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E-Book

Outcome of Arthroscopic ACL Reconstruction by Hamstring Tendon and Peroneus Longus Tendon Autograft

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Abstract

Background: Anterior cruciate ligament (ACL) is the most common ligament to be torn in the knee joint and ACL reconstruction (ACLR) is one of the most commonly performed surgery in orthopaedics nowadays.

Objective: The aim of this study is to compare the clinical and functional outcome along with donor site morbidity of ACL reconstruction using Hamstring tendon and Peroneus longus tendon autograft.

Methods: This prospective observational study was carried out at National Institute of Traumatology and Orthoapedic Rehabilitation, Dhaka from January 2019 to December 2020. A total case of 30 in group 1 (Hamstring tendon) and 30 in group 2 (Peroneus longus tendon) is included in the study according to inclusion and exclusion criteria.

Results: Preoperative Lysholm knee score was 63.33 in group 1 and 62.43 in group 2. An improvement was observed in post-operative Lysholm knee score in both groups (93.67 vs 95.53). Post-operatively anterior drawer and Lachman test was positive in one case in group 1 due to graft failure. Superficial infection was seen in one case in group-1 and two cases in group-2, knee pain was present 6.67% cases in group 1 whereas no pain was reported in group 2. No significant difference was observed regarding graft diameter between two groups (8.02 mm vs 8.3 mm). Overall, most of the cases showed excellent outcome in both groups (76.67% vs 83.33%). Post-operative AOFAS score was excellent in all the case of peroneus longus group.

Conclusion: Although complication rate is lower and excellent outcome is more in group 2, it was not statistically significant. Peroneus longus graft from the ankle did not produce any poor outcome and both hamstring and peroneus longus can be used safely in ACL reconstruction.

Keywords: Anterior Cruciate Ligament (ACL); Knee Joint; ACL Reconstruction (ACLR)

Introduction

ACL injury is a significant cause of disability in active individuals. After ACL injury, most patients experience recurrent episodes of instability, pain and decreased function. Reconstruction of ACL allows the patient to return to pre trauma activity level and delays the occurrence of associated meniscal injury and onset of osteoarthritis [1]. Arthroscopic reconstruction of torn ACL with autogenous graft has become the gold standard in treating ACL tears with high success rate [2].

Arthroscopic assisted reconstruction of torn ACL with an intra-articular graft has become the most common method in ACL surgery [3].

ACL reconstruction involves removal of the damaged ACL, harvesting of the graft (if an autograft is used), preparing of the graft, drilling of tibial and femoral tunnels, placing the graft in an anatomically similar or different position to the original ACL and fixing the graft. The ideal ACL replacement graft should have structural and mechanical properties similar to the native ligament; allow safe fixation and fast biological incorporation, besides limited morbidity of the donor site. This will depend on the surgeon's experience and preference, graft availability, the patient's level of activity and comorbidities, other surgeries and the patient's preference [4].

The various choices of auto grafts include bone patellar tendon bone (BPTB), hamstring (semitendinosus and gracilis) tendon, quadriceps tendon and peroneus tendon autograft. The two most commonly used autografts are the bone-patellar tendon-bone (BPTB) graft and hamstring tendon grafts. Bone patellar tendon bone (BPTB) autograft promotes bone-to-bone healing that allows for an early and accelerated rehabilitation with documented good and excellent long-term results [5].

However, BPTB can cause anterior knee pain, kneeling pain, tenderness over bone defects, patellar fractures, a weakened extensor mechanism, and the possibility of a short graft length for ACL substitution [6]. In this study our main goal is to evaluate the outcome of arthroscopic ACL reconstruction by hamstring tendon and peroneus longus tendon autograft.

Objective

To assess the outcome of arthroscopic ACL reconstruction by hamstring tendon and peroneus longus tendon autograft.

Methodology

This is a prospective observational study was carried out in the National institute of Traumatology and Orthopedic Rehabilitation (NITOR), Dhaka from January 2019 to December 2020. 60 Patients admitted with ACL injury in the NITOR, Dhaka during study period. The diagnosis of ACL rupture was established based on history, physical examination and Magnetic Resonance Imaging of the injured knee. Where 30 patients are divided into Group-1 ACL reconstruction with Hamstring (semitendinosus-gracilis) tendon. Whereas other 30 patients divided in to group – 2: ACL reconstruction with Peroneus Longus tendon.

Inclusion criteria

- Age between 18 to 50 year.
- Clinically and radiologically diagnosed ACL injuries.

Exclusion criteria

- Age less than 18 years and more than 50 years.
- Presence of fracture of bones around the knee and ankle.
- Multiple ligament injuries of the knee.
- Associated meniscus injury.
- Patients with pre-existing flat foot, ankle deformity, paralytic conditions, poliomyelitis or previous significant injuries to ankle.
- Loss of knee motion due to acute injury/stiffness.
- Clinical and radiological evidence of osteoarthritis of the affected knee.

Data collection procedure

Cases were selected for study from OPD. All the patients were thoroughly evaluated both clinically and radiologically and the Lysholm Score was calculated. The patients were then admitted after counseling for surgery and pre-operative data were collected. Then the patients were investigated for anaesthetic check-up and prepared for the operation. An informed written consent was taken for operation after proper pre-operative check-up. After discussing the technique with the surgical team, operation was performed

methodically, per-operative and post-operative data recorded. Each patient followed up for 24 weeks, functional scoring was done and recorded for evaluation of final outcome.

Data processing and analysis

All the data were edited for calculation and assessment. The data were tabulated and quantitative parameters of patient were summarized in terms of mean with standard deviation, to understand the variations present in the data. Percentage expression for positivity of scoring estimated along with 95% confidence interval. The significance of the results as determined in 95.0% confidence interval and a value of $p < 0.05$ considered to be statistically significant. For calculations stata, version 16 software was used.

Results

Figure 1 shows age distribution of the patients where in both group majority were belong to 18-25 years age group (group-1, 63.33%; group 2, 53.33%).

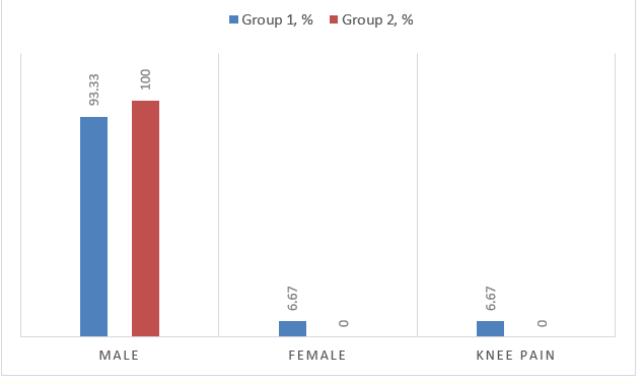

Figure 1: Age distribution of the patients.

Table 1 shows preoperative Lachman test where all patients had positive status in both groups.

Lachman test	Group 1	Group 2	Total	p-value
	n_1 (%)	n_2 (%)	N (%)	
Positive	30 (100.0)	30 (100.0)	30 (100.0)	-
Negative	0 (0.0)	0 (0.0)	0 (0.0)	
Total	30 (100.0)	30 (100.0)	60 (100.0)	

Table 1: Preoperative Lachman test (N = 60).

Table 2 shows that Lachman test was negative in the majority (98.33%) of the postoperative cases except one positive score was found in Group-1. This difference was not statistically significance (p = 1.00).

Lachman test	Group 1	Group 2	Total	p-value
	n_1 (%)	n_2 (%)	N (%)	
Positive	1 (3.33)	0 (0.0)	1 (0.1.67)	1.00[a]
Negative	29 (97.67)	30 (100.0)	59 (98.33)	
Total	30 (100.0)	30 (100.0)	60 (100.0)	

Table 2: Lachman test at last follow up (N = 60).

[a]Fisher's Exact Test.

Table 3 shows that post-operative anterior drawer test was negative for 98.33% patients. One positive test result found in Group-1.

Anterior drawer test	Group 1	Group 2	Total	p-value
	n_1 (%)	n_2 (%)	N (%)	
Positive	1 (3.33)	0 (0.0)	1 (0.1.67)	1.00[a]
Negative	29 (97.67)	30 (100.0)	59 (98.33)	
Total	30 (100.0)	30 (100.0)	60 (100.0)	

Table 3: Anterior drawer test at last follow up (N = 60).

[a]Fisher's Exact Test.

In figure 2 shows preoperative and post operative Lysholm knee score where As shown in above figure, preoperative mean Lysholm knee score was almost similar in both group 63.33 ± 0.45 and 62.43 ± 0.53. This difference was not statistically significant (p = 0.09). Lysholm knee score at 24th week was slightly higher in group 2 (95.534 ± 0.27) in comparison to group 1 (93.67 ± 1.02). Unpaired t test was done, and this difference was not statistically significant (p = 0.079).

Figure 2: Comparison of preoperative and postoperative Lysholm score.

Table 4 shows Preoperative Lysholm knee score status where poor category patient was more in group 1 (76.67%) in comparison to group 2 (60.00%) but fair category patient was reported in 40.00% of patients in group 2 and 23.33% in group 1 whereas no good and excellent category patient was reported in both the groups. However, this association was not statistically significant (p = 0.165).

Category	Group 1	Group 2	Total	p-value
	n_1 (%)	n_2 (%)	N (%)	
Poor	23 (76.67)	18 (60.00)	41 (68.33)	0.165[a]
Fair	7 (23.33)	12 (40.00)	19 (31.67)	
Good	0 (0.0)	0 (0.0)	0 (0.0)	
Excellent	0 (0.0)	0 (0.0)	0 (0.0)	
Total	30 (100.0)	30 (100.0)	60 (100.0)	

Table 4: Preoperative Lysholm knee score (N = 60).

[a]Chi square test.

Table 5 shows functional outcome in follow up where excellent functional outcome was more in group 2 (83.33%) in comparison to group 1 (76.67%) whereas no poor or fair outcome was reported in group 2 but fair outcome was reported in 3.33% of patients in group 1. However, this association was not statistically significant (p = 0.748).

Category	Group 1	Group 2	Total	p-value
	n_1 (%)	n_2 (%)	N (%)	
Fair	1 (3.3)	0 (0.0)	1 (1.7)	0.748[a]
Good	6 (20.00)	5 (16.67)	11 (18.33)	
Excellent	23 (76.67)	25 (83.33)	48 (80.00)	
Total	30 (100.0)	30 (100.0)	60 (100.0)	

Table 5: Functional outcome at last follow up (N = 60).

[a]Fisher's Exact Test.

Table 6 shows that mean graft diameter of Group 2 (8.3 ± 0.42 mm) was larger than that of Group 1 (8.02 ± 0.46 mm). This difference was not statistically significance (p = 0.087).

Group	Number	Mean	SD	p-value
Group 1	30	8.02	0.46	0.087[a]
Group 2	30	8.3	0.42	
Total	60	8.16	0.44	

Table 6: Comparison of graft diameter (N = 60).

[a]Unpaired t test.

Figure 3 illustrates the postoperative complications, includes infection was more in group 2 (6.7%, n = 2) in comparison to group 1 (3.3%, n = 1), knee pain was present in group 1(6.67%, n = 2) whereas no pain was reported in group 2. One case of re-rupture of the graft occurred in group 1(3.3%, n = 1) whereas no re-rupture was reported in group 2.

Figure 3: Postoperative complications.

Table 7 Post-operative AOFAS score of Group-2 patients at final follow up where The AOFAS score was measured in group 2 patients to find out the donor site morbidity of peroneus longus procedure. We have found that the mean score was 95.53 (**±** 2.16) ranging from 91 to 100.

Patient Number (%)	Mean	SD	Min	Max
30 (100)	95.53	2.16	91	100

Table 7: Post-operative AOFAS score of Group-2 patients at final follow up.

Discussion

Both Lachman test and anterior drawer test were positive in all patients in both group I and group 2 preoperatively. As these two examinations are mostly used for clinical diagnosis of ACL rupture, this result was expected. Preoperative Lysholm score was also similar in both groups (63.33 ± 0.45 in group 1 and 62.43 ± 0.53 in group 2). Poor category patient was more in group 1 (76.67%) in comparison to group 2 (60.00%) and fair category patient was reported in 40.00% of patients in group 2 and 23.33% in group 1 whereas no good and excellent category patient was reported in both the groups. Though this difference was not statistically significant (p = 0.165).

Post-operative Lachman and anterior drawer test at 24th week were negative in the majority of the cases (98.33%) except one in Group 1. In this patient, hamstring graft was used and patient has a history of trauma during his recovery period. After that, his Lachman and anterior drawer test became positive. Lysholm knee score at last follow up was slightly higher in group 2 (95.534 ± 0.27) in comparison to group 1(93.67 ± 1.02). This difference was not statistically significant as evidenced by unpaired t test (p = 0.079). Excellent functional outcome was more in group 2 (83.33%) in comparison to group 1 (76.67%) whereas no poor or fair outcome was reported in group 2 but fair outcome was reported in 3.33% of patients in group 1. However, this difference was not statistically significant (p = 0.748). Improvement from the pre-operative Lysholm score to post-operative score signifying improvement in the overall functional outcome of the patient. Similar improvement from pre-operative to postoperative score was noted in other studies [3,6,7].

In our study, mean graft diameter of hamstring graft (8.02 ± 0.46 mm) was smaller than the Peroneus longus grafts (8.3 ± 0.42 mm), although this variance was not statistically significant. There is an adverse co-relation between the graft failure in relation with the graft diameter. There are 3 well-performed studies reporting increased hamstring graft failures that were related to graft diameter [8]. However, in our study both group maintained comparable graft diameter which was not significantly different from each other.

In this study overall infection rate was 5%, which was superficial surgical site infection without any significant intergroup difference. In the study conducted by Eckmorde., *et al*. (2017) observed that infection following ACL reconstruction was rare but not uncommon [9]. Gobbi., *et al*. reported an infection rate of 0.37% after ACL reconstruction. All cases were managed by regular dressing and antibiotic according to culture and sensitivity. However infection did not affect functional outcome in this study [10].

Re-rupture of the graft occurred in 1 (1.7%) case in group 1 whereas no re-rupture was reported in group 2. There was no significant intergroup difference. The case with re-rupture was managed by revision surgery with Peroneus longus graft. In a prospective study of 180 ACL reconstruction patients found that graft rupture occurred in 13% of Hamstring autograft patients, which is more than the present study [11].

Pain around knee was found in 2 (3.3%) cases and both of them were in hamstring group. This is one of the donor site morbidity of hamstring group while patients in Peroneus longus group reported no pain at last follow up. In contrast to our study Kerimoglu., *et al*. (2008), in their study observed that 6.9% of their patients experienced light to moderate pain, dysesthesias and paresthesias in the region of the extracted Peroneus longus tendon [12].

AOFAS score was evaluated in group 2 patients to find out the donor site morbidity of the Peroneus longus procedure. The mean AOFAS score at last follow up was 95.53 ± 2.16, indicating excellent outcome with regards to ankle function and minimal donor site morbidity. In the series of Angthong., *et al*. (2019) they used peroneus longus tendon autograft in ACL reconstruction and evaluated the donor site morbidity with AOFAS Score. In their study, mean postoperative AOFAS scores were 96.0 ± 9.6 which is comparable to the present study [13].

Primary action of Peroneus longus is to plantar flex the first ray of foot, while plantar flexion and eversion of foot at ankle are the other actions. It also supports the arch of foot. The primary concern of a donor ankle is the deficit of first ray plantar flexion. The other concern is the ankle instability. Zhao and Huangfu reported that the use of peroneus tendon has minimal effect to donor site and can be used as an alternative to other autografts for ACL reconstruction [14].

Conclusion

Although ACL reconstruction with peroneus longus has yielded more excellent result in regards to functional outcome and minimal donor site morbidity compared to hamstring tendon graft but it was not statistically significant.

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