

# FUNCTIONAL OUTCOME OF ARTHROSCOPIC ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION USING HAMSTRING GRAFT

## Clinical Article Orthopaedics

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### Abstract:

**Background:** Anterior Cruciate Ligament (ACL) rupture is one of the major knee injuries throughout the world. Number of patients with ACL tear undergoing reconstruction had risen recently and more favourable results have been obtained with the advances in Arthroscopic surgery .

**Objective:** The study was done to evaluate the functional outcome of arthroscopic ACL reconstruction using hamstring graft.

**Materials And Methods:** This study was conducted in department of orthopaedics of Govt. Mohan Kumaramangalam Medical college and hospital. 30 cases with anterior cruciate ligament tear were treated with arthroscopic reconstruction with quadrupled semitendinosus and gracilis graft. Patients were assessed for the functional outcome using Tegner Lysholm score.

**Results:** All 30 cases had good to excellent functional outcomes.

**Conclusion:** Arthroscopic anterior cruciate ligament reconstruction "using quadrupled semitendinosus and gracilis graft" is an effective method and gives stable fixation with excellent results.

**Key words:** Anterior cruciate ligament, Hamstring graft

## Introduction

Anterior Cruciate Ligament (ACL) rupture is one of the major knee injuries throughout the world. The incidence of Anterior Cruciate Ligament tears has increased in the general population with the rise RTA and participation in Sports. The Anterior Cruciate Ligament (ACL) serves an important stabilizing and biomechanical function for the knee joint. Rupture of the ACL leads to abnormal kinematics and predisposes the joint to degenerative changes<sup>5</sup>.

Early reconstruction of ACL allows the patient to return to pre trauma activity level and prevents meniscal injury and late degenerative changes of the knee joint. Reconstruction is also essential to restore the stability of the knee. The methods of ACL reconstruction includes open ACL reconstruction and arthroscopic ACL reconstruction<sup>7</sup>.

Arthroscopic ACL reconstruction has become the "Gold Standard" of choice for ACL insufficiency in active patients where there is marked reduction in postoperative morbidity<sup>8</sup>. It enables early vigorous physiotherapy as compare to open arthrotomy which needs excessive soft tissue dissection leading to complications such as postoperative pain, high rate of infection, post surgical knee stiffness and prolong rehabilitation. For decades, the patellar tendon was the most common autograft for ACL reconstruction. This technique renders good, reproducible results, which has advantage of bone to bone healing. The potential morbidity like patellofemoral pain, loss of motion and patellar fracture in patellar tendon graft has promoted the use of hamstring tendon graft as alternative graft source for ACL reconstruction. The quadruple hamstring tendon graft has excellent

material strength, minimal impact on the knee extensor mechanism and excellent postoperative outcomes. The graft fixation choices varies from bioabsorbable screws, endobutton for femoral side and suture post, interference screw, etc for tibial side which plays an important role<sup>9</sup>.

## Materials And Methods

The study was conducted on 30 patients who undergone arthroscopic ACL reconstruction using quadruple hamstring tendon autograft at the Department of Orthopaedics, Govt. Mohan Kumaramangalam Medical College and Hospital, Salem between the period of Jan 2014 to Dec. 2016.

### Inclusion Criteria:

- 1) Age: 20 to 50 years
- 2) Complete anterior cruciate ligament tear confirmed clinically and radiologically on MRI.
- 3) Associated Meniscal injuries
- 4) Duration of injury more than 6 weeks.

### Exclusion Criteria:

- 1) Age <20 years and > 50 years
- 2) Multiligamentous Injury
- 3) Previous ligamentous injury in the same knee joint.
- 4) Bilateral ACL injury.
- 5) Any other comorbid condition of the same knee joint such as osteoarthritis of knee, local infection etc.

A detailed general and physical examination was carried out followed by radiographic investigation.

## Diagnosis

History.

Physical examination.

Radiology: Roentgenogram and MRI.

## History

Nature of injury.

Mechanism of injury.

Duration since injury.

Pain: onset, duration, location and the site of maximum pain.

Effusion: onset, duration.

Stiffness.

History of giving way (instability).

Locking.

Associated injuries.

Primary treatment if any.

Past medical illness if any.

## 3.2 Physical Examination

Gait.

Tenderness.

Effusion of the knee joint.

Wasting.

Range of movements.

Patellar tracking.

Signs of instability of the anterior cruciate ligament.

Anterior drawer test.

Lachman test.

Pivot shift test.

Tests for associated ligamentous injuries

Diagnostic arthroscopy before the graft harvesting to confirm the nature of ACL injury and associated injuries at the same setting as ACL reconstruction.

## Steps of Surgery

1. Position of the Patient and Draping
2. Marking of the Landmarks
3. Diagnostic Arthroscopy

Diagnostic arthroscopy was done through standard medial and lateral parapatellar portals. Diagnosis was confirmed.

4. Harvesting of Graft



**Graft Harvesting**

Semitendinosus harvest is accomplished with knee in 90 degrees of flexion. A 4-5 cm longitudinal incision is made over the pes tendon beginning 2-3 cms distal to the joint line and 1 cm-2 cm medial to the tibial tuberosity. The sartorius aponeurosis is identified and semitendinosus tendon are palpated. The sartorius aponeurosis is incised in line with its fibers distal to underlining semitendinosus tendon. Using digital palpation the semitendinosus tendon is identified and with the help of right angled forceps isolated from the gracilis tendon. Connecting bands are carefully freed from ST tendon and harvested with tendon stripper. Same procedure is repeated for gracilis tendon. Inspection of superficial part of medial collateral ligament is carried out.

**5. Graft Preparation**

**Harvested Tendon**



**Prepared Graft**

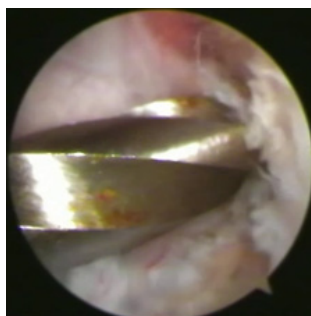
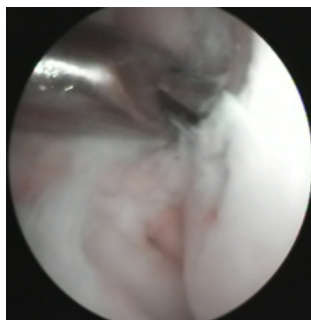


It is preformed on graft preparation board. Overall tendon length is measured. Each tendon ends are prepared with no. 5 ethibond with whip stitch. The two graft are doubled over ready made endobutton and quadrupled graft diameter and length is determined. The graft is kept moist wrapped in a wet sponge to prevent dissecation.

**6. Identification of the ACL Footprints**

The scope was re-inserted and torn ACL substance was shaved off. The ACL footprint on tibial and femoral side was identified. Remnants of the ACL were preserved at the footprint sites as identification landmark for the graft insertion and also to help proprioceptive stimulation.

**7. Femoral Tunnel Drilling by Medial Portal (Anatomic Femoral Tunnel) Technique**



With knee in 90 degrees flexion, an additional medial portal was created about 2/3rd medially across above the medial meniscus. A spinal needle was used to determine the exact location and to avoid accidental insertion of the medial meniscus.

Knee was then flexed maximally to > 120 degrees with leg on the operating table. This femoral tunnel is made via femoral aimer through anteromedial portal technique with a Endoscopic reamer. Depth of the femoral tunnel is measured and appropriate loop size of Endobutton is selected. The femoral tunnel was then over drilled with required diameter femoral drill. 10 mm additional length apart from femoral tunnel graft length was drilled with the same diameter femoral drill for allowing flipping of Endobutton.

**8. Tibial Tunnel Drilling**

**Tibial Jig At Acl Footprint**



**Guide Wire For Tibial Tunnel**



The tibial footprint identified and an ACL tibial jig with an angle set to 55 degrees was used to pass a guide wire up to the medial tibial metaphysis into the joint. The tunnel was enlarged with an appropriate reamer.

**9. Graft Loading and Passage**

A No. 5 ethibond leading suture loop was passed through the medial portal in to femoral tunnel laterally. This retrieved out of the tibial tunnel. The prepared graft was loaded with

appropriate Endobutton, the leading and trailing sutures and was passed over the No. 5 Ethibond suture.

**10. Femoral side fixation**

Graft was fixed on the outer side of femoral cortex side by flipping the endobutton..

**11. Tibial Side Fixation**

The tibial side fixation was performed with an interference screw that was passed up to the tibial tunnel with knee in 15 degrees of flexion with a posterior drawer given for applying tension distally. The size of the interference screw was generally 1 mm more than the diameter of the tibial tunnel in case of bioscrew whereas in case of titanium screws it is equal to that of diameter of tibial tunnel.

Excess graft coming out of the tibial tunnel was excised.

**Arthroscopic View Of Reconstructed ACL**



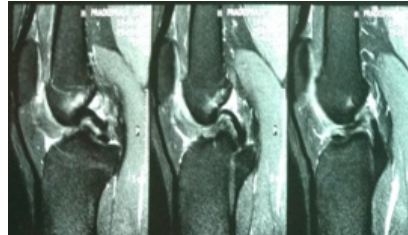
**12. Postoperative Protocol**

A long knee brace was applied over a padded compression dressing. Patient was subsequently discharged on 3rd post-operative day. Suture removal was done on post-operative day 12 if the wound was healthy. Patient was asked to follow up on 2nd, 4th and 6th post-operative months. We followed accelerated ACL rehabilitation protocol.

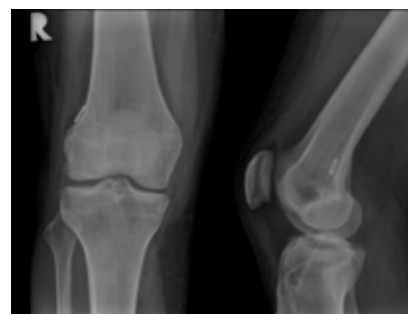
Pre-operative and post-operative scoring according to Tegner–Lysholm scoring system was done and records maintained.

**Tegner–Lysholm scoring**

Knee Score	Pre-operative	Post-operative
Excellent	NIL	22
Good	NIL	8
Fair	7	NIL
Poor	23	NIL



PRE OP MRI



POST OP X RAY



Post Operative Range Of Movements



Post OP Knee Picture

**Complications:**

**Femoral Tunnel Blow Out**



Femoral tunnel blowout occurred in two patients and two patients had numbness over the anteromedial aspect of leg and foot. Apart from that there were no major complications in our study. All patients returned to pre injury level of activity 6 months to 1 year after surgery.

**Discussion**

ACL reconstruction surgery has progressed considerably in the last decade with many recent advances and new developments. A lot of studies explored many factors involved in the different technical aspect of ACL fixation<sup>2,3</sup>. Development in arthroscopic techniques and improvement in technology and research have allowed anterior cruciate reconstruction to become one of the most successful surgical techniques in sports medicine. With advances in accelerated postoperative rehabilitation programs and initial strengths of four-stranded hamstring graft is greater than the native anterior cruciate ligament<sup>1</sup>.

Anterior cruciate ligament injuries are fairly common in younger generations. More common in males and the most common cause is road traffic accidents followed by sports injuries and household falls. Giving way of the knees as a result of instability is the most common symptom in anterior cruciate ligament deficient for which the patients seeks

advice. Locking is present in those patients having meniscal tears.

Kennedy et al compared the long term results of 19 acute tears of the anterior cruciate ligament treated surgically and 31 acute tears not subjected to surgery. A follow up study after seven years showed that the untreated group had deteriorated far more significantly as compared to the treated group, though the short term follow up at 44 months had not shown any significant differences between the two groups<sup>6</sup>. Therefore, he recommended repair of all acute anterior cruciate ligament tears to prevent long term sequelae. Reconstruction of anterior cruciate ligament with quadrupled semitendinosus autograft is a popular procedure. The goal of treatment is to return the injured patient to the preinjury level of function<sup>2</sup>.

Our series comprises 30 cases treated over last two years. We have used Tegner Lysholm knee scoring scale to evaluate the results as this is statistically proven as a better rating system and is widely used.

Wilson et al using combined reconstruction utilizing semitendinosus tendon for intra-articular and ilio-tibial band for extra-articular augmentation obtained 20% excellent, 73% good, 7% fair results. They did not have any poor results. However they used their own grading system<sup>12</sup>.

Sharma et al studied 17 patients who had undergone intra-articular reconstruction of anterior cruciate ligament using middle 1/3rd of patellar tendon along with the patella and tibial tuberosity graft. They had 59% excellent, 19% good and 11% each for fair and poor results<sup>10</sup>.

O'Neil D.B in his study of 127 cases. Compared results of three techniques i.e.,

Group I: Two incision reconstruction with the use of semitendinosus tendon graft.

Group II: Two incision reconstruction with use of patellar tendon graft.

Group III: Single incision reconstruction (endoscopic) with use of patellar tendon graft.

He had 88% excellent to good results for group I, 90% for group II and 93% for group III, according to tegner-lysholm knee score<sup>11</sup>. Results of our study is comparable to above quoted studies.

There were no major complications in the study.

### Conclusion

Arthroscopic ACL reconstruction using quadrupled hamstring graft is an excellent modality of treatment in patients with complete ACL tear. It provided excellent outcomes in terms of knee stability, range of motion and functional improvement of the operated knee. There were no major complications in our study without any graft site morbidity. The clinical impairment caused by hamstring graft harvestment appears to be tolerable virtually in all our patients.

Thus anterior cruciate ligament reconstruction using quadrupled hamstring autograft offer an excellent knee function, knee stability and restoration of preoperative functional status.

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