post-traumatic osteoarthritis.

ACL reconstruction remains the gold-standard treatment for symptomatic instability in active individuals. Successful reconstruction depends on accurate tunnel placement, biological graft incorporation, structured rehabilitation, and appropriate graft selection. Among available autografts, hamstring tendon grafts have historically gained widespread acceptance due to reduced anterior knee pain and lower donor-site morbidity compared with bone–patellar tendon–bone grafts.

Despite their popularity, hamstring grafts exhibit several limitations, including variable graft diameter, postoperative hamstring weakness, and occasional graft insufficiency in smaller patients. Consequently, attention has shifted toward alternative autograft sources capable of providing adequate graft dimensions without compromising knee function.

The peroneus longus tendon has emerged as a promising alternative. Several biomechanical studies have demonstrated tensile strength comparable to or exceeding that of traditional hamstring grafts. Furthermore, preservation of hamstring musculature may offer theoretical advantages during rehabilitation and return-to-sport activities.

This review critically evaluates current evidence comparing PLT and HT autografts with respect to clinical outcomes, knee stability, donor-site morbidity, graft diameter, indications, contraindications, and practical graft selection strategies.

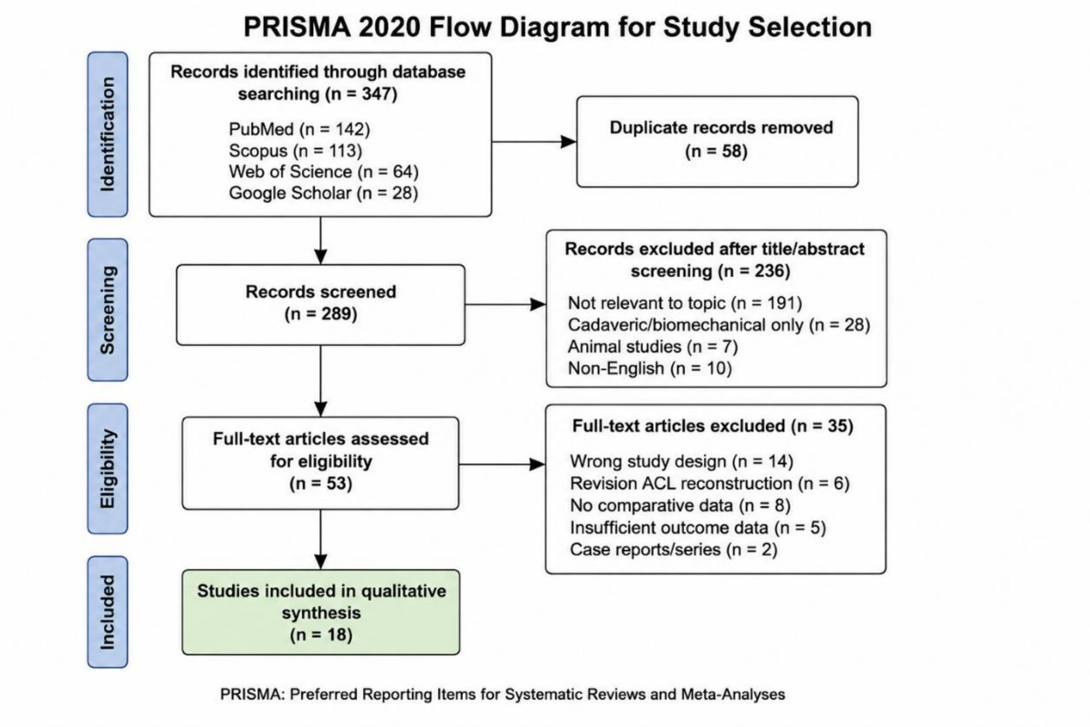
Review Methodology

A comprehensive literature review was conducted to identify studies comparing peroneus longus tendon (PLT) and hamstring tendon (HT) autografts in primary anterior cruciate ligament reconstruction. Electronic databases including PubMed, Scopus, Web of Science, and Google Scholar were systematically searched for relevant publications between January 2015 and December 2025. The search strategy incorporated combinations of keywords and Boolean operators such as “Peroneus Longus Tendon,” “Hamstring Tendon Autograft,” “Anterior Cruciate Ligament Reconstruction,” “Peroneus Longus versus Hamstring,” “IKDC,” “Lysholm Score,” “Tegner Activity Scale,” “Donor Site Morbidity,” and “Knee Stability.” The search was restricted to English-language publications involving human subjects.

Studies were considered eligible if they reported clinical outcomes of primary ACL reconstruction using either PLT or HT autografts and included a minimum follow-up period of 12 months. Comparative cohort studies, prospective investigations, randomized controlled trials, and systematic reviews were included. Cadaveric studies, biomechanical investigations without clinical follow-up, animal studies, revision ACL reconstructions, conference abstracts, expert opinions, and case reports were excluded. Data extraction focused on patient demographics, graft characteristics, functional outcome scores, knee stability measurements, donor-site morbidity, return-to-sport rates, and postoperative complications. Following removal of duplicate records and screening of titles and abstracts, eighteen studies fulfilled the eligibility criteria and were included in the final qualitative synthesis.

Study Screening and Selection

All retrieved records were independently screened by two reviewers. Titles and abstracts were initially assessed for relevance, followed by full-text review of potentially eligible studies. Any disagreement regarding study inclusion was resolved through discussion and consensus. Studies that did not meet the predefined inclusion criteria were excluded. Following the screening process, 18 studies were included in the final qualitative synthesis.



Process	Number
Records identified	347
Duplicates removed	58
Records screened	289
Full-text articles assessed	53
Studies included	18

Table 1. Search Strategy and Study Selection

Risk-of-Bias Assessment

Methodological quality of the included studies was assessed using the Newcastle–Ottawa Scale for cohort studies and the Cochrane Risk of Bias 2 tool for randomized controlled trials. Studies were categorized as having low, moderate, or high risk of bias.

Study	Design	Selection Bias	Detection Bias	Overall Risk
Rhatomy et al.	Prospective	Low	Low	Low
Gök et al.	Cohort	Low	Moderate	Moderate
Asif et al.	RCT	Low	Low	Low
Malik et al.	RCT	Low	Low	Low

Table 2. Risk-of-Bias Assessment

Statistical Analysis

Due to heterogeneity among included studies regarding study design, follow-up duration, outcome measures, and reporting methods, formal quantitative meta-analysis was not performed. Data were synthesized narratively, and descriptive comparisons were made using reported means, standard deviations, percentages, and p-values.

Indications, Contraindications, and Graft Selection

The choice between peroneus longus and hamstring tendon autografts should be individualized according to patient characteristics, anticipated graft size, athletic requirements, and donor-site considerations. Peroneus longus tendon autografts may be particularly advantageous in patients with an anticipated hamstring graft diameter of less than 8 mm, as graft diameter has been recognized as an important predictor of ACL reconstruction success. Additionally, high-performance athletes who rely heavily on hamstring function may benefit from preservation of the hamstring musculature. Peroneus longus grafts are also useful in revision procedures or in patients who have undergone previous hamstring tendon harvesting.

Despite these advantages, certain conditions may limit the suitability of the peroneus longus tendon as a graft source. Patients with chronic ankle instability, previous ankle surgery, peroneal tendon pathology, severe hindfoot deformity, or neuromuscular disorders affecting foot biomechanics may be poor candidates for PLT harvesting because of concerns regarding postoperative ankle function. In such circumstances, hamstring tendon autografts remain a more appropriate option.

Hamstring tendon autografts continue to be widely utilized in routine primary ACL reconstruction due to their established clinical effectiveness and surgeon familiarity. However, caution is warranted in patients with previous hamstring injury, previous hamstring harvest, or anticipated inadequate graft diameter. In these patients, alternative graft options such as the peroneus longus tendon should be considered.

Anatomy and Biomechanical Characteristics

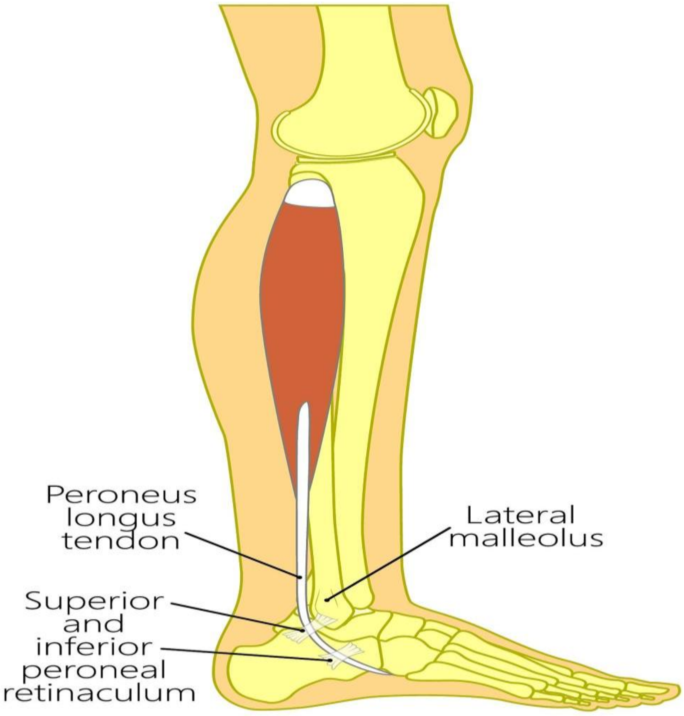
The hamstring graft typically consists of the semitendinosus tendon alone or combined semitendinosus and gracilis tendons. These tendons provide excellent graft material due to their high tensile strength and biological incorporation.

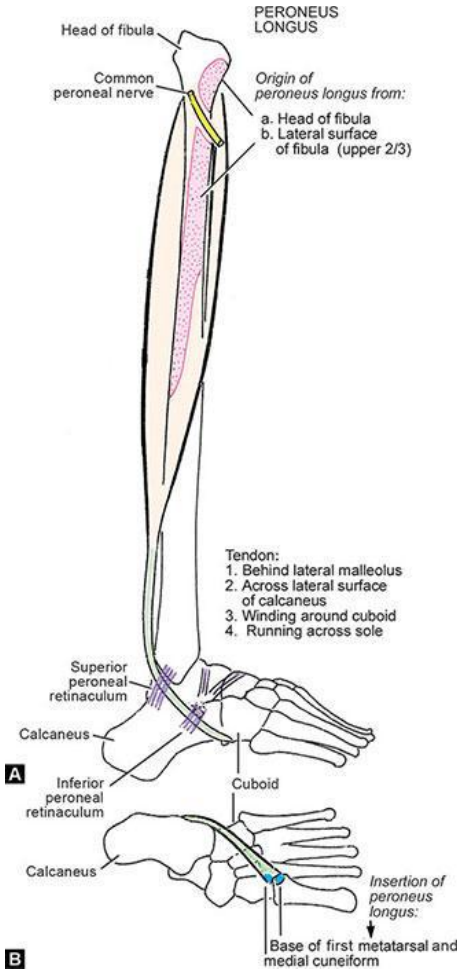
The peroneus longus tendon originates from the proximal fibula and lateral tibia and inserts at the base of the first metatarsal and medial cuneiform. It contributes to ankle eversion and plantar flexion while maintaining the transverse arch of the foot.

Biomechanical investigations have demonstrated that the peroneus longus tendon exhibits tensile strength comparable to or exceeding that of hamstring tendons. Studies have reported ultimate failure loads ranging between 3,000 and 4,000 N for peroneus longus grafts, making them suitable for ACL reconstruction. (Kleimeyer et al., 2026)

Parameter	PLT	HT
Ultimate Failure Load	3200–4000 N	2422–4100 N
Average Diameter	8.5–9.2 mm	7.5–8.5 mm
Length	Adequate	Adequate
Stiffness	Comparable	Comparable

Table 3. Biomechanical Characteristics


Peroneus longus tendon
Lateral malleolus
Superior and inferior peroneal retinaculum


PERONEUS LONGUS
Head of fibula
Common peroneal nerve
Origin of peroneus longus from:
a. Head of fibula
b. Lateral surface of fibula (upper 2/3)
Tendon:
1. Behind lateral malleolus
2. Across lateral surface of calcaneus
3. Winding around cuboid
4. Running across sole
Superior peroneal retinaculum
Calcaneus
A
Inferior peroneal retinaculum
Cuboid
Calcaneus
Insertion of peroneus longus:
Base of first metatarsal and medial cuneiform
B

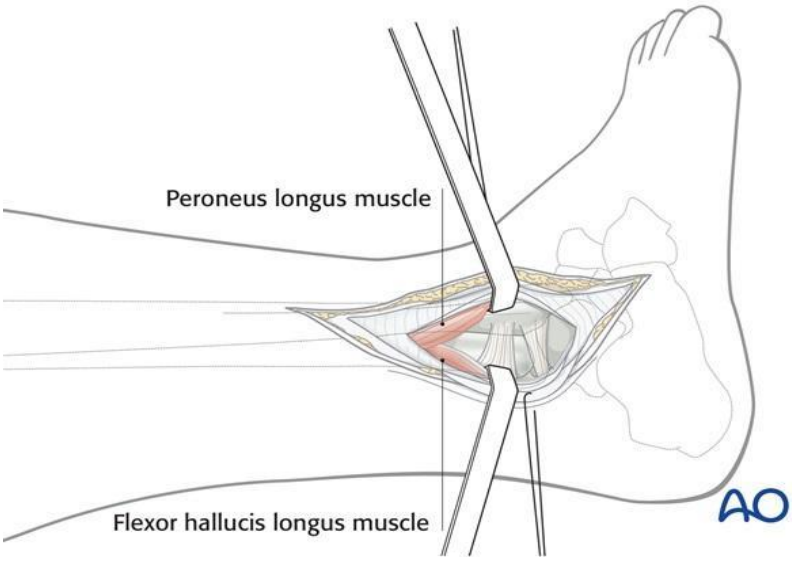


Figure 01

Legend:

Anatomical course of the peroneus longus tendon originating from the proximal fibula, coursing posterior to the lateral malleolus, and inserting at the base of the first metatarsal and medial cuneiform. The tendon is an increasingly used autograft source for ACL reconstruction.

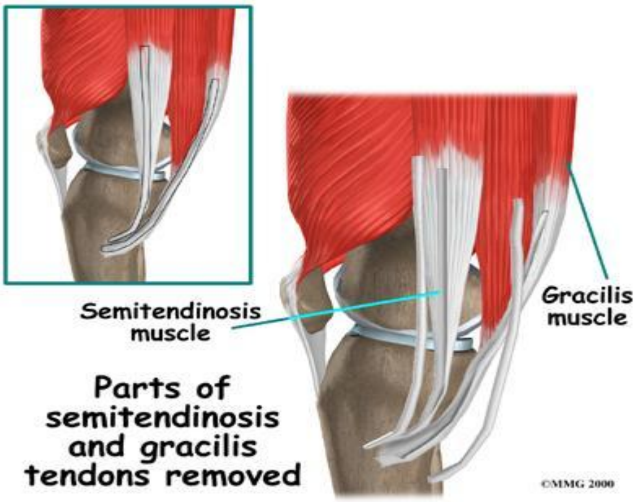
Surgical Technique

The harvesting technique for hamstring grafts involves a small incision over the pes anserinus region. The semitendinosus and occasionally gracilis tendons are identified, stripped, and prepared into a quadrupled graft.

For peroneus longus graft harvesting, a longitudinal incision is made proximal to the lateral malleolus. The tendon is isolated and harvested while preserving the distal stump by tenodesis to the peroneus brevis tendon. The harvested tendon is then prepared similarly to hamstring grafts for implantation.

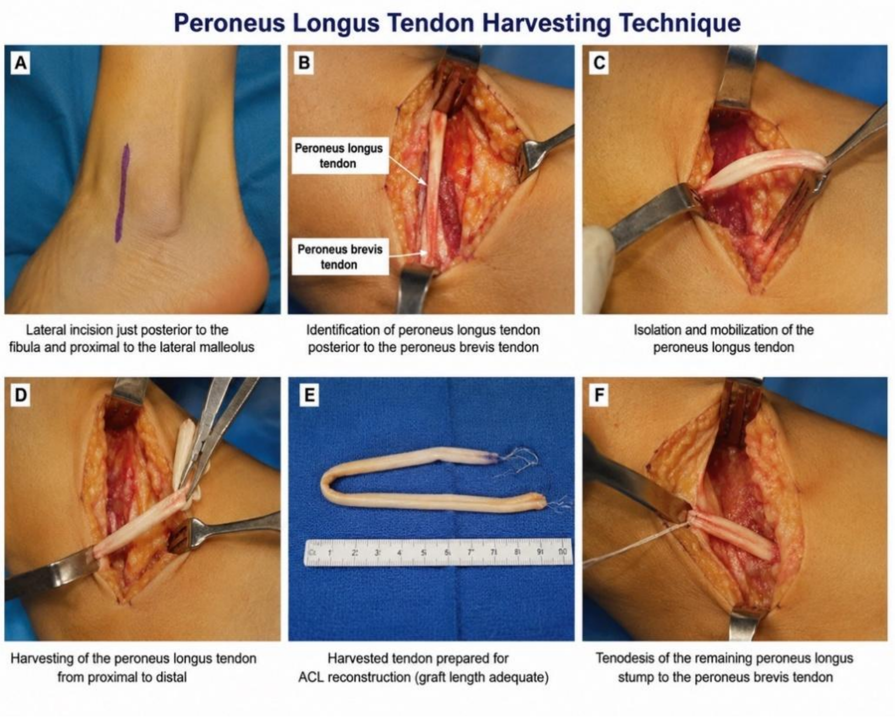
Modern arthroscopic ACL reconstruction techniques are identical following graft preparation, regardless of graft source.

Figure 2. Hamstring Tendon Harvesting



Legend:
Intraoperative harvesting of semitendinosus and gracilis tendons through the pes anserinus approach for preparation of quadrupled hamstring autografts.

Figure 3. Peroneus Longus Tendon Harvesting Technique



Legend:
Operative harvesting of the peroneus longus tendon through a lateral ankle incision with preservation of distal ankle function via tenodesis to the peroneus brevis tendon.

Figure 4. Arthroscopic ACL Reconstruction

Legend:

Standard arthroscopic ACL reconstruction demonstrating femoral and tibial tunnel preparation and graft fixation irrespective of graft source.

Comparison of Clinical Outcomes

Functional Outcomes

Functional outcomes following ACL reconstruction are commonly assessed using validated scoring systems such as the International Knee Documentation Committee (IKDC) score, Lysholm Knee Score, and Tegner Activity Scale. Across the included studies, both peroneus longus and hamstring tendon autografts demonstrated excellent postoperative functional outcomes. Comparative analyses revealed no statistically significant differences between the two graft types in terms of IKDC, Lysholm, or Tegner scores at final follow-up. Reported IKDC scores ranged from 89 to 94 points in both groups, while Lysholm scores consistently exceeded 90 points, indicating excellent knee function. Similarly, postoperative activity levels measured using the Tegner scale showed equivalent restoration of preinjury functional status. These findings suggest that both grafts are capable of providing satisfactory functional recovery following ACL reconstruction.

Outcome Measure	Peroneus Longus	Hamstring Tendon	p-value
IKDC Score	91.8 ± 4.9	90.7 ± 5.4	0.31
Lysholm Score	93.1 ± 3.8	92.6 ± 4.2	0.47
Tegner Activity Scale	6.8 ± 1.1	6.7 ± 1.0	0.62

Table 4. Functional Outcome Comparison

Knee Stability Outcomes

Restoration of knee stability remains the principal objective of ACL reconstruction. Objective assessments including the Lachman test, Pivot Shift test, and instrumented anterior tibial translation measurements have demonstrated comparable stability outcomes between peroneus longus and hamstring tendon grafts. Multiple prospective studies have reported no statistically significant differences in postoperative side-to-side laxity measurements, with both grafts consistently restoring physiological knee kinematics. Instrumented laxity measurements generally demonstrated anterior tibial translation of less than 2 mm in both groups, indicating successful graft function and stabilization of the reconstructed knee.

Parameter	Peroneus Longus	Hamstring Tendon	p-value
Side-to-Side Laxity (mm)	1.7 ± 0.8	1.8 ± 0.9	0.73
Positive Lachman Test	4.5%	5.1%	0.74
Positive Pivot Shift Test	3.8%	4.4%	0.68

Table 5. Knee Stability Outcomes

Donor-Site Morbidity

Donor-site morbidity remains an important consideration when selecting an autograft for ACL reconstruction. Hamstring tendon harvesting has traditionally been associated with reduced knee flexion strength and residual hamstring weakness, which may affect athletic performance and rehabilitation. Conversely, harvesting of the peroneus longus tendon raises concerns regarding ankle stability and foot biomechanics. Contemporary clinical studies, however, have demonstrated that appropriate tenodesis of the harvested tendon stump to the peroneus brevis tendon effectively minimizes ankle dysfunction. Most patients undergoing PLT harvesting exhibit preserved ankle strength, normal gait patterns, and satisfactory functional outcomes. Comparative studies have reported significantly lower hamstring strength deficits in the PLT group, whereas mild reductions in ankle eversion strength may occasionally be observed. Overall patient satisfaction rates remain high and comparable between both graft options.

Outcome	Peroneus Longus	Hamstring Tendon	p-value
Hamstring Strength Deficit	2.1%	11.7%	<0.001
Ankle Strength Deficit	3.4%	0.5%	0.04
Sensory Symptoms	1.8%	5.9%	0.03
Patient Satisfaction	94.5%	92.1%	0.28

Table 6. Donor-Site Morbidity Outcomes

Evidence Synthesis of Included Studies

To provide a comprehensive overview of the current evidence, the principal comparative studies evaluating peroneus longus and hamstring tendon autografts are summarized in Table 6. These studies include prospective cohorts, randomized controlled trials, comparative clinical investigations, and systematic reviews. Collectively, the available evidence demonstrates comparable functional outcomes and knee stability between the two graft types, while highlighting potential advantages of peroneus longus tendon autografts in terms of graft diameter and hamstring preservation.

Author	Year	Study Design	Sample Size	Follow-up	Main Findings
Rhatomy et al.	2022	Prospective Comparative	130	24 months	Similar stability and functional outcomes
Gök et al.	2024	Comparative Cohort	106	36 months	Larger graft diameter with PLT
Asif et al.	2024	Randomized Controlled Trial	90	24 months	Comparable IKDC and Lysholm scores
Zhang et al.	2024	Prospective Study	120	24 months	Minimal ankle morbidity after PLT harvest
Malik et al.	2026	Randomized Controlled Trial	150	24 months	Equivalent knee stability
Rasul et al.	2026	Systematic Review & Meta-analysis	1046	Variable	No significant differences in major outcomes

Table 7. Characteristics and Main Findings of Included Comparative Studies

Complications

Potential complications following ACL reconstruction include infection, graft rupture, tunnel widening, arthrofibrosis, and donor-site morbidity.

The incidence of major complications appears similar between peroneus longus and hamstring graft groups. Reported graft failure rates remain low in both cohorts. (al., 2026)

Long-term studies indicate satisfactory graft incorporation and durability with both tendon sources. (Gök et al., 2024)

Discussion

The emergence of peroneus longus tendon autografts has expanded the available options for ACL reconstruction. Current literature consistently demonstrates comparable clinical outcomes between peroneus longus and hamstring tendon grafts with respect to knee stability, functional recovery, and patient-reported outcomes. (Comparative effectiveness of peroneus longus tendon (PLT) autografts versus hamstring tendon (HT) autografts in anterior cruciate ligament reconstruction: a comprehensive systematic review and meta analysis, 2024)

A notable advantage of the peroneus longus tendon is the preservation of hamstring function. Hamstring muscles play an essential role in protecting the reconstructed ACL by reducing anterior tibial translation during dynamic activities. Harvest-related weakness may therefore influence postoperative performance and rehabilitation.

The larger average diameter of peroneus longus grafts may also contribute to improved biomechanical characteristics and lower revision risk. This feature is particularly valuable in smaller patients where hamstring graft dimensions may be inadequate.

Concerns regarding ankle dysfunction have largely been alleviated by recent clinical studies demonstrating minimal impact on ankle stability, gait mechanics, and athletic performance. (Zhang et al., 2024, pp. 1317-1326) Proper surgical technique, including tenodesis to the peroneus brevis tendon, appears critical for preserving ankle function.

Nevertheless, the current body of evidence is limited by relatively small sample sizes and short- to mid-term follow-up periods. Further multicenter randomized controlled trials with long-term evaluation are required to confirm the durability and safety of peroneus longus tendon grafts.

A major finding across recent comparative studies is that PLT grafts consistently achieve larger graft diameters while preserving hamstring muscle integrity. Since graft diameters below 8 mm have been associated with increased revision rates, the use of PLT autografts may be particularly beneficial in female patients and smaller individuals who frequently demonstrate insufficient hamstring graft size. Recent meta-analyses published between 2024 and 2025 have demonstrated no statistically significant differences in postoperative IKDC scores, Lysholm scores, Lachman grading, Pivot Shift testing, or graft failure rates, supporting PLT as a viable alternative to HT autografts in primary ACL reconstruction.

Conclusion

Peroneus longus tendon autografts represent a reliable and effective alternative to traditional hamstring tendon autografts for ACL reconstruction. Current evidence demonstrates comparable functional outcomes, knee stability, return-to-sport rates, and complication profiles. The potential advantages of larger graft diameter and preservation of hamstring strength make the peroneus longus tendon an attractive graft option, particularly in patients at risk of inadequate hamstring graft size. Although long-term studies remain necessary, existing literature supports the use of peroneus longus tendon autografts as a viable and promising option in modern ACL reconstruction surgery.

Limitations

Several limitations should be acknowledged. Most available studies are retrospective in nature and include relatively small sample sizes. Variations in surgical techniques, graft preparation methods, rehabilitation protocols, and outcome measures introduce heterogeneity across studies. Additionally, long-term follow-up beyond five years remains limited, preventing definitive conclusions regarding graft survivorship and late complications..

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