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Research Article

Surgical Management of Anterior Cruciate Ligament Injuries by Arthroscopic Reconstruction Using Semitendinosus and Gracilis Tendon

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Abstract: The unprecedented growth and development in the past decade of our country saw rapid growth and urbanization resulted in change in life style of the people and also increases in the sports and other occupational related activities by the individuals. This has led to the increased accidental injuries to the knee joint, a major contributing factor to Anterior Cruciate Ligament (ACL) injury . This was a prospective study of consecutive patients with ACL injury who underwent Arthroscopic ACL reconstruction in our institution using quadrupled semitendinosus and gracilis tendon autograft. About 92% of the patients had a favorable outcome as per three scoring systems. All three scoring system had a very high correlation as evidenced by the Kendal-tau values ranging x from 0.464 to 0.923. Statistically, this was found to be highly significant (p value- 0.000 – 0.001). Using IKDC scoring, the results were normal in 14, nearly normal in 10 and abnormal 1. 4 patients (16%) presented with anterior knee pain. Sensory loss was xii noted in 3 patients (12%) at the end of 6 months following surgery. Swelling was present in 4 patients (16%).None were having any infection and FFD. Arthroscopic ACL reconstruction is performed to restore the functional stability in ACL deficient knees and restore the normal kinetics of the knee. Increasing number of ACL reconstruction surgeries have been performed and there is an increasing expectation of patients to speedy recovery and more rapid return to activities of daily living, work and study. We conclude that the functional outcome of arthroscopic anterior cruciate ligament reconstruction using quadrupled semitendinosus and gracilis tendon autograft is excellent to good (92%). With proper patient selection and physiotherapy regimen, full occupational and recreational activities can be expected for most of the patients within four to six months of the procedure.
Keywords: Anterior Cruciate Ligament Injuries, Semitendinosus and Gracilis Tendon, Arthroscopic Repair.

INTRODUCTION AND OBJECTIVES:

The unprecedented growth and development in the past decade of our country saw rapid growth and urbanization resulted in change in life style of the people and also increases in the sports and other occupational related activities by the individuals. This has led to the increased accidental injuries to the knee joint, a major contributing factor to Anterior Cruciate Ligament (ACL) injury [1].

The Anterior Cruciate Ligament is the most frequently completely disrupted ligament in the knee .Its primary function is to prevent anterior subluxation of the tibia relative to the femur and also contributes significantly to normal kinematics of the knee. If an ACL insufficiency remains untreated, meniscal tear and cartilaginous damage of the joint leading to early osteoarthritis may occur. Therefore, ACL reconstruction is generally recommended for active younger people to restore joint stability and prevent secondary arthritis several authors agree that in the young and active patients surgical reconstruction of the torn ACL is the treatment of choice, which allows the patient to return to their previous activity level. Moreover, reconstruction of a torn ACL seems to prevent meniscal and chondral secondary lesions [2].

A wide variety of techniques and graft types are now available for the reconstruction of ACL. The development of new surgical techniques and recent advances in minimally invasive arthroscopic surgeries and instrumentation has enabled surgeons to achieve better results. The use of hamstring tendon autograft has xi been perceived to have less post-operative morbidity

enabling earlier return to activities by patients. Arthroscopic ACL reconstruction using quadrupled semitendinosus and gracilis tendon autograft with using endobutton for femoral tunnel fixation and in the tibial tunnel with hybrid fixation using suture disc and anchored with a cancellous screw and washer or interferential screw is a relatively new technique. We have undertaken this study to analyze the postoperative outcome in our experience with this procedure [3].

METHODS:

This was a prospective study of consecutive patients with ACL injury who underwent Arthroscopic ACL reconstruction in our institution using quadrupled semitendinosus and gracilis tendon autograft. Postoperatively, all patients were initiated on the same rehabilitation protocol. All patients were followed up for four to six months period at regular intervals using IKDC, LGS scoring systems and a subjective questionnaire. Functional assessment with hop test was done.

RESULTS:

About 92% of the patients had a favorable outcome as per three scoring systems. All three scoring system had a very high correlation as evidenced by the Kendal-tau values ranging x from 0.464 to 0.923. Statistically, this was found to be highly significant (p value- 0.000 – 0.001). Using IKDC scoring, the results were normal in 14, nearly normal in 10 and abnormal 1. 4 patients (16%) presented with anterior knee pain. Sensory loss was xii noted in 3 patients (12%) at the end of 6 months following surgery. Swelling was present in 4 patients (16%).None were having any infection and FFD.

Table 1: Age wise Distribution of cases

Age in Years	Number	Percentage
20 to 25	07	28
26 to 30	08	32
31 to 35	08	32
36 to 40	01	04
41 to 45	03	12
46 to 50	00	00
Total	25	100

The mean age in our study was 33.68 years. The youngest patient was 21yrs and the oldest patient was 45 years old. The maximum number of patients was in the age group of 26 to 35 years followed by the age group of 20 to 25 yrs (28%).

Table 2: Post – Op Outcome: IKDC Scoring System

	Frequency	Percentage
Normal	14	56
Nearly Normal	10	40
Abnormal	1	4

Table 3: Post Operative Outcome—SQ

	Frequency	Percentage
Very Satisfied	17	68
Satisfied	07	28
Not Satisfied	01	04
Total	25	100

Table 4: Post–Operative LGS Scoring System

	Frequency	Percentage
Excellent	15	60
Good	08	32
Fair	02	08
Total	25	100

DISCUSSION:

Arthroscopic ACL reconstruction is performed to restore the functional stability in ACL deficient knees and restore the normal kinetics of the knee. Increasing number of ACL reconstruction surgeries have been performed and there is an increasing expectation of patients to speedy recovery and more rapid return to activities of daily living, work and study. Long term outcomes and post-op morbidity following arthroscopic ACL reconstruction depends on graft selection, surgical technique, experience of the surgeon and rehabilitation protocol for 6 months during immediate post operative and follow up period. This is a prospective study to assess the surgical outcome following arthroscopic ACL reconstruction using the quadruple stranded hamstring graft. Although there are many potential graft choices from which to choose for ACL reconstruction, hamstring autografts have over the past decade become increasingly more popular. Several studies have shown that quadrupled-strand hamstring tendon ACL reconstructions have higher strength, stiffness, and cross sectional area compared with patellar tendon grafts. Harvest of hamstring tendon autografts also yields fewer donors site morbidity than harvest of patellar bone- tendon- bone grafts and carries no risk of patellar fracture, however remote. Technical factors, specifically the absence of adequate fixation techniques, initially limited the use of hamstring grafts for ACL reconstruction. New techniques focus on optimizing graft strength and stiffness. Successful ACL reconstruction using hamstring autograft requires stable initial graft fixation and, ultimately, graft- to- bone healing. Hamstring reconstruction using femoral endobutton fixation has been shown to have excellent initial mechanical properties, including pull-out strength. Tibial hybrid fixation with suture disc and an anchoring interferential screw provide excellent soft tissue to bone fixation. In our study 21 male and 4 female patients underwent ACL reconstruction using quadrupled STG tendon autograft and all these patients underwent graft fixation using endobutton in the

femoral tunnel and hybrid fixation with suture disc and an anchoring interferential screw within the tibial tunnel. All aged between 21 and 50 years of age. The side of injury was distributed accordingly –56 % [14patients] to right knee while 44 % [11 patients] injured their left knee. A statistical trend towards a better outcome in all three scoring systems was seen with injury to the dominant lower limb but this was not significant. Arthroscopic ACL reconstruction was done as an in-patient procedure in all patients under spinal anaesthesia.

In 2009, Brown1 and others studied the incidence of sex and limb differences in anterior cruciate ligament injury and stated that even though females are prone for injury, due their less exposure to strenuous environment makes the incidence of males more than females. They also concluded that limb differences have no influence either during injury or in the recovery period. Among the young people the mode of injury was mainly during competitive sports and some of them injured during recreational sporting activity. Majority of our patients are with the history of fall while doing their activities of daily living and were leading sedentary lifestyle followed by RTA and sport related injuries. Once the day to day activities of walking, squatting and climbing stairs returned, after following according to Wilk *et al.;* rehabilitation protocol for 6 months during immediate post operative and follow up period, it was observed that adherence to physiotherapy gradually waned in most of the patients. Vassilios S Nikolaou *et al.;* in June 2008, after a retrospective analysis of MRI efficiency in diagnosing internal lesions of the knee, reported that the accuracy for tears to the medial, lateral meniscus, anterior and posterior cruciate ligaments and articular cartilage was 81%, 77%, 86%, 98% and 60% respectively [2].

They found that the clinical examination had significant lower reliability in the detection of these injuries and concluded that MRI is very helpful in diagnosing meniscal and cruciate ligament injuries. Various studies by different authors show that arthroscopy still remains the gold standard for definitive diagnosis. In our study, clinical evaluation of the patients for instability was an essential component. Lachman test and Pivot shift test was more specific in diagnosing ACL injury which were further confirmed by MRI and later by arthroscopy, unlike anterior drawer test which in most of the patients was inconclusive as no correlation between pre operative and examination under anaesthesia.

According to the ACL rehabilitation Protocol by Evans [3], in order to return to sports following ACL surgery, one should have quadriceps strength of at least 80% of the normal leg and hamstring strength of at least 80% of the normal leg.

According to Bizzini and others4 criteria to return to sports include strength of the hamstrings and quadriceps at least of 85% compared to the contra lateral side and when the patients tolerate sports specific activities. In our study, hamstring and quadriceps strengths were restored to satisfactory levels when compared to normal leg suggesting that the isometric strengths were restored.

In 2003, Fareed H *et al.;* reported the results of a retrospective study were available for follow up [5]. The purpose of their study was to evaluate their initial experience with this procedure. Between July 97 and march 2001, 29 patients underwent arthroscopic ACL reconstruction with 4 strand hamstring tendon graft. 25 were available for follow up. All patients underwent the same rehabilitative program. Patients were evaluated using the IKDC ligament evaluation system. The average follow up was 25.4 months. Similarly Button K and others, in 2005, evaluated the outcome of ACL reconstruction with semitendinosus tendon autograft with same rehabilitation protocol in 48 patients at 20 months6.

In their study, a satisfactory outcome was seen in 96% and 92% respectively while it was 96% in our study. In the LGS system 15 patients (60 %) had an excellent outcome, 8 patients (32 %) had good and 2 patients (08 %) had a fair outcome. Quite similarly, 17 patients (68 %) were very satisfied as per the subjective questionnaire and 7patients (32 %) were satisfied. One patient was not satisfied. This was probably due to the fact that most of the patients were keen on normal day to day activities than return to sports. All three scoring systems had a very high correlation as evidenced by the Kendal-tau values ranging from 0.647 to 0.923. Statistically, this was found to be highly significant [p value 0.000-0.0001]. 92% of the patients were able to return to the preinjury level of activities of daily living. All patients performed the hop test in the postoperative four to six months period. The mean limb symmetry index of the single hop test was 85.50. These values gradually reduced when the outcome became poorer on the three scoring systems. Statistically the hop test was more of a trend with regards to IKDC and LGS, whereas it was significant with SQ. Andrea Reid *et al.;* in March 2007, published their results of a series of hop tests on 42 patients, 15 – 45 years of age who had undergone ACL reconstruction. The mean limb symmetry index in above study was calculated at the 22nd postoperative week against at 24th postoperative week in our study. The mean values of above study were all above 85%. In our study the mean value is around 85%. This could be due to some patients; especially the ones with a poorer outcome had much lower limb symmetry indices which was skewing the mean to the lower side. Moreover, many patients were

quite apprehensive in performing the hop test, thereby increasing the disparity between the normal and the operated limb scores.

Time period elapsed between the injury and the ACL reconstruction ranged from 2 months to 13 with a mean value of 6.8 months. The duration of surgery ranged from 95 minutes to 120 minutes with a mean of 102.5 minutes. 4 patients (16 %) had pain at the graft donor site. 3 patients (12 %) had numbness around the graft donor site which gradually resolved completely. Most of the patients had laxity of up to 101 grades 1. In spite of this, Lachman test was hard end and it is the reason for the success of the surgery. None had superficial skin infection.

Gulick TD [7] and others in 2002 studied on 57 patients and concluded that 84% of their patients returned to pre injury level of function. In our study 92% patients returned to their previous level of function with 92% of the patients' complaint with the physiotherapy regimen.

CONCLUSION:

We conclude that the functional outcome of arthroscopic anterior cruciate ligament reconstruction using quadrupled semitendinosus and gracilis tendon autograft is excellent to good (92%). With proper patient selection and physiotherapy regimen, full occupational and recreational activities can be expected for most of the patients within four to six months of the procedure.

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