

ORIGINAL RESEARCH

To Compare the Functional Outcome of Arthroscopic Reconstruction of Anterior Cruciate Ligament Using Patellar Tendon Bone Grafts v/s Hamstrings Graft: A Multicentric Study

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ABSTRACT

Background: Arthroscopic reconstruction of the injured ACL has become the gold standard. The aim of this study to compare the functional outcome of arthroscopic reconstruction of anterior cruciate ligament using patellar tendon bone grafts v/s hamstrings graft at multicentre tertiary care center. **Materials & Methods:** This prospective randomized controlled trial study was conducted at Orthopaedic Department in multi center tertiary care hospital in Rajasthan during one year period. A total of 60 patients with age above 20 years had unilateral anterior cruciate ligament rupture were enrolled. All sixty patients were divided into two groups; Group I consist of 30 patients those received patellar tendon graft by open technique and Group II consisted of 30 patients who received semitendinosus and gracilis quadruple tendon graft arthroscopically. Anterior kneeling pain during pray or labor was examined between both groups at six months, 1 year, and at the final follow-up. Patient's 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. **Results:** In Group I, patients presented with a mean age of 39.24±10.74 years while in group 2 mean age was 38.78±11.56 years. In group I and Group II, preoperative Lysholm Score were 62.58±4.45 and 63.46±4.56, IKDC was 3.65±0.28 and 3.82±0.55. At final follow-up we found no significant difference in term of Lysholm score, IKDC score and pain score was 88.24±2.07 Vs 89.68±1.42 (p>0.05), 1.86±0.66 Vs 1.28±0.35 (p>0.05) and 7.87±0.62 vs 8.03±0.24 [p>0.05]. When kneeling pain was assessed, 10, 6, 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, 11, 6, and 1 patient had kneeling pain at 6 months, 1 year, and at the final follow-up respectively. **Conclusion:** We concluded that both techniques patellar tendon and hamstrings autografts are safe and effective treatment modalities for anterior cruciate ligament reconstruction.

Keywords: ACL, Lysholm Score, IKDC score, pain score.

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INTRODUCTION

Surgical reconstruction of the Anterior Cruciate Ligament (ACL) is one among them most regular orthopedic procedures, with approximately 100,000–175,000 procedures performed yearly.¹ The knee joint is one of the most commonly injured joints in our body and the most commonly injured ligament in knee is the anterior cruciate ligament. Due to the ever-

increasing Road traffic accidents and increased participation in sporting activities, there is an increase in incidence of ligament injuries of the knee. The ACL along with other ligaments, capsule is the primary stabilizer of knee and prevents anterior translation and restricts valgus and rotational stress to a certain degree.

ACL injuries often generally happen while sports involving sudden stops and changes in direction like basketball, football, downhill skiing, gymnastics, etc.² Ligaments are strong bands of tissue connecting one bone to another. The ACL, one of two ligaments crossing the middle of the knee, joins the thigh bone (femur) to the shin bone (tibia) and helps in stabilizing the knee joint.²

ACL being a central stabilizer of the knee, the objective of doing surgery is to restore integrity of the knee so that the patient can avoid any more injury and return to sports. The final goal of participation in this strenuous activity is dependent on graft selection, the surgical procedure and postoperative rehabilitation.⁵ Anterior Cruciate Ligament Reconstructions (ACLRs) fail at a small but a significant rate. Failure rate after ACLR ranges from 0.7–10%.

When an ACL injury occurs, the symptoms of knee instability, pain and a decrease in joint function occur. Although conservative treatment with intensive physiotherapy, bracing and lifestyle modification can be tried in some patients with less anticipated knee function, in asymptomatic young active individuals, ACL reconstruction is necessary. Also ACL injuries are mostly associated with injury of the meniscus which need to be addressed, else the person can develop early onset of osteoarthritis of the knee.⁴ Hence, graft location, and therefore tibial and femoral tunnel placement, is deemed critical for the success of ACL reconstructive surgery. Postoperative plain radiographs provide a dependable and valid way to assess anatomic graft placement. Radiographs can aid in predicting risk factors for potential graft failure and poor outcome. These risk factors include inappropriate tunnel placement, excessive varus or valgus alignment and increased extension or hyperextension with possible graft impingement. Accurate tibial and femoral tunnel placement has a great effect on the outcomes post ACLR.⁵

Arthroscopic reconstruction of the injured ACL has become the gold standard. Open reconstruction of ACL which was done earlier is not practiced nowadays due to the complications associated such as increased post op pain, stiffness, and a lengthy rehabilitation phase. The “ideal graft” for ACL reconstruction is still a topic of debate. The most commonly used grafts are bone patellar tendon bone graft and hamstring graft. Several studies have demonstrated comparable functional outcomes for both the grafts. The aim of this study to compare the functional outcome of arthroscopic reconstruction of anterior cruciate ligament using patellar tendon bone grafts v/s hamstrings graft at multicenter tertiary care center.

MATERIALS & METHODS

This prospective randomized controlled trial study was conducted at Orthopedic Department in multi center tertiary care hospital in Rajasthan during one year period.

A total of 60 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 sixty patients were divided into two groups; Group I consist of 30 patients those received patellar tendon graft by open technique and Group II consisted of 30 patients who received semitendinosus and gracilis quadruple tendon graft arthroscopically.

In group I (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. The graft was prepared and ends tied with vicryl No.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.

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. 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.

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.

RESULTS

In Group I, patients presented with a mean age of 39.24 ± 10.74 years while in group 2 mean age was 38.78 ± 11.56 years. The maximum no. of patients comes under road traffic accident in both groups (table 1).

Table 1: Causes of injury in both groups

Causes of injury	Group I (N=30)	Group II (N=30)
RTA	15	16
Fall	5	5
Sports injury	4	6
Interpersonal violence	3	2
Others	3	1

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 1-year follow-up with a p-value <0.05 in both groups. In group I and Group II, preoperative Lysholm Score were 62.58 ± 4.45 and 63.46 ± 4.56 , IKDC was 3.65 ± 0.28 and 3.82 ± 0.55 . At final follow-up we found no significant difference in term of Lysholm score, IKDC score and pain score 88.24 ± 2.07 Vs 89.68 ± 1.42 ($p > 0.05$), 1.86 ± 0.66 Vs 1.28 ± 0.35 ($p > 0.05$) and 7.87 ± 0.62 vs 8.03 ± 0.24 [$p > 0.05$] (Table 2).

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

Outcome	Group I	Group II	P value
Lysholm score			
Preoperatively	62.58 ± 4.45	63.46 ± 4.56	
At 1yr follow-up	89.15 ± 2.26	90.18 ± 1.37	>0.05
At 2yr follow-up	88.24 ± 2.07	89.68 ± 1.42	>0.05
IKDC score			
Preoperatively	3.65 ± 0.28	3.82 ± 0.55	
At 1yr follow-up	1.49 ± 0.7	1.82 ± 0.54	>0.05
At 2yr follow-up	1.86 ± 0.66	1.28 ± 0.35	>0.05
VAS score			
At final follow-up	7.87 ± 0.62	8.03 ± 0.24	>0.05

According to the patient's satisfaction, we found no significant difference ($p > 0.05$). In Group I, 19 (63.33%) patients were satisfied, 8 (26.66%) patients were very satisfied and 3 (10%) were neutral while in Group II, 16 (53.33%) patients were satisfied, 8 (26.66%) were very satisfied and 6 (20%) patients were neutral at final follow-up. When kneeling pain was assessed, 10, 6, 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, 11, 6, and 1 patient had kneeling pain at 6 months, 1 year, and at the final follow-up respectively (Table 3).

Table 3: 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	8	8	1.00
Satisfied	19	16	>0.05
Neutral	3	6	>0.05
Not satisfied	-	-	-
Comparison of kneeling pain			
Kneeling pain	Group I	Group II	P value
At 6 months	10	11	>0.05
At 1 year	6	6	
At 2 year	2	1	

DISCUSSION

Due to the increased occurrence of Road Traffic Accidents and increased number of persons participating in sports activities, the number of ACL

reconstructions being done has been increased. Arthroscopic reconstruction of the injured ACL has become the gold standard and is one of the most common procedures done in orthopaedics and thus it

has been extensively studied and outcomes of ACL reconstruction have gained considerable attention. 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.

Among these, the most commonly used are the Bone patellar tendon bone graft and hamstring graft. The advantages of Bone patellar tendon bone graft include high ultimate tensile load (approximately 2300 N) and a rigid fixation due to its bony ends. But hamstring graft has been increasingly used in recent. The advantages of arthroscopic ACL reconstruction using hamstring graft include decreased surgical site morbidity, decreased occurrence of patellofemoral adhesions and reduced incidence of anterior knee pain. Though the semitendinosus tendon has only 75% and gracilis 49% of the strength of native ACL, the quadrupled semitendinosus or semitendinosus-gracilis have a tensile load of around 4108 N.

In our study, the most common mode of injury was Road Traffic Accident followed by Sports injuries & Fall. No significant difference was observed regarding the

mean age of patients between both groups (39.24 ± 10.74 Vs 38.78 ± 11.56 years; $p = > 0.05$) whereas that of Johma et al.⁶, D Choudhary et al.⁷, Railey et al.⁸, Mahir et al.⁹ and Kumar et al.¹⁰ was 26, 27, 33, 24 and 27 years of age

respectively. 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.^{11,12} A study conducted by Dawood et al.¹³ reported no female patient out of 50 enrolled patients.

In the present study, RTA was the most common etiology of injury in both groups. A study by Jeong et al.¹⁴ reported sports injury was the most frequent cause of injury in 47% of patients followed by falling, fight, and RTA.

According to the outcomes score at 1-year and final follow-up, we found no significant difference between

either groups regarding the Lysholm score and IKDC score. However, a significant difference was observed in the preoperative score and at 1-year follow-up with a p -value < 0.05 in both groups. These results were similar to some previous studies in which no significant difference was reported between either procedures regarding Lysholm score, IKDC, and Tegner level with p -value > 0.05 . However, a comparison of pre to postoperative both techniques showed a significant difference p -value < 0.05 .^{15,16}

In our study, we found no significant difference in terms of range of motion and patient 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 ($p > 0.05$).

These results were comparable to international literature.¹⁷

There was no significant patellofemoral pain noticed in the patients in our study. This is similar to the study by Railey et al.⁸ who did not observe any clinically relevant patellofemoral pain in patients in whom arthroscopic ACL reconstruction using hamstring graft was done.

CONCLUSION

We concluded that both techniques, patellar tendon and hamstring 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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