Original Article

Anterior cruciate ligament reconstruction with hamstring tendon auto grafts versus peroneus longus tendon auto grafts in isolated anterior cruciate ligament injury

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Objective: To compare the outcome and donor-site morbidity between peroneus longus tendon (PLT) and hamstring tendon in anterior cruciate ligament (ACL) reconstruction.

Methodology: A total of 80 cases aged 15 – 40 years undergoing single-bundle ACL reconstruction fromJanuary 2019 to December 2020 were enrolled. All were randomly assigned to either hamstring tendon group or PLT group. Functional scoring as "International Knee Documentation Committee (IKDC)", "Modified Cincinnati" and "Lysholm scores" were noted prior to surgery and at the end of follow-up period of 9-months after surgery. Donor-site morbidity was also assessed.

Results: Out of 80 cases, there were 66 (82.5%) were male. Mean age in hamstring group was 27.4 + 9.1 versus 25.8 + 8.6 years in PLT group ($p = 0.4214$). Thigh circumference between operated and sound leg was significantly high in hamstring group ($p < 0.0001$). None of the patient in PLT group had any other donor-site morbidity while 6 (16.7%) patients in hamstring group were found to have anterior kneeling pain.

Conclusion: Peroneus longus as graft choice in isolated ACL injuries needs further encouragement, as it was found to have less donor-site related morbidities especially among individuals who commonly kneel during their daily activities.

Keywords: Anterior cruciate ligament reconstruction, donor-site morbidity, peroneus longus tendon.

INTRODUCTION

Anterior cruciate ligament (ACL) reconstruction is known to improve knee stability and functioning with different types of grafts like autografts or allografts.[1] The most commonly used "bone-patellar tendon-bone (BPTB)" and "four-strand hamstring autografts" have their own benefits and drawbacks.[2,3] Some researchers have found BPTB to be a better graft option as it promotes bone-to-bone healing permitting appropriate integration of tunnel and graft that leads to quick reappearance to normal functioning and sporting activities.[4] BPTB has chances of patellar fracture, invasiveness and a comparatively larger incision.[5] Kneeling without any degree of pain is significant in a Muslim country Pakistan where people kneel down often while praying. For this particular reason, hamstring autografts is becoming a popular choice in Asian Countries.[6]

Hamstring autografts can easily be harvested with minimum donor-site morbidities while the strength is similar to the native ACL.However, it is challenging to predict graft size and a possible decline in hamstring strength.[7] These are the reasons, why some surgeons have put their attention towards peroneus longus tendon (PLT) grafts. PLT autografts are frequency adopted for "spring ligament reconstruction", "deltoid ligament reconstruction" and "medial patellofemoral ligament reconstruction".[8,9] Peroneus brevis to be more efficient avertor of the ankle that gives more justification to harvesting PLT.[5]

Some case-series have documented PLT to be 1st option for an autograft with good outcomes and minimum donor-site morbidities.[10,11] On the other hand, some researchers have found PLT to induce higher than usual donor-site morbidity.[12] A recent study comparing functional outcome between hamstring and PLT groups found 1-year follow up mean functional Modified Cincinnati scores to be 88.1 ± 8.5 and 92.7 ± 5.9, respectively.[13]In Pakistan, no study has been done so far to compare PLT with other grafts in isolated ACL injury.So our aim was to compare the outcome and donor-site morbidity between PLT and hamstring tendon in ACL reconstruction.

METHODOLOGY

Sample size of 80 patients (40 in each group) was calculated considering confidence interval 95%, power 80% and 1:1 sample, mean 1-year functional outcome in terms of Modified Cincinnati scores in hamstring group to be 88.1 ± 8.5 and 92.7 ± 5.9 in peroneus longus

group.[13] All patients were aged 15 to 40 years and had isolated rupture of ACL for a duration of 4 to 6 weeks after injury. All patients having associated ligament injuries, chondral damage, meniscal injuries, fractures around the knee site and existence of any kind of pathological conditions of the lower extremity or those who were having any abnormal contralateral knee joint were excluded. A total of 80 cases undergoing single-bundle ACL reconstruction during the study period were enrolled. All cases were randomly allocated to hamstring tendon or PLT groups.

At surgery, peroneus longus tendon was stripped proximally with a tendon stripper to about four to five centimeters from the fibular head to prevent peroneal nerve injury and implantation of the tendon with graft fixation on the femoral side with a button and graft fixation on the tibial side with a bioabsorbable screw after appropriate tensioning with a graft tensioner was done.

Partial weight bearing was advised to all patients after 3 weeks post-surgery, which was further followed up with full weight bearing. Knee extension was allowed immediately following surgery along with gradual knee flexion from zero to 90° up till 3 weeks post-surgery, and that was further followed up with full flexion. Jogging was allowed after 60 days to all patients. Evaluation of knee stability consisted of anterior drawer, Lachman test and a single-leg hop test.

At 9-months follow-up post-surgery, functional outcomes as well as donor-site morbidity were noted. IKDC, modified Cincinnati and Lysholm scoring and measurement of thigh circumference of the donor-site comparing it with contralateral healthy site were done.[14] Functional scoring of ankle was evaluated using American Orthopedic Foot and Ankle Score (AOFAS), Hindfoot Scale and Foot and Ankle Disability Index (FADI) scoring.[15,16]

Statistical Analysis: Data analysis was performed through SPSS 22. Chi-square test was applied to compare qualitative variables like gender and mechanism of injury. Paired sample t-test was applied to compare pre-surgery and post-surgery follow values of quantitative variables while independent sample t-test was applied to compare quantitative variables between both study groups.

RESULTS

Out of 80 cases, there were 66 (82.5%) were male. Mean age was 26.5 ± 8.9 years. Sports related injuries were the most common mechanism of injury seen in 39 48.8% cases (Table 1). IKDC, modified Cincinnati and Lysholm Scoring pre-surgery and 9-months follow up in both hamstring group and PLT group showed statistically significant functional scoring outcomes ($p < 0.05$) (Table 2).

Pre-surgery and post-surgery functional outcome scores between both groups showed no statistically significant difference ($p > 0.05$) (Table 3). None of the patient in PLT group had any other donor-site morbidity while 6 (16.7%) patients in hamstring group were found to have anterior kneeling pain. Mean functional scores for the ankle using AOFAS and FADI in PLT group were 96.4 ± 5.1 and 97.6 ± 3.6.

Table 1: Demographic characteristics of patients (n = 80).

Characteristic		Hamstring Group (n = 40)	PLT Group (n = 40)	P-Value
Gender	Male	32 (80.0%)	34 (85.0%)	0.5562
	Female	8 (20.0%)	6 (15.0%)	
Age in Years (Mean ± SD)		27.4 ± 9.1	25.8 ± 8.6	0.4214
Area of Residence	Urban	18 (45.0%)	16 (40.0%)	0.6510
	Rural	22 (55.0%)	24 (60.0%)	
Mechanism of Injury	Road-Traffic Accident	14 (35.0%)	13 (32.5%)	0.7582
	Sports	18 (45.0%)	21 (52.5%)	
	Domestic	8 (17.8%)	6 (15.0%)	

Table 2: Functional Outcomes in Both Study Groups at Pre-Surgery and Post-Surgery.

	Functional Outcome Scoring	**Pre-Surgery (n = 40)**	**9-Months Follow-up (n = 36)**	**P-Value**
Hamstring Group	IKDC (Mean ± SD)	58.47 ± 17.31	84.82 ± 9.2	< 0.0001
	Modified Cincinnati (Mean ± SD)	69.82 ± 15.2	86.64 ± 8.8	< 0.0001
	Lysholm Scores (Mean ± SD)	66.56 ± 14.9	90.04 ± 6.24	< 0.0001
	Functional Outcome Scoring	**Pre-Surgery (n = 40)**	**9-Months Follow-up (n = 35)**	**P-Value**
PLT Group	IKDC (Mean ± SD)	56.64 ± 10.13	88.40 ± 6.8	< 0.0001
	Modified Cincinnati (Mean ± SD)	68.46 ± 14.8	88.81 ± 4.2	< 0.0001
	Lysholm Scores (Mean ± SD)	68.55 ± 12.5	92.24 ± 6.2	< 0.0001

Table 3: Comparison of pre and post-surgery Functional Outcome Scoring.

	Scoring (Mean ± SD)	**Hamstring Group (n = 40)**	**PLT Group (n = 40)**	**P-Value**
Pre-Surgery	IKDC	58.47 ± 17.31	56.64 ± 10.13	0.5656
	Modified Cincinnati	69.82 ± 15.2	68.46 ± 14.8	0.6863
	Lysholm Scores	66.56 ± 14.9	68.55 ± 12.5	0.5195
	Functional Outcome Scoring	**Hamstring Group (n = 36)**	**PLT Group (n = 35)**	**P-Value**
9-Months Post-Surgery	IKDC	84.82 ± 9.2	88.40 ± 6.8	0.0671
	Modified Cincinnati	86.64 ± 8.8	88.81 ± 4.2	0.1913
	Lysholm Scores	90.04 ± 6.24	92.24 ± 6.2	0.1408

DISCUSSION

Auto graft choice is a major consideration among cases undergoing ACL reconstruction procedure of the knee. Researchers have found chances of re-surgery in ACL reconstruction cases to reduce 0.8 times with every 0.5 mm rise in graft diameter between graft thickness of 7mm to 9mm.[17] It has also been found that reduction in auto graft diameter is linked with higher chances of revision rates.[18]

Conflicting results have also been reported by some researchers regarding graft diameter and revision rates.[19] ACL reconstruction adopting PLT to had good functional outcome and knee stability.[10,12] We also found that PLT can be utilized in single-bundle ACL reconstruction with excellent functional outcomes. Some studies have assessed functional outcomes at 1-year and 2-year periods following ACL reconstruction and concluded minimal differences between these 2 durations in terms of functional scores.[20]

In the present study, we recorded thigh hypotrophy and subjective symptoms in some patients in hamstring group. Thigh hypotrophy because of hamstring tendon harvesting can result in hamstring strength reduction specifically at deep flexion angles.[21] There were 16.7% patients in hamstring group who had anterior kneeling pain during routine daily or religious activities (e.g., Muslims). Any types of kneeling pain can further progress into significant morbidity and may hamper quality of life.[22]

In the past, donor-site morbidity like reduced peak torque eversion or inversion adopting PLT approach, reduced ankle functioning and ankle stability.[12] We noted excellent AOFAS and FADI scores regarding functional scoring of the ankle. We were unable to assess and compare stability and range of motion between study groups. The planned 9-months follow interval is comparatively small and further studies should be conducted with larger follow up intervals. We

also did not measure ankle avertor strength to assist donor-site morbidity following PLT.

CONCLUSION

Peroneus longus as graft choice in isolated ACL injuries needs further encouragement as it was found to have less donor-site related morbidities especially among individuals who commonly kneel during their daily activities.

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