

Clinical and functional evaluation of anterior cruciate ligament tears after anterior cruciate ligament reconstruction

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Abstract

Introduction: There have been many studies on ACL reconstruction and its outcome. In our study, we used single bundle reconstruction as the technique for Indian rural population as it is one of the most reliable technique for ACL reconstruction after the injury. **Aim:** To study the pattern of clinical and functional evaluation of anterior cruciate ligament injury after anterior cruciate ligament reconstruction. **Objectives:** (1) To assess the pattern of anterior cruciate ligament injury and instability caused by it (2) To study the clinical & functional outcome of ACL in arthroscopic ACL reconstruction in patient with ACL tear. **Results:** The outcome scores themselves, at the end of 12 months follow up were significantly better in operated patient. We found better knee function and patients were able to do their daily activity normal (as before the injury). Results of our study were compared with other study done worldwide and we also found better results and better life style in post operated patient of ACL. The study concludes that, Arthroscopic ACLR is a good choice for ACL reconstruction and HS grafts were a good choice for reconstruction along with endobutton and screw. This study shows that ACL is one of most important ligament in the knee joint and must be taken care of for a better knee function. **Conclusion:** The reconstruction of anterior cruciate ligament tears with hamstring tendon grafts gives a very good clinical and functional outcome.

Keywords: ACLR, Anterior cruciate ligament reconstruction, Sports injury, Arthroscopy

Introduction

Knee is the largest joint in the human body with a very complex anatomy (pivotal hinge joint). The ligaments surrounding the knee joint offer stability by limiting movements, together with several menisci and bursae, shield the articular cartilage and capsule. ACL originates from the medial and anterior aspect of the tibial plateau and runs superiorly, laterally and posteriorly towards its insertion on the lateral femoral condyle. The anterior cruciate ligament is composed of the anteromedial and posterolateral bundles [1,2].

Together, these bundles provide approximately 85% of total restraining force of anterior translation, [3,4]. Since the knee supports nearly the whole weight of the body, it is vulnerable to both acute injury and chronic repetitive trauma leading to the development of osteoarthritis.

ACL is an important ligament for the movement of knee joint. ACL injury commonly causes knee instability and subsequently causes more stress to other knee ligaments [5]. ACL failure has been linked to heavy or stiff-legged landing, as well as twisting or turning the knee while landing, especially when the knee is in the valgus position.

Women in sports are more prone to ACL injuries than men. The discrepancy has been attributed to differences between the sexes in anatomy, general muscular strength, reaction time of muscle contraction and coordination, and training techniques. Study suggests hormone-induced changes in muscle tension associated with menstrual cycles may also be an important factor [6]. Recent research also suggests that there may be a gene variant that increases the risk of injury [7]. ACL injury has an annual incidence of more than 200,000 cases with 100,000 amongst these knees are reconstructed annually.

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The majority of ACL injuries (70%) occur while playing agility sports and most often reported sports are basketball, soccer, skiing, and football. An estimated 70% of ACL injuries are sustained through non-contact mechanisms, while the remaining 30% result from direct contact [8,9].

The Pivot-shift test, Anterior drawer test and the Lachman test are used during the clinical examination of suspected ACL injury and IKDC scoring, Cincinnati scoring & Lysholm score as functional scoring system for patients. KT-1000/2000 can assist in the diagnosis but are more effective in evaluating patients with chronic anterior cruciate ligament disruption when pain and associated muscle guarding are absent [10,11,12].

Surgery remains the treatment of choice in almost all athletes who want to remain active. Some problems that have resulted in failed ACL reconstruction, particularly omitting reconstruction of the PL bundle [13,14]. Long-term studies have shown that there is a significant increase in the rate of damage to menisci and articular cartilage associated with delayed reconstruction [15,16].

Generally, about one-third of patients who are selected as suitable for conservative treatment are able to complete the therapy regimen without the need for surgical intervention [17,18].

However, patients with high level of sports activity show poor results after conservative treatment of ACL ruptures [15,17,19]. No ideal graft site for ACL reconstruction exists; they all have advantages and disadvantages.

Patellar tendon grafts are still considered the historical "gold standard" for knee stability by surgeons [20]. Modern fixation methods of hamstrings avoid graft slippage, producing outcomes that are same in the terms of knee stability with easier rehabilitation, less anterior knee pain and less joint stiffness [21].

Single-bundle ACL reconstruction has been a standard option to treat symptomatic ACL-deficient knees. Single-bundle reconstruction with the bone–patellar tendon–bone (BTB) or hamstring tendon graft did not show any significant effects on the rotatory instability during walking or more active activities [22].

The aim of this study is to assess the benefit of arthroscopic assisted ACL reconstruction using autologous hamstring grafts in term of clinical and functional outcome.

We have compared the functional outcome in patient with ACL tear before surgery and after surgery at regular intervals. For evaluation of functional outcome, the IKDC score [23], Lysholm score [24, 25] and Modified Cincinnati score [26] were used. For clinical outcomes special test like Lachman test, pivot shifting test were used. We have used standardized procedures and the same kind of implants in all patients.

Materials and Methods

Type of Study- Prospective study

Study Setting- Department of Orthopedics of tertiary care hospital.

Sampling Methods- All adult patients who met the inclusion criteria were included in the study. Clinical history of each patient was recorded as per the Performa. Clinical details including risk factors, antibiotics given, complete haemogram and other biochemical parameters were also recorded.

Statistical Methods-The tabulation and cross tabulation will be done. Results will be expressed in percentage. Data entry and analysis will be done using SPSS software for windows version 17.0 and Gratan Pad prism 6.0 version. Pearson's Chi-square test at 95% confidence limit and Fisher's exact test will be used for calculating

Ethical Permission & Consideration- Approval of institutional ethics committee was taken.

Scoring Systems- IKDC score, Lysholm score, Modified Cincinnati score.

Surgical Procedures- Single bundle ACLR.

Study Size- A total of 50 patients were included in the study, allocated to single bundle reconstruction technique.

Subjects- Patients attending Acharya Vinoba Bhave Rural Hospital for Knee Injury.

Sample Size-This Being A Prospective Study included all the fresh cases of anterior cruciate ligament injury. (N= 50)

Place of Study- Department of Orthopaedics, Acharya Vinoba Bhave Rural Hospital, Sawangi (Meghe) Wardha.

Duration of Study: - 2 years (2015-2017)

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Inclusion criteria

1. All the patients between 18-60 years of age admitted in our hospital for Anterior Cruciate Ligament injuries.
2. All the patients between 18-60 years of age who underwent Anterior Cruciate Ligament repair.

Exclusion criteria

1. Patients with active knee joint infection / additional bony injury
2. Patients not willing for any treatment and follow up
3. Patients who were not willing to give consent for surgery / rehabilitation after surgery

Results

Patient Details- A total of 50 patients were recruited under this study. Final data collection was completed for all these 50 patients. All the patients were followed up regularly as per the stipulated timings of the one years.

Descriptive Patient Statistics- Mean age of the patients in ACLR group was 29.33 (18-50 years) years with standard deviation ± 9.98 . Minimum age in study groups was 18 years and maximum age was 50 years Out of the total 50 patients, 46(92 %) patients were male and only 4(8 %) were female.

Table-1: Demographic distribution of patents

| Age Distribution | Female | Male |
|--------------------|----------|-----------|
| 20-24 | 2 | 18 |
| 25-29 | 1 | 7 |
| 30-34 | 1 | 13 |
| 35-39 | | 6 |
| 40-44 | | 2 |
| Grand Total | 4 | 46 |

Mechanism of the injury-The most frequent mechanism was found to be Sports activities (n=22, 44%) followed by Road traffic accidents (n=13, 26%) and then miscellaneous causes like fall from height, twisting injury while going downstairs, hit by animal, slip and fall (n=15, 30%).

Table-2: Mode of Injury.

| Mode of injury | No of patients | Percentage (%) |
|--|----------------|----------------|
| Sports | 22 | 44 |
| Road Traffic Accidents | 13 | 26 |
| Miscellaneous(Fall from height, Twisting Injury, Slip and Fall, Hit by animal) | 15 | 30 |
| Total | 50 | 100 |

Table-3: Distribution of patients according to associated injury

| Associated injury | No of patients | Percentage (%) |
|--------------------|----------------|----------------|
| Lateral Meniscus | 15 | 30 |
| Medial Meniscus | 10 | 20 |
| LM+MM | 2 | 4 |
| No Meniscal Injury | 23 | 46 |
| Total | 50 | 100 |

Associated Meniscal Injuries- Out of the 50 patients, 15(30%) patients had lateral meniscal Injury, 10(20%) patients had medial meniscal Injury, and 2(4%) patients had both lateral and medial meniscal injury 23(46%) patients had no meniscal injury.

Table-4: Distribution of patients according to outcome.

| Rating | Number of patients |
|--------------|--------------------|
| Poor | 2 |
| Fair | 8 |
| Good | 15 |
| Excellent | 25 |
| Total | 50 |

Out of 50 patients we had 2 patients with poor results due to involvement of associated lateral and medial meniscal injuries. 8 patients had fair clinical outcome due to noncompliance with post-operative physiotherapy. 15 were with good results and 25 patients had an excellent result which we assessed by clinical assessment of 3 important clinical tests mentioned above. Similar results were obtained on functional evaluation also as mentioned by the different scoring methods used in this study.



Fig.-1: Graft harvesting.



Fig.-2: prepared hamstring free graft arthroscopic view of ACL stump (tibial side)



Fig-3: post-operative X-ray A-P view



Fig-4: Post-operative X-ray lateral view

Discussion

Many different techniques have been suggested for ACLR using different tunnel positions, fixation systems, and types of graft. A number of studies have been conducted to compare postoperative stability and function after anatomic single bundle and double bundle anterior cruciate ligament reconstruction.

Table-5: Clinical outcome of patients evaluated by the lachman test and anterior drawer tests.

| Clinical Outcome | Results in numbers | Results in % |
|------------------|--------------------|--------------|
| Poor | 2/50 | 4% |
| Fair | 8/50 | 16% |
| Good | 15/50 | 30% |
| Excellent | 25/50 | 50% |

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We undertook a study in which we followed up, evaluated and recorded the function of 50 patients. All of which underwent arthroscopic ACLR. The patients were evaluated pre-operatively, and post-operatively at pre determined time intervals (3 months, 6 months and 12 months) post-operatively. Evaluation was done using three accepted scoring systems for knee function- 2000 IKDC Subjective Knee Evaluation Score, Lysholm Score, Modified Cincinnati Score. Ligament stability was clinically examined by the Lachman test, Pivot-shift test, Anterior drawer test and Pivot shift test. Laxity was graded relative to the uninjured knee according to the IKDC guidelines.

After statistical analysis of the data, a set of results were obtained. Most of our data matched with the literature concerning the outcomes of both the procedures which have been published. Conversely, many differences were found, both in patient profiles and the outcomes. Some of these pertain to socioeconomic differences between the study populations in our study and those conducted abroad. Meanwhile, some parameters differ, probably because of the difference in the kind of physical activity the populations generally engage in.

The mean age of the patients in our ACLR group was 29-33 (18-50 years) with standard deviation ± 9.98 . Minimum age in study groups was 18 years and maximum age was 50 years. This aspect of our data matches the overall published literature as various authors have noted that the problem occurs in young and athletic, physically active individuals. In the study done by Daisuke Arak [27] et al an average age in SB group was 24.7 ± 11.8 (mean standard deviation) years. In a study by Alberto Gobbi [28] et al, the mean age of patients at surgery in SB group was 31.9 ± 1.9 years. Eun Kyoo Song [29] et al found that an average age of patients SB group was 30.3 years (range, 17-50). N. Adachi [30] et al found that the average age of patients in SB group was 29.5 (14 to 49). No studies in literature have so far commented about the effect of age on the functional outcome.

As for the sex distribution, out of the 50 patients in our study, 46 patients were male, and 4 patient were female. Overall amongst the various studies published, the number of male patients has consistently been far larger than the female patients [31-35]. This predisposition is probably due to the fact frequently participate in sports activities and occupations involving vigorous activities and risks of fall and twisting injuries.

In this study, the number of female patients (n=4), made it impossible to perform any valid analysis on whether sex is a significant factor influencing the outcome. The scenario is similar in several other studies. However, even studies where the number of female patients could probably have allowed analysis, have not mentioned any association with any outcome parameters with the sex.

In our study amongst the 50 patients, 35 (70%) patients had ACL tear on the right side, 15(30 %) patients had the injury on the left side. In a study by Alberto Gobbi et al, in SB group, 18 patients had the injury in left knee and 12 patients had the injury in right knee. In a study by R. Siebold [36] et al, 17 patients had injury in right knee and 11 patients had the injury in left knee in a SB group. No studies in literature have so far commented about the effect of laterality on the functional outcome.

The average time from injury to reconstruction was 7.01 ± 5.99 (0.27 months-24 month). The studies in the literature have reported the similar findings. In a study by Eun Kyoo Song [29] et al the average time from injury to reconstruction in the double-bundle group was 8.3 months (range, 1-26). The average time from injury to reconstruction in the single-bundle group was 7.6 months (range, 2-20). In a study held by Eiji Kondo [29] et al, average time was 12 months in SB group and 16 months in DB group. In a study by N. Adachi [37] et al the average time was 27 months in SB group. No studies in literature have so far commented about the effect of the average time from injury to reconstruction on the functional outcome.

The results as per the various scoring systems are the most important aspect of our study. Comparison with the published data has shown some similarities and some differences between our study results and those done abroad. The studies published in the literature do not give the specific scores at the intervening time intervals and straight away state the scores at the end of the study. This means we can make a comparison only between our final results and theirs, although there is a large discrepancy between the duration of follow up in our study and theirs. The scores at the intermediate follow ups are not mentioned in these other studies, so comparisons on whether the course of our patients' progress matches theirs are difficult.

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Alberto Gobbi [30] et al found that in SB group, the IKDC score in preoperative period was 41.5 ± 4.21 (mean \pm SEM) and that in post-operative period at 3 year follow up was 89.4 ± 1.47 (mean \pm SEM) with a p-value suggestive of significant improvement. In the same study the Lysholm score in preoperative period was 42.4 ± 3.30 (mean \pm SEM) and that in post-operative period at 3 year follow. Another study done by R. Siebold [32] et al shows that in SB group, the IKDC score in post-operative period was ± 15.1 and the Cincinnati knee score in the post-operative period was 81.8 .

In a study done by Takeshi Muneta [38] et al the total Lysholm knee scale score was 93 in the post-operative period at 2 year in a SB group. In this study the IKDC score in the preoperative period, at 3rd month, 6th month and 12th month, was 46.38,51.16,54.64,61.20 respectively which was suggestive of improvement in the functional status with time.

The Lysholm score in SB group also has increasing trend, the average score in the preoperative period, at 3rd month, 6th month and 12th month was 65.14, 72.04,74.72 ,78.90 respectively which was suggestive of improvement in the functional status of the patients with time.

Similar trend was observed in Modified Cincinnati Score, the average score in the preoperative period, at 3rd month, 6th month and 12th month, was 52.26, 61.42, 63.98, 67.2.35, respectively which was suggestive of improvement in the functional status of the patients with time.

Another important analysis is of laxity testing by Lachman and Pivot shift test. In a study by Eun Kyoo Song [29] et al, in SB group were such that, in pre-operative period, out of 20 patients, 4 had grade 2 laxity and 16 patients had grade 3 laxity and in post-operative period at 2 year follow up, 12 patients had grade 0 laxity, 5 patients had grade 1 laxity, 2 had grade 3 laxity and no pt had grade 4 laxity was suggestive of non-significant difference. In the same study, Pivot shift grading was used for measuring laxity. The difference was found to be statistically insignificant.

Conclusion

Majority of the population affected in this study belonged to the group of sports injuries which is a major cause of ACL tear. This study showed that single bundle ACLR is a must needed operative procedure for a better functional outcome of knee and to perform daily activities of life. This concludes that, Arthroscopic ACL reconstruction with Hamstring grafts was a good choice for good to excellent outcomes.

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