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# Functional outcomes in arthroscopic anterior cruciate ligament reconstruction using peroneus longus tendon graft

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## ABSTRACT

**Background:** Anterior cruciate ligament (ACL) rupture is a common knee injury in active individuals, leading to instability, meniscal and chondral damage, and early osteoarthritis. Arthroscopic ACL reconstruction is the preferred treatment. The concerns about donor site morbidity have prompted interest in alternative grafts such as the peroneus longus tendon, which offers adequate strength and potentially lower morbidity. This study evaluates the functional outcomes of arthroscopic ACL reconstruction using peroneus longus tendon autograft.
**Methods:** This 30-month prospective study at a tertiary centre evaluated arthroscopic ACL reconstruction with ipsilateral peroneus longus autograft in ≥34 skeletally mature patients (≥18 years) with complete ACL rupture and instability. Single-bundle medial portal technique used Endo button and interference screw fixation. Outcomes assessed preoperatively and at 3, 6, and 9 months using Tegner-Lysholm (T-L), International Knee Documentation Committee (IKDC) knee, and AOFAS ankle scores.
**Results:** The mean age of patients was 30.41 years±5.83, with male predominance (61.76%). Sports injury was the most common cause (55.88%), 73.53% had a graft diameter of 9 mm. The mean T-L score improved significantly from 65.79±4.66 preoperatively to 90.85±2.10 at 9 months. The mean IKDC score increased from 59.91±7.23 to 92.02±2.34. The mean AOFAS score decreased from 100±0.00 to 98.29±1.91, remaining within excellent to good range.
**Conclusions:** Peroneus longus autograft ACL reconstruction delivers excellent functional recovery and minimal donor-site impact, ideal for active patients.

**Keywords:** Anterior cruciate ligament, Peroneus longus tendon graft, Arthroscopic ACL reconstruction

## INTRODUCTION

The cruciate ligaments are the main contributors to the stability of the knee joint in the sagittal and rotational planes. The anterior cruciate ligament (ACL) is an important stabilizer against anterior translation and rotational loads on the tibia relative to the femur.[1]

Rupture of the ACL is one of the most common ligamentous injuries of the knee seen in orthopaedic practice, especially in the young, active population involved in sports and high-demand recreational activities. The incidence of ACL injury has increased in parallel with increasing participation in such activities.[2] When injured, the deficiency of the ACL predisposes to recurrent instability episodes, secondary meniscal and chondral damage, and may contribute to the development of premature osteoarthritis if not appropriately managed.[3,4]

In symptomatic, physically active patient, reconstructive surgery is generally preferred because it restores mechanical stability and facilitates a return to pre-injury

activity levels.[3,5] Arthroscopic ACL reconstruction has become the standard technique with a minimally invasive approach, superior intra-articular visualization, and earlier rehabilitation compared to traditional open techniques.[4,6]

The bone-patellar tendon-bone and hamstring tendon autograft options are the most commonly used, with predictable clinical outcomes; however, donor-site complications such as anterior knee pain after patellar tendon harvest and residual flexor weakness after hamstring tendon harvest have been reported.[5,7] Such concerns have led to the investigation of alternative sources of autograft.

Peroneus longus tendon has recently been found to be a promising autograft with adequate dimensions of the graft, good biomechanical strength, and relatively low donor-site morbidity.[8] Early clinical studies show similar knee stability and functional outcomes after ACL reconstruction with peroneus longus autograft and hamstring tendon grafts, and ankle function is largely preserved.[9-11]

However, limited data are available from Indian tertiary-care settings on short-term functional recovery and donor-site effects in active patients.[12-15] In this context, the present study was conducted to study the functional outcomes of arthroscopic ACL reconstruction with ipsilateral peroneus longus tendon autograft in patients treated at a tertiary care centre.

Aim and objectives were to study functional outcome of arthroscopic ACL reconstruction using peroneus longus tendon graft at tertiary care centre.

## METHODS

### *Study design and setting*

This prospective observational study evaluated functional outcomes following arthroscopic ACL reconstruction using ipsilateral peroneus longus tendon autograft. The study was conducted at Dr. Vasantrao Pawar Medical College, Hospital and Research Centre, Nashik, Maharashtra during period of August 2020 to December 2022, it enrolled a minimum of 34 skeletally mature patients (aged ≥18 years) with complete ACL rupture and clinical knee instability who met predefined inclusion and exclusion criteria.

### *Inclusion criteria*

Skeletally mature patients aged >18 years, complete ACL tear and symptomatic knee instability were included in study.

### *Exclusion criteria*

Patients with age<18 years, neurovascular compromise, multi-ligament injuries, ACL avulsion injuries and fractures around the knee were excluded from study.

### *Ethical considerations*

The study included hospitalized patients after obtaining informed written consent. It was approved by the institutional ethics committee prior to initiation.

### *Preoperative assessment*

All patients underwent comprehensive preoperative evaluation, including clinical tests (Lachman, anterior drawer, and pivot-shift), plain radiography, and magnetic resonance imaging (MRI) of the knee.

### *Surgical technique*

Arthroscopic single-bundle ACL reconstruction was performed using the medial portal technique. The ipsilateral peroneus longus tendon was harvested, tripled to form the graft, and fixed with an Endo button on the femoral side and interference screw on the tibial side. Anatomic drilling of femoral and tibial tunnels was employed.

### *Outcome assessment*

Functional outcomes were evaluated preoperatively and at 3, 6, and 9 months postoperatively using validated scores: T-L and IKDC subjective knee scores for the knee, and American Orthopaedic Foot and Ankle Society (AOFAS) score for the ankle.

### *Data analysis*

Data was fed into MS excel. SPSS trial version was used for analysis. Data were analyzed using descriptive and non-parametric statistics. Continuous variables were summarized as mean and standard deviation. For paired pre- and post-intervention scores (e.g., T-L score, IKDC, AOFAS), the Wilcoxon signed-rank test was used to evaluate significant changes, with statistical significance set at $p<0.05$.

## RESULTS

The study included 34 patients with a mean age of 30.41 years with standard deviation of 5.83. Among the 34 participants, the majority that is 11 (32.35%) belonged to the 26-30 years age group, followed by 10 (29.41%) belonged to 31-35 years. Participants aged ≤25 years constituted 7 (20.59%), while those aged 36-40 years and 41-45 years accounted for 4 (11.77%) and 2 (5.88%), respectively. Males predominated, accounting for 21 patients (61.76%), while females constituted 13 patients (38.24%) (Table 1).

The mode of injury was predominantly sports injury at 19 (55.88%), followed by other causes at 9 (26.47%) and road traffic accidents at 6 (17.65%). Associated meniscal injury was present without tear in 19 (55.88%) and with tear in 15 (44.12%), while type of meniscal injury included no

tear at 19 (55.88%), medial meniscus tear at 11 (32.35%), and lateral meniscus tear at 4 (11.76%) (Table 2).

Majority that is 25 (73.53%) yielded 9 mm grafts, considered optimal for ACL reconstruction strength, with 6 (17.65%) yielded 8 mm and 3 (8.82%) yielded 10 mm grafts (Figure 1).

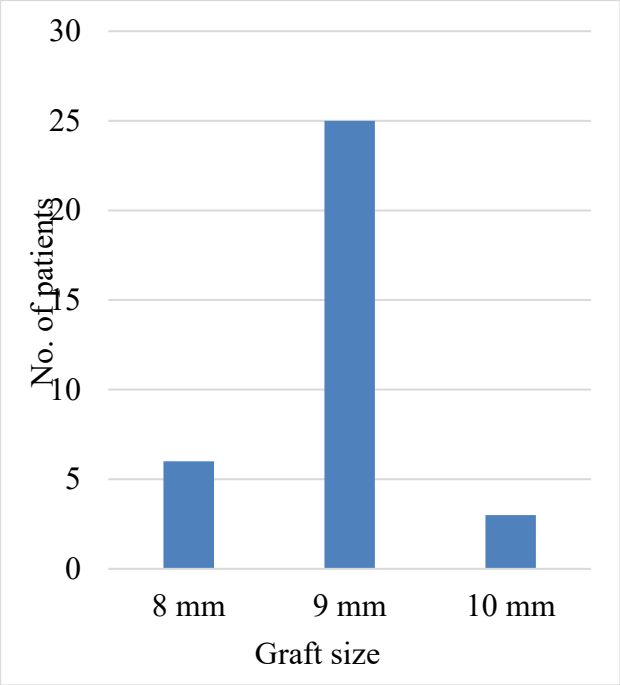


**Figure 1: Distribution of patients according to graft size.**

In T-L score category, preoperatively, 29.41% of patients were categorized as Fair and 70.59% as Poor, with none in the Excellent or Good categories. At 9 months postoperatively, 52.94% of patients were classified as Excellent and 47.06% as Good, with no patients in the Fair or Poor categories. The mean T-L score improved from 65.79±4.66 preoperatively to 90.85±2.10 at 9 months, reflecting a mean improvement (mean difference) of 25.06±4.98 points. The Wilcoxon signed-rank test comparing the paired preoperative and 9-month scores yielded a test statistic of 5.092 with a p=0.000, indicating a statistically and clinically significant improvement in knee function after surgery (Table 3).

In IKDC score category, preoperatively, 8.82% of patients were categorized as Fair and 91.18% as Poor, with none in the Excellent or Good categories. At 9 months postoperatively, 85.29% of patients were classified as Excellent and 14.71% as Good, with no patients in the Fair or Poor categories. The mean IKDC score improved from 59.91±7.23 preoperatively to 92.02±2.34 at 9 months, reflecting a mean improvement (mean difference) of 32.12±7.92 points. The Wilcoxon signed-rank test comparing the paired preoperative and 9-month scores yielded a test statistic of 5.089 with a p-value of 0.000, indicating a statistically and clinically significant improvement in subjective knee function after surgery (Table 4).

All 34 patients had an Excellent AOFAS score preoperatively (100%), while at 9 months postoperatively, 32 (94.12%) remained in the Excellent category and 2 (5.88%) were classified as Good, with no patients in the Fair or Poor categories. The mean AOFAS score was 100.00±0.00 preoperatively (indicating no variability, all at maximum), and 98.29±1.91 at 9 months, reflecting a small mean reduction of 1.71±1.95 points. The Wilcoxon signed-rank test comparing the paired preoperative and 9-month scores yielded a test statistic of -4.139 with a p=0.000, indicating a statistically significant change in scores over time, although the clinical difference is small and the scores remain in the Excellent to Good range (Table 5).

**Table 1: Distribution of demographic variables.**

| Variables | Category | N | Percentage (%) |
|---|---|---|---|
| **Age group (in years)** | ≤25 | 7 | 20.59 |
| | 26-30 | 11 | 32.35 |
| | 31-35 | 10 | 29.41 |
| | 36-40 | 4 | 11.77 |
| | 41-45 | 2 | 5.88 |
| **Sex** | Female | 13 | 38.24 |
| | Male | 21 | 61.76 |
| **Total** | | 34 | 100.00 |

**Table 2: Distribution of variables according to injury.**

| Variables | Category | N | Percentage (%) |
|---|---|---|---|
| **Mode of injury** | Sports injury | 19 | 55.88 |
| | Road traffic accident (RTA) | 6 | 17.65 |
| | Other causes | 9 | 26.47 |
| **Associated meniscal injury** | With meniscal tear | 15 | 44.12 |
| | Without meniscal tear | 19 | 55.88 |
| **Type of meniscal injury** | Lateral meniscus tear | 4 | 11.76 |
| | Medial meniscus tear | 11 | 32.35 |
| | No meniscal tear | 19 | 55.88 |
| **Total** | | 34 | 100.00 |

**Table 3: Distribution of T-L knee scores preoperatively and postoperatively at 9-months.**

| T-L score category | Preoperative, (n=34) | | Post op at 9 Months, (n=34) | |
|---|---|---|---|---|
| | N | % | N | % |
| Excellent | 0 | 0.00 | 18 | 52.94 |
| Good | 0 | 0.00 | 16 | 47.06 |
| Fair | 10 | 29.41 | 0 | 0.00 |
| Poor | 24 | 70.59 | 0 | 0.00 |
| Mean±SD | 65.79±4.66 | | 90.85±2.10 | |
| Mean difference | -25.06±4.98 | | | |
| Test statistic, p value | 5.092, 0.000 | | | |

**Table 4: Distribution of IKDC subjective knee scores preoperatively and postoperatively at 9-months.**

| IKDC score category | Preoperative, (n=34) | | Post op at 9 months, (n=34) | |
|---|---|---|---|---|
| | N | % | N | % |
| Excellent | 0 | 0.00 | 29 | 85.29 |
| Good | 0 | 0.00 | 5 | 14.71 |
| Fair | 3 | 8.82 | 0 | 0.00 |
| Poor | 31 | 91.18 | 0 | 0.00 |
| Mean±SD | 59.91±7.23 | | 92.02±2.34 | |
| Mean difference | -32.12±7.92 | | | |
| Test statistic, p value | 5.089, 0.000 | | | |

**Table 5: Distribution of AOFAS ankle scores preoperatively and postoperatively at 9-months.**

| AOFAS score category | Preoperative, (n=34) | | Postoperative at 9 months, (n=34) | |
|---|---|---|---|---|
| | N | % | N | % |
| Excellent | 34 | 100.00 | 32 | 94.12 |
| Good | 0 | 0.00 | 2 | 5.88 |
| Fair | 0 | 0.00 | 0 | 0.00 |
| Poor | 0 | 0.00 | 0 | 0.00 |
| Mean±SD | 100.00±0.00 | | 98.29±1.91 | |
| Mean reduction | 1.71±1.95 | | | |
| Test statistic, p value | -4.139, 0.000 | | | |

## DISCUSSION

The present study demonstrated significant improvements in functional outcomes following arthroscopic ACL reconstruction using peroneus longus tendon autograft. Both T-L and IKDC scores showed substantial gains over the 9-month follow-up, reflecting robust recovery of knee function. These findings align with Shetty et al who reported excellent postoperative outcomes in knee stability, subjective knee/ankle function, and range of motion using peroneus longus graft with fixed-loop Endobutton and interference screws.[12]

In the present study, the mean age of patients was 30.41 years±5.83, with the majority in the 26-30-year age band and only a few older than 40 years. This aligns with Vijay et al who reported a mean age of 31.7 years with maximum representation in the 31-40-year age group, Gupta et al with a mean age of 26.8 years, and Savery et al with a mean age of 24.2 years.[1,13,14] Males predominated, accounting for 21 patients (61.76%) of the cohort, while females constituted 13 patients (38.24%). Similarly, Savery et al found 65% males, and Gupta et al reported 70% males.[13]

The mode of injury was predominantly sports-related, affecting 19 patients (55.88%), followed by other causes in 9 patients (26.47%), and road traffic accidents in 6 patients (17.65%). Similarly, Vijay et al found contact sports as the most common cause, involving 45 of 65 patients, while Savery et al observed sports injuries in 58%, followed by motorbike accidents in 27%.[1,14]

Mean T-L score improved from 65.79±4.66 preoperatively to 90.85±2.10 at 9 months, reflecting a mean difference of25.06±4.98 points and indicating clinically significant improvement in knee function. These results align with Savery et al (preoperative mean 65.4±3.2; postoperative 89.7±23.2), Gupta et al (preoperative 48.7±7.1; postoperative 90.3±4.8), and Hijas et al (preoperative 66.52; 6 months 81; 12 months 85.64).[13-15]

The mean IKDC score improved from 59.91±7.23 preoperatively to 92.02±2.34 at 9 months, reflecting a

mean difference of 32.12±7.92 points and indicating clinically significant improvement in subjective knee function. These results align with Savery et al (preoperative mean 55.1±12.1; postoperative 92.2±13.4), Gupta et al (preoperative 41.2±6.8; postoperative 86.5±5.9), and Hijas et al (preoperative 62; 6 months 76; 12 months 83.12).[13,14]

All 34 patients had an excellent AOFAS score preoperatively (100.0%), while at 9 months postoperatively, 32 patients (94.12%) remained Excellent and 2 patients (5.88%) were Good, with none in the Fair or Poor categories. The mean AOFAS score was 100.00±0.00 preoperatively (indicating no variability, all at maximum) and 98.29±1.91 at 9 months, reflecting a small mean reduction of 1.71±1.95 points, though scores remained in the Excellent to Good range. This aligns with Hijas et al (preoperative 98.12; 12 months postoperative 96.4).[15]

### *Limitations*

The small sample size from a single tertiary care centre and the relatively short 9-month follow-up restrict the generalizability of the results and do not capture long-term outcomes. In addition, the observational design without a comparison graft group and reliance on subjective functional scores limit the ability to draw definitive conclusions about the superiority of peroneus longus autograft and may introduce response bias.

## CONCLUSION

Arthroscopic ACL reconstruction using peroneus longus tendon autograft at a tertiary care centre demonstrated excellent functional outcomes at 9 months postoperatively. There was a statistically and clinically significant improvement in T-L and IKDC scores, with the majority of patients shifting from preoperative “Poor” or “Fair” categories to “Excellent” or “Good” at follow-up. The high proportion of 9 mm grafts, short hospital stay, and maintained excellent AOFAS scores indicate that peroneus longus tendon is a reliable and effective graft option for ACL reconstruction, particularly in a resource-constrained setting. These findings support the use of this technique, but larger, prospective, comparative studies are needed to further validate its long-term outcomes and functional superiority.

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