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ORIGINAL ARTICLE

Outcome of ankle joint function after anterior cruciate ligament reconstruction using peroneus longus graft.

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ABSTRACT… Objective: To evaluate the outcome of ankle joint function after anterior cruciate ligament (ACL) reconstruction using the peroneus longus tendon (PLT) autograft. **Study Design:** Prospective Longitudinal study. **Setting:** Department of Orthopedic Surgery, Madinah Teaching Hospital, Faisalabad. **Period:** 19th July 2025 to 1st Feb 2026. **Methods:** Arthroscopic repair utilizing ipsilateral PLT autograft was performed on 96 patients, ranging in age from 18 to 50 years, who had a verified ACL rupture. The American Orthopedic Foot and Ankle Society (AOFAS) score was used to evaluate ankle function before and after surgery at 3,6, and 12 weeks. Statistical analysis was carried out using repeated measures ANOVA to analyze changes over time, based on demographic and clinical data. To account for any confounding factors such as age, gender, BMI, involved side, comorbidities, and injury mechanism, stratification was used. **Results:** The mean AOFAS scores increased progressively from 64.35 ± 4.14 at 3 weeks to 73.35 ± 3.13 at 6 weeks and 81.75 ± 3.71 at 12 weeks, indicating significant improvement in ankle function ($p < 0.001$). Excellent and good functional outcomes were achieved in 92.7% of patients, with fair outcomes in 7.3%. Donor-site complications were minimal, with preserved eversion and plantarflexion strength in the majority of patients. No patient reported ankle instability, gait disturbance, or limitations in daily or sports activities. Functional outcomes were significantly associated with age, BMI, gender, and mode of injury, while side of knee involvement had no effect. **Conclusion:** ACL reconstruction using the peroneus longus tendon autograft provides excellent knee stability while preserving ankle joint function. The procedure is safe, effective, and associated with minimal donor-site morbidity, making PLT a reliable graft option for ACL reconstruction.

Key words: Anterior Cruciate Ligament, Autograft, Ankle Function, AOFAS Score, Donor-site Morbidity, Peroneus Longus Tendon.

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INTRODUCTION

The anterior cruciate ligament (ACL) is a crucial anatomical structure that maintains knee joint stability and movement.[1] Rupture of the anterior cruciate ligament (ACL) compromises knee stability, limits natural knee motion, speeds up knee deterioration, and ultimately causes osteoarthritis. Arthroscopic ligament repair surgery is the primary method for treating an ACL tear.[2] It is ideal for the material used for ACL reconstruction to have dimensions that are comparable to the original, including enough length and diameter, and to perform physiological tasks.[3,4]

In recent years, ACL restoration has made use of the peroneus longus tendon (PLT). This tendon is easily harvestable since it is superficially situated. Experiments in biomechanics have shown that PLT can replace grafts in cross-ligament restoration because it possesses biomechanical characteristics that are comparable to ACLs.[5] Improvements in graft materials, fixation procedures, and surgical techniques have led to better clinical results in the last 30 years. An ideal anterior cruciate ligament (ACL) graft would be long enough and wide enough to allow for secure fixation, have biomechanical qualities similar to the natural ACL, and have as little donor-site morbidity as possible.[6,7] Synthetic ligaments, allograft tendons, and autologous tendons are all viable transplant choices; nevertheless, autografts continue to have a prevailing preference owing to their biological integration and reduced failure rates.

Arthroscopic ligament repair surgery is the treatment of choice for anterior cruciate ligament rupture. It is ideal for the material used for ACL reconstruction to have dimensions that are comparable to the

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original, including enough length and diameter, and to perform physiological tasks.[8,9] Recently, ACL restoration has made use of the peroneus longus tendon (PLT). This tendon is easily harvestable since it is superficially situated. To replace grafts in cross-ligament restoration, biomechanical studies have shown that the Peroneus Longus tendon (PLT) exhibits biomechanical characteristics comparable to ACLs.[10]

The research found that after ACL restoration using the peroneus longus tendon autograft, knee function significantly improved. After 12 months, 80% of patients had Lysholm scores of excellent or good, and 80% of patients had normal or near-normal IKDC grades. While 22 patients had negative findings from the pivot-shift test, 24 patients had normal Lachman tests, with just 6 exhibiting grade-1 laxity. There was no discernible decrease in the mean ankle AOFAS scores from the preoperative values of 100 ± 0.0 to the end follow-up values of 96.8 ± 3.36. Ankle strength in the donor group was maintained in a large majority of patients (93.3% plantar-flexion and 86.7% grade-V eversion). Following graft harvest, no patient reported instability of the ankle, alteration of gait, or functional impairment.[11]

The results of this research will provide light on how well the ankle joint functions after ACL repair with the Peroneus longus graft. Contributing to the advancement of evidence-based procedures in orthopedic surgery, this research will evaluate the effects of the Peroneus Longus graft on ankle joint function. Patients having ACL restoration should expect better results and a higher quality of life as a result of this study.

METHODS

A prospective longitudinal research will be carried out at the Orthopedic Surgery Department of Madinah Teaching Hospital in Faisalabad. The College of Physicians and Surgeons of Pakistan and the Institutional Ethical Review Committee (TUF/IRB/04/25-13/1/25) have both given their permission for this initiative. After the summary is approved, the research will be conducted over 19th July 2025 to 1st Feb 2026. Using a non-probability sequential sampling method, 96 patients will be included in the study who will undergo arthroscopic anterior cruciate ligament restoration using an ipsilateral peroneus longus tendon autograft.

This research will involve male and female patients (ranging in age from 18 to 50 years) who have an ACL tear (as determined by clinical and radiological means) and are scheduled to undergo repair with a peroneus longus graft. This study will not include patients who have a history of anterior cruciate ligament (ACL) tears along with tibial or femoral fractures, avulsion injuries, serious ankle pathology or instability, grade III collateral ligament injuries, systemic illnesses that impact walking, or a prior surgical procedure on the affected knee.

Before enrolling any participant, their written informed permission will be sought. The following basic clinical and demographic information will be documented on a pre-designed proforma: age, gender, BMI, injured knee side, injury mechanism, and comorbidities. Ankle and foot function of the donor will be evaluated before surgery using the AOFAS score.

All surgical procedures will be performed by a single experienced knee surgeon under spinal anesthesia with the patient in the supine position. Arthroscopic ACL reconstruction will be carried out using a full-thickness ipsilateral peroneus longus tendon autograft following a standardized surgical technique. Postoperatively, all patients will receive broad-spectrum intravenous antibiotics for two days. Wound dressings will be performed on the 2nd, 5th, and 10th postoperative days. Patients will be encouraged to begin partial weight-bearing with a range-of-motion knee brace from the second postoperative day onward, following a standardized rehabilitation protocol.

Postoperative evaluation of donor ankle joint function will be conducted using the AOFAS score at 3 weeks, 6 weeks, and 12 weeks after surgery. All clinical findings will be documented systematically. Data will be analyzed using SPSS version 25.0. Quantitative variables such as age, body mass index, and AOFAS scores will be expressed as mean ± standard deviation, while categorical variables will be presented as frequencies and percentages. Repeated measures ANOVA will be applied to

compare AOFAS scores at different time intervals. Effect modifiers, including age, gender, body mass index, side of knee involvement, comorbidities, and mode of injury, will be controlled through stratification, and post-stratification comparisons will be performed using one-way ANOVA. A p-value of ≤0.05 will be considered statistically significant.

RESULTS

In the end, 96 individuals who had peroneus longus tendon autograft performed to repair their anterior cruciate ligament were considered. The majority of the participants in the research were male (60.4%), and their average age was 30.67 ± 4.09 years. A majority of patients (65.6%) had their injuries happen while playing sports, with a somewhat higher incidence of injuries to the right knee (51%). Progressive improvement in ankle joint function was observed over follow-up, as reflected by a steady rise in AOFAS scores from 3 weeks to 12 weeks postoperatively. By 12 weeks, the majority of patients demonstrated good to excellent functional outcomes, with no clinically significant donor-site morbidity. Statistical analysis showed significant improvement in ankle function over time, indicating preservation of ankle stability and gait following peroneus longus graft harvest.

TABLE-I presents the baseline demographic and clinical characteristics of the study participants. It shows that most patients were between 26 and 35 years of age (78.1%), with a mean BMI of 24.49 ± 1.21. Sports-related injuries were the most common cause of ACL rupture, and the majority of patients had no associated comorbidities (71.9%).

Table-II illustrates the progression of AOFAS scores at different postoperative follow-up intervals. The mean AOFAS score increased from 64.35 ± 4.14 at 3 weeks to 73.35 ± 3.13 at 6 weeks, and further improved to 81.75 ± 3.71 at 12 weeks, indicating continuous recovery of ankle joint function over time.

Table-III summarizes the overall functional outcomes at final follow-up based on AOFAS grading. A good functional outcome was observed in the majority of patients (77.1%), while 15.6% achieved excellent outcomes. Only a small proportion (7.3%) had fair results, and no patient fell into the poor outcome category.

Table-IV shows the association between patient characteristics and functional outcomes. Statistically significant associations were observed between functional outcome and gender, age group, BMI category, and mode of injury ($p < 0.001$). Younger patients, those with normal BMI, and patients with sports-related injuries demonstrated better functional outcomes, while the affected side of the knee did not show a significant association with outcome ($p = 0.895$).

DISCUSSION

The present study demonstrated that ACL reconstruction using an autologous peroneus longus tendon (PLT) graft resulted in favorable knee stability while preserving donor-site ankle function. In our cohort, good-to-excellent ankle functional outcomes were observed in approximately 92% of patients, with only 7–8% showing fair results and none demonstrating poor function. These findings are consistent with the growing body of literature supporting PLT as a reliable graft option. For example, Goyal et al. reported excellent or good AOFAS scores in 90% of patients at one-year follow-up, with no subjective complaints of ankle instability or pain.[12] Similarly, Keyhani et al. found that more than 95% of patients maintained normal ankle function following PLT harvest, concluding that compensatory action of the peroneus brevis likely mitigates functional loss.[13] Our results align closely with these studies, reinforcing the safety of PLT harvesting with respect to ankle performance.

Regarding muscle strength, Park et al. also demonstrated minimal loss of ankle strength following PLT harvest, with isokinetic testing revealing less than 10% reduction that was clinically insignificant.[14] In contrast, Soleymanha et al. reported reduced peak torque in eversion and plantarflexion in their series.[15] However, their study involved a smaller sample size and shorter follow-up, which may explain the discrepancy. Later investigations with larger cohorts and longer follow-up durations, such as Liu et al., failed to reproduce these negative findings, instead showing near-complete recovery of ankle strength by 6–12 months.[16]

TABLE-I

Frequency distribution of study variables (n = 96)

Variable	Category	Frequency (n)	Percent (%)
Gender	Male	58	60.4
	Female	38	39.6
Age	≤ 25 Years	9	9.4
	26–35 Years	75	78.1
	≥ 36 Years	12	12.5
	Mean ± SD	30.67	4.09
Weight	Mean ± SD	69.19	8.278
Height	Mean ± SD	167.63	6.365
BMI Groups	Mean ± SD	24.498	1.2194
	Normal	55	57.3
	Overweight	41	42.7
Affected Side	Right	49	51.0
	Left	47	49.0
Mode of Injury	Sports	63	65.6
	Road Traffic Accident	22	22.9
	Self-fall	11	11.5
Comorbidity	Diabetes Mellitus	7	7.3
	Hypertension	13	13.5
	Other	7	7.3
	None	69	71.9

TABLE-II

AOFAS scores at different follow-up intervals (n = 96)

Assessment Time Point	Minimum	Maximum	Mean	S. D
AOFAS at 3 Weeks	56	71	64.35	4.140
AOFAS at 6 Weeks	67	79	73.35	3.135
AOFAS at 12 Weeks	74	88	81.75	3.708

TABLE-III

Functional outcome of patients

	Frequency	Percent
Excellent	15	15.6
Good	74	77.1
Fair	7	7.3
Total	96	100.0

TABLE-IV

Distribution of patient characteristics across functional outcomes (N=96)

Variable	Category	Excellent (n=15)	Good (n=74)	Fair (n=7)	Total (n=96)	P-Value
Gender	Male	3 (20.0%)	48 (64.9%)	7 (100.0%)	58 (60.4%)	<0.001*
	Female	12 (80.0%)	26 (35.1%)	0 (0.0%)	38 (39.6%)	
Age Groups	≤25 years	6 (40.0%)	3 (4.1%)	0 (0.0%)	9 (9.4%)	<0.001*
	26-35 years	9 (60.0%)	65 (87.8%)	1 (14.3%)	75 (78.1%)	
	≥36 years	0 (0.0%)	6 (8.1%)	6 (85.7%)	12 (12.5%)	
BMI Groups	Normal	15 (100.0%)	40 (54.1%)	0 (0.0%)	55 (57.3%)	<0.001*
	Over eight	0 (0.0%)	34 (45.9%)	7 (100.0%)	41 (42.7%)	
Affected Side						0.895
	Right	8 (53.3%)	38 (51.4%)	3 (42.9%)	49 (51.0%)	
	Left	7 (46.7%)	36 (48.6%)	4 (57.1%)	47 (49.0%)	
Mode of Injury	Sports	15 (100.0%)	48 (64.9%)	0 (0.0%)	63 (65.6%)	<0.001*
	RTA	0 (0.0%)	15 (20.3%)	7 (100.0%)	22 (22.9%)	
	Self-fall	0 (0.0%)	11 (14.9%)	0 (0.0%)	11 (11.5%)	

In terms of functional scores, the progressive improvement in AOFAS values observed in our study mirrors the trajectory reported in multiple prospective studies. Zhang et al. also reported excellent ankle outcomes in 88% of patients following PLT grafting, with no gait abnormalities detected during functional assessment.[10] These results suggest that initial postoperative weakness or discomfort is transient and resolves with appropriate rehabilitation. Moreover, studies utilizing dynamic gait analysis, such as those by Karimi et al., have demonstrated no significant alteration in ankle kinematics during walking and running after PLT harvest, supporting the functional integrity of the donor ankle under physiological conditions.[17]

When compared with traditional graft options, PLT has shown comparable or even superior outcomes. Rhatomy et al. compared PLT with hamstring tendon grafts and found no significant difference in IKDC or Lysholm scores, while donor-site morbidity was lower in the PLT group.[18] Khalid et al. reported similar findings, noting reduced thigh hypotrophy and faster quadriceps recovery with PLT compared to hamstring autografts.[19] These comparative advantages, combined with preserved ankle function, make PLT an attractive alternative graft choice, particularly in patients where hamstring preservation is desired.[11]

The low rate of donor-site complications in our study is also consistent with previous reports. No patients experienced chronic ankle pain, instability, or limitation in daily activities, findings echoed by Zhao et al. and Khalid et al., who reported donor-site complication rates below 5%.[8,19] Long-term study by Teja et al. further confirmed that PLT harvest does not predispose patients to ankle arthritis or arch collapse.[20] Furthermore, systematic reviews and meta-analyses that PLT grafts provide equivalent knee outcomes with minimal ankle morbidity when compared to conventional grafts. Collectively, these findings support our results and highlight that PLT autograft is a biomechanically sound and clinically safe option for ACL reconstruction.

Overall, the present study adds to the existing evidence by demonstrating high percentages of preserved ankle function and favorable clinical outcomes following PLT harvest. When interpreted alongside prior studies, our findings suggest that concerns regarding donor-site ankle dysfunction may be overstated, particularly when modern surgical techniques and structured rehabilitation protocols are employed.

CONCLUSION

This study concludes that anterior cruciate ligament reconstruction using the peroneus longus tendon autograft is a safe and effective option with minimal donor-site morbidity. Postoperative assessment demonstrated progressive improvement in ankle joint function, as reflected by significantly increasing AOFAS scores over successive follow-up intervals. The majority of patients achieved excellent to good functional outcomes, with preserved ankle stability, muscle strength, and gait, indicating that harvesting the peroneus longus tendon does not result in clinically significant impairment of ankle function. Functional outcomes were influenced by patient-related factors such as age, body mass index, and mode of injury, whereas the side of involvement showed no significant association. Overall, the peroneus longus tendon represents a reliable and viable graft choice for ACL reconstruction, offering favorable knee stability while maintaining satisfactory ankle joint function and quality of life.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	**Abdullah Tahir Bin Yousof:** Data collection, paper writing.
2	**Hafiz Salman Saeed:** Paper writing.
3	**Nouraiz Shakoor:** Discussion, review of manuscript.
4	**Muhammad Abubakar Mujahid:** Data analysis.
5	**Muhammad Noman Tahir:** Critical revisions.