Peroneus Longus Tendon Autograft for Anterior Cruciate Ligament Reconstruction: A Safe and Effective Alternative in Nonathletic Patients

Rahaman SK¹, Halder RC¹, Tayaba T², Mamun MBA¹, Islam MS¹, Khan MMR¹, Rahman MM³, Hossain GMJ¹, Kamruzzaman M¹

Abstract

Background: The Anterior Cruciate Ligament (ACL) is one of the most vital parts for sustaining knee joint stability. But, the frequency of ACL injuries is increasing alarmingly. The Peroneus Longus Tendon (PLT) is now considered to be a promising graft which is a safe and efficient alternative to other grafting methods.

Methods: This was a prospective interventional study conducted at a tertiary care orthopaedic teaching hospital, during the period of March, 2019-August, 2022. The sample size for this study was 64. For statistical analysis, SPSS version 20 was used as a statistical tool.

Result: There were 9 (14.1%) respondents who were <18 years of age, followed by 22 (34.4%) who were aged between 18-20 years, while the remaining 33 (51.6%) were aged >20 years. The mean ± SD diameter (mm) was 8.3 ± 0.8, length (mm) was 8.5 ± 0.4, height (cm) was 174.1 ± 8.6, weight (kg) was 76.2 ± 13.2 and BMI was 25.0 ± 3.4. The majority of the patients (50%) were injured 1-3 months prior to the surgery. At the 6-month follow-up period, according to Lachman indicators after the surgery, 59 (92.2%) of the respondents were graded 0, and the remaining 5 (7.8%) were graded I. At the 6-month follow-up period by KT-2000 indicators (mm) after the surgery, 57 (89.1%) of the respondents were graded 0-2 mm, followed by 7 (10.9%) graded 3-5 mm. At 12-months followed up the most 59 (92.2%) were graded 0-2 mm and followed by 5 (7.8%) graded 3-5 mm.

Conclusion: Peroneus longus tendon autograft in ACL reconstruction is a safe procedure that has a satisfactory result which was proved by the Lachman’s Test and the IKDC (KT-2000) score. PLT can prove to be an effective alternative autograft for ACL reconstruction.

Keywords: Peroneus Longus Tendon; Autograft, Anterior Cruciate Ligament Reconstruction; Nonathletic Patients

Introduction

The Anterior Cruciate Ligament (ACL) is one of the most vital parts for sustaining the knee joint's stability [1]. But, the frequency of ACL injuries is raising alarmingly [2]. Hence, ACL Reconstruction (ACLR) has been known as the most frequently practiced procedure for restoring knee stability [3]. A report claimed that in the United States, each year approximately 200,000
Any injuries to the Posterior Cruciate Ligament (PCL) or the Posterolateral Corner (PLC). Anteroposterior and lateral view radiographs of the afflicted joint were taken, and the case was subsequently confirmed using Magnetic Resonance Imaging (MRI). Inclusion criteria were clinically diagnosed and MRI-confirmed nonathletic patients with only ACL injury and aged between 16 and 45 years. Patients with a pathological condition in the lower extremity and fracture around the knee or associated ligament injury, meniscal injury, chondral damage, and any abnormality of the contralateral knee joint were excluded. Revision cases and patients who refused to provide consent were also excluded. The study was approved by the tertiary care center’s Institutional Review Board and informed written consent as per the Declaration of Helsinki was obtained from all the participants. For statistical analysis, SPSS version 20 was used as a statistical tool. The patients have undergone an operation according to the standard protocol of the institution. The PLT and peroneus brevis tendons were identified as dividing through the subcutaneous tissue and superficial fascia. Then to prevent peroneal nerve injury, the PLT was stripped until 5 cm below the fibular head. The donor site was closed, and the graft length was recorded. After this, the ACL repair was done arthroscopically. To simplify the visualization, the intercondylar notch was cleared of fibrous tissue. After implementing the graft with an appropriate tensioner which was protected on the femoral edge of the tunnel by a button and tibial end with a bio-absorbable screw. The patients were observed till 18 months after the surgery.

**Results**

Figure 1 shows the age distribution of the respondents. There were 9(14.1%) respondents who were <18 years and followed by 22(34.4%) were aged between 18-20 and the most 33(51.6%) were >20 years.

Table 1 denotes the baseline characteristics of the respondents. The mean ±SD diameter (mm) was 8.2 ± 0.8, length (mm) was 8.4 ± 0.4, height (cm) was 173.1 ± 8.6, weight (kg) was 75.2 ± 13.2 and BMI was 24.0 ± 3.4.

Figure 2 describes the length of graft (mm), where 18(28%) patients had grafts of length between 275-285 mm, followed by 21(33%) patients who had grafts between 286-295 mm, 15(23%) between 296-305 mm, and 10(16%) had graph length of >305 mm.

Figure 3 shows the thickness of graft (mm), where the majority of patients (33%) thickness graft ranged between 7.5-8 mm, followed by 8(13%) in between 8.1-8.5 mm, 20(31%) in between 8.6-9 mm and 15(23%) was >9 mm.

Table 2 shows the time duration from the injury to surgery (months) where 8(12.5%) got injured 1 month before the surgery and followed by the most 32(50%) injured before 1-3 months, 16(25%) before 3-6 months and 8(12.5%) before >6 months.

**Objectives**

The objective of this prospective observational study was to evaluate the stability and the functional outcome of arthroscopic ACL reconstruction by PLT as an effective and safe alternative graft option for ACL reconstruction.

**Methods**

This prospective study, held between March 2019-January, 2022, observed patients who underwent arthroscopic ACL reconstruction by the same operating surgeon at a tertiary care orthopaedic teaching hospital in the nation's capital. Using consecutive sampling, 78 patients were identified at the emergency and casualty department, and finally, 64 patients were evaluated. Patients were recruited after the surgery and followed by the most 32(50%) injured before 1-3 months, 16(25%) before 3-6 months and 8(12.5%) before >6 months.
Figure 4 shows the follow-up period at Lachman indicators after the surgery. At the 6-month follow-up, 59(92.2%) of the respondents graded 0 and followed by 5(7.8%) grade I. At 12-months follow up the most 60(93.8%) were graded 0 where 4(6.3%) graded I and at the 18-months follow up, 59(92.2%) graded 0 where 5(7.8%) graded I.

Figure 5 shows the follow-up period at KT-2000 indicators (mm) after the surgery. At the 6-month follow-up, 57(89.1%) of the respondents graded 0-2 mm, followed by 7(10.9%) graded 3-5 mm. At the 12-month follow-up, the majority (92.2%) were graded 0-2 mm, followed by 5(7.8%) graded 3-5 mm at the 18-month follow-up, 57(89.1%) graded 0-2 mm, and followed by 7(10.9%) graded 3-5 mm.

Figure 6 shows that at the final follow-up of 18 months, 92% of participants had a Lachman test score of Grade 0, while 89% of participants had a KT-2000 score between 0-2.

Table 1: Duration of injury before surgery.

<table>
<thead>
<tr>
<th>Time duration from the injury to surgery (months)</th>
<th>N=64</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before 1</td>
<td>8</td>
<td>12.5</td>
</tr>
<tr>
<td>44986</td>
<td>32</td>
<td>50</td>
</tr>
<tr>
<td>45080</td>
<td>16</td>
<td>25</td>
</tr>
<tr>
<td>&gt;6</td>
<td>8</td>
<td>12.5</td>
</tr>
</tbody>
</table>

Table 2: Baseline characteristics of the respondents.

<table>
<thead>
<tr>
<th>Baseline Characteristics</th>
<th>Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter (mm)</td>
<td>8.2 ± 0.8</td>
</tr>
<tr>
<td>Length (mm)</td>
<td>8.4 ± 0.4</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>173.1 ± 8.6</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>75.2 ± 13.2</td>
</tr>
<tr>
<td>BMI</td>
<td>24.0 ± 3.4</td>
</tr>
</tbody>
</table>

Figure 1: Age Distribution of the Respondents.

Figure 2: Length of Graft (mm).

Figure 3: Thickness of graft (mm).

Figure 4: Postoperative Lachman Test.

Figure 5: Postoperative KT-2000 measurements.
Discussion

In the present study, 14.1% of respondents were <18 years of age, followed by 34.4% who were aged between 18-20, and the majority (51.6%) were >20 years [Figure 1]. In the study of Kumar et al. [29] peroneus longus grafts were used in 15 patients, and semitendinosus was used in 15 patients, with 27.7% and 13.3% from both groups respectively in the age group of <18 years, followed by 20% and 33.3% respectively in the age group of 18-20 years, and 53.3% of both groups participants from the age group >20 years.29 The mean ± SD diameter (mm) was 8.2 ± 0.8, length (mm) was 8.4 ± 0.4, height (cm) was 173.1 ± 8.6, weight (kg) was 75.2 ± 13.2 and BMI was 24.0 ± 3.4 [Table 1]. The study of Song et al. [30] found the mean ± SD diameter (mm) was 8.3 ± 0.8, length (mm) was 8.5 ± 0.4, height (cm) was 174.1 ± 8.6, weight (kg) was 76.2 ± 13.2 and BMI was 25.0 ± 3.4.30 28% of participants had graft length between 275-285 mm, followed by the 33% who had between 286-295 mm, 23% in between 296-305 mm and 16% with >305 mm [Figure 2]. Kumar et al. [31] in their study found that 28% of participants had graft lengths between 275-285 mm, followed by the 32% was in between 286-295 mm, 24% in between 296-305 mm and 16% was >305 mm. The majority of the patients' graft thickness ranged between 7.5-8 mm, followed by 13% in between 8.1-8.5 mm, 31% between 8.6-9 mm, and 23% with graft thickness >9 mm [Figure 3]. In a related study, the majority had graft thickness between 7.5-8 mm, followed by 12% in between 8.1-8.5 mm, 32% in between 8.6-9 mm, and 24% was >9 mm. 3112.5% got injured before 1 month to the surgery, followed by half the study population injured before 1-3 months, 25% before 3-6 months and 12.5% before >6 months [Table 2]. The study of Joshi et al. [32] reported 6% of the respondents got injured 1 month before the surgery, followed by the most 24% injured before 1-3 months, 12% before 3-6 months, and 6% before >6 months [32]. At the 6-month follow-up period at Lachman indicators after the surgery, 92.2% of the respondents graded 0, followed by 7.8% at grade I. At the 12- month follow-up, 93.8% were graded 0, whereas 6.3% were graded I. At the 18-month follow-up, 92.2% graded 0 whereas 7.8% graded I [Figure 4]. Joshi et al. [32] in their study observed that at the 6-month follow-up period at Lachman indicators after the surgery, 91.67% of the respondents were graded 0, followed by 8.37% at grade I. At the 12-month follow-up, 93.75% were graded 0, while 6.25% were graded I, and at the 18-month follow-up, 91.67% were graded 0, and 8.37% were graded I [32]. At the 6-month follow-up period, at KT-2000 indicators (mm) after the surgery, 89.1% of the respondents were graded 0-2 mm, followed by 10.9% who were graded 3-5 mm. At the 12- month follow-up, 92.2% were graded 0-2 mm, followed by 7.8% with a grade of 3-5 mm. At the 18-month follow-up, 89.1% grade 0-2 mm, followed by 10.9% grade 3-5 mm [Figure 5]. Joshi, et al. [32] in their study also reported that at the 6-month follow-up period at KT-2000 indicators (mm) surgery, 89.58% of the respondents graded 0-2 mm, followed by 10.41% grade 3-5 mm. At 12-months followed up the most (91.67%) were graded 0-2 mm and followed by 8.37% graded 3-5 mm and at the 18-month followed up, 89.58% were graded 0-2 mm and followed by 10.41% grade 3-5 mm [32].

Conclusion

According to studies, the use of peroneus longus tendon autograft in ACL reconstruction is a safe treatment with a satisfactory outcome, as demonstrated by the Lachman’s test and the IKDC (KT-2000) scores. Peroneus longus tendon may be a viable alternative autograft for ACL restoration. PLT is easy to harvest and takes less time to harvest, has adequate size, a higher ultimate tensile load, more thickness and length, almost no donor site morbidity, and a satisfactory functional outcome and knee stability scores, and after removal, the peroneus longus tendon has no effect on gait parameters and does not cause ankle instability. Furthermore, its excision has no discernible effect on the ankle joint. PLT is an effective and safe autograft option for ACL reconstruction due to all of these characteristics.

References

29. Kumar PM, Shevte I, Phalak M, et al. Arthroscopic anterior...

