



DISTAL PERONEUS LONGUS STUMP TENODESIS VERSUS FREE TENOTOMY AFTER PERONEUS LONGUS TENDON HARVEST FOR ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION: A SYSTEMATIC REVIEW WITH LIMITED META-ANALYSIS

Dr Amit Joshi¹, Dr Yash Haresh Ratanpal², Dr. Anubhav Vichitra³, Dr Rizwan Yusuf Halai⁴, Dr. Shrikrushna Bhaskarrao Shinde⁵, Vinayaka Reddy K C⁶

¹MS Ortho ; Assistant Professor ; Orthopaedics ; 400060; Mumbai; India; ORCID ID: 0009-0003-7119-7656; Email ID: Dr.amitjoshi85@gmail.com

²MS Ortho; Assistant Professor; Orthopaedics; 400101; Mumbai; India; ORCID ID : 0009-0002-8711-8193; Email ID: yashratanpal89@gmail.com

³MS ORTHOPEDICS ; Senior Resident; ORTHOPAEDICS ,HBT TRAUMA CARE ; Delhi University ; 400037; MUMBAI; INDIA ORCID ID: 0009-0007-9691-5123; Email ID: ortho.anubhavvichitra.2019@gmail.com

⁴MS ORTHO, Senior Resident, ORTHOPAEDICS ,HBT TRAUMA CARE, MUHS Nashik, 400037, MUMBAI, INDIA

⁵MS ORTHO; Senior Resident ; ORTHOPAEDICS ,HBT TRAUMA CARE ; MUHS Nashik; 400037; MUMBAI ; INDIA ; ORCID ID: 0009-0000-2478-1727; Email ID: shindekrushna148@gmail.com

⁶MS ORTHO; Senior Resident ; ORTHOPAEDICS ,HBT TRAUMA CARE ; 400060; MUMBAI ; INDIA ORCID ID : 0009-0000-8915-437X; Email ID: kevreddy15@gmail.com

Received:- 26/06/26

Revised:-27/07/26

Accepted:-03/08/26

Published:- 10/08/26

Abstract

Background: Peroneus longus tendon (PLT) autograft is increasingly used in anterior cruciate ligament reconstruction (ACLR). Some surgeons routinely tenodesise the distal peroneus longus stump to the peroneus brevis to reduce donor-ankle morbidity, whereas others leave the stump free after tenotomy. The incremental benefit of stump tenodesis remains uncertain.

Purpose: To systematically review and, where possible, quantitatively synthesize comparative evidence on distal PLT stump tenodesis versus free tenotomy/no tenodesis in ACLR using PLT autograft.

Methods: A systematic search was performed for comparative studies evaluating ACLR with PLT autograft in which the donor-site technique included distal PL-to-PB tenodesis/suturing versus no tenodesis/free tenotomy. Outcomes of interest included AOFAS, FADI or VAS-FA scores, ankle plantarflexion/eversion strength, radiographic or footprint-based arch morphology, donor-site complications, and knee outcomes. PRISMA 2020 principles were followed. Risk of bias was appraised using RoB 2 for randomized studies and ROBINS-I for non-randomized comparative studies. Meta-analysis was planned with inverse-variance random-effects models when at least two studies reported comparable parametric outcomes. When pooling was not statistically appropriate, a single-study effect estimate and structured qualitative synthesis were presented.

Results: Two comparative studies met inclusion criteria: one randomized controlled trial reported as an ISAKOS 2023 ePoster (n=24) and one retrospective comparative cohort published in 2026 (n=60). Both studies found no clinically meaningful superiority of distal stump tenodesis over no tenodesis. The RCT showed no significant between-group differences at 6 months for AOFAS, VAS-FA, Clarke angle, or first-ray plantarflexion strength. The cohort showed similarly high AOFAS and FADI scores and no clinically relevant deficits in ankle motion or strength at final follow-up. Because only one study provided means and standard deviations for validated final ankle scores, pooled meta-analysis was not possible. In that study, the mean difference favored tenodesis by 2.30 points for AOFAS (95% CI -0.34 to 4.94) and 1.50 points for FADI (95% CI -1.21 to 4.21), below commonly meaningful clinical thresholds.

Conclusion: Current comparative evidence is sparse and does not demonstrate a clinically meaningful benefit of distal peroneus longus stump tenodesis to peroneus brevis over free tenotomy/no tenodesis after PLT harvest for ACLR. Routine tenodesis cannot be considered evidence-mandated; however, existing data are

limited by small sample size, short to medium follow-up, and incomplete reporting. Larger randomized trials with standardized isokinetic testing, gait analysis, validated ankle PROMs, and long-term arch morphology assessment are required.

Level of evidence: Level III, systematic review of one randomized trial and one retrospective comparative cohort.

Introduction

Graft selection in ACLR continues to evolve. Hamstring, bone-patellar tendon-bone, quadriceps tendon, and allograft remain established choices, but PLT autograft has gained attention because it is easy to harvest, has predictable diameter, avoids donor morbidity around the knee, and has biomechanical characteristics reported as acceptable for ligament reconstruction. The central concern with PLT harvest is donor-ankle morbidity, particularly the potential effect on first-ray plantarflexion, ankle eversion, dynamic arch support, and foot posture.

To reduce this theoretical morbidity, some techniques recommend suturing or tenodesing the distal peroneus longus stump to the peroneus brevis. The rationale is anatomical and biomechanical: peroneus longus and brevis have synergistic roles, but peroneus brevis is an important evorter, whereas peroneus longus contributes to first-ray plantarflexion and transverse/medial arch mechanics. However, tenodesis adds a procedural step, may increase dissection, and has not clearly been shown to improve patient-reported or objective ankle outcomes.

This systematic review addresses a narrow clinical question: in patients undergoing ACLR with PLT autograft, does distal PLT stump tenodesis to peroneus brevis improve donor-ankle outcomes compared with free tenotomy/no tenodesis?

Methods

Design and registration

This manuscript was prepared according to PRISMA 2020 principles. No PROSPERO registration was available for this rapid review manuscript. Before journal submission, prospective registration or explicit declaration of non-registration should be added according to target-journal policy.

Eligibility criteria

Population: adults or skeletally mature patients undergoing primary ACLR using ipsilateral PLT autograft. Intervention: distal peroneus longus stump suturing or tenodesis to peroneus brevis. Comparator: free tenotomy/no tenodesis/without distal stump suturing. Outcomes: validated ankle scores, donor-ankle strength or ROM, foot arch morphology, donor-site complications, and knee-related functional outcomes. Study designs: randomized trials and comparative observational studies. Non-comparative PLT graft studies, PLT versus hamstring studies without a tenodesis/no-tenodesis comparison, revision-only series, technical notes, narrative reviews, and animal/cadaveric-only studies were excluded.

Search strategy

The search combined terms for ACL reconstruction, peroneus longus graft, tenodesis, stump suturing, peroneus brevis, and donor-site morbidity. Sources included PubMed/PMC, Google Scholar-accessible pages, publisher pages, trial registries, and ISAKOS ePoster resources. The final search was run on 24 May 2026. Example search string: (ACL OR anterior cruciate ligament) AND (peroneus longus OR PLT) AND (tenodesis OR suturing OR stump OR peroneus brevis OR tenotomy) AND (AOFAS OR FADI OR donor site morbidity OR ankle function).

Data extraction and synthesis

Extracted data included study design, sample size, surgical technique, follow-up, outcome scores, p values, and complications. For continuous outcomes, mean differences were calculated as tenodesis minus no tenodesis, with standard errors derived from group standard deviations and sample sizes. Random-effects pooling was prespecified if two or more clinically comparable studies reported parametric data. Because the RCT reported median/range values rather than means/standard deviations and the cohort alone provided parametric data for AOFAS and FADI, formal pooling was not performed. Forest plots therefore display single-study estimates rather than pooled effects.

Risk of bias assessment

The randomized trial was appraised using RoB 2 domains. The retrospective comparative cohort was appraised using ROBINS-I domains. Judgements were qualitative because the RCT was available only as a conference ePoster and detailed allocation concealment, missing data handling, and protocol information were limited.

Results

Study selection

The search identified 42 records. After duplicate removal and screening, seven reports were assessed in detail. Two studies fulfilled the narrow comparison of distal PL-to-PB tenodesis/suturing versus no tenodesis/free tenotomy in ACLR using PLT autograft.

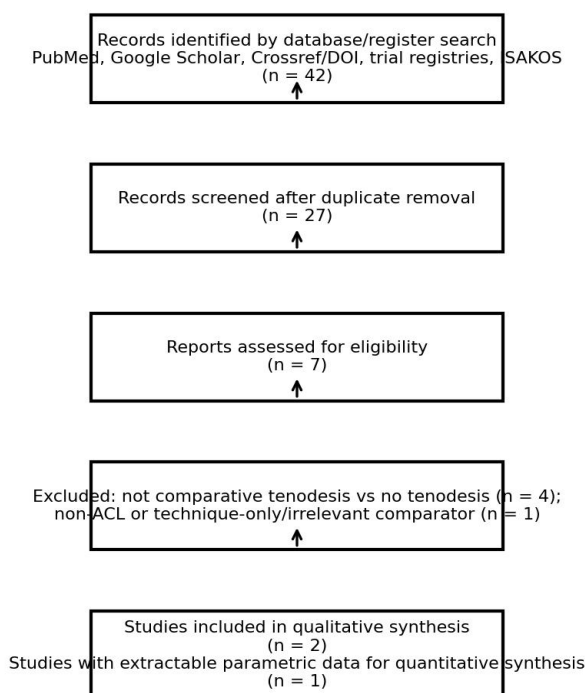


Figure 1. PRISMA-style study flow diagram.

Characteristics of included studies

Study	Design	Participants	Intervention	Comparator	Follow-up	Main outcomes
Lubis et al., ISAKOS 2023	Single-blinded randomized controlled trial/ePoster	24 ACLR patients; 12 per group	Distal PLT stump sutured/tenodesed to PBT	No distal suturing/free stump	Preop, 3 months, 6 months	AOFAS, VAS-FA, Clarke angle, first-ray plantarflexion strength
Dogruoz et al., 2026	Retrospective comparative cohort	60 primary ACLR patients; 30 per group	Single inframalleolar PL-to-PB tenodesis	No tenodesis	Final follow-up; bilateral weight-bearing radiographs available	AOFAS, FADI, ROM/strength, complications, Meary angle, calcaneal pitch

Functional ankle outcomes

The RCT found no statistically significant differences between intervention and control groups in VAS-FA or AOFAS at 3 or 6 months. At 6 months, AOFAS was 99.20 (range 96-100) in the tenodesis group versus 99.14 (range 96-100) in the no-tenodesis group ($p=0.934$), and VAS-FA was 100.00 (100-100) versus 99.78 (99-100), respectively ($p=0.126$).

The retrospective cohort reported high final scores in both groups. AOFAS was 97.3 $\pm$ 4.9 with tenodesis versus 95.0 $\pm$ 5.5 without tenodesis ($p=0.078$), and FADI was 96.8 $\pm$ 5.2 versus 95.3 $\pm$ 5.5 ($p=0.091$). The calculated single-study mean differences were small and statistically non-significant.

Outcome	Study	Tenodesis	No tenodesis	Between-group result
AOFAS 6 months	Lubis 2023	99.20 (96-100)	99.14 (96-100)	$p=0.934$
VAS-FA 6 months	Lubis 2023	100.00 (100-100)	99.78 (99-100)	$p=0.126$
AOFAS final	Dogruoz 2026	97.3 $\pm$ 4.9	95.0 $\pm$ 5.5	MD 2.30; 95% CI -0.34 to 4.94; $p=0.078$
FADI final	Dogruoz 2026	96.8 $\pm$ 5.2	95.3 $\pm$ 5.5	MD 1.50; 95% CI -1.21 to 4.21; $p=0.091$

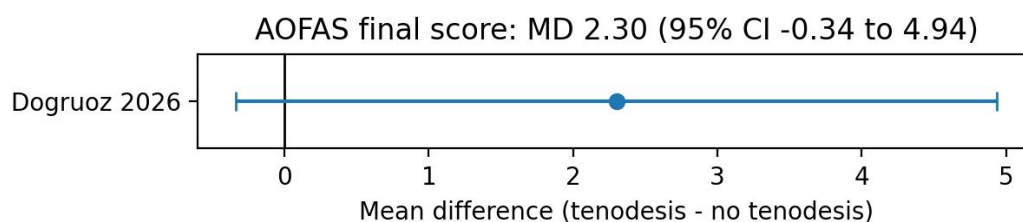


Figure 2. Single-study forest plot for AOFAS final score.

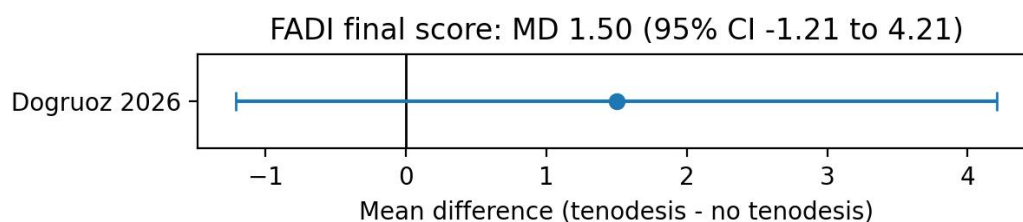


Figure 3. Single-study forest plot for FADI final score.

Objective donor-site outcomes and foot arch morphology

In the RCT, plantarflexion strength and Clarke angle did not differ significantly between groups at any assessed time point. At 6 months, first-ray plantarflexion strength was 26.42 N (range 14.00-36.67) with tenodesis versus 24.36 N (15.00-35.67) without tenodesis ($p=0.429$). Clarke angle at 6 months was 39.10 degrees (36-44) versus 39.50 degrees (32-44), respectively ($p=0.757$).

In the cohort study, no patient demonstrated clinically relevant loss of ankle ROM or strength at final follow-up. Radiographic alignment was similar between groups: operated-side Meary angle 7.99 $\pm$ 6.76 degrees versus 4.76 $\pm$ 6.32 degrees ($p=0.061$), and calcaneal pitch 23.19 $\pm$ 5.94 degrees versus 21.41 $\pm$ 4.64 degrees ($p=0.201$).

Outcome	Tenodesis	No tenodesis	p value	Interpretation
---------	-----------	--------------	---------	----------------

Plantarflexion strength, 6 months (N; Lubis)	26.42 (14.00-36.67)	24.36 (15.00-35.67)	0.429	No significant difference
Clarke angle, 6 months (degrees; Lubis)	39.10 (36-44)	39.50 (32-44)	0.757	No significant difference
Meary angle, operated side (degrees; Dogruoz)	7.99 +/- 6.76	4.76 +/- 6.32	0.061	Borderline but not significant
Calcaneal pitch, operated side (degrees; Dogruoz)	23.19 +/- 5.94	21.41 +/- 4.64	0.201	No significant difference

Complications

The cohort reported sural nerve sensory disturbance in 6/30 tenodesis patients and 5/30 no-tenodesis patients ($p=0.739$), with no harvest-site infection. The ePoster did not report a clear excess complication signal in either group.

Risk of bias

Study	Tool	Key concerns	Overall judgement
Lubis et al.	RoB 2	Conference ePoster only; randomization stated but allocation concealment and missing-data handling not fully described; small sample; short follow-up.	Some concerns
Dogruoz et al.	ROBINS-I	Retrospective grouping; potential confounding by surgeon preference/technique, follow-up selection, and availability of radiographs; outcomes objective/validated.	Moderate risk

Discussion

Principal findings

The available comparative literature does not demonstrate a clinically meaningful advantage of distal peroneus longus stump tenodesis to peroneus brevis over free tenotomy/no tenodesis in ACLR using PLT autograft. The randomized ePoster found no superiority of suturing for AOFAS, VAS-FA, plantarflexion strength, or foot arch measures at 6 months. The larger retrospective cohort similarly found high AOFAS and FADI scores in both groups and no meaningful difference in ankle function, strength, ROM, complications, or radiographic alignment.

Clinical interpretation

The small numerical advantage of tenodesis in the 2026 cohort did not reach statistical significance and was below a threshold likely to influence clinical decision-making. Conversely, the RCT showed near-ceiling ankle scores in both groups. This ceiling effect is important: when postoperative AOFAS and VAS-FA scores are already close to 100, small differences are unlikely to be clinically perceptible. These findings support the view that routine distal tenodesis is optional rather than mandatory, provided the tendon is harvested carefully and the peroneal sheath/soft-tissue envelope is handled meticulously.

Why tenodesis may not show measurable benefit

Several explanations are plausible. First, the peroneus brevis and other extrinsic/intrinsic muscles may compensate after PLT harvest. Second, PLT regeneration has been reported in other literature, which may reduce long-term functional consequences. Third, validated ankle scores may not be sensitive to subtle high-

demand deficits in athletes. Fourth, short follow-up and small sample sizes may miss rare or delayed donor-site morbidity.

Implications for surgical technique

Based on current evidence, surgeons may reasonably continue either technique. Tenodesis may be selected when it is already part of a familiar, low-morbidity harvest method, particularly in patients with high functional demand or concern for first-ray mechanics. Free tenotomy/no tenodesis may be reasonable when minimizing dissection and operative time is preferred. The evidence does not support presenting tenodesis as proven to improve donor-ankle outcomes.

Limitations of the evidence base

This review is limited by the very small number of eligible comparative studies. One eligible study is available only as a conference ePoster, preventing full evaluation of allocation concealment, blinding, attrition, and protocol deviations. The second is retrospective and subject to confounding. Heterogeneous reporting prevented pooled meta-analysis. No included study provided long-term isokinetic eversion testing, advanced gait analysis, return-to-sport subgroup data, or athlete-specific ankle performance outcomes.

Future research

A definitive trial should randomize patients to tenodesis versus free tenotomy, stratify by athletic level and foot morphology, standardize harvest and closure technique, and include AOFAS/FADI, FAAM/FAAM-Sports, isokinetic eversion and first-ray plantarflexion, pedobarography/gait analysis, ultrasound/MRI assessment of tendon regeneration, and long-term weight-bearing radiographs. Sample-size calculations should be based on minimally clinically important differences rather than statistical differences alone.

Conclusion

Current comparative evidence does not show clinically meaningful superiority of distal peroneus longus stump tenodesis to peroneus brevis compared with free tenotomy/no tenodesis after PLT harvest for ACL reconstruction. Because evidence remains sparse and underpowered, tenodesis should be considered an optional technical adjunct rather than a required step. Larger, well-reported randomized trials are needed before firm recommendations can be made.

Practical Take-Home Message For Orthopaedic Surgeons

In ACLR using PLT autograft, both distal stump tenodesis and free tenotomy appear to yield excellent short- to medium-term donor-ankle outcomes. Tenodesis has a sound anatomical rationale but no proven clinically meaningful outcome advantage in the available comparative literature.

Tables And Figure Legends

Table 1. Characteristics of included studies. Table 2. Ankle functional outcomes. Table 3. Objective donor-site and foot morphology outcomes. Table 4. Risk-of-bias summary. Figure 1. PRISMA-style study flow diagram. Figure 2. Single-study forest plot for AOFAS. Figure 3. Single-study forest plot for FADI.

References

1. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*. 2021;372:n71.
2. Sterne JAC, Savovic J, Page MJ, Elbers RG, Blencowe NS, Boutron I, et al. RoB 2: a revised Cochrane risk-of-bias tool for randomized trials. *BMJ*. 2019;366:l4898.
3. Sterne JAC, Hernan MA, Reeves BC, Savovic J, Berkman ND, Viswanathan M, et al. ROBINS-I: a tool for assessing risk of bias in non-randomised studies of interventions. *BMJ*. 2016;355:i4919.
4. Lubis AMT, Oesman I, Dalitan IM, Hutami WD. Donor site morbidity of distal stump suturing of peroneus longus to peroneus brevis tendon compared to without suturing for ACL reconstruction - a randomized controlled trial. ISAKOS Congress ePoster. 2023.
5. Dogruoz F, Sari MK, Ertan MB, Ergun A, Gurcan S, Kose O. Ankle function and donor-site morbidity following peroneus longus graft harvesting with or without tenodesis to peroneus brevis in anterior cruciate ligament reconstruction. *J Clin Med*. 2026;15(7):2577.
6. Arora M, Tapasvi S, Shukla T, Garg S, Shah JD. Peroneus longus to peroneus brevis tenodesis does not improve ankle functional outcomes: a prospective cohort study. *Indian J Orthop*. 2025;59:558-565.

7. Rhatomy S, Wicaksono FH, Soekarno NR. Eversion and first ray plantarflexion muscle strength in anterior cruciate ligament reconstruction using a peroneus longus tendon graft. *Orthop J Sports Med.* 2019;7:2325967119872462.
8. Angthong C, Chernchujit B, Apivatgaroon A, Chaijenkit K, Nualon P, Suchao-in K. The anterior cruciate ligament reconstruction with the peroneus longus tendon: a biomechanical and clinical evaluation of the donor ankle morbidity. *J Med Assoc Thai.* 2015;98(6):555-560.
9. Rhatomy S, Asikin AIZ, Wardani AE, Rukmoyo T, Lumban-Gaol I, Budhiparama NC. Peroneus longus autograft can be recommended as a superior graft to hamstring tendon in single-bundle ACL reconstruction. *Knee Surg Sports Traumatol Arthrosc.* 2019.
10. Saoji A, Arora M, Jain G, Shukla T. There is a minimal difference in ankle functional outcomes after peroneus longus harvest: systematic review and meta-analysis. *Indian J Orthop.* 2023.