ORIGINAL ARTICLE

Hamstring vs Peroneus Longus Tendon Autograft in Anterior Cruciate Ligament Reconstruction: A Comparative Study

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Abstract

Introduction: Anterior cruciate ligament (ACL) injury is one of the most common knee ligament injuries. There is much debate about the best treatment for this injury, and many studies have been conducted to compare different graft options. Hamstring (HT) autografts have withstood the test of time and are currently the most commonly used graft for ACL reconstruction (ACLR). However, there are also many alternative graft options that have been explored and are being used. In this article, we will explore whether the peroneus longus (PL) graft can be a comparable alternative to the HT graft.

Materials and methods: We conducted a prospective randomized study involving 80 patients who underwent ACLR. These patients were divided into two equal groups randomly—the HT group and the peroneus longus tendon (PLT) group. To evaluate functional outcomes, we utilized the International Knee Documentation Committee (IKDC) score for the knee joint, while the American Orthopaedics Foot and Ankle Scoring System (AOFAS) was employed for assessing the ankle joint. To gauge donor site morbidity, we measured thigh circumference preoperatively and postoperatively. These measurements were taken at 1- and 2-year follow-up intervals.

Results: A total of 80 patients were evaluated with a minimum follow-up of 2 years. In terms of clinical outcomes and knee stability, neither group displayed any discernible differences. The diameter of the PL graft was substantially bigger than the diameter of the HT. The PLT group did not appear to have any abnormal ankle joint function according to the assessment of AOFAS and ankle range of motion (ROM). The HT group showed a significant wasting of the quadriceps when compared to the PLT group.

Conclusion: With regard to its strength, larger graft diameter, satisfactory ankle function, and prevention of potential complications of HT autograft obtained from the knee region, the current study demonstrated that PLT autograft might be considered a safe and practical autograft source for arthroscopic ACLR.

Keywords: Anterior cruciate ligament reconstruction, Hamstring graft, Peroneus longus.

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Introduction

Following an occurrence of an anterior cruciate ligament (ACL) rupture, the widely acknowledged and established course of action for restoring optimal joint functionality is the implementation of ACLR. The existing autograft options for ACL reconstruction (ACLR) encompass the bone-patellar bone, hamstring (HT), and quadriceps tendon composites. The autografts under consideration exhibit both advantageous and disadvantageous attributes. When considering the optimal approach for graft harvesting, it is imperative for the surgeon to carefully evaluate several key factors, namely the strength, size, and ease of the procedure, while simultaneously minimizing any potential donor site morbidity.[1]

The procedure known as ACLR involves several key steps. Firstly, the damaged ACL is surgically removed. Following this, a graft is obtained and meticulously prepared. Subsequently, tunnels are created in both the femoral and tibial regions. The graft is then meticulously positioned in a manner that closely resembles the original anatomical location of the ACL. Finally, the graft is firmly secured in place, ensuring its stability and functionality. The selection of an ideal graft for the purpose of ACLR necessitates the consideration of various factors. Foremost, it is imperative that the chosen graft exhibits structural and mechanical properties that closely mimic those of the native ligament. This is crucial in order to restore the functionality and stability of the knee joint effectively. Furthermore, the graft should enable secure fixation within the anatomical site and promote rapid biological integration. This ensures that the graft becomes an integral part of the recipient tissue, facilitating the restoration of normal joint function. Swift integration also contributes to the overall success of the surgical procedure. In addition to these functional aspects, it is essential to minimize any potential adverse effects at the donor site. The chosen graft should yield limited morbidity, thereby reducing postoperative complications and promoting a smooth recovery process for the patient. In summary, the optimal graft

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for ACL replacement should possess structural and mechanical characteristics akin to the natural ligament, facilitate secure fixation and swift biological integration, and result in minimal morbidity at the donor site. These considerations are crucial in achieving successful outcomes in ACLR procedures. The acquisition of these attributes is contingent upon various factors, including the proficiency and inclination of the surgeon, the accessibility of grafts, the level of physical activity exhibited by the patient, and any concurrent medical conditions that may be present.[2]

The current autografts commonly employed in contemporary medical practice are derived from the knee joint, a practice that may entail several inherent limitations, such as the possibility of knee laxity or an imbalance between the quadriceps and HT muscles subsequent to the graft extraction procedure. Moreover, in instances characterized by the occurrence of multiple ligament injuries, it is worth noting that the utilization of HT autograft alone may not be adequate in producing a graft that possesses the necessary attributes to effectively fulfil its intended function.[3] The peroneus longus tendon (PLT) exhibits a superficial placement, rendering it readily accessible. Unlike the HT tendons, its proximity to adjacent structures does not significantly impede its accessibility.[4]

The noteworthy aspect lies in the comparability of strength between an HT autograft and the original ACL. Additionally, the former demonstrates the advantage of being easily extracted with minimal complications at the donor site. However, it is imperative to acknowledge that a certain degree of ambiguity persists with regard to the precise magnitude of the graft, thereby giving rise to the possibility of a subsequent reduction in HT strength. The aforementioned aspect bears substantial significance for athletes who depend on a strong HT power.[5]

In light of the aforementioned circumstances, it has come to the attention of certain orthopedic surgeons that the PLT may hold potential as an autograft option for ACLR. In order to successfully perform an autograft procedure, it is imperative that the donor possesses adequate strength, possesses dimensions that are suitable for the intended purpose, and can be harvested in a manner that is both convenient and safe. The utilization of the PLT as a substitute autograft for ACLR has been suggested in various scholarly works. The present study highlights the inherent characteristics of the PLT that render it a suitable candidate for autograft utilization in ACLR. The PLT demonstrates the essential attributes of strength and size, which are imperative for achieving favorable outcomes in ACLR procedures. The utilization of PLT as an autograft for ACL repair has garnered recognition due to its commendable attributes in terms of strength, safety, and morbidity of the donor site. Notably, the comprehensive excision of the PLT does not engender any deleterious consequences on gait or ankle stability, further affirming its efficacy as a viable autograft option for ACL repair. Based on a comprehensive analysis of pertinent studies, it is evident that the potency of ankle elevation is significantly augmented owing to the existence of the peroneus brevis (PB) muscle.[6]

The primary objective of the present investigation was to examine the morbidity experienced at the donor site subsequent to ACLR. This study aimed to evaluate and compare the functional outcomes and donor site morbidity associated with the utilization of PL and HT autografts. In light of a potentially favorable clinical outcome and the absence of significant adverse effects at the donor site, our hypothesis posits that the utilization of the PL autograft could serve as a viable alternative autograft option.

Materials and Methods

The study protocol of our esteemed institute has successfully obtained approval from the Ethics Committee, ensuring adherence to ethical standards in our research endeavors. Furthermore, it is noteworthy to mention that all participants in our study have willingly and knowingly provided informed consent, demonstrating their voluntary agreement to partake in this investigation. In this prospective comparative study, the utilization of a quadrupled HT tendon autograft was implemented for ACLR in a cohort of 40 patients spanning the period from 2018 to 2020. In a separate cohort of patients during the identical temporal span, the implementation of a PLT autograft was observed. All procedures were conducted by a single surgeon. The diagnosis of ACL ruptures necessitates a meticulous evaluation encompassing the patient's complete medical background, thorough physical examinations, and the utilization of magnetic resonance imaging techniques. The study's inclusion criteria were defined to encompass individuals within the age range of 20–45 who had encountered an ACL rupture. In contrast, the exclusion criteria encompassed the presence of concomitant chondral lesions rated higher than grade III, previous knee surgery, cases necessitating revision, and the existence of an ankle joint ailment."

The study encompassed a comprehensive follow-up period of not <2 years, spanning from 26 to 34 months, during which all patients were diligently monitored and evaluated. The comprehensive evaluation of functional outcomes included the utilization of the International Knee Documentation Committee (IKDC) scores and measurements of knee range of motion (ROM). These assessments were conducted prior to the surgical intervention and subsequently at intervals of 1 and 2 years following the procedure. The present study sought to investigate the phenomenon of graft harvesting in the postoperative phase. This investigation was conducted by means of a comparative analysis between the measurement of thigh circumference, specifically 15 cm proximal to the upper pole of the patella, and the corresponding measurement on the contralateral healthy side. This analysis was performed on both study groups, thereby enabling a comprehensive examination of the aforementioned issue. The assessment of the ankle donor site within the PLT group was conducted utilizing the American Orthopaedics Foot and Ankle Scoring System (AOFAS) scoring system.

Surgical Procedure

The present investigation employed the utilization of standard anterolateral and anteromedial portals. The process of ACLR entails the utilization of a selected autologous graft, namely the HS or PLT graft. The assignment of the patient to a particular cohort dictated the selection of the graft employed. The autograft was procured from the ipsilateral limb and subsequently affixed utilizing a loop endobutton on the femur tunnel aspect, while a bioabsorbable screw was employed on the tibial tunnel aspect for secure fixation.

The surgical procedure of ACLR was executed by a solitary surgeon, employing an ipsilateral PLT. The acquisition of the full-thickness PL graft involved a surgical procedure wherein a 2 cm incision was made posterior to the lateral malleolus, specifically positioned above the superior peroneal retinaculum. Great attention was devoted to the meticulous exposure of the PLT and the PB tendon, ensuring that no harm was inflicted upon the delicate sural nerve. After the initial exposure, the PL and PB were meticulously manipulated to be extracted from the skin window. The procedure of conducting tenodesis of the PL to the PB was subsequently performed. The application of robust, nonabsorbable Krackow sutures was performed on the PLT, followed by a subsequent incision. The process of isolating the PL from the adjacent soft tissues was subsequently undertaken. The tendon was procured at a distance of approximately 4–5 cm from the fibular head. Figure 1 illustrates the process of PLT graft harvest.

In the context of an HT graft procedure, it is imperative to carefully consider the placement of the incision. The optimal location for this incision is situated between the tibial tubercle and the posterior-medial boundary of the tibia. It is worth noting that this incision typically measures around 3 cm in length. It is imperative to exercise the utmost caution in order to mitigate any potential harm that may be inflicted upon the underlying medial collateral ligament, as well as the saphenous nerve. At this particular juncture, it is customary to identify the gracilis and semitendinosus tendons through the method of palpation, utilizing the fingertip to apply pressure just beneath the sartorial fascia. The meticulous separation of the gracilis and semitendinosus tendons from the sartorial fascia within the tissue flap is achieved through the utilization of tissue forceps and scissors. Upon the conclusive identification of the two tendons, a meticulous procedure ensues whereby each tendon is meticulously separated from the sartorial fascia. Subsequently, the free extremities are meticulously fastened utilizing a no. 5 high-strength nonabsorbable suture employing a whipstitching technique. The exclusion of extratendinous restraints is of paramount significance in ensuring the integrity of the tendon. A meticulous and methodical approach is employed to meticulously dissect the tendons, ensuring the complete removal of any adhered soft tissue. This is done with the intention of preventing any unintended amputation of the tendon during the utilization of the tendon stripper. Following the initial procedure, a tendon stripper is employed with the purpose of liberating each tendon from its proximal musculotendinous attachment. The application of continuous traction on the sutures located on the distal end of the tendon, combined with a simultaneous and consistent push of the tendon stripper towards the proximal attachment of the HT at the pelvis, is expected to result in a smooth and uninterrupted release of the tendon. Upon achieving liberation, the tendon that has been released undergoes transportation to the designated back table, where it is subjected to meticulous preparation for grafting purposes.

Fig. 1: Illustrates the process of PLT graft harvest

The utilization of Krackow-type sutures is a strategic approach in which nonabsorbable sutures are positioned on both extremities of each tendon, as depicted in Figure 2. The graft underwent a fourfold increase, leading to a final thickness ranging from 7 to 9 mm. Following the meticulous creation of the femoral and tibial tunnels, the tendon is then meticulously traversed and firmly secured in a manner that has been previously outlined and expounded upon. The PLT exhibited a customary range of 8–9 cm in length, accompanied by an average diameter of approximately 8.5 cm. The present study observed that PLT autograft demonstrated superior measurements in terms of length and diameter in comparison to the HT autograft.

Results

Within the allocated timeframe for scholarly inquiry, a cohort comprising 80 individuals who met the predetermined eligibility criteria underwent a discrete surgical procedure known as single-bundle ACLR. The relevant demographic data pertaining to the cohort under investigation was subsequently subjected to a thorough and comprehensive analysis, as delineated in Table 1. Following a sequential course of action, the individuals under study were assigned in a random manner to two distinct cohorts solely based on the specific type of graft utilized.

The mean diameter of the PLT and HT is shown in Table 2, which shows a significant difference.

Fig. 2: The graft underwent a fourfold increase

Table 1: Demographic data of the study population

Variable	*PLT*	*HT tendon*
Age	29 ± 3.82	28 ± 3.12
Gender (male/female)	32/8	30/10

Table 2: Comparison of graft diameter

Graft used	*Diameter (mm)*	*p-value*
PL	8.53 ± 0.2 (range 8–9 mm)	$p < 0.001$
HT	7.45 ± 0.3 (range 7–8.5 mm)	

Table 3: International Knee Documentation Committee (IKDC) scores of the HT and PL groups at 1- and 2-year follow-up

	Preoperative	*1-year*	*2-years*	*p-value*
PL	53.4 ± 4.5	89.8 ± 6.7	91.8 ± 8.7	<0.001
HT	52.5 ± 9.4	92.3 ± 6.4	92.3 ± 5.3	<0.001

Table 4: Ankle ROM (degrees)

Movement	*PL group*	*Normal side*	*p-value*
Dorsiflexion	20.2 ± 5.4	20.6 ± 5.2	0.723
Plantarflexion	35.8 ± 6.9	36.2 ± 3.2	0.626
Inversion	31.2 ± 3.2	31.7 ± 4.2	0.465
Eversion	23.9 ± 8.9	24.9 ± 5.6	0.829

The presented data in Table 3 illustrates the discrepancy in IKDC scores between the two groups prior to surgery, as well as at the 1- and 2-year postoperative follow-up periods. Both experimental groups exhibited a statistically significant outcome in the postoperative period, while the disparity between the two groups did not reach a level of statistical significance that could be considered substantial.

Table 4 shows the movements of the ankle from which the PLT graft was harvested, and the same is compared to the normal ankle; the results did not show a statistically significant difference between the same.

The mean AOFAS score for the donor's ankle was 91.54 ± 2.0 at 1 year and 93.23 ± 33 at 2 years follow-up, and there was no difference between both sides.

Thigh hypotrophy was considerably more significant in the HT tendon group compared to the PL group at 2 years of follow-up (13.0 ± 3.4 mm mean thigh hypotrophy in the HT group and 4.0 ± 3.3 mm mean thigh hypotrophy in the PL group; $p < 0.001$).

Discussion

The principal finding of this inquiry elucidated that the PLT exhibited promising viability as an autograft alternative in the context of ACLR. The utilization of this particular alternative has resulted in favorable functional outcomes, effectively reducing the likelihood of potential complications commonly associated with autografts procured from the knee region. Furthermore, it has been observed that this approach exerts a negligible influence on the integrity and functionality of the ankle joint.

A research study conducted by Wiradiputra et al.[7] exhibited that the AOFAS assessment yielded a perfect score of 100% during the 12-month follow-up period. Furthermore, the patient displayed satisfactory ankle motoric power and did not report any issues pertaining to ankle functionality. The study further concluded that the PLT displays promise as a graft option in ACLR. This particular graft is regarded as the primary choice in ACLR due to its ability to avoid significant postoperative morbidity and biomechanical inconvenience at the ankle donor site.

A study was carried out by Goyal et al.,[8] the utilization of PLT has been observed in the context of ACLR and multiligamentous injuries, wherein researchers have incorporated this technique for the purpose of revision. The findings of the study indicate that a range of parameters, including ankle dorsiflexion, ankle plantarflexion, eversion strength, first ray plantarflexion strength, and the AOFAS score, exhibited similar values to those observed in the unaffected side across all patients. Therefore, it can be inferred from the findings of the study that the utilization of the PLT may be regarded as a feasible alternative for ACLR in instances of multiligament knee injuries and revision ACLR. Moreover, it is noteworthy to mention that no notable complications were observed at the site of donation throughout the duration of the subsequent monitoring period.

In a study conducted by Agarwal et al.,[9] the present study was conducted with a targeted cohort comprising 194 individuals, of which 96 participants received HT grafts while the remaining 98 individuals underwent peroneus grafts. It is worth mentioning that there were no discernible discrepancies of statistical significance detected in the IKDC and Lysholm knee scores when comparing the two groups at three distinct intervals—prior to the surgical procedure, 6 months following the surgical procedure, and 1 year following the surgical procedure. Moreover, it is worth noting that there was no significant difference in the average AOFAS scores between the PLT and HT groups. However, it is important to highlight that there was a substantial increase in thigh muscle wasting observed in the PLT group during the final follow-up period, with a p-value of <0.001. As a result, the researchers arrived at the conclusion that both cohorts exhibited similar levels of knee stability and functional outcomes, with no discernible complications observed at the donor site. Moreover, it is worth noting that these individuals exhibited enhanced responses to physiotherapeutic interventions, thereby facilitating their recuperation from the deleterious effects of quadriceps muscle atrophy. Therefore, it is advisable to consider utilizing a PLT graft as a reliable, viable, and efficacious alternative for conventional arthroscopic single-bundle ACLR.

A meta-analysis conducted by He et al.[10] has observed that autografts derived from the PLT have demonstrated functional outcomes and graft survival rates that are akin to those achieved by autografts sourced from the HT for ACLR. However, it is imperative that the process of surgical planning duly considers the potential implications of a marginal decrease in the AOFAS score. Therefore, it can be inferred that the PLT serves as a viable autograft alternative for ACLR when procured from a source external to the knee joint. This approach effectively mitigates the potential complication of quadriceps—HT imbalance that may arise when autografts are obtained from within the knee joint.

In a study conducted by Keyhani et al.,[1] a comprehensive analysis was conducted on a cohort comprising a total of 130 individuals, equally divided into two distinct groups denoted as the PLT group and the HT group, each consisting of 65 patients. The prescribed duration for follow-up in this study was a minimum of 2 years. The findings of this study indicate that both groups demonstrated a lack of statistically significant differences in relation to clinical outcomes and knee stability. Significantly, the diameter of the PLT graft was observed to be considerably greater in comparison to that of the HT graft, with a statistically significant difference ($p < 0.001$). The assessment of the AOFAS, Foot and Ankle Disability Index (FADI), and ROM revealed no discernible impairment in the ankle joint among the participants belonging to the PLT group. In light of the aforementioned observations, it can be deduced that individuals who were administered platelet autografts exhibited expedited knee extension capabilities, diminished anteromedial knee discomfort, and a notable decline in thigh hypotrophy. Hence, the utilization of this particular autograft variant, owing to its robustness, wider graft diameter, and the circumvention of potential complications linked to HT autografts procured from the knee region, can be considered suitable for ACLR.

In a study conducted by Hossain et al.,[11] a comprehensive analysis was conducted on a cohort of 439 individuals who underwent ACLR utilizing a PLT graft. The findings of the investigation revealed that the utilization of a patellar tendon autograft in the context of single-bundle ACLR yielded advantageous functional outcomes, as demonstrated by the IKDC, modified Cincinnati, and Tegner–Lysholm scoring systems. The donor ankle exhibited remarkable functional test scores, as evidenced by the noteworthy outcomes in both the Foot and FADI and the AOFAS scores. Moreover, the outcomes derived from the single-hop, triple-hop, and crossover-hop tests have exhibited that the PLT possesses the potential to be regarded as a secure, efficient, and encouraging alternative for arthroscopic primary ACLR.

The findings of our investigation indicate that individuals who underwent arthroscopic single-bundle ACLR, with the utilization of the PLT as an autograft, exhibited a noteworthy functional outcome, as demonstrated by the IKDC score. Moreover, the subjects demonstrated similar levels of postoperative knee stability, as assessed through the utilization of the anterior drawer test, in comparison to individuals who underwent a quadruple HT tendon graft procedure. The implementation of the PLT as an autograft demonstrated negligible adverse consequences at the donor site and resulted in notable enhancements in the atrophy of the thigh musculature. Therefore, it can be inferred that this particular approach serves as a highly effective and reliable alternative for autograft utilization in the context of conventional ACLR methodologies.

Limitation

The present investigation encountered certain limitations that warrant acknowledgment. Firstly, it is important to note that this study was conducted solely at a single center, thereby potentially limiting the generalizability of the findings to a broader population. Additionally, the study sample size comprised a modest cohort of 80 patients, which may have constrained the statistical power and precision of the results. Consequently, it is plausible to surmise that a multicentric trial encompassing a larger patient cohort would likely yield more robust and reliable outcomes. The study was conducted over a span of 2 years, during which the establishment of long-term outcomes was not feasible.

Conclusion

The present investigation has yielded findings that indicate patients who underwent arthroscopic single-bundle ACLR utilizing the PLT as an autograft exhibited a remarkable functional outcome, as evidenced by the IKDC score. Furthermore, these individuals displayed postoperative knee stability comparable to those who received a quadruple HT tendon graft. The utilization of this particular autograft option for the standard ACLR procedure has demonstrated notable advantages, including the absence of noteworthy complications at the donor site and superior amelioration of thigh muscle atrophy. Consequently, it can be deemed an efficacious and secure alternative for ACLR.

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References

1. Keyhani S, Qoreishi M, Mousavi M, et al. Peroneus longus tendon autograft versus hamstring tendon autograft in anterior cruciate ligament reconstruction: a comparative study with a mean follow-up of two years. Arch Bone Jt Surg 2022;10(8):695–701. DOI: 10.22038/ABJS.2022.59568.2938
2. Daniel DM, Stone ML, Dobson BE, et al. Fate of the ACL-injured patient. A prospective outcome study. Am J Sports Med 1994;22(5):632–644. DOI: 10.1177/036354659402200511
3. Cristiani R, Forssblad M, Engström B, et al. Risk Factors for abnormal anteroposterior knee laxity after primary anterior cruciate ligament reconstruction. Arthroscopy 2018;34(8):2478–2484. DOI: 10.1016/j.arthro.2018.03.038
4. Kumar PM, Shevte I, Phalak M, et al. Arthroscopic anterior cruciate ligament reconstruction with semitendinosus graft versus peroneus longus tendon graft. Int J Res Orthop 2020;6(2):386–392. DOI: 10.18203/issn.2455-4510.IntJResOrthop20200735
5. Yasuda K, Van Eck F, Hoshino Y, et al. Anatomic single- and double-bundle anterior cruciate ligament reconstruction, part 1: basic science. Am J Sports Med 2011;39(8):1789–1799. DOI: 10.1177/0363546511402659
6. Chen H, Tie K, Qi Y et al. Anteromedial versus transtibial technique in single-bundle autologous hamstring ACL reconstruction: a meta-analysis of prospective randomized controlled trials. J Orthop Surg Res 2017;12(1):167. DOI: 10.1186/s13018-017-0671-3
7. Wiradiputra AE, Febyan, Aryana GNW. Peroneus longus tendon graft for anterior cruciate ligament reconstruction: a case report and review of literature. Int J Surg Case Rep 2021;83:106028. DOI: 10.1016/j.ijscr.2021.106028
8. Goyal T, Paul S, Choudhury AK, et al. Full-thickness peroneus longus tendon autograft for anterior cruciate reconstruction in multi-ligament injury and revision cases: outcomes and donor site morbidity. Eur J Orthop Surg Traumatol 2023;33(1):21–27. DOI: 10.1007/s00590-021-03145-3
9. Agarwal A, Singh S, Singh A, et al. Comparison of functional outcomes of an anterior cruciate ligament (ACL) reconstruction using a peroneus longus graft as an alternative to the hamstring tendon graft. Cureus 2023;15(4):e37273. DOI: 10.7759/cureus.37273
10. He J, Tang Q, Ernst S, et al. Peroneus longus tendon autograft has functional outcomes comparable to hamstring tendon autograft for anterior cruciate ligament reconstruction: a systematic review and meta-analysis. Knee Surg Sports Traumatol Arthrosc 2021;29(9):2869–2879. DOI: 10.1007/s00167-020-06279-9
11. Hossain GMJ, Islam MS, Rahman Khan MM, et al. A prospective study of arthroscopic primary ACL reconstruction with ipsilateral peroneus longus tendon graft: experience of 439 cases. Medicine (Baltimore) 2023;102(9):e32943. DOI: 10.1097/MD.0000000000032943