

To Compare the Functional Outcome of the Patellar Tendon and Hamstring Tendon Autograft for Anterior Cruciate Ligament Reconstruction in Males

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ABSTRACT

Objective: To determine the functional outcomes and patient satisfaction status after using the patellar tendon and hamstring tendon autograft for anterior cruciate ligament reconstruction in male patients

Study Design: Prospective randomized clinical trial

Place and Duration of Study: Department of Orthopaedic, Dr. Ruth KM Pfau Civil Hospital Karachi and Medicare Cardiac & General Hospital Karachi between April 2017 and November 2019.

Methodology: Forty one patients of the male gender and age above 20 years with unilateral anterior cruciate ligament rupture were enrolled. Patients were divided into two groups; Group I consisted of 22 patients receiving Patellar Tendon Graft for open ACL reconstruction and Group II consisted of 19 patients receiving Hamstring (semitendinosus and gracilis) Quadruple Tendon Graft for arthroscopic ACL reconstruction. Outcomes of both techniques were examined and compared. Patients were followed for 24 months.

Results: No significant difference was observed regarding age and causes of injury between both groups (p-value >0.05). Postoperatively no significant difference in terms of Lysholm score, IKDC, Lachman test, pivot shift test, and pain during kneeling at 2 years. In Group I, 14 (63.64%) patients were satisfied, 6 (27.27%) patients were very satisfied and 2 (9.09%) patients were neutral, and in Group II, 10 (52.63%) patients were satisfied, 5 (26.32%) patients were very satisfied and 4 (21.05%) patients were neutral at final follow-up. In our study, morbidity like anterior knee pain during kneeling was not significant in either group at 2 years.

Conclusion: The patellar tendon and semitendinosus tendons are considered as a procedure of choice for the rupture of the anterior cruciate ligament. We concluded that both techniques patellar tendon and semitendinosus tendon autografts are safe and effective treatment modalities for anterior cruciate ligament reconstruction. We found no significant difference in terms of functional outcomes, patient satisfaction, and kneeling pain between both groups.

Keywords: Outcome, Patellar tendon (PT), Hamstring tendon (HT) auto-graft, Anterior cruciate ligament reconstruction

INTRODUCTION

An anterior cruciate ligament (ACL) is a very common sport-related damage at a younger age and can lead to knee functional instability. Functionally unstable knee problems leading to ACL breaks and subsequent meniscus and cartilage injury may contribute to untreated degenerative illness.¹ ACL rupture routine rehabilitation has been initiated, or ACL repair is arthroscopic. Despite widespread ACL reconstruction procedures around the world, there is still debate about the option of ligament graft by the surgeon. In conjunction with different fixation techniques,^{2,3} the outcomes of all surgical techniques using BPTB or Hams tendon can be compared but the BPTB technique has a greater degree of malaise while kneeling. The main operations are conducted in general with either bone patellar tendon-bone (BPTB) or hamstring autograft.^{4,5} The reconstruction of the anterior cruciate ligament helps to provide the knee with protection and to protect it from osteoarthritis.

For a successful reconstruction, the positioning of anatomic graft, the mechanical quality of the graft tissue, the mechanical actions and the fastening power of the fasteners must be understood and the biological processes must be understood.⁶ All these factors affect the

mechanical properties of the knee joint after ACL rebuilding and determine the healing and time span, before the knee joint is normal.⁷ After the operation, graft healing in the patellar tendon (PT) and hamstring tendon (HT) autografts are characterized by remodeling process.⁸ Recovery protocols involving immediate knee movement appear to be safe and effective.⁹

There is no clinical advantage of a postoperative knee brace after PT ACLR. Early mobilization with full weight-bearing is possible without graft damage.¹⁰ The present study aims to determine the functional outcome and patient satisfaction after using the patellar tendon-bone graft, and semitendinosus tendon autograft for ACL reconstruction.

PATIENTS AND METHODS

This prospective randomized controlled trial study was conducted at Orthopaedic Department, Dr. Ruth KM Pfau Civil Hospital Karachi, and Medicare Cardiac & General Hospital Karachi between April 2017 and November 2019. A total of 41 male patients with age above 20 years had unilateral anterior cruciate ligament rupture were enrolled. Patient's detailed demographic including age, sex, causes of injury, and operative time were recorded after written consent. Patients with revision surgery after ACL

reconstruction, multi-ligament reconstruction, posterior cruciate ligament reconstruction, and patients below 20 years were excluded from the study. All forty-one patients were divided into two groups; Group I consist of 22 patients those received patellar tendon graft by open technique and Group II consisted of 19 patients who received semitendinosus and gracilis quadruple tendon graft arthroscopically.

In group 1 (patellar tendon), after spinal anesthesia, knee was examined and started with a diagnostic arthroscopy with standard surgical protocol. The associated meniscus tear was excised or repaired according to pathology. A midline anterior incision from the lower pole of the patella to tibial tuberosity was made. The middle third of the patellar tendon (10mm) was harvested by protecting the overlying paratenon (Fig.1).

The graft was prepared and ends tied with vicrylNo.2. The femoral tunnel was made independently by an outside-in technique with the help of a femoral jig then a tibial tunnel was made with help of tibial guide jig at 55° angle according to the size of the graft. We usually reverse the graft, tibial tuberosity graft in the femoral tunnel and patellar bone graft in the tibia, femoral graft fixed at 90° degree knee flexion, and tibial graft at 20° knee flexion by using titanium interference screws (Karl Storz and Arthrex).

In group II, after diagnostic arthroscopy and associated meniscus injury treatment, the graft was harvested by 3 to 4 cm oblique incision over the pes anserine tendons. The gracilis and semitendinosus tendons were identified and separated from surrounding soft tissues and harvested with close tendon stripper [Fig.2]. Semitendinosus and gracilis grafts were prepared as a quadruple graft. Open ends were sutured with vicryl 2 in krackow locking stitch fashion and close ends of quadruple tendon loop were secured with a Tight rope endo button (Arthrex).

The Trans-portal technique was used for the femoral tunnel which was made with 7mm offset femoral aimer guide. A tibial tunnel was made with 55° degree tibial jig according to the size of the graft. Graft was passed through tibial and femoral tunnel. Anterior cruciate ligament Tight Rope (RT) suture was used for femoral tunnel graft fixation, after femoral graft fixation with RT, 15 to 20 times cycling of the knee was done for graft tensioning and fixed the tibial graft in 20 degrees of knee flexion with bioabsorbable (Arthrex) screw (Fig.3).

Rehabilitation was started on the first postoperative day with ankle pumping, static quads exercises, and weight-bearing walk as pain tolerated with the help of a walker. Range of motion and further rehabilitation continued according to our institution rehabilitation protocol. Outcomes such as Lysholm score, IKDC, Lachman test, range of motion (at 1 year, and 2 years), were recorded postoperatively.

Anterior kneeling pain during pray or labor was examined between both groups at six months, 1 year, and at the final follow-up. Patients satisfaction and VAS score were recorded at the final follow-up. All the data were analyzed by SPSS 24. Chi-square test and student t' test was applied to compare the outcomes with a p-value of ≤ 0.05 considered statistically significant.

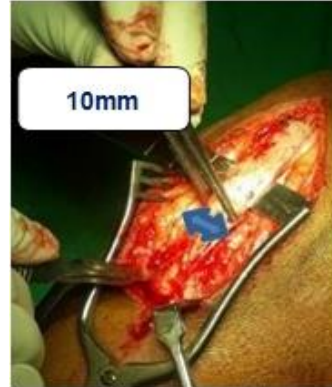


Fig. 1: The distal patellar bone (8x20 mm) was taken as a bone graft along with the distal tibial tuberosity (10x25 mm)



Fig.2: Hamstring grant



Fig.3: Post ACL reconstruction X rays

RESULTS

In Group I, patients presented with a mean age of 37.54 ± 11.23 years while in group 2 meanage was 37.02 ± 12.42 years. Operative time for both groups was almost the same (87.5 ± 11.6 vs 88.01 ± 10.2 respectively). The causes of injury are presented in Table1.

According to the outcomes score at 1-year and final follow-up, we found no significant difference between both groups regarding the Lysholm score and IKDC score. However, a significant difference was observed in the preoperative score and at a 1-year follow-up with a p-value < 0.05 in both groups. In group I and Group II, preoperative Lysholm Score were 63.27 ± 4.63 and 64.02 ± 4.13 , IKDC was 3.56 ± 0.22 and 3.85 ± 0.54 . At final follow-up we found no significant difference in term of Lysholm score, IKDC score and pain score 88.03 ± 2.14 Vs 89.82 ± 1.65 , 7.65 ± 0.14 Vs $6.9.83 \pm 0.41$ ($p=0.66$), 1.89 ± 0.67 Vs 1.25 ± 0.32 ($p=0.39$) and 7.9 ± 0.68 vs 8.01 ± 0.284 [$p=0.84$] (Table 2).

According to the functional outcomes, we found no significant difference in the mean values of lack of extension and lack of flexion, preoperatively, and follow-ups. Regarding the Lachman test in Group I 19 (86.36%) patients improved to grade 1 at one-year follow-up and 21 (95.45%) patients improved to grade 0 at the final follow-up while in Group II, 16 (84.21%) patients improved to grade 1 at one year and 18 (94.74%) patients improved to grade 0 at final follow-up (Table 3).

Table 1: Causes of injury in both groups

Causes of injury	Group I	Group II
RTA	11 (50%)	10 (52.63%)
Fall	4 (18.18%)	3 (15.79%)
Sports injury	3 (13.64%)	4 (21.05%)
Interpersonal violence	2 (9.09%)	1 (5.26%)
Others	2 (9.09%)	1 (5.26%)

Table 2: Comparison of outcomes at 1 year and final follow-up between both groups

Outcome	Group I	Group II	P value
Lysholmscore			
Preoperatively	63.27±4.63	64.02±4.13	
At 1yr follow-up	89.62±2.13	90.01±1.42	0.06
At 2yr follow-up	88.03±2.14	89.82±1.65	>0.05
IKDC score			
Preoperatively	3.56±0.22	3.85±0.54	
At 1yr follow-up	1.54±0.8	1.87±0.6	0.42
At 2yr follow-up	1.89±0.67	1.25±0.32	N/S
VAS score			
At final follow-up	7.9±0.68	8.01±0.284	0.53

Table 3: Comparison of Lachman score and range of motion

Variable	Group I	Group II	P value
Lack of extension (degree)			
Preoperatively	0.69±0.52	0.46±0.33	
At 1yr follow-up	0.02±0.004	0.2±0.124	N/S
At 2yr follow-up	1.52±0.538	2.97±0.488	N/S
Lack of flexion (degree)			
Preoperatively	7.23±2.058	8.58±1.96	
At 1yr follow-up	0.062±0.001	0.72±0.587	N/S
At 2yr follow-up	1.91±0.428	1.76±0.574	N/S
Lachman score			
Preoperative (Grade 3)	Group I	Group II	P value
At 1yr follow-up (Grade 1)	20 (84%)	16 (84.21%)	N/S
At 2yr follow-up (Grade 0)	23 (92%)	18 (94.74%)	N/S

Table 4. Comparison of patient's satisfaction and kneeling pain between both groups at the final follow-up

Comparison of patient's satisfaction			
Variable	Group I	Group II	P value
Very satisfied	6 (27.27%)	5(26.32%)	>0.05
Satisfied	14 (63.64%)	10 (52.63%)	>0.05
Neutral	2 (9.09%)	3 (21.05%)	>0.05
Not satisfied	-	-	-
Comparison of kneeling pain			
Kneeling pain	Group I	Group II	P value
At 6 months	8 (32%)	7 (36.84%)	0.42
At 1 year	5 (20%)	4 (21.05%)	
At 2 year	2 (8%)	1 (5.26%)	

According to the patient's satisfaction, we found no significant difference (p>0.05). In Group I, 14 (63.64%)

patients were satisfied, 6 (27.27%) patients were very satisfied and 2 (9.09%) were neutral while in Group II, 10 (52.6%) patients were satisfied, 5 (26.3%) were very satisfied and 4 (21.05%) patients were neutral at final follow-up. When kneeling pain was assessed, 8, 5, and 2 patients in group I had kneeling pain during working or praying at 6 months, 1 year, and at the final follow-up respectively, while in group II, 7, 4, and 1 patient had kneeling pain at 6 months, 1 year, and at the final follow-up respectively (Table 4).

DISCUSSION

Anterior cruciate ligament reconstruction is the common performing surgical treatment in orthopedics settings. Many treatment modalities have been introduced for the treatment of anterior cruciate ligament rupture, patellar tendon, and semitendinosus tendon are the most frequently performing techniques for the treatment of ACL.^{11,12}The present study was conducted aimed to examine the outcomes of the patellar tendon and semitendinosus tendon for the rupture of the anterior cruciate ligament. In this study 41 patients were enrolled and divided into two groups, Group I received patellar tendon and Group II received semitendinosus. All of the patients were males. No significant difference was observed regarding the mean age of patients between both groups (37.54±11.23 Vs 37.02±12.42 years; p=>0.05). These results showed similarity to many of previous studies in which male patients population was high as compared to female patients 75 to 95% and most patients were ages 25 to 45 years.^{13,14} A study conducted by Dawood et al¹⁵ reported no female patient out of 50 enrolled patients.

In the present study, RTA was the most common etiology of injury in both groups overall 51.22% patients had RTA followed by fall from height 17.07%, interpersonal violence 7.32%, 17.07% patients had a sports injury, and 7.32% patients had other reasons. A study by Jeong et al¹⁶ reported sports injury was the most frequent cause of injury in 47% of patients followed by falling, fight, and RTA.

In our study according to the outcomes score at 1 year and follow-up, we found no significant difference between both groups regarding the Lysholm score (89.62±2.13 Vs 90.01±1.42;p=0.06), Tegner score (7.12±0.03 Vs 7.34±0.4;p=0.74), and IKDC score (1.54±0.8Vs 1.87±0.6; p=0.42). We found a significant difference regarding preoperatively and at a 1-year follow-up and final follow-up (p<0.05). These results were similar to some previous studies in which no significant difference was reported between both procedure regarding Lysholm score, IKDC, and Tegner level with p-value >0.05. However, a comparison of pre to postoperatively both techniques showed a significant difference p-value <0.05.^{17,18}

In our study, we found no significant difference in terms of a range of motion and patients satisfaction between both groups. However, knee stability was found more in group I patients as compared to group II patients. According to the patient's satisfaction, we found no significant difference (p>0.05). In Group I 14 (63.64%) patients were satisfied, 6 (27.27%) patients were very satisfied and 2 (9.09%) patients were neutral and in Group II 10 (52.6%) patients were satisfied, 5 (26.3%) patients

were very satisfied and 4 (21.05%) patients were neutral at final follow-up taken at postoperative 24 months. These results were comparable to international literature.^{19,20}

CONCLUSION

We concluded that both techniques patellar tendon and semitendinosus tendon autografts are safe and effective treatment modalities for anterior cruciate ligament reconstruction. We found no significant difference in terms of functional outcomes, patient satisfaction, and kneeling pain between both groups.

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