Morbidities Following Anterior Cruciate Ligament Reconstruction Using Semitendinosis-Gracilis Autograft

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Citation

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Abstract

Aims and objectives: To evaluate the performance of ST-G graft in ACL reconstruction and to study the associated morbidities in short term follow-up. Evaluation of hamstring strength following use of semitendinosus and gracilis graft to reconstruct ACL was also done.Methodology: The prospective study was done in a tertiary care center involving subjects with clinically confirmed ACL rupture who underwent ACL reconstruction with semitendinosus and gracilis quadruple graft with distal titanium endobuters and tractopexy proximally (ST-G Graft) during the study period. Post-operatively, the muscle strength was assessed at 2nd, 4th and 6th post-operative months. Results: The average flexion of the knee at first and third month of follow-up was 44.5 (range: 10-90) and 115 (range: 90-140) respectively. The mean power at 3rd month was 4.7 kg (range: 4kg-6kg).Conclusion: In the series of evaluation of hamstring strength following ST-G graft to reconstruct ACL, we found that most of the study subjects had regained hamstring strength by 3rd post-op month.

INTRODUCTION

Rupture of the ACL of knee affects over 175,000 patients a year worldwide.[1] It impairs the stability of the knee, resulting in difficulty with athletic performance. There is also an increased risk of meniscal injury and oateosarthritis if ACL tear is left untreated.[2] The ACL has a poor capacity of healing compared to other ligaments such as medial collateral ligament, even with suture repair. Therefore, suture repair of the ligament is obsolete nowadays and almost universal treatment is by reconstruction.[3] There are various grafts evaluated for ACL reconstruction purpose, of which Semitendinosus gracilis has been found to be most efficient. However, even with this technique, significant problems have been reported. Associated morbidities with harvesting the graft in short term to premature degeneration of the joint in long term have been reported from various studies worlwide.[4] However, Studies evaluating the efficiency of ST-G graft for ACL reconstruction in India are limited.

The aim of the present study was to evaluate the performance of ST-G graft in ACL reconstruction and to study the associated morbidities in short term follow-up. Evaluation of hamstring strength following use of semitendinosus and gracilis graft to reconstruct ACL was also done.

METHODOLOGY

This prospective observational study was conducted in Kamineni Hospital, Hyderabad from November 2004 to May 2005. The study included subjects with clinically confirmed ACL rupture who underwent ACL reconstruction with semitendinosus and gracilis quadruple graft with distal titanium endobuters and tractopexy proximally (ST-G Graft) during the study period. The inclusion criteria were 1) clinically confirmed ACL rupture; 2) No pervious ligament reconstruction done; 3) Healthy contra lateral knee; 4) No diagnosis of re-injury during the follow-up period.

SURGICAL TECHNIQUE

All surgeries were performed by the same surgeon. Hence the technique, graft placement, graft fixation and rehabilitation were similar in all the study subjects.

With pre-operative antibiotics given, the patient was placed in supine position. Under regional/general anesthesia, and tourniquet control, the lower limb is painted and draped. The knee is flexed towards the opposite leg. About 3 to 4 cm long antero-medial incision was taken over the pes anserinus insertion and semitendinosis and gracialis tendons were identified and were harvested using metal tendon stripers. The four strand graft of sufficient length was prepared using ethibond. The diameter of the graft measured using gauges.

Arthroscopy of the knee was carried out to locate the isometric tibial and femoral points keeping the knee in 90 of flexion. The tibial isometric point is anterior and medial to anatomic site of tibial attachment of ACL. Guide wire was passed through this point with help of ACL jig so that guide wire passes from the anteromedial incision 2 to 3 cm from articular surface of the tibia at an angle of 45 and 1 to 1.5 cms medial to tibial - tuberosity.

Under arthroscopic guidance the guide wire was passed through the femoral isometric point at same angle of knee flexion which is at anterior and superior to anatomic femoral attachment of ACL and advanced through the femoral condyle and skin and 2 cm incision made on - the anterolateral aspect of thigh. The final graft length required was measured using depth gauge and graft is prepared for the same length.

Both the tunnels were drilled over the guide wire to match diameter of the graft by increasing size drill bits. The knee is washed to clear the debris with normal saline. The graft is passed through the tibial tunnel and brought out through the femoral tunnel. The graft was fixed proximally by tractopexy using iliotibial band and distally with titanium endobutton. The iliotibial band also provided the advantage of extra-articular reconstruction to negate the pivot shift phenomenon. The wounds were closed in layers and compression bandage was applied.

REHABILITATION

The knee is immobilized in ACL brace and put on ACL rehabilitation program. The study subjects underwent 3-6 weeks of rehabilitation program to develop sufficient muscle mass and strength. ACL was reconstructed with quadruple ST-G graft, after which the patient was immobilized in brace. After one week of immobilization, the study subjects were put on ACL reconstruction program. These patients were discharged after suture removal and asked to follow-up regularly with physiotherapy. In these regular follow-up, the patients were checked for hamstring and quadriceps muscle strength, range of movements and other tests mentioned in the program protocol.

ASSESSMENT AND EVALUATION

Initial assessment of the study subjects included testing the strength of hamstring muscles pre-operatively in comparison with contra lateral limb. The assessment included testing the strength of knee flexors and extensors. Anterior drawer test, Lachmann test and pivot shift test were done to test the stability of knee. X-ray of the knee was done to rule out any bony injuries. MRI was done to rule out any other associated injury such as medial or lateral collateral ligaments, meniscal injury or posterior cruciate ligament injuries. Post-operatively, the muscle strength was assessed at 2^{nd}, 4^{th} and 6^{th} post-operative months.

RESULTS

Total 20 patients were included in the study of which 19 were males and one subject was female. The mean age of the study group was 24.35 years (range: 18-34 years). Of the twenty subjects, 12 had left ACL reconstruction and 8 had undergone right ACL reconstruction.

Range of motion- The average flexion of the knee at first and third month of follow-up was 44.5 (range: 10-90) and 115 (range: 90-140) respectively. We were able to follow-up only two of the study subjects at 6^{th} post-op month. The range of motion for these two subjects was 130 and 140 respectively.

Power evaluation- The study subjects were evaluated for power at 3^{rd} and 6^{th} post-op months. The mean power at 3^{rd} month was 4.7 kg (range: 4kg-6kg). The two subjects followed up at 6^{th} month had power of 6kg and 8kg respectively.

DISCUSSION

Arthroscopic assisted intra-articular reconstruction with or without extra-articular reconstruction is the treatment of choice of ACL reconstruction. Surgical reconstruction of the ACL involves various technical factors such as graft selection, positioning, fixation, tensioning and avoidance of stress risers. Three basic types of materials are available for intra-articular reconstruction-autograft, allograft and prosthetic ligament. Allograft tissue carries the risk of disease transmission and delayed biologic incorporation. With high cost and limited availability of prosthetic grafts, autograft stay the most opted graft for ACL reconstruction. However, significant problems do arise even in this procedure. The morbidities associated with graft harvest are donor site pain, hamstring weakness and saphenous nerve damage.[5]

The various autograft materials available are bone patellar tendon bone graft, double looped semitendinosus tendon graft, cigarette rolled fascia lata graft, combined semitendinosis and iliotibial band and combined semitendinosus and gracilis tendon graft.[6] In the present

study, we evaluated the use of ST-G in ACL reconstruction and the morbidities associated with the technique.

The most common complication reported with ST-G graft is hamstring weakness. Various studies worldwide have shown that although there is decreased hamstring strength initially, there was not much difference in the strength index of hamstrings at 2 years of follow up.[5, 7] Some studies have reported almost complete recovery of strength with 9 to 12 months of post-operative period with aggressive physiotherapy.[8, 9] Similarly in the present study, we found that most of the study subjects had regained hamstring strength by third post-op month.

Some studies have reported moderate anterior knee pain with ST-G reconstruction. Soon et al postulated that early achievement of extension and quadriceps strengthening is responsible this anterior knee pain.[5] However none of our patients had this complaint.

The morbidity studied in the present study was sensory changes. A study done by Spicer et al reported sensory changes in the front of knee in 50% of the operated patients, of which 86% had sensory deficit in infra-genicular region. Injury to this nerve can occur during skin incision, tendon exposure, tibial drilling, during tendon dissection or during passage of the tendon stripper.[10] In the present study, none of the subjects complained any sensory deficit post-operatively. Strict adherence to the surgical technique prevents this complication.

CONCLUSION

In the series of evaluation of hamstring strength following ST-G graft to reconstruct ACL, we found that most of the study subjects had regained hamstring strength by 3rd post-op month. There were no other morbidities reported during the follow-up.

LIMITATION

Hamstring muscle strength was assessed only manually in the present study. A detailed assessment using ENMG, torque measurement by isokinetic testing and cybex II testing would help in a more accurate hamstring strength assessment.

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