Assessment of Clinical Outcome in Anterior Cruciate Ligament Reconstruction Augmented With Fiber Tape

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HOW TO CITE:

Ambrish V.S , Lionel John.J, G. Vignesh (2026). Assessment of Clinical Outcome in Anterior Cruciate Ligament Reconstruction Augmented With Fiber Tape. International Journal of Special Education, 41(17s), 1258-1268

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ABSTRACT:

Introduction: Anterior cruciate ligament (ACL) injuries are common in young active individuals and can lead to instability and functional impairment. Fiber Tape augmentation (internal bracing) has been introduced to enhance graft protection and improve early postoperative stability [1,3].

Aim: To evaluate the clinical and functional outcomes of arthroscopic ACL reconstruction augmented with Fiber Tape.

Materials and Methods: This descriptive case series included 30 patients with ACL tear who underwent arthroscopic reconstruction with hamstring autograft augmented with FiberTape. Patients were followed up for 12 months. Functional outcomes were assessed using the Lysholm Knee Score.

Results: At final follow-up, 86.67% of patients achieved good to excellent outcomes. Only one superficial infection was reported, with no graft failures.

Conclusion: Fiber Tape augmentation provides excellent short-term functional outcomes with improved stability and minimal complications [1,3,4]

Keywords: Ligament Reconstruction; digital real estate; Bangalore; residential housing; market dynamics.

1. Introduction

Anterior cruciate ligament (ACL) injuries are among the most common ligament injuries of the knee, particularly in young active individuals. Untreated ACL deficiency leads to instability and increased risk of secondary meniscal and chondral injuries. Although arthroscopic ACL reconstruction is the gold standard, limitations such as graft elongation and delayed incorporation persist. FiberTape augmentation, also known as internal bracing, provides additional mechanical support by sharing load with the graft and protecting it during early healing [5]. Biomechanical studies have demonstrated increased load-to-failure strength, reduced elongation, and improved construct stiffness with FiberTape augmentation [3,4]. Clinical studies have shown comparable functional outcomes with no significant increase in complications [1,7].

AIM AND OBJECTIVES

Aim: To evaluate the functional outcome of arthroscopic ACL reconstruction augmented with FiberTape.

Objectives:

- To assess functional outcome using Lysholm Knee Score
- To evaluate postoperative knee stability
- To analyse complications
- To assess effectiveness of FiberTape augmentation

MATERIALS AND METHODS

This descriptive case series was conducted at a tertiary care centre over a period of one year.

Study Population: Thirty patients with clinically and MRI-confirmed ACL tear were included.

Inclusion Criteria:

- Age 18–40 years;
- symptomatic ACL tear;
- willing for surgery and follow-up.
- Active individual with graft size 7mm

Exclusion Criteria:

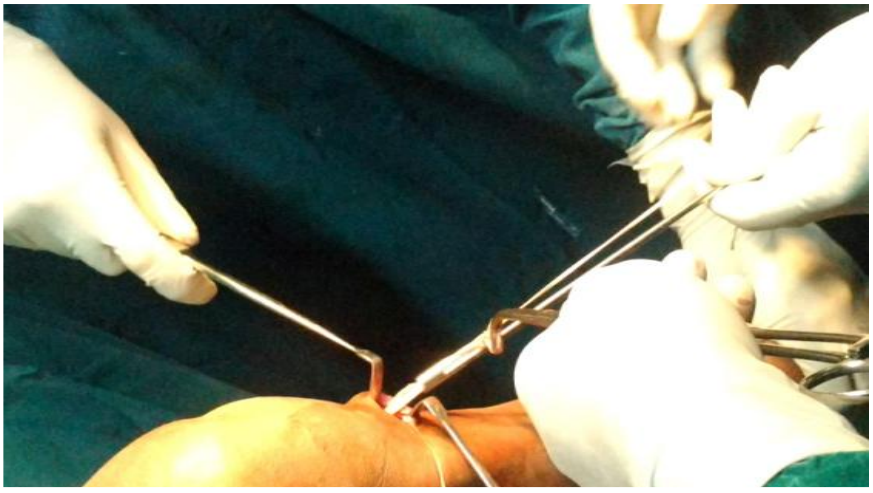
- Mult ligament injuries;
- Previous knee surgery;
- Associated fractures.
- Associated meniscal injury &cartilage injury
- Grade 3 or more knee osteoarthritis
- Skin infection
- Inflammatory arthritis

Preoperative Assessment: Clinical examination (Lachman, anterior drawer, pivot shift), MRI confirmation, baseline Lysholm scoring.

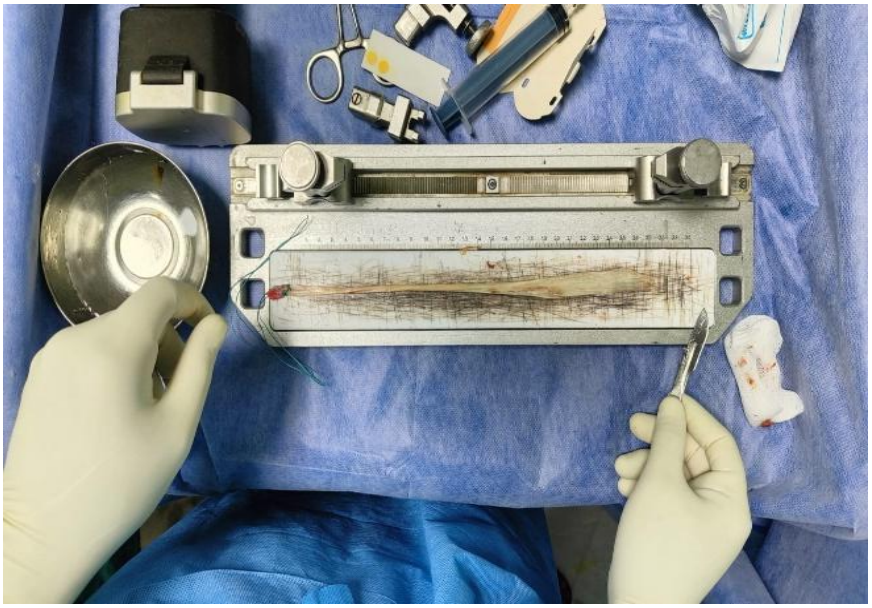
Surgical Technique:

Hamstring graft harvesting is performed using the semitendinosus and gracilis tendons through a small anteromedial incision over the pes anserinus. The harvested tendons are prepared and quadrupled to obtain an adequately sized graft. Following diagnostic arthroscopy, the tibial tunnel is created at the anatomical ACL footprint using an ACL guide. The femoral tunnel is then drilled through the anteromedial portal to ensure anatomical placement and restoration of native knee biomechanics. The prepared hamstring graft, along with FiberTape, is passed through the tibial and femoral tunnels. Femoral fixation is achieved using an Endobutton, providing secure cortical fixation. On the tibial side, the graft is fixed with a bio-interference screw. The FiberTape is then tensioned and secured independently using a SwiveLock anchor distal to the tibial tunnel, with care taken to avoid overtensioning and potential stress shielding. Finally, the knee is taken through a full range of motion to assess graft tension and stability, ensuring the absence of impingement. Arthroscopic visualization confirms proper graft placement and reinforcement.

Positioning Of The Patient



Graft Harvesting



Graft Preperation

Graft Augmented With Fibertape

Rehabilitation: Early mobilization, progressive weight bearing, quadriceps strengthening.

Follow-up: 6 weeks, 3 months, 6 months, and 12 months.

Outcome Measures: Lysholm Knee Score, clinical stability, range of motion, complications.

CASE SERIES

Case-1

A 30-year-old male engineer, Mr. Balan, presented with a history of right knee injury sustained during a sports activity (kabaddi). There was no history of associated systemic illness. The patient underwent arthroscopic anterior cruciate ligament reconstruction under spinal anaesthesia using a hamstring graft, which was fixed with a bioabsorbable screw and augmented with FiberTape. The postoperative period was uneventful with no complications reported. The patient was followed up for a duration of 12 months, during which satisfactory clinical recovery was observed

PREOP MRI

Findings are suggestive of a complete tear of the anterior cruciate ligament (ACL), evidenced by discontinuity and abnormal signal intensity of the ligament fibers. Associated joint effusion is present. The posterior cruciate ligament (PCL) appears intact. No obvious displaced fracture is identified in the visualized sections. Clinical correlation is recommended.

POSTOP XRAY

Post Operative Wound

POST OP FOLLOW

1st week

Knee Extension with Hip Flexion in Supine

2nd Week

Knee Flexion in Supine

6th week

Knee Flexion In Standing

Case-2

A 23-year-old male software engineer, Mr. Ganesh, presented with a history of right knee injury following a road traffic accident. There were no associated injuries or systemic illnesses. The patient underwent arthroscopic anterior cruciate ligament reconstruction under spinal anaesthesia using a hamstring graft, which was fixed with a bioabsorbable screw and augmented with FiberTape. The postoperative course was uneventful, with no reported complications. The patient was followed up for a period of 12 months and demonstrated satisfactory clinical recovery.

PREOP MRI

The anterior cruciate ligament (ACL) fibers appear discontinuous and poorly defined, with increased signal intensity and loss of the normal taut, low-signal band appearance, suggestive of a complete ACL tear. The posterior cruciate ligament (PCL) is intact, maintaining its normal low-signal, continuous morphology. There is mild anterior translation of the tibia relative to the femur, supporting features of ACL insufficiency.

POSTOP XRAY

Postop follow up

1st week-Knee Flexion in Supine

2nd week -Knee Extension with Hip Flexion In Supine

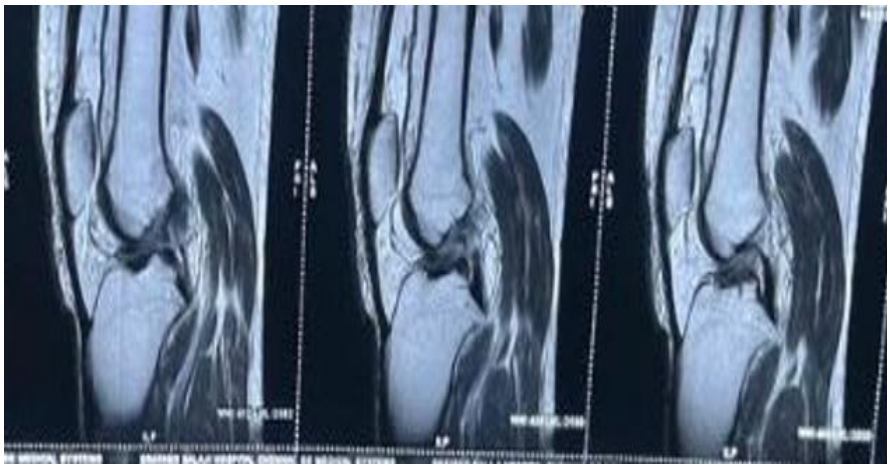
3rd month -squatting

Sitting crossed legs-3months

CASE-3

A 36-year-old male hotel manager, Mr. Jaganathan, presented with a history of left knee injury following a road traffic accident. There was no history of systemic illness. The patient underwent arthroscopic anterior cruciate ligament reconstruction under spinal anaesthesia using a hamstring graft, which was fixed with a bioabsorbable screw and augmented with FiberTape. The postoperative period was uneventful, with no reported complications. The patient was followed up for 12 months and demonstrated satisfactory clinical recovery.

PREOP MRI



Findings are suggestive of a complete tear of the anterior cruciate ligament (ACL), demonstrated by discontinuity of the normal ACL fibers. There is associated buckling of the posterior cruciate ligament (PCL), representing an indirect sign of ACL insufficiency. Mild anterior translation of the tibia relative to the femur is noted. Additionally, a small joint effusion is present, indicated by fluid signal within the intercondylar region.

POST OP XRAY

POSTOP FOLLOW UP

1st week-Knee Extension with Hip Flexion In Supine

2nd week -Knee Flexion in Supine

6th week -squatting

Sitting crossed legs-3 months

RESULTS

Mean age: 34 years; Males: 76.67%; Right knee: 56.67%.

Mode of injury: RTA 46.67%, slip and fall 30%, sports 16.67%.

Functional outcome: Excellent 40%, Good 46.67%, Fair 10%, Poor 3.33%.

Overall good to excellent outcome: 86.67%.

Complications: One superficial infection; no graft failure or instability.

DISCUSSION

ACL reconstruction with FiberTape augmentation has gained attention due to its biomechanical advantages. The internal brace reduces graft strain and improves early stability [5].

In this study, 86.67% achieved good to excellent outcomes, consistent with Bora et al. [1].

Biomechanical studies by Wicks et al. and Raja et al. demonstrated increased strength and reduced elongation [3,4].

Systematic reviews show superior mechanical properties compared to sutures [2,8].

Clinical outcomes remain comparable to conventional reconstruction, indicating FiberTape acts as a protective adjunct [3,7].

CONCLUSION

FiberTape-augmented ACL reconstruction is a safe and effective technique that yields excellent functional outcomes, enhanced knee stability, and low complication rates. Acting as an internal brace, FiberTape provides a load-sharing mechanism alongside the graft, reducing mechanical stress during the early postoperative phase and protecting against excessive elongation or potential graft failure [5]. This additional support facilitates early rehabilitation, enabling patients to regain range of motion and return to daily activities with greater confidence.

Importantly, FiberTape augmentation does not compromise biological graft incorporation, allowing normal ligamentization and healing to occur [4]. Clinical outcomes are consistently favorable, with a high proportion of patients achieving good to excellent functional scores and a low incidence of complications such as infection or graft failure [1,3,7]. While definitive long-term superiority over conventional ACL reconstruction remains to be established, FiberTape serves as a valuable adjunct by enhancing early stability and graft protection, thereby contributing to improved overall recovery and patient satisfaction [2,3].

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