FUNCTIONAL RESULTS OF ISOLATED ACL INJURIES TREATED WITH ENDOSCOPIC HAMSTRING AUTOGRRAFT: OUR EXPERIENCE
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ABSTRACT: BACKGROUND/AIM: ACL repair using Hamstring tendon autograft is very well known. Our study aims to find the outcome of ACL injuries treated in our unit arthroscopically with anatomic 4 strand hamstring autograft fixed with RCI screw. SETTINGS AND DESIGN: Prospective/case series. MATERIALS AND METHODS: First 20 patients out of 88 cases (operated between 2008 and 2010) were taken for the study. Patients with isolated ACL injuries were included. Patients with bony ACL avulsion/other associated fractures/ ligamentous / meniscal injuries were excluded from our study. The final outcome was done using IKDC subjective scoring and Lysholm knee scoring systems at the end of 24 months of follow up. The preferred method of fixation was RCI screw as it provides aperture fixation. STATISTICAL ANALYSIS: Kruskaal wall is test, linear regression. RESULTS: In our study groups of 20 cases of Arthroscopic ACL reconstruction, Majority of the patients (12 cases) were in the age group between 21-30 years - indicates that young and active people were most often involved. Males were injured more commonly than females. Sports injuries were the common cause of ACL injury closely followed by RTA. Right knee was found to be involved more than Left. CONCLUSION: ACL reconstruction by using four strand hamstring tendon autograft is highly successful with very few complications when proper graft, harvest preparation and anatomical tunnel placement and secure fixation are achieved.

KEYWORDS: Knee injuries, ACL tear, Hamstring autograft, Arthroscopic repair.

INTRODUCTION: Current concept of ACL reconstruction is Transportal anatomical technique.¹ There is a new found interest in some centers doing double bundle reconstruction, particularly in sports injuries which is much more technically demanding. With technical advancement in computer-assisted navigation and fluoroscopic placement of tunnels, results have improved in a great way. In our prospective study of 20 cases of ACL Reconstruction with Arthroscopic four strand Hamstring autograft we have assessed the functional outcome of the cases using Lysholm knee score7 & IKDC subjective knee evaluation score. The aim of this study was to assess the functional outcome of the procedure done with aperture fixation.

MATERIALS AND METHODS: A prospective study of isolated anterior cruciate ligament injuries treated arthroscopically with four strand hamstring autograft in our institute was initiated. Cases operated between November 2008 and October 2010 was taken for the study. Patients with clinically Lachman test/ anterior drawers test/ pivot shift test positive for ACL rupture were included in our study and confirmed with MRI. Patients with bony ACL avulsion, other associated
fractures or ligamentous/meniscal injuries, previous history of intra- or extra-articular ligament surgery in the involved knee, bilateral ACL injuries, and revision ACL reconstruction were excluded. A total of 88 patients were screened and out of which first 20 were included in this study. In our study of 20 patients, 19 were males and one was a female. The mode of injury was RTA in 8 cases (40%), sports injuries in 10 cases (50%) and other modes in 2 cases (10%).

Operative Procedure: All our patients had spinal anesthesia and positioned supine with thigh and foot supports with tourniquet in place. Diagnostic scopy was performed first and subsequently hamstring graft including semi Tendinosus and Gracilis were harvested and prepared with tibial attachment in situ using no: 5 ethibond. Remaining ACL fibers are debrided and tibial foot print outline is left to help with tibial tunnel placement. Lateral wall and roof preparation done for intercondylar notch and is cleared off all debris. The femoral tunnel is made first in the anatomic footprint using a 4.5 mm drill bit with free hand technique with knee in 120 deg of flexion. Subsequently femoral tunnel was dilated to appropriate graft size up to initial 25 mm. The Tibial tunnel is made with the Director Guide –Elbow Aimer. ACL Tibial guide is inserted through Antero medial portal and its tip placed on the tibial foot print of ACL.ACL Tibial Guide is placed over ACL footprint that is on upslope of tibial spine just lateral to edge of articular surface of medial tibial plateau, the angle of the guide being 55. Beath pin was passed into the femoral tunnel and no: 1 pds suture was used to pull the graft in. Femoral fixation is done by interference screw of size 7 by 30 mm regardless of the size of the graft. However a reverse thread RCI screw was used for the right knee and standard RCI screw for the left knee. The knee is hyper flexed to allow parallel placement of screw to the graft by an anti-rotation guide wire and interference screw at anterior interface of Tibial tunnel. The knee is cycled through a full range of motion for about 20 times (Tensioning). The knee is then brought to full extension; maximal manual tension is applied to tibial tunnel and after adequate tensioning in full extension tibia was fixed with standard RCI screw regardless of the side. Wound closed in layers.

POST OP PROTOCOL: No Knee immobilizer was used. The patient was encouraged to maintain extension as possible and continue static Quadriceps exercises. Patients were mobilized with full weight bearing with elbow crutches the next day and advised to use crutches for a week only. Strengthening exercises of the quadriceps femoris and the hamstrings were initiated after the 1st post-operative day. Closed chain kinetic exercises were initiated after the 1st post-operative day and were continued for 12 weeks. Open chain exercises started after the 12th week. Return to sports allowed at the end of 12 months.

RESULTS: Of the 20 patients who underwent surgery, all except one were males. All patients belonged to the economically productive age group (Mean age: 29.5 years, SD: 7.6). 50% of the patients (n=10) had suffered a sports injury which led to the ligament tear, while 40% had suffered a RTA.

The mean time interval between the injury and undergoing the surgery was 6.4 months. This ranged between 1 month and 2 years in the group that underwent surgery.
Before the surgery, 11 of the patients (55%) had poor Lysholm grades (< 65), while only one was classified as good (> 83 to 90). No statistically significant relationships were noted between the pre-op grades and mode of injury (\( p = 0.903, \chi^2 \text{ statistic} = 0.205, \text{Kruskaal Wallis test}\))

Patients were followed up after a mean time interval of 15.3 months (SD: 3.7). The follow up period ranged between 10 months and 22 months. After the surgery, 50% (n=10) had excellent Lysholm grades (> 90), 25% (n=5) had good grades (83 to 90) and only 2 patients had poor grades. The mean IKDC score was 88.8 (SD=7.6) after the surgery.

No statistically significant relationships were noted between the post-op grades and mode of injury (\( p = 0.501, \chi^2 \text{ statistic} = 1.384, \text{Kruskaal Wallis test}\). The post-op and pre-op Lysholm scores were found to have a moderately strong positive correlation (Pearson’s \( r = 0.48, p = 0.031 \)), while IKDC and pre-op scores also had a moderately strong positive correlation (Pearson’s \( r = 0.69, p = 0.031 \)).

Of the 11 patients who had a poor pre-op Lysholm score, only 2 had reported poor scores after the surgery (18.2%) while 5 reported as excellent (45.5%). Eight patients had reported fair Lysholm scores before surgery and 4 of them (50%) had excellent scores after the surgery while 3 (37.5%) reported good scores. This pattern of transformation in pre-op and post-op scores was found to be statistically significant (\( p < 0.001, \chi^2 \text{ statistic} < 0.005, \text{Friedman test}\)).

In a linear regression model incorporating age of the patient, time interval between injury and surgery and the pre-op Lysholm score as the predictors and post-op Lysholm score as the dependent variable, only the pre-op scores had a statistically significant relationship (\( B=0.417, (p=0.018) \). For every 1 point increase in the pre-op score, this model explained about 30% of the variability in the post-op scores. A similar relationship was found between pre-op Lysholm score and IKDC score was found in a linear regression model with the same predictors (\( B = 0.294, p = 0.003 \)).

**DISCUSSION:** Over the past several decades, development in arthroscopic techniques and improvements in research have allowed ACL reconstruction to become one of the most successful surgeries in sports medicine.

Our study of Arthroscopic anatomic ACL Reconstruction (which is preferred over transtibial method) resulted in smaller amount of blood loss and better ROM at least during the first three months.

Our knee scoring system “the Lysholm Knee score” has been accepted as the standard scoring by various studies and the efficacy of its constituents are shown by Boden moyar et al\(^{11}\) in their 26 months follow-up study.

Our method of aperture fixation has provided excellent initial fixation strength. Yoshiiya et al, showed that cyclical movements of passive flexion and extension produced a local elongation of the graft before final fixation.

The use of the patellar bone tendon for the reconstruction of ACL has shown very good results. The drawbacks that were noticed at the donor site led to the extensive use of hamstrings tendons for ACL reconstruction during the last decade. The maximum load to failure of the native anterior cruciate ligament varies between 1750-2160 N, whereas that of the patellar tendon graft...
is 2646 N approximately and of the four stranded Hamstrings graft, between 3560-4108 N, which makes the hamstrings approximately 206-238% stronger than the native ACL.

A normal ACL has an average width of 10 mm and a cross sectional area of 55 sq.mm. The BPTB has an average width of 10mm and a cross sectional area of 32 sq.mm and the Hamstrings of 8mm diameter, 53 sq.mm respectively, which makes the hamstrings nearly identical to the normal anterior cruciate ligament.\textsuperscript{12,13} The hamstring autograft and rehabilitation protocol were the same for all patients. Out of 20 cases all of them had a soft end point in pre op lachman when compared to 18 cases with firm end point post op and 2 cases with delayed firm end point and none of them had a soft end point post operatively.

CONCLUSION: ACL reconstruction by using four strand hamstring tendon autograft is highly successful with very few complications when proper graft, harvest preparation and anatomical tunnel placement and secure fixation are achieved.

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**Table 1: Results Cross Tab.**

| Preop Lysholm grading | Frequency | Percent |
|------------------------|-----------|---------|
| Poor                   | 11        | 55.0    |
| Fair                   | 8         | 40.0    |
| Good                   | 1         | 5.0     |
| Total                  | 20        | 100.0   |

| Postop Lysholm grading | Frequency | Percent |
|------------------------|-----------|---------|
| Poor                   | 2         | 10.0    |
| Fair                   | 3         | 15.0    |
| Good                   | 5         | 25.0    |
| Excellent              | 10        | 50.0    |
| Total                  | 20        | 100.0   |

**Preop Lysholm grading * Postop Lysholm grading Crosstabulation**

| Preop Lysholm grading | Postop Lysholm grading | Total |
|------------------------|------------------------|-------|
|                        | Poor                   | Fair  | Good | Excellent |  |
| Poor                   | 2                      | 2     | 2    | 5         | 11  |
| Fair                   | 0                      | 1     | 3    | 4         | 8   |
| Good                   | 0                      | 0     | 0    | 1         | 1   |
| Total                  | 2                      | 3     | 5    | 10        | 20  |

**Fig. 1: Pre op X-ray along with femoral notch view**
Fig. 2: Pre OP MRI

Fig. 3: Post Op X-ray with RCI screws in situ

Fig. 3: Clinical photograph showing the functional results
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