

ORIGINAL RESEARCH

Arthroscopic Anterior Cruciate Ligament Reconstruction Using Hamstring Tendon – A Prospective Study

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ABSTRACT

Background: The standard approach for anterior cruciate ligament (ACL) injuries has historically been arthroscopic ACL reconstruction. It's a minimally invasive treatment that allows the surgeon to understand the derangement of the knee joint. The aim of arthroscopic ACL reconstruction is to restore normal kinematics in the knee joint. The goal of this research was to evaluate the results of Anatomic single bundle ACL reconstruction with hamstring tendon.

Methods: The prospective clinical study was conducted in the Orthopaedic Department, Dr Moopens Medical College formerly DM WIMS Wayanad, Kerala on 36 patients 31(86.11%) males and 5(13.88%) females with chronic ACL tear treated with the hamstring tendon for reconstruction of the anterior cruciate ligament in all patients during the period from June 2019 to December 2021.

Results: There were 31 men (86.11%) and 5 women (13.88%) among the 36 patients. About 25 patients (69.44%) had right-sided ACL injuries, whereas the remaining 11 (30.55%) had left-sided ACL injuries. IKDC SCORE was improved from 42.45 with SD of 9.68 preoperatively to 81.87 with SD of 13.40 postoperatively.

Conclusion: Anatomic anterior cruciate ligament reconstruction with hamstring tendon is more effective at replicating the anatomy of the ACL and achieving favourable clinical results.

Keywords: anterior cruciate ligament, anatomic reconstruction, clinical outcomes

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INTRODUCTION

The knee joint is frequently injured in sports, automobile accidents, and everyday activities. The anterior cruciate ligament (ACL) is a common ligament impacted in these injuries¹.

By inhibiting anterior tibial translation and tibial rotation, the ACL contributes to the overall stability of the knee. Those who have had their ACL ruptured experience knee instability and an increase in anterior tibia translation. Untreated ACL insufficiency can result in meniscal tear and cartilaginous joint damage. As a result, ACL reconstruction is commonly suggested for active younger adults who want to restore joint stability and avoid subsequent arthritis². Hamstring grafts are a well-known and widely accepted surgical technique for arthroscopic-assisted ACL reconstruction³. The semitendinosus and Gracilis tendon (STG) has been shown to be a good donor for autografts.

The surgical procedure seeks to restore knee stability while allowing the patient to resume his pre-injury activity level⁴. If a patient is unwilling to change their active lifestyle, surgical

intervention should be considered^{5,6}. It's vital to get the injured limb's range of motion and strength back to normal.

The goal of this study is to evaluate the post-operative results of arthroscopic ACL reconstruction using quadrupled hamstring autografts secured with an endobutton on the femoral side and an interference screw in the tibial tunnel⁷⁻¹¹.

Aims and objectives

Assessed the effectiveness and functional outcome of arthroscopic ACL reconstruction with quadrupled hamstring auto graft.

Patients and methods

This prospective clinical study was conducted in Orthopedic Department, Dr Moopens Medical College formerly DM WIMS, Wayanad, on 36 patients with chronic ACL tear treated with the hamstring tendon for reconstruction of the anterior cruciate ligament in all patients, during the period from June 2019 to December 2021. The study was approved by Ethical committee of the Hospital. Informed Consent of each patient was obtained.

Inclusion criteria

Age range >18years and >45years, Initial ACL tear (not having any previous reconstruction).

Exclusion criteria

Patients who have radiographic indications of degenerative alterations (joint space narrowing). Patients who have suffered several ligamentous injuries. Patients who show clinical signs of misalignment (varus or valgus). Previously, the same knee had been operated on. Patient with open physeal plate (before skeletal maturity).

Approach

All patients were subjected to the Present history and clinical examination -Mechanism of injury, side affected (Right/ Left)¹². The clinical evaluation was carried out by an experienced blinded examiner in the outpatient clinic just prior to starting the walking tasks, both before and after ACL reconstruction¹³. Participants were evaluated with the Lysholm Knee Scoring Scale and International knee documentation committee score (IKDC) score.

Radiological evaluation

X-rays: AP and lateral views of the injured and normal knee before and after reconstruction were done. Magnetic resonance imaging was performed to confirm the ACL tear and to exclude any other knee injuries and after reconstruction for evaluation of graft location, tunnel location, graft signal intensity, graft quality, and graft ligamentization.

RESULTS

In the Department of Orthopaedics at Dr Moopens Medical College in Wayanad, Kerala, a prospective research of ACL reconstruction utilising four fold hamstring autograft was undertaken.

During June 2019 and December 2021, 65 patients had ACL reconstruction surgery, with 36 of them being followed up on and evaluated. Thirty-one patients (86.11 percent) were men, whereas five patients (13.88 percent) were women. As demonstrated around 25 patients (69.44%) had right sided ACL injury, whereas the remaining 11 patients (30.55%) had left sided ACL injury.

As illustrated, 19 patients (52.77 percent) had RTA, 10 patients (27.77 percent) had sports injury, and 07 patients (19.44 percent) had other modes of injury such as fall from ladder or slip. When comparing patients based on the injury they have, As demonstrated, 25 patients (69.44%) had isolated ACL injury, 8 patients (22.22%) had ACL+MCL injury, and 3 patients (8.33%) had ACL+PCL injury. As indicated in Table 1, the average age of ACL injury patients was 38.68 years (SD 10.23).

The proportion of patients, 24 (66.6 percent), were between the ages of 20 and 30. As evidenced, patients ranged in age from 18 to 48 years old, with a mean age of 38.68 years. The majority of the patients were men, with 31 (86.11 percent) being male and 5 (13.88 percent) being female. In ACL injuries, the right knee to left knee ratio was 2.27:1. The right knee was implicated in 25 (69.44 percent) of the cases, whereas the left knee was involved in 11 (30.55 percent). The study did not include any bilateral cases.

In 25 patients, isolated ACL injury was observed (69.44 percent). As demonstrated, the remaining incidences were related with either MCL (22.22 percent) or PCL (8.33 percent) injury. About 19 (69.44%) cases of ACL damage were caused by automobile accidents, followed by 10 (27.77%) cases caused by sports injuries, and another 07 (19.44%) cases caused by slipping on the floor/missing steps, etc. The most prevalent cause of ACL rupture was shown to be pivoting stress, which is a twisting force over the knee as the body turns and pivots on a securely fixed foot placed on the ground.

As demonstrated in Figure 1, the majority of patients presented for surgery within six months of injury 32 (88.88 percent). After 12 months, only 2.77 percent of cases were fixed. Patients who received reconstruction between 2 and 4 weeks after their injury and went through an expedited rehabilitation program had a lower rate of arthrofibrosis than those who went through a traditional rehabilitation program.

As shown, the majority of the patients 27 (75%) experienced a sense of the knee giving way during normal work and guarded walking with pain with or without locking, whereas 09 (25%) had a feeling of giving way exclusively during sporting activity/heavy labour with pain with or without locking.

Pre- and post-operative IKDC scores were used to evaluate the patients' functional outcomes. As indicated in Table 1, the mean pre-operative IKDC score was 42.45 with an SD of 9.68, and the mean post-operative IKDC scoring was 81.87 with an SD of 13.40. We used SPSS software to analyze the data and used the paired t test. The P value for this study was 0.0001, which is statistically significant.

As demonstrated, the majority of patients with ACL injuries were in group C (abnormal), followed by 18 (25 percent) in group B (severe abnormal), and 08 (11.11 percent) in group D (near abnormal).

Twenty seven (74.99%) cases reported their knees as normal or nearly normal after ACL reconstruction as shown in Figure 2. About 07 (19.44%) cases described their knee as abnormal and 02 (5.55%) cases described his knee as severely abnormal.

As indicated in Figure 2, twenty-seven (74.99%) cases reported their knees to be normal or substantially normal after ACL reconstruction. Around 07 (19.44%) individuals described their knee as aberrant, with 02 (5.55%) cases describing it as highly abnormal.

Almost two-thirds of the patients (72.22 percent) were able to regain nearly complete range of motion (no flexion contracture i.e. full extension and full flexion) Figure 3. The study shows that about 04 (11.11 percent) of the cases had both flexion and extension restrictions.

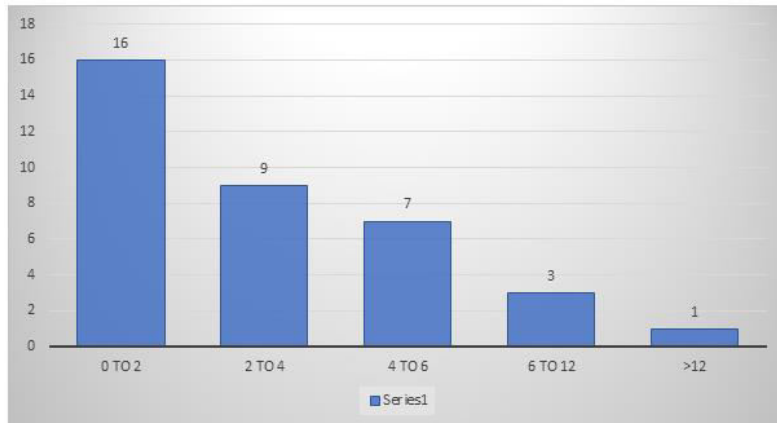


Figure 1: Injury- Surgery Interval for ACL Reconstruction Surgery.

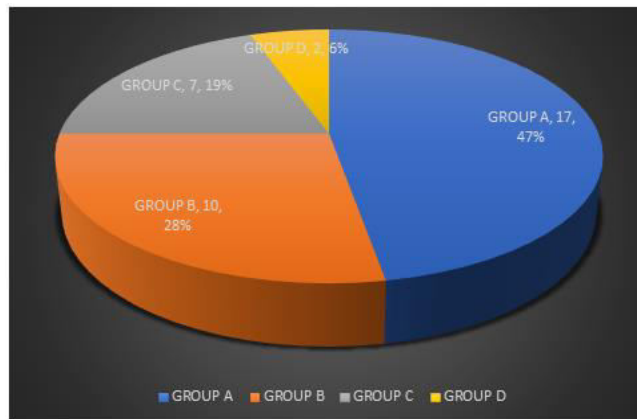


Figure 2: Objective IKDC grade after ACL Reconstruction

Table 1: Comparison of Pre and Post-Operative Result of Validated Knee Scoring System

VALIDATED KNEE SCORING SYSTEM	PREOPERATIVE	POSTOPERATIVE	P VALUE
IKDC SCORE	42.45± 9.68	81.87± 13.40	0.0001



Figure 3: Intra Operative Picture



Figure 4: 21 year old Male**Figure 5: 36 year old Male****Figure 6: 31 year old Male**



Figure 7: 33 year old Male**Figure 8: 23 year old Male****Figure 9: 33 year old Male**

DISCUSSION

More and more cases of ACL tear are being diagnosed now days due to the increasing participation of people in sports, increasing vehicular accidents and due to the increasing role of arthroscopy and MRI (magnetic resonance imaging) as a diagnostic tool.

The ACL injury is not only immediately problematic because of functional instability but it is the source of long term complications such as meniscus tears, failure of secondary stabilizers and early onset of osteoarthritis. Figure 4 to 9 Reconstruction of the ACL allows patients to resume their active life style and can delay the onset of osteoarthritis¹⁴.

Most common associated injury in our study was medial meniscal (26%) injury followed by lateral meniscus injury (7.4%) which is in accordance with meta analysis of Lewis et al in which the most common injury was medial meniscus injury (39%). Robert et al also had medial meniscus (27.02%) as most common associated injury.

Smith et al reported no differences in clinical outcomes between early (less than 3 weeks) and delayed (greater than 6 weeks) ACL reconstruction (ACLR) in their systematic review; however, their conclusion is based on current literature, which has limitations such as non-randomization and lack of appropriate blinding¹⁵. Mayr et al looked at how timing and preoperative knee state affected ACLR outcomes. The authors recorded the irritability of the knee before to surgery (swelling, effusion, and hyperthermia), as well as ROM and other injuries.

When deciding the best time for surgery, timing of surgical intervention may be just one issue to consider. The decision to have ACLR is likely to be multifaceted, with considerations such as the knee's pre-operative condition, family, school or job obligations, and mental preparation all playing a role. More research is needed to develop a multifactorial objective criteria that may help surgeons and patients decide when surgical treatments should be performed to get the best clinical outcomes.

Patients' ages ranged from 18 to 42 years in this study, with a mean age of 38.68 years, which is slightly higher than Specchiulli et al's (27 years), Jomha et al's (26 years), and Siebold et al's (27 years) mean ages (29 years). This could be due to the current study's limited sample size.

The analyses show that the majority of ACL tears occur as a result of sports injuries. The subjective IKDC score in this study is 88.87, which is consistent with Siebold et al's 90 points utilizing Hamstring autograft with Endobutton and Aglietti et al's 85 and 82 points using double strand hamstring autograft. In the current study, 74.99 percent of ACL tear patients reported their knees to be normal or near normal (group A & B) following reconstruction, which is consistent with Jomha et al's 94 percent at 5 years using either hamstring or BPTB graft, and Siebold et al's 92 percent utilizing Endobutton.

CONCLUSIONS

This subjective study indicates that the majority of patients who had arthroscopic ACL reconstruction were satisfied with the results, and statistical analysis comparing preoperative and postoperative Lysholm and IKDC scores were highly significant, implying that ACL reconstruction with quadrupled hamstring filled with endobutton in the femoral tunnel and bio-interference screw in the tibial is a reliable, effective, and reproducible technique, but more quantitative and long term. The significant variation between the preoperative and postoperative anterior drawer test and pivot shift test imply that ACL restoration with quadrupled hamstring auto graft enhances anterior and rotational stability.

REFERENCES

1. Cirstoiu C, Circota G, Panaitescu C, Niculaita R. The Advantage of Arthroscopic Anterior Cruciate Ligament Reconstruction with Autograft from the Tendons of the Semitendinosus – Gracilis Muscles for the Recovery of the Stability of the Knee. *Mædica*. 2011;6(2):109-13.
2. Lyman S, Koulouvaris P, Sherman S, Do H, Mandl LA, Marx RG. Epidemiology of anterior cruciate ligament reconstruction: trends, readmissions, and subsequent knee surgery. *J Bone Joint Surg Am*. 2009;91(10):2321-8.
3. Frank CB, Jackson DW. Current concepts review. *J Bone Joint Surg Am*. 1998;79(10):1556-75.
4. Shervegar S, Nagaraj P, Grover A, Niranthara Ganesh DJ N, Abdul Ravoof A. Functional outcome following arthroscopic ACL reconstruction with rigid fix: A retrospective observational study. *Arch Bone Jt Surg*. 2015;3(4):264-8.
5. Moore KL. *The Knee Joint In: Clinically oriented anatomy*. 2nd ed. Williams & Wilkins. 1985;523-41.
6. Colombet P, Robinson J, Christel P, Franceschi JP, Djian P, Bellier G, et al. Morphology of anterior cruciate ligament attachments for anatomic reconstruction: a cadaveric dissection and radiographic study. *Arthroscopy*. 2006;22:984-92.
7. Ferretti M, Ekdahl M, Shen W, Fu FH. Osseous landmarks of the femoral attachment of the anterior cruciate ligament: an anatomic study. *Arthroscopy* 2007;11:1218-25.
8. Purnell ML, Larson AI, Clancy W. Anterior cruciate ligament insertions on the tibia and femur and their relationships to critical bony landmarks using high-resolution volume-rendering computed tomography. *Am J Sports Med*. 2008;36:2083-90.
9. Siebold R, Ellert T, Metz S, Metz J. Tibial insertions of the anteromedial and posterolateral bundles of the anterior cruciate ligament: morphometry, arthroscopic landmarks, and orientation model for bone tunnel placement. *Arthroscopy* 2008;24:154-61.
10. Siebold R, Ellert T, Metz S, Metz J. Femoral insertions of the anteromedial and posterolateral bundles of the anterior cruciate ligament: morphometry and arthroscopic orientation models for double-bundle bone tunnel placement—a cadaver study. *Arthroscopy*. 2008;24:585-92.

11. Tantuway V, Mustafa Johar SA, Patel V, Nagla A, Gupta R, Bhambani P. Assessment of foot print of femoral tunnel placement with commercially available off set guide in arthroscopic ACL reconstruction. *Int J Res Orthop*. 2017;3:43-9.
12. Prins M. The Lachman test is the most sensitive and the pivot shift the most specific test for the diagnosis of ACL rupture. *Aust J Physiother*. 2006;52(1):66.
13. Miller RH III, Azar FM. Knee injuries. In: Canala ST, Beaty JH, editors. *Campbell's Operative Orthopaedics*. 11th ed. Philadelphia: Mosby Elsevier; 2008: 2395-2575.
14. Robindro P, Latchumi NVK, Kanthimathi BD. To study the functional outcome of arthroscopic ACL reconstruction using hamstring graft fixed with endobutton for femur and interference screw and suture post for tibial fixation. *Int J Med Dent Sci*. 2016;5(1):978-83.
15. Smith TO, Davies L, Hing CB. Early versus delayed surgery for anterior cruciate ligament reconstruction: a systematic review and metaanalysis. *Knee Surg Sports TraumatolArthrosc*. 2010;18:304-11.