



RESEARCH ARTICLE

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Comparison of Functional outcome of Arthroscopic ACL reconstruction between Quadruple Hamstring, Peroneus Longus and BPTB Autograft in Indian Population

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ABSTRACT

The Anterior Cruciate ligament (ACL) is the primary stabilizer of the knee and its deficiency affects Knee stability, resulting in giving way symptoms in daily and sports activities with increased the risk of intra-articular damage. To prevent the deterioration of the existing lesions ACL reconstruction is necessary. Arthroscopic reconstruction of the injured ACL has become the “gold standard” method for treatment of ACL tear. However there is a controversy in literature regarding the best graft option is to replace the injured graft. The present study was aimed to study and compare the functional outcome of single bundle arthroscopic ACL reconstruction by Hamstring , Peroneus Longus and BPTB autografts using Lysholm Knee Activity Score.

ARTICLE HISTORY

Received September 07, 2022
Accepted September 16, 2022
Published September 20, 2022

KEYWORDS

ACL, BPTB, Hamstring,
Lysholm, Peroneus, RTA**Keywords:** ACL, BPTB, Hamstring, Lysholm, Peroneus, RTA

Abbreviations

ACL- Anterior Cruciate Ligament

RTA- Road Traffic Accident

SD- Standard Deviation

ROM- Range of Motion

BPTB- Bone Patellar Tendon Bone.

Introduction

The Anterior Cruciate ligament (ACL) is the primary stabilizer of the knee and prevents the knee against anterior translation of the tibia over the femur and is important in counteracting rotation and valgus stress. Anterior knee instability associated with rupture of the ACL is a disabling clinical problem [1]. The ACL has a poor capacity for intrinsic repair. Thus patients, who have knee symptoms related to ACL deficiency, may consider ligament reconstruction as a means of stabilizing the tibio-femoral joint and restoring high level function of the knee joint.

The goal of treatment of an anterior cruciate ligament deficient knee is to provide a stable knee.. Arthroscopic reconstruction of the injured ACL has become the “gold standard”. Unfortunately, ligament reconstruction cannot recreate the anatomical, biological, biomechanical and neuro physiological properties of a native ACL [2]. Numerous authors have described successful reconstruction of the ACL with use of a donor autograft (patellar tendon, hamstring tendon or quadriceps tendon) and allograft (Achilles, patellar tendon, hamstring tendon or tibialis anterior) tendons. However, there is no consensus to what the best graft

option is to replace the injured graft. The present study was aimed to study and compare the functional outcome of arthroscopic ACL reconstruction by Hamstring and Peroneus Longus and BPTB autografts using Lysholm Knee Activity Score with the minimum follow-up up to 6 months.

Materials and Methods

This prospective study of 24 patients presented in Department of Orthopaedics, Gandhi Medical College, Bhopal from May 2019 to May 2021 with complaint of knee pain or instability who were diagnosed to have ACL tear. Patients who satisfied the inclusion criteria (>20 yrs old, both sexes with clinical or radiological evidence of ACL tear with no previous history of surgery in the same knee) were included in the study. Patients having multiple bilateral ACL tear associated lower limb fractures or multi ligamentous injuries like PCL,MCL,LCL were excluded. The clinical assessment involved detailed history with clinical examination .Patient workup included X- rays of the involved knee joint-anteroposterior and lateral views, MRI imaging evaluation and Lysholm knee activity score along with routine investigations.

Consent for surgery was obtained after explaining the risk benefit ratio .After obtaining pre-anesthetic clearance, surgical procedure was carried out using standard portals and techniques under tourniquet.

Graft Harvesting

Hamstring Quadruple Graft

A 4 cm longitudinal incision given approx 4 cm medial and distal to the tibial tubercle. Subcutaneous tissue and fat was dissected and the tendon of gracilis and semitendinosus could be palpated.

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The sartorius fascia was carefully incised and Gracilis and semitendinosus tendons were harvested using tendon stripper. The graft was prepared on the graft master board by quadrupling them using krackow sutures and attached to endobutton tight rope.

Peroneus Longus Graft

Care was taken not to distinguish Peroneus Longus Tendon from Per- oneus Brevis Tendon. Perneus Brevis tendon was identifies at its insertion site and isolated from the PLT. PLT was completely transected 1 to 1.5cm proximal to its insertion and harvested prox- imally with a tendon stripper. PLT graft was prepared for ACL reconstruction using ethibond. PLT stump was sutured to PBT to maintain some function of PLT.

Bone Patellar Tendon Bone Graft

A longitudinal, 3 cm curved incision given over the medial tibial tubercle. The paratenon is exposed and incised in transverse direction with width of approx 2 cm. The paratenon detachment from the patellar tendon is extended from the incision toward the distal third of the patella, using scissors. Patella tendon is cut using guide plate and tendon cutter and tibial bone fragment is detached using bone saw. Patellar end of tendon is pulled form the lower pole of patella after osteotomy.

Femoral and Tibial Tunnel Preparation

The femoral tunnel is drilled through the transportal approach. With the femoral offset aimer device inserted through the anteromedial port, the entry

point is drilled with a guide wire in 120 degrees of knee flexion and drilled till it emerges out from distal thigh. The femoral tunnel was made by drilling with the 4.5 mm cannulated drill bit and reaming done and stopped 15-20 mm from the lateral cortex. The beath pin was used to pass the graft through tunnel. In 70 – 90 degrees of knee flexion, the tibial tunnel is made with the help of the “Tibial Guide” adjusted at 55 in 70 – 90 degrees of knee flexion, the tip of the tibial guide is placed 2 – 3mm anterior to the (posterior margin of) anterior horn of lateral meniscus and slightly medial to the midline of the ACL tibial attachment area and should pass very close to the PCL. Reaming done over the guide pin using cannulated drill bit with diameter equal to the diameter of the graft.

The graft is passed through the tibial tunnel under arthroscopic guidance until it breaches the femoral cortex and the endobutton is flipped. The knee was cycled approx. 20 times and the interference screw is then placed over the guide pin in the tibial tunnel to fix the tibial graft end. After irrigation of the knee joint, all the wounds were sutured. Sterile dressing applied. Tourniquet was deflated and the cuff was removed. Compression

bandage applied and lower limb im- mobilized in long knee brace.

Rehabilitation Protocol

Patients were placed in a long knee brace till 2 weeks with Quadriceps Isometric exercices with in the brace. Weight bearing was allowed from 2nd day as tolerated with crutches and Full weight bearing was achieved by 2 weeks. Passive ROM exercise was started from 3rd postop day and active ROM around 90 degree was targeted by 3 weeks. By 3rd week, Isotonic closed chain exercises were started and progressed to Open chain exercises using free weights after 2 weeks. Proprioceptive exercises like ball balancing and Cardiovascular fitness like Treadmill were be- gin after 8 weeks Postoperatively. Functional activities like car driving and stairs climbing were allowed after 3 months. Non cutting, non pivoting sports was allowed after 3 months while Cutting and pivoting sport activities were started by 6 months after checking strength.

Post Operative Evaluation

Knee stability and function were evaluated with Lysholm Knee Scoring Scale for different types of graft (preoperatively) and then compared at 6 months follow up (post operatively) The monitored and calculated parameters were analyzed using paired t-test for comparison be- tween pre-operative and postoperative outcomes having significant p value of <0.05.

Results

Out of 24 cases operated, majority of the patients were treated using hamstring and peroneus grafts (10 patients each). 4 patients (16.4%) were treated with BPTB graft.

Table 1: Comparing Lysholm Score with Graft Types

Graft Type	Pre op		Post op		P value
	Mean	Std. Deviation	Mean	Std. Deviation	
BPTB	44.00	10.033	84.00	11.431	<0.001
Hamstring	38.80	8.929	84.30	8.111	<0.001
Peroneus	32.00	9.226	85.00	7.040	<0.001
Total	36.83	9.920	84.54	7.896	<0.001
P value	0.083		0.972		

As depicted in table 1, during pre op evaluation, the mean Lysholm score in patients who received BPTB, Hamstring and peroneus grafts were 44, 38.8 and 32 respectively which mean score of 36.83. Whereas, after operation, the same scores for these grafts were 84, 84.3 and 85 respectively with the means scoring of 84.54. This difference in all three types of graft was statistically significant (p value <0.001).

Table 2: Comparing Complication between Graft Types

			Graft Type			Total
			BPTB	Hamstring	Peroneus	
Complication	Deep infection	Count	1	3	0	4
		%	25.0%	30.0%	0.0%	16.7%
	None	Count	2	2	6	10
		%	50.0%	20.0%	60.0%	41.7%
	Post op knee pain	Count	1	2	0	3
		%	25.0%	20.0%	0.0%	12.5%
	Stiffness	Count	0	1	2	3
		%	0.0%	10.0%	20.0%	12.5%
	Superficial infection	Count	0	2	2	4
		%	0.0%	20.0%	20.0%	16.7%
Chi-Square Tests						
		Value	df	Asymp. Sig. (2-sided)		
Pearson Chi-Square		8.900 ^a	8	.351		
Likelihood Ratio		12.665	8	.124		
N of Valid Cases		24				
a. 15 cells (100.0%) have expected count less than 5. The minimum expected count is .50.						

Table no 2: shows the rate of complications observed in the patients. There were 16.7% patients who developed deep infection after the surgery. Out of these, 30% were with hamstring grafts and 25% were with BPTB graft. 41.7% patients didn't develop any complications afterwards. 12.5% patients complained of post operative knee pain. 12.5% patients developed post operative knee stiffness. 16.7% patients reported occurrence of superficial infection. There was no statistical significance observed in the occurrence of complication during the post operative stage.

Discussion

Due to the ever-increasing RTAs and increased participation in sporting activities, there is an increase in incidence of ligament injuries of the knee, most common being the ACL. Surgical reconstruction of ACL along with Accelerated rehabilitation programs has become the standard of care to restore its function. The choice of graft is a topic of great debate in recent years. The various options include bone patellar tendon bone graft, hamstring autograft, quadriceps tendon, various synthetic grafts and allograft.

In the present study, Functional evaluation was performed with Lysholm Knee Activity Score which are designed specially for evaluation for injuries involving knee ligament. During pre op evaluation, the mean Lysholm score in patients who received BPTB, Hamstring and peroneus grafts were 44, 38.8 and 32 respectively which mean score of 36.83. Whereas, after operation, the same scores for these grafts were 84, 84.3 and 85 respectively with the means scoring of 84.54 There was significant improvement in post-operative IKDC score when compared with preoperative score.

Li, et al concluded that ACLR with PT or HS autografts achieved similar postoperative effects in terms of restoring knee joint function, graft failure and incidence of re-operations related to the meniscus. HS autografts were inferior to PT grafts for restoring knee stability, but were associated with fewer

postoperative complications. Romanini, et al reviewed 30 studies and demonstrated that PT grafts appeared superior to HS grafts in terms of stability, return to pre-injury level activity and flexion strength. HS autograft was associated with less anterior knee pain and less risk of extension loss compared with PT autograft. Xie, et al showed that PT autograft might be superior in resuming rotation stability of the knee joint and allow patients to return to higher levels of activity in comparison to HS autograft after ACLR. From the above data, it can be seen that the post-op Lysholm Knee Activity Score in this study was comparable with the scores from other studies [3-5].

Conclusion

Present prospective study was conducted in Department of Orthopaedics, Gandhi Medical College, Bhopal from May 2019 to May 2021 comprising 24 patients to clinically evaluate the results of arthroscopic anterior cruciate ligament reconstruction using various types of graft. Majority of the patients were treated using hamstring and peroneus grafts (10 patients each). 4 patients (16.4%) were treated with BPTB graft. Functional evaluation was done using Lysholm Knee Activity Score which was found to be improved significantly as the mean Preop Lysholm score in patients who received BPTB, Hamstring and Peroneus grafts were 44, 38.8 and 32 respectively which mean score of 36.83. Whereas, after operation, the same scores for these grafts were 84, 84.3 and 85 respectively with the means scoring of 84.54 which statistically significant (p value <0.005).

There was no statistical significance observed in the occurrence of complication during the post operative stage.

Hence it is concluded that all the three graft used have shows equal potential in ACL reconstruction in present study especially in young athletes and high demand individuals. It not only significantly increases the stability of the knee but also improves functional outcome of injured knee with early return to sports.

Limitations of this study are - Small sample size, Short duration of follow-up and Unavailability of KT arthrometer. In consequence of above mentioned reasons, studies of large sample size, longer duration follow up with KT arthrometer based objective evaluation are required in future to assess the outcome of this procedure and to see persistence of improved knee score and function with a high level of evidence.

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