

FUNCTIONAL OUTCOMES OF COMBINED ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION AND MENISCUS REPAIR: A CASE SERIES

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ABSTRACT

Background: Anterior cruciate ligament (ACL) injuries are frequently associated with meniscal tears, leading to impaired knee stability and increased risk of degenerative changes. Combined arthroscopic ACL reconstruction with meniscal repair aims to restore joint function and biomechanics.

Objective: To evaluate the functional outcomes of combined arthroscopic ACL reconstruction and meniscal repair using the all-inside technique.

Methods: This case series included 10 patients (18–50 years) with clinically and MRI-confirmed ACL tears with concomitant meniscal injuries. All patients underwent arthroscopic ACL reconstruction with meniscal repair. Pain and functional outcomes were assessed using the Visual Analog Scale (VAS) and Lysholm Knee Scoring Scale preoperatively and at 6 months follow-up. Statistical analysis was performed using paired t-test.

Results: Mean VAS score significantly decreased from 7.5 ± 1.08 to 1.9 ± 1.45 ($p < 0.001$). Mean Lysholm score improved from 47.0 ± 10.46 to 90.4 ± 4.88 ($p < 0.001$). Good to excellent outcomes were observed in 90% of patients. No major complications or graft failures were reported.

Conclusion: Combined ACL reconstruction with meniscal repair using the all-inside technique yields significant short-term improvement in pain and knee function and is a safe and effective treatment option.

KEYWORDS: ACL reconstruction, meniscal repair, Lysholm score, all-inside technique, functional outcome

INTRODUCTION

Injuries to the anterior cruciate ligament (ACL) are the most frequently encountered ligamentous injuries of the knee joint, particularly in individuals engaged in sports and high-demand physical activities. These injuries are often associated with concomitant meniscal tears, with reported incidence ranging from 50% to 70% in ACL-deficient knees ^(1,2).

Anterior cruciate ligament (ACL) injuries associated with meniscal tears represent a significant clinical challenge due to their impact on knee stability, biomechanics, and long-term joint health⁽³⁾. Although arthroscopic ACL reconstruction combined with meniscal repair is widely accepted as the preferred treatment approach, variability in functional outcomes continues to be reported in the literature⁽⁴⁾. Loss or damage to meniscal tissue results in increased contact stresses across the articular cartilage, accelerating the development of osteoarthritis⁽⁵⁾.

With advancements in surgical techniques, arthroscopic ACL reconstruction has become the standard of care for restoring knee stability. This minimally invasive approach allows precise anatomical reconstruction with reduced soft tissue trauma and faster postoperative recovery⁽⁶⁾. The combined approach of ACL reconstruction with meniscal repair aims to restore both stability and load distribution within the knee.

Assessment of functional outcomes following such procedures is essential to determine the effectiveness of surgical intervention. The Lysholm Knee Scoring Scale is a validated and widely used patient-reported outcome measure that evaluates symptoms including pain, instability, locking, swelling, and functional limitations during daily activities [8]. It provides a reliable indicator of knee function and has been extensively utilized in studies assessing outcomes after ACL reconstruction and meniscal repair, yet there is a need for more focused studies correlating its outcomes specifically in patients undergoing simultaneous ACL reconstruction and meniscal repair.

This case series aims to evaluate the functional outcomes of patients undergoing combined arthroscopic ACL reconstruction and meniscus repair using the Lysholm Knee Scoring Scale.

MATERIALS AND METHOD

Methodology

This study was conducted as a case series in the Department of Orthopedics and included a total 10 patients diagnosed with anterior cruciate ligament (ACL) tear associated with meniscal injury. Patients aged between 18-50 years with clinically and radiologically confirmed ACL tears along with meniscal injuries (fig.1). Only those patients who consented to undergo arthroscopic ACL reconstruction with meniscal repair using the all-inside technique and were willing to comply

with regular follow-up were considered. Patients with isolated ACL injuries without meniscal involvement, previous surgery on the affected knee, advanced osteoarthritis, multi-ligament injuries, or those unwilling to participate in follow-up were excluded.

All patients underwent detailed preoperative clinical evaluation, including history taking and physical examination with special tests such as the Lachman test, anterior drawer test, and pivot shift test. Magnetic resonance imaging (MRI) was performed in all cases to confirm the diagnosis and assess the pattern of meniscal injury (fig.1). The primary outcome variables assessed were the pain and functional scores. The pain was assessed using VAS (visual analogue scale) score. The functional scoring was done by Lysholm Knee Scoring Scale. Both scores were measured preoperatively and at the last follow-up.

Statistical analysis was performed using appropriate statistical software. Continuous variables were expressed as mean $\pm$ standard deviation, while categorical variables were presented as frequencies and percentages. Preoperative and postoperative VAS and Lysholm scores were compared using the paired t-test. A p-value of less than 0.05 was considered statistically significant.

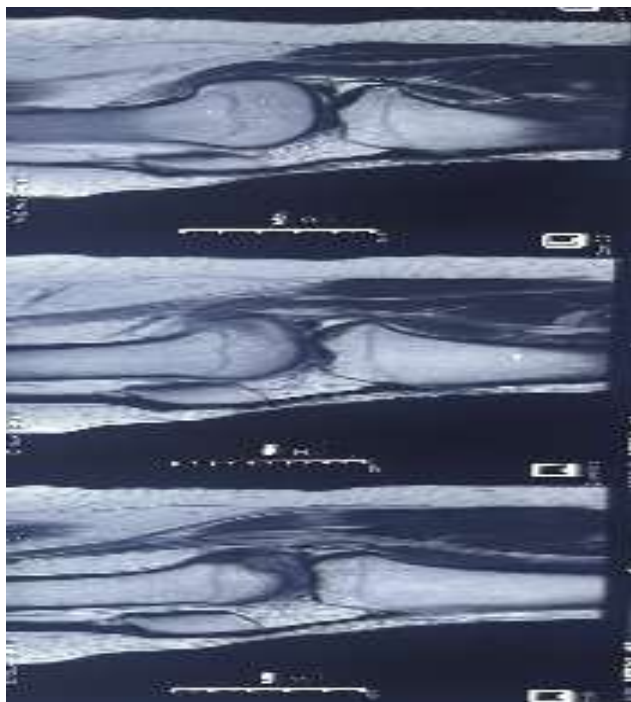


Fig 1- Preoperative MRI of the right knee showing lateral meniscus tear

Surgical Technique

Under the spinal anesthesia patient is positioned in supine. A pneumatic tourniquet was applied to the proximal thigh. The operative limb was positioned in approximately 90° of knee flexion (fig.2) using a leg holder to facilitate optimal arthroscopic access and instrumentation. Standard anterolateral and anteromedial portals were established. A systematic diagnostic arthroscopy was carried out to evaluate intra-articular structures, including confirmation of anterior cruciate ligament (ACL) tear and detailed assessment of the meniscal tear with respect to its location, configuration, and extent.

The meniscal tear was addressed. Meniscal repair was performed using an all-inside technique with dedicated suture-based repair devices introduced arthroscopically. Under direct visualization, the device was positioned across the tear site, and fixation was achieved by deploying implants to approximate the torn meniscal fragments (fig.3). The suture configuration was selected based on the morphology and orientation of the tear. Care was taken to ensure stable fixation while avoiding damage to adjacent articular cartilage. The integrity of the repair was confirmed using a probe to assess stability and proper reduction. At the completion of the procedure, the knee was taken through a full range of motion to evaluate graft isometry, tension, and to exclude any impingement. Stability of both the reconstructed ligament and repaired meniscus was reconfirmed. The semitendinosus and gracilis tendons were identified and carefully harvested using a tendon stripper. The graft was prepared and sized according to standard protocols. Femoral and tibial tunnels were created arthroscopically, with femoral fixation achieved using an Endo Button and tibial fixation with an interference screw (fig. 4 and 5). Hemostasis was achieved, and the arthroscopic portals were closed in layers. A sterile compression dressing was applied. The patient was transferred to the recovery unit in stable condition, and a structured postoperative rehabilitation protocol was initiated. Post-operatively, patients were immobilized in a long knee brace, and had dressings changed at 72 h. Sutures were removed at 2 weeks, and rehabilitation included early mobilization and strengthening exercises under protocol-based physiotherapy. Patients were followed up at 6 weeks, 3 months, and 6 months post-operatively. Functional outcomes were assessed using Lysholm Knee Scoring Scale, which comprehensively evaluates pain, swelling, stability, stair climbing, and overall mobility. Pain was evaluated using the Visual Analog Scale (VAS), providing a reliable measure of symptom improvement over time.



Fig 2- Preoperative knee marking



Fig 3- Meniscus repair using All-inside



Fig 4- Intraoperative graft harvesting



Fig 5- Endobutton fixation

RESULTS

A total of 10 patients with anterior cruciate ligament (ACL) injury associated with meniscal tear were included in this case series. The mean age of the study population was 32.9 ± 5.46 years (range: 18–50 years), with an equal distribution of males ($n=5$) and females ($n=5$). The most common mechanisms of injury were road traffic accidents and slip and fall incidents. All patients underwent arthroscopic ACL reconstruction with meniscal repair using the all-inside technique and were followed up for a period of 6 months. The mean duration of follow up was 6 ± 0 .

There was a statistically significant improvement ($p < 0.001$) in mean VAS score at follow-up (1.9 ± 1.45 ; range 0–4) when compared with the mean preoperative score (7.5 ± 1.08 ; range 6–9).

The mean preoperative Lysholm score was 47.0 ± 10.46 , indicating poor knee function. At the end of 6 months follow-up, the mean postoperative Lysholm score improved substantially to 90.4 ± 4.88 , reflecting good to excellent functional

outcomes. This improvement was found to be statistically highly significant ($p < 0.001$) using the paired t-test. One (10%) patients achieved fair functional status while six (60%) patients achieved good functional status and three (30%) patients achieved excellent outcome. None had poor functional outcome.

All patients demonstrated significant clinical and functional improvement following combined ACL reconstruction and meniscal repair using the all-inside technique (table 1). No major postoperative complications or graft failures were observed during the follow-up period.

Table 1- The master chart of the demographic and follow-up data of the patients

	Age	Gender	Pre-existing cause	Type of injury	Follow up	VAS Preop	VAS Postop	Lysholm preop	Lysholm postop
1	34	female	Trivial slip and fall	ACL+Rt Lat meniscus tear	6	7	2	66	88
2	23	male	RTA	ACL+Lt Lat meniscus tear	6	8	4	40	96
3	37	female	Slip and fall	ACL+ Lt Med meniscus tear	6	6	1	52	94
4	29	female	Direct Blow injury	ACL+ Rt Lat meniscus tear	6	9	2	48	82
5	36	male	RTA	ACL + Rt Med meniscus tear	6	8	3	38	90
6	25	male	Slip and fall	ACL+Rt Lat meniscus tear	6	7	2	60	84
7	34	female	Slip and fall	ACL+Rt med meniscus tear	6	9	0	42	92
8	40	male	RTA	ACL+Rt lat meniscus tear	6	6	0	38	96
9	35	female	Slip and fall	ACL+Lt Med meniscus tear	6	8	4	52	94
10	36	male	RTA	ACL+Lt lateral meniscus	6	7	1	34	88

DISCUSSION

The present case series was conducted to evaluate the functional outcomes of combined arthroscopic anterior cruciate ligament (ACL) reconstruction with concomitant meniscal repair using the all-inside technique. The findings of this study demonstrate significant improvement in both pain and knee function at 6 months follow-up, supporting the effectiveness of this combined surgical approach.

ACL injuries are frequently associated with meniscal tears, particularly in young and active individuals, as also observed in the present study with a mean patient age of 32.9 years ⁽⁹⁾. The equal gender distribution and common mechanisms of injury such as road traffic accidents and slip and fall incidents are consistent with previously reported epidemiological patterns, especially in non-athletic populations ⁽¹⁰⁾.

Pain reduction following surgery is a key indicator of clinical success. In this study, the mean Visual Analog Scale (VAS) score showed a statistically significant reduction from 7.5 preoperatively to 1.9 postoperatively ($p < 0.001$). This finding is in agreement with the study by Shelbourne and Gray, who reported significant improvement in pain and symptoms

following ACL reconstruction, particularly when meniscal tissue is preserved ⁽¹¹⁾. The reduction in pain can be attributed to restoration of knee stability and resolution of mechanical irritation caused by meniscal pathology.

Functional recovery, as assessed by the Lysholm Knee Scoring Scale, showed a marked improvement from a mean preoperative score of 47.0 to 90.4 at 6 months ($p < 0.001$), with the majority of patients achieving good to excellent outcomes. The previous study reported by Lysholm and Gillquist, who demonstrated the reliability of this scoring system in evaluating outcomes following ligament reconstruction ⁽¹²⁾. Furthermore, Barber-Westin and Noyes highlighted that combined ACL reconstruction with meniscal repair leads to superior functional outcomes compared to meniscectomy, emphasizing the importance of meniscal preservation ⁽¹³⁾.

The role of ACL reconstruction in conjunction with meniscal repair is well established in preserving joint biomechanics and preventing long-term degenerative changes. In the present study, all repairs were performed using the all-inside technique, which offers several advantages, including reduced surgical trauma, shorter operative time, and avoidance of accessory incisions. Paxton et al. reported in their systematic review that meniscal repair is associated with better long-term joint preservation compared to meniscectomy ⁽¹⁴⁾. Additionally, Grant et al. demonstrated that the all-inside technique provides comparable healing rates to traditional techniques, with the added benefit of lower complication rates ⁽¹⁵⁾.

The outcome distribution in the present study, with 90% of patients achieving good to excellent Lysholm scores, is consistent with previous literature reporting favorable outcomes following combined procedures ⁽¹⁶⁾. This further supports the concept that simultaneous restoration of ligament stability and meniscal integrity results in improved functional recovery and patient satisfaction. No significant complications were observed in this series, which is in line with the established safety profile of arthroscopic ACL reconstruction and all-inside meniscal repair. The minimally invasive nature of the procedure, along with adherence to a structured rehabilitation protocol, likely contributed to the favorable outcomes observed. Despite these encouraging results, certain limitations must be acknowledged. The study is limited by a small sample size and short duration of follow-up, which may not fully capture long-term outcomes such as graft survival or development of osteoarthritis. However, the strength of this study lies in the uniformity of the surgical technique and consistent use of a validated functional outcome measure.

CONCLUSION

Combined arthroscopic anterior cruciate ligament (ACL) reconstruction with meniscal repair using the all-inside technique provides significant improvement in pain relief and functional knee outcomes at short-term follow-up. The observed enhancement in Lysholm scores and reduction in VAS scores indicate effective restoration of joint stability and patient function. Preservation of the meniscus through a minimally invasive approach further supports favorable recovery and may contribute to long-term joint health. This technique represents a reliable and effective treatment option for ACL injuries associated with meniscal tears.

Declarations

Patient Consent- Written informed consent was obtained from the patient for publication of this case report and accompanying images.

Conflict of Interest- The authors declare that there are no conflicts of interest regarding the publication of this article.

Ethical Approval- Shree Balaji Medical College and Hospital, Chennai, Tamilnadu, India.

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