

# Posterior Cruciate Ligament Reconstruction Using Peroneus Longus Tendon Autograft: Functional Outcomes and Donor-Site Morbidity: A Systematic Review

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## Abstract

**Objective:** Autografts or allografts are used frequently in posterior cruciate ligament (PCL) reconstruction. This study aims to assess functional results and donor-site morbidity associated with using the peroneus longus tendon (PLT) autograft in primary posterior cruciate ligament (PCL) reconstruction.

**Methods:** This systematic review followed PRISMA guidelines. We searched the literature through multiple databases. After using predetermined eligibility criteria, seven studies published between 2019 and 2024 were included in this systematic review. All studies reported quantitative outcomes in patients who underwent isolated PCL reconstruction using PLT autografts and had a follow-up of  $\geq 12$  months. Extracted data included International Knee Documentation Committee (IKDC), Lysholm and Cincinnati scores, hop test results, thigh circumference differences, the American Orthopaedic Foot and Ankle Society (AOFAS) score, and the Foot and Ankle Disability Index (FADI) scores.

**Results:** The analysis included a total of 178 patients, with 131 males and 47 females. The average follow-up duration was  $22.36 \pm 3.18$  months, and their mean age was  $33.74 \pm 6.10$  years. Significant improvement was observed in all measured functional outcome scores. The average IKDC score was 82.48. The average postoperative Lysholm score was 84.44. Furthermore, the Modified Cincinnati score increased by more than 30 points, and the Hop test results revealed that limb function exceeded 91% compared to the contralateral side. Differences in thigh circumference ranged from  $-0.7$  cm to  $-1.5$  cm and were not considered clinically significant. The average AOFAS score was 92.34, and the FADI score averaged 94.30, indicating preservation of ankle function and minimal impairment at the donor site. Comparative studies showed that the use of PLT autografts yielded equal or superior outcomes to hamstring autografts.

**Conclusion:** PCL reconstructions that use PLT autografts have shown encouraging results, resulting in favourable functional outcomes and minimal donor-site morbidity. However, evidence remains constrained, as it is primarily derived from small, single-centre studies with low-level designs and high bias risk. Future high-quality randomised studies are necessary to confirm the broad use of this technique.

**Keywords:** Posterior cruciate ligament reconstruction, peroneus longus tendon autograft, knee arthroscopic surgery, functional outcomes, systematic review

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## Introduction

The posterior cruciate ligament (PCL) is one of the four primary ligaments of the knee joint; it prevents posterior tibial translation and resists rotational and angular forces at the knee.<sup>1</sup> Although stronger than the anterior cruciate ligament (ACL), PCL injuries are less common, accounting for about 3% of outpatient knee injuries and usually occurring alongside other ligament injuries rather than in isolation.<sup>2,3</sup>

PCL injuries generally result from a posteriorly directed force applied to a flexed knee while the foot is in plantar flexion. This injury mechanism appears mainly in contact sports, including football, skiing, soccer, baseball, and motor vehicle collisions (i.e., “dashboard injuries”).<sup>4,5</sup>

Non-operative treatment may be adequate for isolated, low-grade injuries; however, high-grade ruptures, especially those with multiligamentous injury, typically require surgical intervention to restore biomechanical stability to avoid long-term morbidity, impaired function, and the occurrence of early osteoarthritis.<sup>1</sup>

For PCL reconstruction, different graft options can be used, including allografts and autografts.<sup>5</sup> Achilles tendon allografts minimise donor-site morbidity but exhibit increased

retear rates due to their insufficient strength after sterilisation.<sup>5,6</sup> The autograft options are hamstring, bone-patellar tendon-bone (BPTB), and quadriceps tendons, each having its own advantages and limitations in terms of graft quality, healing potential, donor-site morbidity, and long-term function.<sup>7-10</sup>

At present, the results of PCL reconstruction are highly variable, and no singular graft material has consistently demonstrated superior outcomes in the literature. Recently, the peroneus longus tendon (PLT) has emerged as a promising alternative autograft source. It is used in some orthopaedic procedures, such as ACL reconstruction, with good clinical outcomes, minimal donor site morbidity, and proportional tensile strength compared to hamstring grafts.<sup>11,12</sup> Also, it has been used in lateral ankle ligament reconstruction and medial patellofemoral ligament (MPFL) reconstruction.<sup>13,14</sup>

The aim of this systematic literature review was to assess the functional outcomes and donor-site morbidity associated with the use of the peroneus longus tendon (PLT) autograft in PCL reconstruction. In this review, our aim is to identify whether PLT autograft is a reliable alternative to more well-known graft options for PCL reconstruction.

## Materials and Methods

### Protocol and Registration

This systematic review used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).<sup>15</sup> The review protocol is registered in PROSPERO under the registration number CRD42025114624.

### Search Strategy

The PICOT algorithm guided the initial search:

- P (population): PCL tears.
- I (intervention): primary isolated PCL reconstruction.
- C (comparison): was made using PLT autografts.
- O (outcomes): focusing on the two aspects: (1) Knee functional outcomes were tested employing different scores: Lysholm Knee Score, International Knee Documentation Committee (IKDC) Score, Cincinnati Score, thigh circumference at 10 cm and 20 cm, and postoperative single and triple hop test scores. (2) Evaluation of donor site morbidity obtained using the American Orthopaedic Foot and Ankle Society (AOFAS) score and the Foot and Ankle Disability Index (FADI) score.
- T (Timing): > 12 months of follow-up.

### Literature Search

Two authors (A.S. & E.M.) independently performed the literature search in October 2024. Access was granted to the following databases: PubMed, Scopus, Google Scholar, ResearchGate, China National Knowledge Infrastructure, Cochrane Library, and ScienceDirect. The following keywords were used for the search: posterior cruciate ligament reconstruction, autograft, and peroneus longus tendon. To minimise publication bias and ensure a comprehensive search, grey literature was also systematically searched to capture conference abstracts, theses, and unpublished studies. The same authors performed a separate screening of the abstracts and titles. The full text of the article was accessed if the abstract aligned with the topic of interest. The reference lists of the included studies and review articles will be manually checked to identify any additional studies that weren't found in the database searches, in addition to this search.

## Study Eligibility

### Inclusion Criteria

1. Prospective and retrospective clinical studies, including cohort and comparative designs, which evaluated the PLT autograft in primary reconstruction of the PCL in skeletally mature participants.
2. Isolated posterior cruciate ligament injuries of either acute or chronic presentation.
3. Studies reporting data from a follow-up of 1 year or more.
4. The complete text is available. For published studies, peer review was required; for grey literature sources, institutional or conference review processes were accepted.
5. No language restrictions.
6. Only articles presenting quantitative data for functional outcomes and donor site morbidity.

### Exclusion Criteria

Studies were excluded if:

1. Employed a different graft option.
2. Multiligamentous repairs.
3. Utilised supplemental tendons, such as hamstring tendons, in conjunction with the peroneus tendon.
4. Utilised therapies such as platelet-rich plasma.
5. Publications derived from cadaveric research.
6. Review articles, case reports, case series, technical notes, and letters.

### Data Extraction

Extracted data consisted of the author, year of publication, country, research design, sample size, demographics of the patients (mean age and sex), duration of follow-up, and conclusions made by the study. Additionally, functional outcomes were documented, including the Lysholm Knee Score, IKDC Score, Cincinnati Score, AOFAS Score, and FADI Score. Along with the postoperative single-hop and triple-hop test scores and postoperative thigh circumferences at 10 cm and 20 cm proximal to the patella, as well as any reported complications.

## Methodology Quality Assessment

The risk of bias in the included studies was evaluated using the ROBINS-I tool, which is specifically designed for assessing non-randomised interventions which evaluate bias across seven domains.<sup>16</sup> Two independent reviewers conducted the assessments, and any disagreements were resolved through discussion. Confounding was the most frequent and significant source of bias, especially in studies that didn't use control groups or randomise participants. Five studies (Faisal et al.,<sup>17</sup> Setyawan et al.,<sup>18</sup> Lu et al.,<sup>19</sup> Zhong et al.,<sup>20</sup> and Jiang et al.)<sup>21</sup> were assessed to have a serious overall risk of bias, while two studies (Kumar et al.<sup>22</sup> and Rhatomy et al.<sup>23</sup>) were judged to have a moderate risk of bias. These assessments were considered in the synthesis and interpretation of the findings; the detailed results are summarised in [Table 1](#).

## Results

### Study Selection

A total of 81 articles were identified through database searches and manual screening. This search included reliable resources such as Scopus ( $n = 25$ ), PubMed ( $n = 21$ ), ResearchGate ( $n = 19$ ), China National Knowledge Infrastructure ( $n = 10$ ), ScienceDirect ( $n = 4$ ), Google Scholar ( $n = 1$ ), and Cochrane Library ( $n = 1$ ). Following the removal of 21 duplicates and an evaluation of titles and abstracts, 13 full-text articles were assessed for eligibility. Finally, seven studies met the inclusion criteria and were included in the qualitative synthesis. A PRISMA flow diagram detailing the selection process is provided in [Figure 1](#).

### Study Characteristics

All research was carried out between 2019 and 2024. Seven studies included both prospective and retrospective designs; three were prospective cohort studies, one was a prospective

Table 1. Summary of Risk of Bias Across Included Studies (ROBINS-I Tool)

Study (Reference No.)	Confounding	Selection	Classification	Deviations	Missing data	Outcome measurement	Reporting	Overall risk
Faisal et al. <sup>17</sup>	Serious	Moderate	Low	Low	Low	Moderate	Low	Serious
Setyawan et al. <sup>18</sup>	Serious	Moderate	Low	Low	Low	Moderate	Low	Serious
Lu et al. <sup>19</sup>	Serious	Moderate	Low	Low	Low	Moderate	Low	Serious
Zhong et al. <sup>20</sup>	Serious	Moderate	Low	Low	Moderate	Moderate	Low	Serious
Jiang et al. <sup>21</sup>	Serious	Moderate	Low	Low	Low	Moderate	Low	Serious
Kumar et al. <sup>22</sup>	Moderate	Moderate	Low	Low	Low	Moderate	Low	Moderate
Rhatomy et al. <sup>23</sup>	Moderate	Moderate	Low	Low	Low	Moderate	Low	Moderate

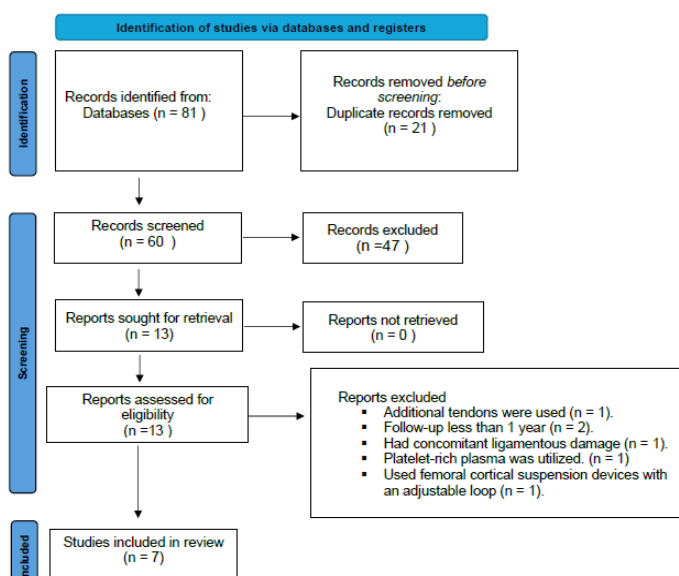


Fig. 1 Flow chart of the literature search.

comparative cohort study, two were retrospective comparative studies, and one was a retrospective cohort study.

### Patient Demographics

A total of 178 patients, 131 were male and 47 were female. This means that approximately 73.6% of the patients were male, while only 26.4% were female. Data were retrieved for patients with a mean age of  $33.74 \pm 6.10$  years and a mean follow-up of  $22.36 \pm 3.18$  months.

We summarise the seven clinical studies included in this systematic review, arranging them chronologically by publication year. The summary includes details on the year, country, study design, level of evidence, sample size, patient demographics, follow-up duration, and main conclusions are shown in Table 2.

## Functional Outcomes

### International Knee Documentation Committee (IKDC) Score Change

The IKDC score was reported in six studies; the mean of postoperative IKDC scores was 82.48, and the mean increase in IKDC score is approximately 35.19, which shows good IKDC

improvements from preoperative baseline to final follow-up. One study by Jiang et al. did not specify absolute IKDC means in their article; hence, IKDC values are omitted. The summary of IKDC score improvements reported across studies evaluating PCL reconstruction utilising PLT autografts is shown in Table 3.

### Lysholm Score

The Lysholm score was the most frequently reported functional outcome in the studies. All included studies reported significant improvements in Lysholm scores, with a mean Lysholm score was 84.44, and the mean improvement in Lysholm score across the studies was +35.50 following PCL reconstruction using PLT autograft. A summary of preoperative and postoperative Lysholm scores and degree of change is shown in Table 4.

### Modified Cincinnati Score Change

Modified Cincinnati scores were reported by two studies. Setyawan et al.<sup>18</sup> reported a significant rise in Modified Cincinnati scores from  $48.86 \pm 12.22$  preoperatively to  $79.00 \pm 4.82$  at two years ( $\Delta + 30.14$ ), while Rhatomy et al.<sup>23</sup> observed an increase from  $50.60 \pm 10.40$  to  $82.20 \pm 5.80$  over the same follow-up period ( $\Delta + 31.60$ ).

### Postoperative Hop Test

The postoperative single- and triple-hop test results reported by Faisal et al.<sup>17</sup> were a mean single-hop score of  $94.40 \pm 3.65$  and a triple-hop score of  $92.60 \pm 1.38$  at two years, while Setyawan et al.<sup>18</sup> found mean single-hop and triple-hop scores of  $95.73 \pm 3.08$  and  $91.86 \pm 1.92$ , respectively, also at a 2-year follow-up. This demonstrated excellent functional recovery following PCL reconstruction using PLT autograft.

### Postoperative Thigh Circumference

Postoperative thigh circumference measurements at 10 cm and 20 cm above the patella in the operated leg and contralateral healthy leg were measured and reported by two studies.<sup>18,23</sup> The differences ranged from  $-0.73$  cm to  $-1.50$  cm, which is not clinically significant; the detailed results are summarised in Table 5.

### Donor Site Morbidity in PCL Reconstruction

Donor site morbidity was evaluated using the American Orthopaedic Foot and Ankle Society (AOFAS) score and the

Table 2. Descriptive characteristics of included studies

Study (first author et al.)	Year – Country	Study design level of evidence	N	Male/Female	Age (year)	Follow-up	Conclusion
Setyawan et al. <sup>18</sup>	2019 – Indonesia	Prospective Cohort (LOE IV)	15	11/4	25.86	2 years	Significant IKDC, Cincinnati, Lysholm, hop test gains; excellent AOFAS/FADI.
Rhatomy <sup>23</sup>	2020 – Indonesia	Prospective comparative cohort (LOE II)	55 (PLT 28; HT 27)	HT 11:16 PLT 22/6	HT 30.30 ± 10.50 PLT 29.10 ± 8.60	2 years	PLT ≈ HT in knee scores; PLT had no donor-site morbidity.
Zhong <sup>20</sup>	2021 – China	Retrospective Cohort (LOE IV)	46*	34/12	40.70 (20–58);	12–26 months (mean 16)	Improved Lysholm & IKDC; AOFAS unchanged.
Faisal <sup>17</sup>	2022 – Bangladesh	Retrospective cohort (LOE IV)	18	16/2	32	2 years	Improved IKDC, Lysholm, and hop tests; minimal donor-site morbidity.
Lu et al. <sup>19</sup>	2022 – China	Retrospective comparative (LOE III)	48 (PLT 25; HT 23)	PLT 11:14 HT 10:13	PLT 38.23 ± 10.84 HT 36.88 ± 11.33	2 years	Both are effective; PLT harvests faster and simpler.
Kumar et al. <sup>22</sup>	2023 – India	Prospective case series (LOE IV)	24	24/0	29.50	2 years	Significant improvement in IKDC & Lysholm; preserved ankle function (FADI).
Jiang et al. <sup>21</sup>	2024 – China	Retrospective comparative (LOE III)	42 (PLT 22; HT 20)	PLT: 13/9 HT: 11/9	PLT: 40.80 ± 7.17 HT: 41.21 ± 6.64	20.5 months	PLT had better outcomes and fewer adverse reactions than HT.

Abbreviations: PCL: posterior cruciate ligament; PL: peroneus longus; HT: hamstring tendon; FU: follow-up; LOE: level of evidence. \*Of 46 enrolled, 40 completed follow-ups.

Table 3. Results of IKDC score

Study (First author et al.)	Preop IKDC (mean ± SD)	Postop IKDC (mean ± SD)	Δ IKDC	Follow up
Kumar et al. (2023, India)	66.80 ± 2.30	91.60 ± 2.40	+24.80	2 y
Zhong et al. (2021, China)	33.58 ± 5.97	87.13 ± 6.27	+53.55	12–26 mo. (mean 16 mo.)
Faisal et al. (2022, Bangladesh)	45.61 ± 10.29	80.24 ± 7.72	+34.63	2 y
Setiawan et al. (2019, Indonesia)	47.58 ± 11.75	78.17 ± 4.52	+30.59	2 y
Rhatomy et al. (2020, Indonesia)	49.80 ± 10.30	81.30 ± 5.80	+31.50	2 y
Lu et al. (2022, China)	40.37 ± 4.52	76.46 ± 4.82	+36.09	2 y
Jiang et al. (2024, China)	Not reported	Not reported	-	-

IKDC: International Knee Documentation Committee; SD: Standard deviation. The symbol "Δ" denotes the absolute change in scores from preoperative to postoperative assessment.

Table 4. Results of Lysholm scores

Study	Pre-op score (mean ± SD)	Post-op score (mean ± SD)	Change (Δ)
Faisal et al. (2022, Bangladesh)	46.11 ± 13.27	79.55 ± 8.42	+33.44
Setyawan et al. (2019, Indonesia)	49.26 ± 11.54	80.20 ± 5.04	+30.94
Rhatomy et al. (2020, Indonesia)	50.70 ± 10.00	83.20 ± 5.80	+32.50
Lu et al. (2022, China)	52.36 ± 11.55	86.49 ± 9.38	+34.13
Zhong et al. (2021, China)	36.68 ± 7.89	84.85 ± 7.03	+48.17
Kumar et al. (2023, India)	Not stated	Excellent (no exact value)	-
Jiang et al. (2024, China)	58.54 ± 8.41	92.35 ± 9.68	+33.81

SD: Standard deviation. The symbol "Δ" denotes the absolute change in scores from preoperative to postoperative assessment.

Table 5. Postoperative thigh circumference measurements

Study	Location (above the patella)	Operated leg (mean $\pm$ SD, cm)	Contralateral healthy leg (mean $\pm$ SD, cm)	$\Delta$ Difference
Setyawan et al. (2019)	10 cm	42.73 $\pm$ 4.33	43.83 $\pm$ 4.27	-1.10 cm
	20 cm	49.67 $\pm$ 4.60	50.40 $\pm$ 4.66	-0.73 cm
Rhatomy et al. (2020)	10 cm	43.70 $\pm$ 4.00	44.40 $\pm$ 3.90	-0.70 cm
	20 cm	54.50 $\pm$ 4.50	56.00 $\pm$ 4.50	-1.50 cm

SD: Standard deviation.

Table 6. Results of the AOFAS score and FADI scores

Study	AOFAS (Post-op)	FADI (Post-op)
Faisal et al. (2022)	92.65 $\pm$ 3.85	91.30 $\pm$ 4.55
Setyawan et al. (2019)	94.46 $\pm$ 2.56	94.80 $\pm$ 2.42
Zhong et al. (2021)	93.98 $\pm$ 2.14	Not measured
Rhatomy et al. (2020)	94.60 $\pm$ 3.10	95.10 $\pm$ 2.60
Lu et al. (2022)	86.00 $\pm$ 3.19	Not measured
Kumar et al. (2023)	Not measured	96.00 $\pm$ 0.00

AOFAS: American Orthopaedic Foot and Ankle Society score; FADI: Foot and Ankle Disability Index scores.

Foot and Ankle Disability Index (FADI) scores. Across most reviewed studies, the reported mean scores of 92.34 for the AOFAS score and 94.30 for the FADI score demonstrate that donor-site morbidity from harvesting PLT was consistently minimal or absent, and only one study, Jiang et al.,<sup>21</sup> did not report any data regarding both ankle scores; detailed results are summarised in Table 6.

## Comparative Study

Three comparative studies evaluated functional outcomes and donor-site morbidity between peroneus longus tendon (PLT) and hamstring tendon (HT) autografts in PCL reconstruction. Rhatomy et al.<sup>23</sup> found that both PLT and HT groups achieved similar improvements in IKDC, Lysholm, and Modified Cincinnati scores, but the PLT group reported no donor-site morbidity, with high postoperative AOFAS and FADI scores.

Lu et al.<sup>19</sup> also reported comparable functional outcomes between the two graft types, although PLT harvest was noted to be quicker and less invasive and had minimal donor site morbidity with excellent AOFAS scores, and the peroneus longus tendon (PLT) may serve as a suitable graft option for PCL reconstruction, particularly in cases where the hamstring tendon is inadvertently compromised or proves insufficient.

Jiang et al.<sup>21</sup> demonstrated the PLT group had improved outcomes, as reflected by increased IKDC and Lysholm scores, better graft integrity determined with the use of MRI, and a decrease in complications.<sup>21</sup> The HT group had more postoperative pain and donor-site morbidity. The finding reveals that the use of PLT autografts can provide comparable or superior functional results but with lower morbidity compared to the conventional hamstring tendon grafts.

## Discussion

This systematic review evaluated the literature about the usage of PLT autograft for PCL reconstruction to assess functional outcomes and donor site morbidity.

In reviewed articles, significant functional improvements were observed in key clinical scores such as IKDC score, Lysholm score and Modified Cincinnati scores. This result is approximately equivalent to the postoperative IKDC scores, Lysholm scores, and Modified Cincinnati scores obtained from using hamstring, bone-patellar tendon-bone, and quadriceps tendon autografts.<sup>7</sup> These results highlight the procedure's effectiveness in restoring subjective and objective knee stability and function and symptom relief.

In addition, both single-hop and triple-hop tests, which were reported by two studies with average scores exceeding 93% for the contralateral limb, demonstrated that patients recovered excellent dynamic strength, balance, lower limb function, and favourable patient-reported outcomes and were safer to go back to high-level activities or sports after PCL surgery.<sup>24</sup>

Thigh circumference measurements used to assess muscle preservation post-reconstruction in two studies<sup>18,23</sup> showed negligible differences between the injured and healthy limbs at both 10 cm and 20 cm above the patella. These results further support the biomechanical and clinical safety of PLT harvest, with no evidence of quadriceps atrophy, allowing for functional preservation of the extensor mechanism of the thigh. Such outcomes are critical in maintaining knee strength and performance, particularly in athletes or physically active individuals.<sup>25,26</sup>

According to reviewed studies, the reported mean scores are 92.34 for the AOFAS score and 94.30 for the FADI. According to established benchmarks, AOFAS scores between 90 and 100 are considered "excellent", indicating minimal pain, high functional ability, and proper alignment in the foot and ankle. The combination of high mean scores on both the AOFAS and FADI reinforces the safety of PLT harvest and supports its use as a reliable autograft option without compromising the integrity or function of the ankle joint.<sup>27,28</sup>

The peroneus longus tendon was initially utilised as an autograft in ACL reconstruction before its usage in PCL reconstruction, as documented by Kerimoğlu et al.<sup>29</sup> This therefore expands the clinical evidence on the donor site morbidity. Both original research articles and systematic reviews indicate that its harvest does not cause significant functional or structural issues at the donor ankle site.<sup>30-35</sup>

Three comparative studies<sup>19,21,23</sup> evaluated functional outcomes and donor-site morbidity between peroneus longus tendon (PLT) and hamstring tendon (HT) autografts in PCL reconstruction and suggest that PLT autografts may provide comparable or superior functional outcomes with lower morbidity compared to traditional hamstring tendon grafts.

The PLT provides many advantages for PCL reconstruction, such as an easier and more straightforward extraction process than hamstring tendons,<sup>19</sup> which may reduce the complexity and duration of the surgery. Furthermore, the PLT can be extracted as a long single-strand graft (25–30 cm), which simplifies reconstruction in comparison to the complex multi-strand hamstring grafts that necessitate both the semitendinosus and gracilis tendons.<sup>36</sup> While hamstring autografts are commonly used and associated with easy harvesting and less anterior knee pain, they have some disadvantages, such as a risk of injury to the infrapatellar branches of the saphenous nerves occurring in 39.7%–88% of patients, variable graft size, potential hamstring strength loss, quadriceps hypertrophy, and longer healing times for soft tissue to bone.<sup>7,8</sup>

While most available studies compare PLT autografts with hamstring tendons, it is important to contextualise PLT within the spectrum of grafts used for PCL reconstruction.

The Achilles tendon allograft is the common graft choice for posterior cruciate ligament (PCL) reconstruction, as it reduces donor site morbidity while offering adequate graft strength. However, allografts are more likely to re-tear due to their insufficient strength after sterilisation, disease transmission risks, and variable availability depending on the health-care setting.<sup>6</sup>

The bone-patellar-tendon-bone (BPTB) autograft has good stability of the graft with bone-to-bone healing and, thus, allows earlier return to sports. It also entails a number of disadvantages, such as anterior knee pain, pain when kneeling with potential patellar fracture, and poor range of movement.<sup>9</sup> Furthermore, the quadriceps tendon autograft is a viable alternative for PCL reconstruction due to its greater graft quality, customisable size, lower risk of neurovascular injury, and reduced anterior knee pain. The potential disadvantages include patellar fracture, anterior knee pain, and possible complications with future arthroscopy resulting from suprapatellar pouch penetration.<sup>7,10</sup>

Fundamentally, when comparing single structures, the native PCL and the peroneus longus tendon demonstrate high tensile strengths, often surpassing that of individual hamstring tendons. However, preparing hamstrings as a multi-strand graft (their common surgical use) typically results in the strongest graft.<sup>37</sup> The growing recognition of the feasibility of PLT as a choice for a graft is a result of its anatomic and biomechanical properties, making it suitable for PCL reconstruction. Regarding the tensile strength of commonly used autografts, the unfolded PLT has the highest value at 223.5 N, followed by hamstring, quadriceps, and the patellar tendon in descending order.<sup>38,39</sup>

Kneeling pain occurs with HT harvest, although it is less common than BPTB and remains problematic in populations requiring frequent kneeling.<sup>40</sup> Patients face significant obstacles in Muslim and other Asian countries, where kneeling is part of daily life, religion, and culture. PLT offers a viable alternative and makes it especially advantageous for patients in whom hamstring preservation is preferred, such as athletes requiring optimal knee flexion/internal rotation strength, like sprinters and soccer players, and small-sized or thin individuals, where hamstring grafts may not be strong or large enough.<sup>39</sup>

Furthermore, removing the peroneus longus tendon will not affect the surrounding anatomical components.<sup>40,41</sup> But there are a few potential risks and complications associated

with harvesting the peroneus longus tendon, which range from transient nerve issues, such as hypoesthesia around the lateral side of the foot, to rare severe events like compartment syndrome.<sup>42</sup>

The encouraging findings of reviewed articles should be interpreted with caution due to a significant risk of bias, particularly confounding in non-randomised studies without control groups. These limitations may have led to overestimation of treatment effects, as improvements could reflect factors beyond graft choice.

Finally, recent long-term follow-up data of 19.5 years strongly favour PLT harvesting as an alternative autograft option and indicate that this method does not alter foot and ankle anatomy and function.<sup>42</sup> Overall, selecting ideal candidates for peroneus longus tendon grafts involves a comprehensive evaluation of individual patient factors and surgical considerations to optimise functional outcomes post-reconstruction.

## Limitations

Include the limited number of research available for inclusion and the variety of study designs. Mainly Level III–IV evidence; the small participant samples and their follow-up periods mostly lasted two years or less, limiting the ability to make conclusions about long-term outcomes. Additionally, due to inconsistent outcome measures, non-standardised rehabilitation protocols, and potential publication bias, positive results may be over-represented in available literature, and most studies are from South and Southeast Asia, making the findings' broad applicability limited. In addition, even though many studies reported minimal donor-site morbidity, the absence of reported complications should not be interpreted as the absence of morbidity, as underreporting is likely. The interpretation and application of the findings are significantly limited by these constraints. Future research should concentrate on the development of high-quality, large-scale studies that utilise standardised outcome measures and rehabilitation programmes and offer long-term follow-up. And performing a randomised controlled trial comparing PLT autografts to other graft types (e.g., hamstring, quadriceps). Including more geographically diverse populations should also improve the generalisability of findings.

## Conclusion

This systematic review highlights the emerging evidence that supports the use of the peroneus longus tendon (PLT) autograft for posterior cruciate ligament (PCL) reconstruction. PLT autograft consistently yields favourable functional outcomes and minimal donor-site morbidity. However, most evidence comes from small, single-centre, regional studies with predominantly Level III–IV designs and a high risk of bias. Although the findings are encouraging, larger multi-centre randomised trials with long-term follow-up are needed to verify the safety, effectiveness, and generalisability of PLT autografts in PCL reconstruction.

## Conflict of Interest Statement

The authors declare no conflict of interest. ■

## References

- Pache S, Aman ZS, Kennedy M, Nakama GY, Moatshe G, Ziegler C, et al. Posterior Cruciate Ligament: Current Concepts Review. *Arch Bone Jt Surg.* 2018 Jan;6(1):8–18. <https://doi.org/10.22038/abjs.2017.25851.1686>
- Raj MA, Mabrouk A, Varacallo MA. Posterior Cruciate Ligament Knee Injuries. In: *StatPearls*. Treasure Island (FL): StatPearls Publishing; 2025. <http://www.ncbi.nlm.nih.gov/books/NBK430726/>
- Shelbourne K.D., Benner R.W., Ringenberg J.D., Gray T. Optimal management of posterior cruciate ligament injuries: current perspectives. *Orthop. Res. Rev.* 2017; 9:13–22. <https://doi.org/10.2147/ORR.S113617>
- Bernhardson AS, DePhillipo NN, Daney BT, Kennedy MI, Aman ZS, LaPrade RF. Posterior Tibial Slope and Risk of Posterior Cruciate Ligament Injury. *Am J Sports Med.* 2019 Feb;47(2):312–7. <https://doi.org/10.1177/0363546518819176>
- Johnson P, Mitchell SM, Görtz S. Graft Considerations in Posterior Cruciate Ligament Reconstruction. *Curr Rev Musculoskelet Med.* 2018 Sep;11(3):521–7. <https://doi.org/10.1007/s12178-018-9506-z>
- Migliorini F, Pintore A, Oliva F, Eschweiler J, Bell A, Maffulli N. Allografts as alternative to autografts in primary posterior cruciate ligament reconstruction: a systematic review and meta-analysis. *Knee Surg Sports Traumatol Arthrosc.* 2023;31(7):2852–60. <https://doi.org/10.1007/s00167-022-07258-y>
- Migliorini F, Pintore A, Vecchio G, Oliva F, Hildebrand F, Maffulli N. Hamstring, bone-patellar tendon-bone, quadriceps and peroneus longus tendon autografts for primary isolated posterior cruciate ligament reconstruction: a systematic review. *Br Med Bull.* 2022 Apr 22;142(1):23–33. <https://doi.org/10.1093/bmb/ldac010>
- Hardy A, Casabianca L, Andrieu K, Baverel L, Noailles T. Complications following harvesting of posterior cruciate tendon or hamstring tendon grafts for anterior cruciate ligament reconstruction: Systematic review of literature. *Orthop Traumatol Surg Res.* 2017 Dec;103(8): S245–8. <https://doi.org/10.1016/j.otsr.2017.09.002>
- Zhang XF, Liu P, Huang JW, He YH. Efficacy and safety of quadriceps tendon autograft versus bone–patellar tendon–bone and hamstring tendon autografts for anterior cruciate ligament reconstruction: a systematic review and meta-analysis. *J Orthop Traumatol.* 2024 Dec 18;25(1):65. <https://doi.org/10.1186/s10195-024-00801-2>
- Gyemi LA, Bednar ED, Sheean AJ, Kuroda R, de Sa D. The quadriceps tendon autograft is an option for primary PCL reconstruction: a systematic review. *J ISAKOS Jt Disord Orthop Sports Med.* 2022 Feb;7(1):27–34. <https://doi.org/10.1016/j.jisako.2021.08.002>
- Park JY, Fernandes A, Park SY, Lim H, Sayudo IF, Leibovitch L, et al. 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. *Eur J Orthop Surg Traumatol.* 2024;34(5):2691–9. <https://doi.org/10.1007/s00590-024-03984-w>
- Shi FD, Hess DE, Zuo JZ, Liu SJ, Wang XC, Zhang Y, et al. Peroneus Longus Tendon Autograft is a Safe and Effective Alternative for Anterior Cruciate Ligament Reconstruction. *J Knee Surg.* 2019 Aug;32(8):804–11. <https://doi.org/10.1055/s-0038-1669951>
- Yang Z, Liu F, Cui L, Liu H, Zuo J, Liu L, et al. Comparison of the effects of reconstruction of the lateral ankle ligaments using peroneus longus and peroneus brevis tendon graft. *Medicine (Baltimore).* 2020 Nov 13;99(46): e22912. <https://doi.org/10.1097/MD.00000000000022912>
- Xu C, Zhao J, Xie G. Medial patellofemoral ligament reconstruction using the anterior half of the peroneus longus tendon as a combined procedure for recurrent patellar instability. *Asia-Pac J Sports Med Arthrosc Rehabil Technol.* 2016 Apr 26; 4:21–6. <https://doi.org/10.1016/j.jasmar.2016.03.001>
- Liberati A, Altman DG, Tetzlaff J, Mulrow C, Gøtzsche PC, Ioannidis JPA, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: explanation and elaboration. *BMJ.* 2009 Jul 21;339:b2700. <https://doi.org/10.1136/bmj.b2700>
- Sterne JA, Hernán MA, Reeves BC, Savović J, Berkman ND, Viswanathan M, et al. ROBINS-I: a tool for assessing risk of bias in non-randomised studies of interventions. 2016 Oct 12. <https://doi.org/10.1136/bmj.i4919>
- Faisal MA, Chowdhury AZ, Kundu IK, Mahmud CI, Ali MY, et al. Evaluation of the clinical outcome of arthroscopic posterior cruciate ligament reconstruction with peroneus longus tendon. *Int J Nurs Health Care Res.* 2022;5:1313. <https://doi.org/10.29011/2688-9501.101313>
- Setyawan R, Soekarno NR, Asikin AIZ, Rhatomy S. Posterior cruciate ligament reconstruction with peroneus longus tendon graft: 2-year follow-up. *Ann Med Surg.* 2019 Jul; 43:38–43. <https://doi.org/10.1016/j.amsu.2019.05.009>
- Lu Y, Xu H, Zhou Z, Fang L, Tao R. The promotive effect of grafts with the double-stranded peroneus longus tendon and with the four-stranded hamstring tendon on reconstruction of the posterior cruciate ligament injury. *Orthop Traumatol Surg Res.* 2022 Dec;108(8):103336. <https://doi.org/10.1016/j.otsr.2022.103336>
- Zhong H, Jin Y, Wu S, Liu Y. [Study on reconstruction of posterior cruciate ligament with autologous peroneus longus tendon under arthroscopy]. *Zhongguo Xiu Fu Chong Jian Wai Ke Za Zhi Zhongguo Xiu Fu Chongjian Waike Zazhi Chin J Reparative Reconstr Surg.* 2021 Feb 15;35(2):166–70. <https://doi.org/10.7507/1002-1892.202008051>
- Jiang D, Li J, Lu X, Zhou M, Hou G, He Z, et al. Effect comparison of reconstruction of posterior cruciate ligament with autologous ipsilateral peroneus longus tendon and hamstring tendon autograft. *J Clin Orthop.* 2024;13(2):115–119. <https://doi.org/10.3969/j.issn.2095-378X.2024.02.008>
- Kumar R, Kumar M, Sharma AK, Kumar S. A prospective study to evaluate the functional outcome of knee after arthroscopic posterior cruciate ligament reconstruction using ipsilateral peroneus longus autograft. *Sci J Health Res Afr.* 2023;4(9). <https://doi.org/10.51168/sjhafrica.v4i9.653>
- Rhatomy S, Abadi MBT, Setyawan R, Asikin AIZ, Soekarno NR, Imelda LG, et al. Posterior cruciate ligament reconstruction with peroneus longus tendon versus hamstring tendon: a comparison of functional outcome and donor site morbidity. *Knee Surg Sports Traumatol Arthrosc.* 2021 Apr;29(4):1045–51. <https://doi.org/10.1007/s00167-020-06077-3>
- Di Paolo S, Zaffagnini S, Tosarelli F, Grassi A, Della Villa F. Beyond Distance: A Simple Qualitative Assessment of the Single-Leg Hop Test in Return-to-Play Testing. *Sports Health.* 2022;14(6):906–911. <https://doi.org/10.1177/19417381211063450>
- Hébert MB, Dill LL, Stuhr pt, Schmidt DJ. Comparison of Lower Limb Mass, Thigh Circumference, and Balance Ability after Anterior Cruciate Ligament Reconstruction and in Control Participants. *Int J Exerc Sci.* 2024 Dec 1;17(1):1306–17. <https://doi.org/10.70252/ONAL9517>
- Sasetyo DR, Rhatomy S, Pontoh LAP. Peroneus longus tendon: The promising graft for anterior cruciate ligament reconstruction surgery. *Asia-Pac J Sports Med Arthrosc Rehabil Technol.* 2017 Jul 1;9:25. <https://doi.org/10.1016/j.jasmar.2017.05.033>
- Martin R, Burdett R, Irgang J. Development of the Foot and Ankle Disability Index (FADI). *J Orthop Sports Phys Ther.* 1999;29:532–533.
- Van Lieshout EMM, De Boer AS, Meuffels DE, Den Hoed PT, Van der Vlies CH, Tuinebreijer WE, et al. American Orthopaedic Foot and Ankle Society (AOFAS) Ankle-Hindfoot Score: a study protocol for the translation and validation of the Dutch language version. *BMJ Open.* 2017 Feb 27;7(2):e012884. <https://doi.org/10.1136/bmjopen-2016-012884>
- Kerimoğlu S, Aynacı O, Saraçoğlu M, Aydın H, Turhan AU. [Anterior cruciate ligament reconstruction with the peroneus longus tendon]. *Acta Orthop Traumatol Turc.* 2008;42(1): 38–43. <https://doi.org/10.3944/aott.2008.038>
- Jadhav R, Bharadwaj V. Assessment of donor site morbidity and ankle stability after management of anterior cruciate ligament reconstruction with peroneus longus autograft – a prospective study in Indian patients. *Glob J Res Anal.* 2024 Mar 15;1–5. <https://doi.org/10.36106/gjra/5700179>
- Khalid MN, Janjua SN, Sheraz M, Kanwal S, Ghouri QM, Shaheen UU. Quantifying donor site morbidity in anterior cruciate ligament reconstruction using peroneus longus tendon autograft. *J Musculoskelet Surg Res.* 2024 Jul 31;8:349–53. [https://doi.org/10.25259/JMSR\\_165\\_2024](https://doi.org/10.25259/JMSR_165_2024)
- Viswanathan VK, Iyengar KP, Jain VK. The role of peroneus longus (PL) autograft in the reconstruction of anterior cruciate ligament (ACL): A comprehensive narrative review. *J Clin Orthop Trauma.* 2024 Feb;49:102352. <https://doi.org/10.1016/j.jcot.2024.102352>
- Quinn M, Byrne RA, Albright JA, Testa E, Ahn B, Lemme N, et al. Peroneus Longus Tendon Autograft May Present a Viable Alternative for Anterior Cruciate Ligament Reconstruction: A Systematic Review. *Arthrosc J Arthrosc Relat Surg.* 2024 Apr;40(4):1366–1376.e1. <https://doi.org/10.1016/j.arthro.2023.10.016>
- Manit A, Rohit R, Abhishek K, Shukla T. Peroneus Longus Graft Harvest Does Not Affect Ankle Biomechanics: A Narrative Review. *Indian J Orthop.* 2024 Sep;58(9):1206–12. <https://doi.org/10.1007/s43465-024-01219-y>
- Mohamed Abdel Rahman HAA, Hafez Sallam HEE, Badr AMAA. Reconstruction of Anterior Cruciate Ligament Using Peroneus Longus Autograft. *Systematic Review.* *QJM Int J Med.* 2024 Oct 1;117(Supplement\_2): hcae175.665. <https://doi.org/10.1093/qjmed/hcae175.665>

36. Teja KVC, Kumar S, Kumar A, Haripriya H. Long-term outcomes of anterior cruciate ligament reconstruction: peroneus longus versus hamstring tendons. *J Arthrosc Surg Sports Med.* 2025;6(2):174–178. [https://doi.org/10.25259/JASSM\\_46\\_2024](https://doi.org/10.25259/JASSM_46_2024)
37. Frank RM, Hamamoto JT, Bernardoni E, Cvetanovich G, Bach BR, Verma NN, et al. ACL Reconstruction Basics: Quadruple (4-Strand) Hamstring Autograft Harvest. *Arthrosc Tech.* 2017 Aug 1;6(4):e1309–13. <https://doi.org/10.1016/j.eats.2017.05.024>
38. Phatama KY, Hidayat M, Mustamsir E, Pradana AS, Dhananjaya B, Muhammad SI. Tensile strength comparison between hamstring tendon, patellar tendon, quadriceps tendon and peroneus longus tendon: A cadaver research. *J Arthrosc Jt Surg.* 2019 May;6(2):114–6. <https://doi.org/10.1016/j.jajs.2019.02.003>
39. Nguyen Hoang Q, Nguyen Manh K. Anatomical and Biomechanical Characteristics of Peroneus Longus Tendon: Applications in Knee Cruciate Ligament Reconstruction Surgery. Pavone V, editor. *Adv Orthop.* 2023 Jun 27;2023:1–7. <https://doi.org/10.1155/2023/2018363>
40. Rahardja R, Love H, Clatworthy MG, Young SW. Comparison of Knee Pain and Difficulty With Kneeling Between Patellar Tendon and Hamstring Tendon Autografts After Anterior Cruciate Ligament Reconstruction: A Study from the New Zealand ACL Registry. *Am J Sports Med.* 2023 Nov;51(13):3464–72. <https://doi.org/10.1177/03635465231198063>
41. Cakar A, Kose O, Selcuk H, Egerci OF, Tasatan E, Dogruoz F. Complications of peroneus longus tendon harvesting: a retrospective review of 82 cases. *Arch Orthop Trauma Surg.* 2023 Jul 15;143(11):6675–84. <https://doi.org/10.1007/s00402-023-04988-7>
42. Velioğlu K, Öner K, Aslan FG, Okutan AE, Kerimoğlu S, Turhan AU. Harvesting the Full Thickness Peroneus Longus Tendon Is Not Associated with Structural Foot Impairments: A 12- to 23-Year Follow-up Study. *Orthop J Sports Med.* 2025 Apr;13(4):23259671251320659. <https://doi.org/10.1177/23259671251320659>

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