

A PROSPECTIVE STUDY ON THE FUNCTIONAL OUTCOMES OF PRIMARY ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION TREATED WITH PERONEUS LONGUS AUTOGRAFT

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Abstract

Background: Anterior cruciate ligament (ACL) injuries are common, especially among young, active individuals. While various autograft options exist for ACL reconstruction, each has associated drawbacks. The peroneus longus tendon has emerged as a promising alternative, but literature on its functional outcomes remains limited. The objective is to evaluate the functional outcomes of primary ACL reconstruction using peroneus longus tendon autograft. **Materials and Methods:** This prospective study included 31 patients who underwent ACL reconstruction with peroneus longus autograft at BLDE (Deemed to be University) Shri B. M. Patil Medical College, Hospital & Research Centre from August 2022 to January 2024. Patients were followed up for 12-21 months. Functional outcomes were assessed using Lysholm and International Knee Documentation Committee (IKDC) scores preoperatively and at 6 and 12 months postoperatively. Return to pre-injury activity levels and complications were also evaluated. **Result:** The mean Lysholm score improved from 46.41 ± 6.5 preoperatively to 96.61 ± 3.22 at 12 months postoperatively. The mean IKDC score increased from 41.87 ± 6.91 preoperatively to 91.12 ± 6.86 at 12 months postoperatively. Both improvements were statistically significant ($p < 0.001$). Twenty-eight patients (91%) returned to their pre-injury activity level, with 20 (64.5%) resuming sports activities. Minor complications were observed in 16.2% of cases, with no major complications requiring revision surgery. **Conclusion:** ACL reconstruction using peroneus longus tendon autograft demonstrates excellent functional outcomes, high rates of return to pre-injury activity levels, and a low complication rate. These findings suggest that peroneus longus autograft is a viable option for ACL reconstruction, particularly when traditional graft choices are less favorable.

INTRODUCTION

Anterior cruciate ligament (ACL) injuries are among the most common knee ligament injuries, particularly in young, active individuals.^[1] These injuries can significantly impact knee stability, function, and long-term joint health.^[2] Surgical reconstruction remains the gold standard treatment for ACL tears, especially in patients desiring to return to high-level athletic activities.^[3]

While various graft options exist for ACL reconstruction, autografts are generally preferred due to their superior integration and lower risk of rejection.^[4] Traditionally, hamstring tendons and bone-patellar tendon-bone (BPTB) grafts have been widely used.^[5] However, these grafts are associated with certain drawbacks, including donor site morbidity and potential long-term complications.^[6] In recent years, the peroneus longus tendon has emerged as a promising alternative autograft source for ACL reconstruction.^[7] This tendon offers several potential advantages, including adequate length and

diameter, minimal donor site morbidity, and preservation of knee extensor and flexor mechanisms.^[8] However, the literature on the functional outcomes of ACL reconstruction using peroneus longus autografts remains limited.

The peroneus longus tendon, traditionally considered essential for foot eversion and plantar flexion, has been shown to have minimal functional impact when harvested for ACL reconstruction.^[9] This is due to the compensatory action of the peroneus brevis and other surrounding muscles. The use of this graft also avoids the potential complications associated with hamstring harvest, such as reduced knee flexion strength and internal rotation torque.^[10]

Despite these potential benefits, concerns persist regarding the long-term functional outcomes and potential complications associated with peroneus longus autografts. Questions remain about the graft's biomechanical properties, its ability to replicate the native ACL, and the potential for donor site morbidity.^[11]

Our study aims to address these knowledge gaps by providing comprehensive data on the functional outcomes of ACL reconstruction using peroneus longus autografts. This study seeks to shed light on the efficacy of peroneus longus autografts in ACL reconstruction, potentially offering surgeons and patients an additional viable option in the spectrum of ACL reconstruction techniques. By comprehensively assessing functional outcomes, complications, and patient satisfaction, we hope to provide valuable insights that will inform clinical decision-making and improve patient care in the management of ACL injuries.

MATERIALS AND METHODS

This prospective randomized controlled study was conducted at BLDE (Deemed to be University) Shri B. M. Patil Medical College, Hospital & Research Centre, Vijayapura, from August 1, 2022, to January 2024. The study protocol was approved by the institutional ethics committee, and informed consent was obtained from all participants. Patients aged 18-50 years with clinically and MRI-confirmed Anterior Cruciate Ligament ruptures were included in the study. Exclusion criteria encompassed patients outside the specified age range, ACL ruptures associated with meniscal injuries requiring meniscectomy, multi-ligament knee injuries, associated neurovascular injury, polytrauma, and medical unfitness for surgery.

The sample size was calculated based on anticipated mean \pm SD scores for peroneus longus graft outcomes. Using a significance level of 95% and power of 80%, the minimum required sample size was determined to be 31 patients. All patients underwent thorough clinical examination, including specific tests for ACL injury (Lachman test, Anterior Drawer test, and Pivot-shift test) and associated structures (valgus and varus stress tests, McMurray's and Apley's grind tests, and Posterior Drawer test).

Standard radiographs and MRI of the affected knee were performed for all patients.

All surgeries were performed under spinal or epidural anesthesia. A standard arthroscopic technique was used for ACL reconstruction. The peroneus longus tendon was harvested through a longitudinal incision along the posterior border of the fibula, starting 2 cm above the tip of the lateral malleolus, with care taken to preserve the peroneus brevis tendon. Femoral and tibial tunnels were created using standard arthroscopic techniques. The graft was secured on the femoral side using a fixed-loop endobutton and on the tibial side with an interference screw.

Post-operatively, patients were immobilized in a knee brace with limb elevation for the first few days. Intravenous antibiotics were administered for three days. Wound inspection was performed on the second and seventh post-operative days, with suture removal on the twelfth day. A standardized rehabilitation protocol was initiated immediately post-surgery.

The primary outcome measures were the International Knee Documentation Committee (IKDC) subjective score and the Lysholm Knee Scoring Scale, assessed pre-operatively and at 6 and 12 months post-operatively. Secondary outcomes included range of motion, return to pre-injury activity level, and complications. Data were analyzed using SPSS version 29.0.02. Results are presented as mean \pm SD, counts, and percentages. Categorical variables between groups were compared using the Chi-square test or Fisher's exact test. A p-value $<$ 0.05 was considered statistically significant, and all statistical tests were two-tailed.

RESULTS

This prospective study included 31 patients who underwent Arthroscopic ACL Reconstruction with Peroneus Longus Graft at BLDE (Deemed to be University) Shri B. M. Patil Medical College, Hospital & Research Centre, Vijayapur from August 2022 to January 2024. Patients were followed up for a period ranging from 12 to 21 months.

The demographic characteristics and injury patterns of the patients are presented in [Table 1].

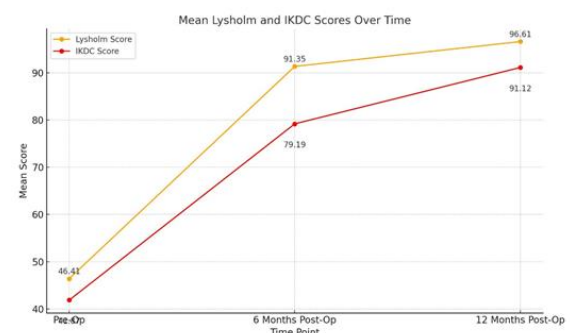


Figure 1: Mean Lysholm and IKDC Scores Over Time Following ACL Reconstruction with Peroneus Longus Autograft

As shown in [Table 1], the majority of patients (42%) were under 30 years of age, with male patients significantly outnumbering female patients. Road traffic accidents were the most common cause of injury, accounting for 61.3% of cases. Associated meniscal injuries were common, with only 29% of patients having isolated ACL tears. Medial meniscus injuries (35.5%) were more frequent than lateral meniscus injuries (29%).

The left knee was involved in 16 cases (52%) and the right knee in 15 cases (48%).

Functional outcomes, as measured by the Lysholm and IKDC scores, showed significant improvement over time, as presented in [Table 2].

[Figure 1] illustrates the progression of mean Lysholm and IKDC scores from pre-operative to 12 months post-operative time points. As shown, both scores demonstrated substantial improvement over time, with the most significant increase occurring in the first 6 months post-operation and continued improvement up to the 12-month follow-up

Twenty-eight patients (91%) were able to return to their pre-injury activity level. Of these, 20 patients resumed sports activities, while 11 reported mild pain and difficulty with cutting, acceleration, and sudden stops during running.

Minor complications were observed in a few cases. Two patients developed superficial infection at the donor site, which was successfully treated with IV antibiotics. Three patients experienced restricted range of motion (10 to 80 degrees) due to poor compliance with post-operative rehabilitation, which improved with aggressive physiotherapy. One patient reported numbness over the lateral aspect of the foot near the fifth digit. Importantly, no cases of deep infection, implant failure, or fixation failure requiring removal or revision were observed at the end of the 1-year follow-up period.

Representative Case of ACL Reconstruction with Peroneus Longus Graft



A. Preoperative MRI showing ACL deficiency



B. Postoperative radiograph with Endobutton and Titanium interference screw in situ



C. Postoperative knee range of motion and Postoperative straight leg raising test

A representative case of a 31-year-old male with chronic ACL deficiency is presented in Figure 1. The patient underwent Arthroscopic ACL reconstruction with Peroneus Longus graft, using a fixed loop endobutton for femoral fixation and an interference screw for tibial fixation. Post-operative radiographs confirmed proper placement of the graft and fixation devices. At the 1-year follow-up, the patient demonstrated excellent knee range of motion and straight leg raising ability, with a significant improvement in both Lysholm and IKDC scores. These results suggest that ACL reconstruction using Peroneus Longus autograft is a viable option, providing good functional outcomes and a high rate of return to pre-injury activity levels, with minimal complications.

Table 1: Demographic Characteristics and Injury Patterns.

Characteristic	Category	Number of Patients	Percentage
Age (Years)	< 30	13	42
	30 - 39	9	29
	40+	9	29
Gender	Male	27	87
	Female	4	13
Mode of Injury	Road Traffic Accident	19	61.3
	Self-Fall	9	30
	Sports	3	9.7
Associated Meniscal Injuries	Both	2	6.5
	Lateral	9	29

	Medial	11	35.5
	None	9	29

Table 2: Comparison of Lysholm and IKDC Scores

Score	Time Point	Mean Score	Standard Deviation	Minimum	Maximum
Lysholm	Pre-operative	46.41	6.5	38	54
	6 months post-op	91.35	4.02	81	95
	12 months post-op	96.61	3.22	86	100
IKDC	Pre-operative	41.87	6.91	38	61
	6 months post-op	79.19	7.06	67	86
	12 months post-op	91.12	6.86	77	97

The improvements in both Lysholm and IKDC scores were statistically significant ($p < 0.001$).

DISCUSSION

This prospective study evaluated the functional outcomes of primary anterior cruciate ligament (ACL) reconstruction using peroneus longus autograft in 31 patients. Our results demonstrate significant improvements in knee function and stability, with high patient satisfaction and a low complication rate, aligning with recent literature on this emerging graft option.

The demographic profile of our study population, with a predominance of young male patients (87%) and road traffic accidents as the primary cause of injury (61.3%), aligns with previous literature on ACL injuries.^[12,13] This reinforces the need for effective treatment strategies that can restore knee function and stability in this active population.

Our study's findings support the efficacy of peroneus longus tendon (PLT) as an autograft choice. The mean Lysholm score in our study improved from 46.41 preoperatively to 96.61 at 12 months post-operation. This result is comparable to recent studies, such as Amaresh et al,^[14] who reported a mean Lysholm score of 86.1 at one-year post-surgery. Our IKDC score increased from 41.87 preoperatively to 91.12 at 12 months post-operation, which aligns well with the findings of Khater et al,^[15] in their systematic review, where they reported a mean IKDC score improvement from 64.7 preoperatively to 97.8 postoperatively.

The improvements in both Lysholm and IKDC scores in our study are statistically significant and clinically relevant, surpassing the minimal clinically important difference (MCID) reported for both scoring systems.^[16] The high scores at 12 months suggest that the peroneus longus graft provides excellent knee stability and function, allowing patients to return to their pre-injury activity levels.

Our study found that 91% of patients were able to return to their pre-injury activity level, with 64.5% resuming sports activities. This high rate of return to sports is particularly noteworthy and compares favorably with recent literature. Khalid et al,^[17] reported that 34 out of 35 patients in their PLT group could jog without discomfort within six months post-surgery. Additionally, a study on high-level basketball players by Ainbinder et al,^[18] reported a 96% overall return to sport rate post-ACLR, although this was not specific to PLT grafts.

Regarding complications, our study observed a low rate of minor complications (16.2%) and no major complications requiring revision surgery. This aligns with recent literature highlighting the safety profile of PLT grafts. Jadhav & Bharadwaj,^[19] reported no cases of graft failure, infection, or significant donor site complications in their prospective study of 100 patients. Our findings, along with recent literature, suggest that PLT autografts have lower complication rates compared to other autograft types, particularly in terms of donor site morbidity.^[20]

One of the theoretical concerns with using the peroneus longus tendon as a graft is the potential for donor site morbidity and impaired foot function.^[21] However, our study did not observe any significant donor site complications or reports of foot instability, which is consistent with recent studies reporting no loss of ankle strength following PLT harvest.^[22]

Comparative analyses in recent literature show that PLT autografts perform similarly or better than hamstring and patellar tendon grafts. Park et al,^[23] conducted a systematic review of six randomized controlled trials involving 683 patients and concluded that PLT autografts are a non-inferior alternative to hamstring tendon autografts, with fewer donor-site complications.

The strengths of our study include its prospective design, the use of validated outcome measures, and a follow-up period extending to 21 months for some patients. However, there are limitations to consider. The sample size, while adequate based on our power calculation, is relatively small compared to some larger studies on ACL reconstruction. Additionally, the lack of a control group using a different graft type limits direct comparisons with other reconstruction techniques.

CONCLUSION

This prospective study demonstrates that anterior cruciate ligament reconstruction using peroneus longus tendon autograft yields favorable outcomes. The significant improvements in Lysholm and IKDC scores, high rate of return to pre-injury activity levels, and low complication rates observed in our cohort suggest that this graft option is a viable alternative to traditional autografts. The minimal donor site morbidity and absence of foot instability further support its clinical utility. While our results are promising and Large-scale, randomized controlled

trials with long-term follow-up are needed to definitively establish the role of peroneus longus autograft in ACL reconstruction. Nonetheless, our findings contribute to the growing body of evidence supporting the use of this graft type, particularly in cases where traditional options may be less favourable.

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