Original Article

Arthroscopic anterior cruciate ligament reconstruction: comparison between hamstring graft versus patellar bone tendon bone graft

Rounat Jadhav[1], Sanjay Patil[2*], Amit Mahajan[3]

Department of Orthopaedics, Bharati Hospital, Pune – 411043 Maharashtra, INDIA.
Email: sanjaypatil67@hotmail.com

Abstract

Background: Anterior cruciate ligament (ACL) tear is the most common serious ligamentous injury to the knee joint. The ACL is the primary stabilizer against anterior translation of the tibia on the femur and is important in counteracting rotation and valgus stress. The goals of the ACL reconstruction are to restore stability to the knee; allow the patient to return to normal activities, including sports; and to delay the onset of osteoarthritis with associated recurrent injuries to the articular cartilage and loss of meniscal functions. The bone-patellar tendon-bone graft and the hamstring tendon graft are the two most commonly used autografts for reconstruction. **Objectives:** This study is to compare the results of arthroscopically assisted ACL Reconstruction using Bone-Patellar-Bone and Hamstring grafts in young individuals. **Methods:** During a period of 3 years of study 40 cases of adult patients with ACL tear were operated and surgical outcomes of Arthroscopically assisted ACL Reconstruction using Bone-Patellar-Bone and Hamstring grafts were compared according to IKDC Scoring method. In all the above test the. "p" value of less than 0.05 was accepted as indicating statistical significance. **Results:** Results of our study clearly showed that both bone-patellar tendon-bone and hamstring tendon grafts could effectively improve knee stability and functions after anterior cruciate ligament reconstructionin long run. At follow-up evaluation, both groups had similar subjective outcomes but patellar-bone-tendon-bone graft provided early stability allowing patients return to activity with some graft site morbidity.
Keywords: Arthroscopic anterior cruciate ligament

[*]**Address for Correspondence:**
Dr. Sanjay Patil, Department of Orthopaedics, Bharati Hospital, Pune – 411043 Maharashtra, INDIA.
Email: sanjaypatil67@hotmail.com
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INTRODUCTION

Anterior cruciate ligament (ACL) tear is the most common serious ligamentous injury to the knee joint[1,2]. ACL deficiency leads to knee instability. This results in recurrent injuries and increased risk of intra-articular damage, especially the meniscus[3,4]. The goals of the ACL reconstruction are to restore stability to the knee; allow the patient to return to normal activities, including sports; and to delay the onset of osteoarthritis with associated recurrent injuries to the articular cartilage and loss of meniscal functions[5,6,7]. The patellar-bone-tendon-bone graft and the hamstring tendon graft are the two most commonly used autografts for reconstruction. This study is to compare the results of arthroscopically assisted ACL Reconstruction using Patellar-Bone-Tendon-Bone and Semitendinosus grafts. Despite an abundance of literature on ACL reconstruction and its outcome, there is little data directly comparing hamstring tendon autograft and patellar tendon autograft to aid the patient and surgeon in selecting the appropriate graft[8]. There is little or no difference between patellar-bone- tendon-bone and combined semitendinosus and gracilis hamstring tendon grafts in terms of the functional outcome after ACL reconstruction, despite greater laxity measurements in the hamstring tendon group patients. This suggests that operating surgeon must decide how to select the appropriate graft for an individual patient[9]. Graft choice, Surgeon experience, correct graft position, choice the

graft fixation, and postoperative rehabilitation confound the results of comparison of ACL reconstruction. Stiffness and strength tend to be slightly better with bone–patellar tendon–bone, but overall results are comparable[10]. The purpose of this study is determine which of the 2 grafts is suitable and gives better functional outcome in younger individuals requiring early return to jobs specially with high demands of knee involving activites. The patellar-bone-tendon-bone autograft has been widely accepted as the gold standard for ACL reconstruction with a high success rate[11-14]. However, donor site morbidities and extensor mechanism problems associated with the use of the bone-patellar tendon-bone have led to increasing popularity of the hamstring tendon graft which had advantages of low donor site morbidities, avoidance of extensor mechanism problems and better look cosmetically.

MATERIALS AND METHODS

A comparative prospective study conducted at Orthopedics Department of Bharati Hospital, Pune where 40 Patients with ACL tear between the age of 20 to 50 years were chosen in the study divided into 2 groups. Duration of study was 3 years. One group underwent arthroscopic ACL reconstruction with Hamstring graft (STG group) and the other group had Patellar-Bone-Tendon-Bone graft (pBTB Group).

Inclusion Criteria

- Patients diagnosed with ACL tear
- Patients having high demand of knee bending and pivoting activity
- Patients expecting to return to their high level athletic activity
- Patients with recurrent episodes of knee instability opting for surgical management and not conservative

Exclusion Criteria

- Patients of more than 40 years of age diagnosed with ACL tear
- Patients diagnosed with ACL tear associated with Proximal third tibia and Distal third femur fractures
- Patients diagnosed with ACL tear associated with degenerative conditions of knee joint
- Patients diagnosed with old ACL tear (more than 1year)

Patients with demands of returning to daily activities early specially requiring pivoting of knee and athletic activities were chosen in pBTB Group, at the sametime those of slightly older age (more than 35years) with demands of excessive knee bending activities were avoided in this Group. The anterior cruciate ligament reconstruction was done arthroscopicy assisted trans-portal (anatomical) technique of graft fixation. The hamstring tendons were harvested through a small longitudinal anteromedial incision over the pes anserinus insertion. The graft was then prepared for a quadrupled semitendinosus construct using the Acufex Graft Master Table. The bone-patellar-tendon-bone autograft was harvested via a longitudinal incision (usually 4-5 cm in length) over the patellar tendon, 1cm chunk of bone from patella and tibial tuberosity was harvested along with similar width of patella tendon. The graft was prepared into a bone-patellar-tendon-bone construct with the leading suture on the patellar side. The portals used for arthroscopy included the superomedial portal for gravitational inflow canula, high inferolateral for arthroscope and inferomedial for instruments. The notch was prepared using a curette and motorized shaver until the over the-top position and femoral ACL footprint were clearly demonstrated. The tibial stump was cleaned leaving a short amount of stump for reference and covering the graft. The tibial guide pin was inserted to the posterior half of the remnant using the Acufex-elbow-tipped tibial guide and tibial tunnel reamed according to the size of the graft. With the knee flexed at 90 degrees, a guide pin was passed through the tibial tunnel to the femoral tunnel position. The femoral tunnel was reamed according to the size of the graft. Using a suture passing pin, the graft was passed through the tibial tunnel into the femoral tunnel and the suture passing pin passing out distal to the anterolateral skin of the thigh. The fixation method for patellar tendon graft was a cannulated interference screw usually 7 x 25 mm. The femoral site was fixed at 120 degrees knee flexion with the screw guide pin passed through the inferomedial portal. After femoral fixation, tension was applied to the tibial bone block suture and the knee passed through several cycles of flexion-extension to pretension the graft. The tibial site was fixed at 20 degrees knee flexion. Cannulated interference screws were used to fix the grafts at femoral and tibial ends. The knee was placed in a compressive dressing and hinge knee brace locked in full extension post-operatively. The knee brace was unlocked to allow 0-90 degrees knee motion on the second or third postoperative day. Weight bearing as tolerated was allowed with axillary crutches but delayed in patients with concomitant meniscal repair. Full weight bearing without support was allowed as soon as the patients were comfortable. The usual clinical follow-up included review at 10-14 days for wound inspection and suture removal, the brace set to 0-120 degrees at 4 weeks and removed at 6 weeks. Wall sliding semi-squats were allowed as early as possible. Bicycling was allowed at 2-3 months and general strengthening exercises continued. Returning to sports involving jumping, pivoting or side-stepping was

prohibited until 9 months post-operatively but with variable patient compliance. All patients were evaluated under IKDC subjective assessment by operating surgeon twice at intervals of 1 and 2 years post-surgery. Points of assessment were knee effusion, lack of knee flexion and extension (passive motion defect, knee instability(anterior drawer test, lachmans test)graft harvest site morbidity, compartment findings Ligamentous laxity was graded as 1+ (0-2 mm), 2+ (3-5 mm), 3+ (6-9mm), 4+ (>10mm). A single legged hop for distance was used for functional testing. The test was performed three times and averaged.

RESULTS

75% of patients were able to strenuous activities like heavy physical work in pBTB group compared to 50% in Hamstring group two years after surgery. 4 patients in each group had knee effusion in both groups after 1 year of surgery which was absent after 2 years. 6 patients in pBTB group and 2 in STG group had extensor lag in the range 6-10 degrees 2 years after the surgery. 2 patients in pBTB group and 4 in STG group had lack of flexion in the range 6-15 degrees. 1 patient in pBTB group and 2 in STG group had ACL laxity in the range 3-5 degrees at end of 2 years as measured by arthrometer**.** 6 patients of pBTB group had patella-femoral pain at the end of one year, but none of STG group after 2 years after surgery. None had sensory loss over infrapatellar area. 18 patients of pBTB group and 15 of STG group were able to do 90% and more single leg functional hop test 2 years after surgery.

DISCUSSION

The mean age in PTB graft people is 29 years and in STG graft is 36 years. Majority were males 32, and 8 were females. Manual Lachman and anterior drawer's tests were used for stability testings and pBTB group patients had no laxity and relatively more stable knee compared to STG group at end of 1 year. Stable knee allowed pBTB group patients to get to their routine work earlier. Results of our study clearly showed that both patellar-bone-tendon-bone and hamstring tendon grafts could effectively improve knee stability and functions after ACL reconstruction at the end of 2 years. At follow-up evaluation after 2 years, both groups had similar subjective outcome but pBTB had more graft site mobidity. According to statistical tests and analysis "p" value of less than 0.05 was accepted as indicating statistical significance In a similar study, Corry, *et al* found that the two grafts did not differ in terms of clinical stability, range of motion and general symptoms[13]. The hamstring tendon group also had a lower graft harvest site morbidity[14,15]. In the study of arthroscopic ACL reconstruction with BTB graft, Akgun, *et al* found that the best results could be obtained if the reconstruction was done in the subacute period between 3-5 weeks post-injury[16] as done in 32 of our patients. The patients in the pBTB group had more desire to return to sports activity or higher functional demand than in the hamstring group, therefore higher expectation. Donor site morbidity is a major drawback of the patellar bone-tendon-bone graft. All patients in the pBTB group of the present study had experienced a disturbance of anterior knee sensation which continued for a period of time although it returned to normal within one year of the follow-up. In contrast, there was no sensory disturbance in the hamstring group. There have been many prospective randomized control studies comparing the two groups published in recent years. Results from these studies showed that the two groups had similar outcomes at the 2-5 year period[17,18]. On the contrary, with similar prospective randomized comparisons, Beynnon, *et al* found that after three years of follow-up, the objective results of anterior cruciate ligament reconstruction with a patellar-bone- tendon-bone graft were superior to those of reconstruction with a two-strand semitendinosus-gracillis tendon graft with regard to knee laxity, pivot shift grade, and strengths of the knee flexor muscle[19]. However, the two groups had comparable results in terms of patient satisfaction, activity level, and knee functions. Results from our study and these prospective randomized studies were still conflicting but there was a trend toward similar outcomes. In 2001, Yunes, *et al* were the first to report a meta-analysis conducted from controlled trials of patellar tendon versus hamstring tendons for ACL reconstruction[20]. They found that the patellar tendon patients had a greater chance of attaining a statically stable knee and nearly a 20% greater chance of returning to preinjury activity levels. They concluded that although both techniques yielded good results, patellar tendon reconstruction led to higher postoperative activity levels and greater static stability than hamstring reconstruction.

CONCLUSION

The outcome for patients in this study undergoing ACL reconstruction with a hamstring tendon graft did not differ from that of patients with a patellar tendon graft in terms of clinical stability, range of motion, and general symptoms in the long run. Either of grafts is suitable for young individuals but pBTB graft gives relatively more stable knee within first year of surgery allowing early return to pre-injury activities. The hamstring tendon group also had lower graft harvest site morbidity, as demonstrated by less kneeling pain at 1 and 2 years.

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