

Outcome Analysis of Anterior Cruciate Ligament Reconstruction Fixed by Varying Modalities: A Retrospective and Prospective Study.

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ABSTRACT

Background: Anterior cruciate ligament (ACL) often is injured in athletic activities, Motor vehicle accidents, fall or direct contact when sudden, severe loading or tension is placed on the ligaments, such as when a running athlete plants a foot to suddenly decelerate or change directions. Even day to day activities patient can sustain ACL injuries like stepping down from bus, fall from stairs etc. A torn ACL is less likely to restrict the movement of the knee. When ACL tear is not reconstructed it can lead to recurrent bouts of instability, damage to the meniscus & articular cartilage and may accelerate the progression of osteoarthritis for the active individual. The form of treatment is determined based on the severity of the tear of the ligament, physical condition of patients & routine activity of patient. During surgery the ACL is not repaired, instead it is reconstructed using other ligaments or tendons. There are different types of ACL reconstruction. Bone-patellar tendon-bone (BPTB) auto graft and quadrupled hamstring auto graft are the most common and preferred and tend to produce the best result. **Methods:** 64 patients were included in the study with complaints indicating towards ACL deficiency of knee joint. 60 underwent Arthroscopic ACL reconstruction by Quadrupled Hamstring tendon graft and 4 with BPTB graft. All were given common rehabilitation protocol and the results were evaluated periodically at 6 months, 9 months, 12 months and 18 months. **Results:** Out of total 64 patients, 55 patients (85.93%) were male and 9 patients (14.07%) were female with age distribution ranged from 18-45 years. 92.19% of patients were of physically active age group (18-40 years). Most of the patients were having signs and symptoms indicating towards ACL deficiency of knee of 1-5 months duration (54.68%). Most of the ACL injury was caused by road traffic accident (37.50%). Next common cause was sport activity (29.68%). The pre-operative Lysholm knee score of 64 patients ranged from 61-90. Most of the patients (43.75 %) fall in range of 71-80. The mean Lysholm knee score of patients was 69.06 points. Around 82.75% of the patients reported outcome as excellent and good with scores above 95 and 76-94 respectively according to Lysholm scoring. 10 patients (17.23 %) scored 65-75 or below and were grouped as fair outcome at follow up of 6 month or more. Complication includes Post-operative infection in 5 patients stiff knee in 4 patients, 1 patient had residual instability and femoral tunnel blow out in 2 patients. **Conclusion:** There was no significant difference in the clinical outcomes at 6 months or more follow-up between two groups of patients.

Keywords: Anterior Cruciate Ligament, Injury, Reconstruction.

INTRODUCTION

Galen of Greece (201-131 BC) was the first to name the ligaments based on their appearance of crossing over as "ligament genu cruciate". The first detailed anatomic description of the anterior

Cruciate ligament (ACL) was given by the Weber brothers in the early 19th century.^[1] They defined the two bundles of the ACL and showed different tension patterns in the separate bundles at different knee flexion angles. They also reported the basis of the anterior drawer sign and showed that sectioning the ACL resulted in abnormal antero-posterior (AP) movement. Ivar Palmer from Sweden, a pioneer of ACL surgery, published his thesis: "On the injuries to the ligaments of the knee joint" in 1938. He described the ACL as consisting of two bundles and stated that anatomic reconstruction with the

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repair of both bundles separately is advantageous. In 1975, Girgis described more precisely the two bundles of the ACL; the antero-medial (AM) and postero-lateral (PL) bundles.^[2]

ACL often is injured in athletic activities such as football, skiing, hockey, gymnastics, and other sports. Motor vehicle accidents, especially those involving motorcycles, often cause ACL disruptions. ACL disruption can occur without a fall or direct contact when sudden, severe loading or tension is placed on the ligaments, such as when a running athlete plants a foot to suddenly decelerate or change directions. In traditional Indian sport like kabaddi, playing Kho-Kho, rural wrestling pivoting is more common. Even day to day activities patient can sustain ACL injuries like stepping down from bus, fall from stairs etc.

A torn ACL is less likely to restrict the movement of the knee. When ACL tear is not reconstructed it can lead to recurrent bouts of instability, damage to the meniscus & articular cartilage and may accelerate the progression of osteoarthritis for the active individual. The form of treatment is determined based on the severity of the tear of the ligament, physical condition of patients & routine activity of patient.

If the tear is severe, surgery may be necessary because the ACL cannot heal independently because there is a lack of blood supply to this ligament. Surgery is usually required among athletes because the ACL is needed in order to perform sharp movements safely and with stability. During surgery the ACL is not repaired, instead it is reconstructed using other ligaments or tendons. There are different types of ACL reconstruction.

Bone-patellar tendon-bone (BPTB) auto graft and quadrupled hamstring auto graft are the most common and preferred and tend to produce the best result. The post-operative complications when using BPTB graft includes anterior knee pain, quadriceps weakness, patellar fracture and patellar tendon rupture. The quadrupled hamstring tendon graft has higher graft strength, stiffness and cross-sectional area compared to the BPTB graft, and additionally, the extensor mechanism is intact.^[7]

The goal of the present study is to analyze the outcome of patients managed by ACL reconstruction and compare outcome of patients fixed by varying modalities.

MATERIALS AND METHODS

This was a prospective & retrospective outcome study conducted in the department of orthopaedics of GSVM Medical College during Oct. 2012 to Oct. 2014. The inclusion criteria included Patients complaining of unstable knee, Age between 18 -45 years, either sex, Active working lifestyle, Duration of injury > 3 weeks. Exclusion criteria including Patients having multiple intra articular injuries,

Patients having large osteochondral defects (>2 cm), Patients having juxta articular fractures, any other associated injury in the affected limb and Acute injury in and around knee.

Initially Patients were examined first without anesthesia and then under anesthesia to look for following

- a) Lachman test
- b) Anterior /posterior drawer test
- c) Mc murray test
- d) Valgus stress instability
- e) Varus stress instability
- f) Pivot shift test

Preanaesthetic checkup was done for surgery. 60 underwent Arthroscopic ACL reconstruction by Quadrupled Hamstring tendon graft and 4 with Bone Patellar tendon bone graft. Patient was discharged after stitch removal as per protocol and was asked to come for follow up.

Post-operatively Early mobilization of knee was done as per knee injury management protocol and ACL reconstruction rehabilitation protocol. The patient was followed up in OPD at 3 weeks, 6 weeks, 3 month, 6 month and 9 month interval to assess progress of rehabilitation. The patient was also followed up to compare the functional outcome at 6 month, 9 months, 1 year and 1½ years with preoperative condition by Lysholm Knee Score.

As per Rehabilitation program Non weight bearing range of motion exercises for 3 weeks under brace support was started. Partial weight bearing range of motion exercises for 6 weeks was started. Weight bearing exercises was started after 6 weeks. Patients were encouraged to scrub planter surface against bed after attaining 90 degree flexion at knee joint, to encourage proprioception. Stair climbing and down stair started at 3 months. Sports activity was started at 6 to 9 months depending upon recovery of the patient.

Statistical Analysis

All statistical analyses were performed using SPSS 16.0 for windows. Data was expressed as either mean and standard deviation or numbers and percentages. The monitored and calculated parameters were analyzed using unpaired t test for comparison between two groups and paired t test for comparison between pre-operative and post-operative outcomes. P value<0.05 was statistically "Significant"

RESULTS

Out of total 64 patients, there were 55 patients (85.93%) were male and 9 patients (14.07%) were female (Male Predominance) (figure.1). The age of the patients ranged from 18-45 years. The youngest patient was of 18 years and the oldest one of 45

years of age. Most of the patients were of 18-30 years. 92.19% of patients were of physically active age group (18-40 years). It may be because of the involvement of males in outdoor activity like sports, farming and road traffic accident. [Figure 2].

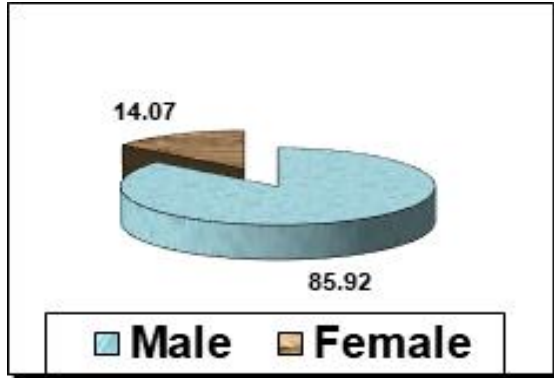


Figure 1: chart showing sex incidence.

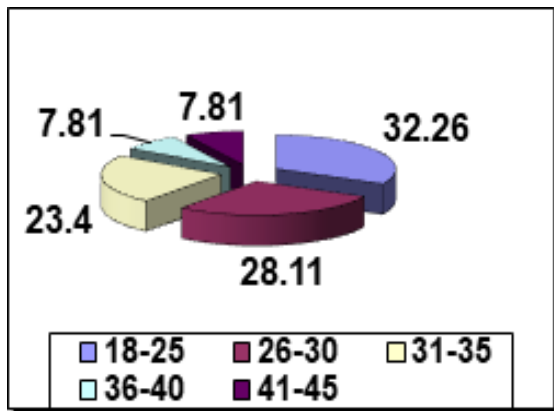


Figure 2: chart showing age incidence.

Out of 64 patients, 36 patients had right knee involvement and 28 patients had that of left knee [Figure 3].

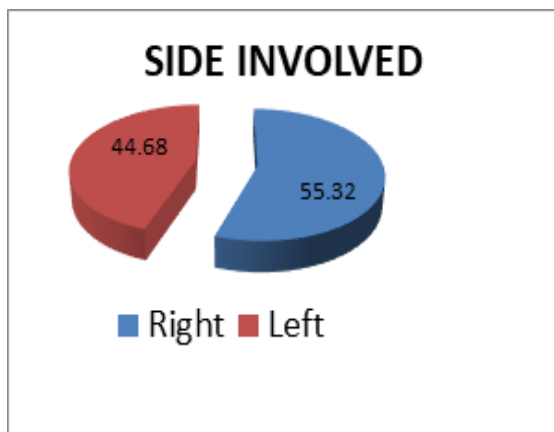


Figure 3: Chart showing incidence of side of limb involvement.

Most of the patients in our study were having signs and symptoms indicating towards ACL deficiency of knee of 1-5 months duration (54.68%) [Table 1].

Table 1: Incidence of duration of admission after injury.

Duration	No. Of Cases	Percentage
1-5 months	35	54.68%
6-10 months	10	15.62%
11-15 months	7	10.93%
16-20 months	4	6.25%
21-25 months	6	9.37%
26-30 months	2	3.12%
TOTAL	64	100%

Most of the ACL injury was caused by road traffic accident (37.50%). Next common cause was sport activity (29.68%) like football, kabbadi, and athletics. Some patients got injured while doing daily activities like slip on ground, fall from height [Figure 4].

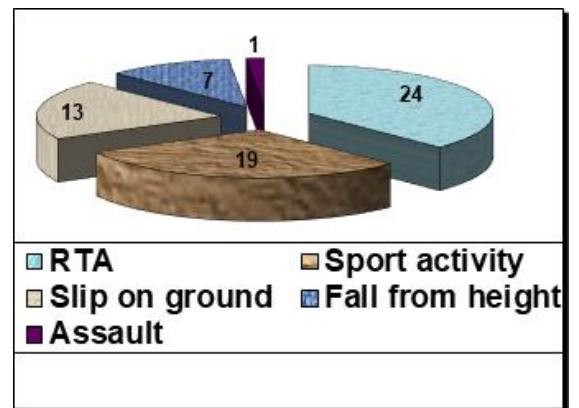


Figure 4: Chart showing incidence of type of injury.

The pre-operative Lysholm knee score [Table 2] of 64 patients ranged from 61-90. Most of the patients (43.75 %) fall in range of 71-80. The mean Lysholm knee score of patients was 69.06 points. Around 82.75% of the patients reported outcome as excellent and good with scores above 95 and 76-94 respectively according to Lysholm scoring [Table 3]. 10 patients (17.23 %) scored 65-75 or below and were grouped as fair outcome. At follow up of 6 month or more.

Table 2: The pre-operative Lysholm knee score

Lysholm knee score	No. Of patients	%
<60	0	0
61-70	23	35.93
71-80	28	43.75
81-90	13	20.31
91-100	0	0
TOTAL	64	100

In this study, 6 months follow up of 58 patients, who were managed by arthroscopic ACL reconstruction by quadrupled hamstring tendon graft, 6 patients had pain. Post-operative infection

was seen in 5 patients. Knee joint arthrotomy and proper irrigation was done in 1 patient and another 4 was treated with proper antibiotic coverage. 4 patients had stiff knee and 1 patient had residual instability [Table 4]. Another complication femoral tunnel blow out was seen in 2 patient were was lost to follow up.

Table 3: The post-operative Lysholm knee score

	No. Of patients	%
Excellent (≥95)	16	27.58
Good (76-94)	32	55.17
Fair (65-75)	8	13.79
Poor (≤64)	2	3.44
Total	58	100

Table 4: Incidence of complication occurring in the study.

Complication	No. Of Patients
Stiff Knee	4
Pain	6
Infection	5
Instability	1
Femoral Tunnel Blow Out	2

In above study we have done comparison between two groups of patients of ACL reconstruction by quadrupled hamstring graft one fixed by interference screw both side and other by interference screw and endobutton. The difference between mean Lysholm score of two groups are statistically insignificant at $t = 0.009, p > 0.05$.

DISCUSSION

Surgical reconstruction has become the standard of care in the treatment of anterior cruciate ligament injury. The primary goal of the reconstruction is to restore the stability to the knee and thereby, presumably to restore its function and allow the patient to return to normal activities, including sports. Another goal is to prevent early degenerative changes.^[8]

The application of knee arthroscopy to patient care has steadily expanded over the past two decades. Arthroscopically assisted techniques for ACL reconstruction are well established now a day. The recovery and rehabilitation following these procedures has also been shortened.^[9]

The major goal of surgical ACL reconstruction is the restoration of normal knee kinematics.^[10] Bone patellar tendon autograft and quadrupled hamstring tendon autograft are being used for arthroscopic ACL reconstruction now a days. At present time hamstring tendon autograft is the best choice for ACL reconstruction.^[11]

In the present study of 64 patients, 55 were males and 9 were females. This male predominance may be due to the fact that they are more involved in outdoor and sports activity in our scenario. Road traffic accident (37.50%) and sports activity (29.68%) were the two common cause of injury.

Among the sport activity, cricket and football were most common. Other patients gave the history of injury doing daily activities like slip on ground and fall from height. William G Clancy, Jr Devon A. Nelson, Bruce Reider and Rajesh G Narechania (1982) had 50 patients in their study, 88% of their cases the mode of injury was sports especially football, as popular in western world, contrary to our study.^[12]

Li et al.^[13] conducted a study on 25 patients with ACL deficiency and treated with arthroscopy, ranging in age from 17-43 years with an average of 25.8 years. There were 17 patients (68%) caused by sports injury, 24% patients caused by accidental falling and 8% patients caused by traffic injury. In our study the age of the patients ranged from 18-45 years. The youngest patient was of 18 years and the oldest one of 45 years of age. Most of the patients were of 18-30 years. 92.19% of patients were of physically active age group (18-40 years).

In our study, out of 64 patients, 36 patients (56.25%) had right knee involvement and 28 patients (43.25%) had that of left knee.

In our study the patient presented with ACL deficiency had duration of symptom ranged from 1-24 months. Maximum patients in our study had sign and symptoms indicating towards ACL deficiency since 1-5 months (54.68%). The average duration of symptoms was 8.6 months. In the study of Li et al.^[13] the average duration of presenting symptoms was 3 months.

Pulate et al (2012) and Charles WP et al conducted a study from 2007 to 2009 to compare the function outcome in patients who underwent arthroscopic ACL reconstruction by transtibial and transportal techniques and the functional status was studied using Tegner Lysholm scoring.^[14] The results were analyzed using t-test and they found significant difference in the functional outcomes between the two groups, the transportal ACL reconstruction having better outcome. In our study we also studied functional status using Lysholm scoring and analyzed using t-test that concluded that anatomical medial portal ACL reconstruction having better outcome, similar to above study.

Bedi et al (2011) conducted a study to evaluate the anatomic and biomechanical outcomes of anterior cruciate ligament (ACL) reconstruction with transtibial versus anteromedial portal drilling of the femoral tunnel.^[15] They found anteromedial portal drilling of the femoral socket may allow for improved restoration of anatomy and stability with ACL reconstruction compared with conventional transtibial drilling techniques. Our study comparable to this study, that anatomical medial portal tunnelling technique has given better outcome than transtibial approach.

In our study, anterior knee pain was the most common post-operative complication seen in 6 patients. Post-operative infection was seen in 5

patients. Deep surgical site infection was seen in 1 patient in which knee joint arthrotomy and proper irrigation was done. Superficial surgical site infection was seen in 4 patients and was treated with proper antibiotic coverage. Post-operative stiff knee was seen in 4 patients out of whom 2 patients had meniscal tear in which partial meniscectomy was done simultaneously with ACL reconstruction. Post-operatively femoral tunnel blow out was seen in 2 patient in which femoral tunnel drilling was done through transportal route.

Maletis et al.^[16] conducted a study to determine the incidence of surgical site infections in large sample of patients who underwent arthroscopic ACL reconstruction and evaluated the risk of superficial and deep surgical site infection associated with graft used for reconstruction. They concluded that patients with a Hamstring autograft had higher incidence of deep surgical site infection than patients with BPTB autograft. They reported that although the overall infection rates after ACL reconstruction were low, there was an increased risk of deep infections with hamstring tendon autografts.

Struewer et al.^[17] reported that post-operative osteoarthritis was developed in about 25 percent of patients.

Ramsingh et al.^[18,19] reported an incidence of 5% of pre-tibial reaction in patients undergoing ACL reconstruction with bio-absorbable interference screw fixation for the proximal tibia.

In our study we compared outcome of patients graft fixed by in one group both side interference screw and in other one side by interference screw and other side by endobutton. We divided Lysholm knee score in 8 groups and compared each component separately but none of the above came statistically significant. The difference between mean Lysholm score of two groups are statistically insignificant at $t = 0.009$, $p > 0.05$. Fixation by both sides by endobutton cannot be done at our centre due to some cost factors.

Young et al.^[20,21] study shows that hybrid femoral fixation of DGST grafts via the Endo Button CL device and a Bio absorbable interference screw is stronger than interference screw or Endo Button CL fixation alone with respect to ultimate tensile strength, stiffness, and slippage.

CONCLUSION

In The study entitled "Outcome analysis of Anterior cruciate ligament reconstruction fixed by varying modalities a Retrospective and Prospective study There was no significant difference in the clinical outcomes at 6 months or more follow-up between two groups of patients one fixed by both side interference screw and other by one side screw and other side by endo button. Anterior knee pain was the most common post-operative complaint.

Mode of injury in maximum no. of patients was road traffic accident followed by sports injury. Limitation of our study was that it was the short period study and small number of patients in our study. Long follow up studies are required in future to know long term outcomes of this procedure.

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