

## Study of clinical outcome following arthroscopic anterior Cruciate ligament reconstruction using autologous quadruple hamstrings graft

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### Abstract

**Introduction:** The Anterior Cruciate ligament (ACL) is the primary stabilizer of the knee and prevents the knee against anterior translation. Arthroscopic reconstruction of torn ACL has become the gold standard in treating ACL tears. The surgical reconstruction of the anterior cruciate ligament with auto graft represents an attempt to reestablish knee kinematics.

**Materials and Methods:** This is a prospective type of study conducted at NRI Medical College & General Hospital, Chinna Kakani, Guntur, Andhra Pradesh. During the period of December 2015 to November 2017 in ACL injuries, reconstruction of ACL using autologous quadruple hamstrings graft. All the cases were operated electivley on regular operation theatre days.

**Results:** The present study consists of 30 cases of complete ACL tear treated surgically with arthroscopic ACL reconstruction. In age distribution, 10 (33.3%) patients were between 18-24 years, 13(43.3%) were between 25-31 years and 7(23.3%) were between 32-38 years. In sex distribution, there were 27 (90%) males and 3(10%) females. Left lower limb was involved in 12 (40%) cases and right lower limb in 18 (60%) cases. All the cases were operated electivley on regular operation theatre days. ACL associated with medial meniscus injury in 8(26.6%) and ACL associated with lateal meniscus injury in 2(7.2%). Chronic ACL injury in 22(73.33%) and acute ACL injury in 8(26.6%). Post operative complications like Anterior knee pain in three patients(10%) treated with analgesics, Infection (Superficial)in one (3.3%) treated with intravenous antibiotics, deep Infection in one (3.3%) treated with intravenous antibiotics+ debridement finally hardware removal and extensor lag in one (3.3%) treated with rehabilitation.

**Conclusion:** Clinical outcome after arthroscopic anterior cruciate ligament reconstruction using autologous quadrupled hamstrings graft with post operative rehabilitation is excellent to good and patients will have near normal pre injury activity level.

**Keywords:** Anterior Cruciateligament (ACL), Quadruple hamstrings graft, Arthroscopy.

### Introduction

The knee joint is the most commonly injured of all joints and the anterior cruciate ligament is the most commonly injured ligament. The modern high speed vehicular trauma and sporting life style has led to increased ligament injuries of the knee. The sports related injuries followed by road traffic accidents were more common among youngsters while domestic fall injuries among elders.

The Anterior Cruciate ligament (ACL) is the primary stabilizer of the knee and prevents the knee against anterior translation.<sup>1</sup> ACL also important in counteracting rotational and valgus stress. After ACL injury patients experience recurrent episodes of instability, pain and decreased function which is more noticed while weight bearing and turning to side.

Reconstruction of ACL allows the patient to return to a pre trauma activity level and delays the occurrence of associated meniscal injury and onset of osteoarthritis. The incidence of associated cartilage damage in acute tears is reported at 15-40% whereas it increases to 79% in chronic tears.

Reconstruction is aimed primarily to restore the stability of the knee and secondarily prevents worsening of existing meniscal or chondral lesions and decreases incidence of newer lesions. Arthroscopic reconstruction of torn ACL has become the gold standard in treating ACL tears. The surgical reconstruction of the anterior cruciate ligament with

auto graft represents an attempt to re establish knee kinematics. Hamstring tendon graft which has similar functional outcome and kinematics compared to bone patella tendon bone graft. Even after better surgical techniques, fixation devices along with good rehabilitative measures few athletes with the injury retire due to residual knee instability range of motion, stiffness and pain and functional in capacitance to carry out the similar performance post trauma. Till now majority of the studies concentrate on the sports related injuries however due to raise in motor vehicle accidents and trauma in general population need for study of functional outcome in non sports individual due to varying amount of force, lack of awareness in seeking early medical attention, cost factors, lack of adequate continuous rehabilitation post operatively compared to sports individual needs to be studied

### Materials and Methods

This is a prospective type of study conducted at NRI Medical College & General Hospital, Chinna Kakani, Guntur, Andhra Pradesh. During the period of December 2015 to November 2017 and the title of the study is "Clinical Outcome following Arthroscopic Anterior Cruciate Ligament Reconstruction using autologous quadruple hamstrings Graft. Inclusion criteria for this study are patients between 15 – 45 age group with isolated near total or total tear of anterior cruciate ligament tear or associated meniscal tear with

no previous surgeries to the concerned knee. Patients above 45 years and below 15 years of age, patients with comorbid conditions and medically not fit for anesthesia, patients associated with fractures around knee and other ligament injuries and patients with generalized ligamentous laxity were excluded from study. All the patients who came to orthopaedic OPD were examined to confirm laxity of knee joint and to rule out any associated injuries. All the patients were subjected for X-rays which includes X-ray knee joint with antero posterior and lateral views to rule out any tibial spine avulsion and clinical diagnosis was confirmed with MRI scan of concerned knee (Fig. 1)

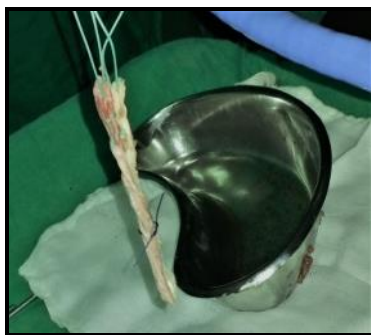


**Fig. 1: MRI showing complete ACL tear**

After surgical profile screening and getting fitness, all the patients were posted for surgery electively.

### Operative Technique

All the patients were operated under spinal anaesthesia and concerned lower limb scrubbed and draped after application of tourniquet. Diagnostic arthroscopy done and ACL tear confirmed. 5 cm long skin incision was given starting from 2 cm below and behind tibial tubercle, deep dissection done and tendons of semitendinosus and gracilis identified. After tendon harvesting quadrepulled tendon prepared. (Fig. 2)



**Fig. 2: Quadrepulled tendon**

After thorough shaving and debridement femoral tunnel made at 9.30 to 10.30 clock position on right side and 1.30 to 2.30 clock position on left side using 7mm or 8mm femoral of set. Femoral tunnel reamed

using femoral reamer depending on graft size. Tibial entry made using tibial jig with 55° angle and tibial tunnel reamed with tibial reamer. After measuring femoral tunnel length, concerned size of endobutton (Fig. 3) attached to graft and tendon passed from tibial tunnel to femoral tunnel. Endobutton flipped and graft cycling done. Tibial tunnel fixed with titanium interference screw. In some cases on both sides titanium interference screw used depending on affordability for endobutton. Intraoperatively graft tightness was checked and found satisfactory. Compression bandage applied after deflating tourniquet. Post operatively position of screw confirmed on x-ray knee joint (Fig. 4)



**Fig. 3: Endobutton.**



**Fig. 4: Post operative X-ray showing endobutton and interference screw**

Antibiotics and analgesics were given to the patient till the time of suture removal. Sutures/staples were removed after the 10th post operative day depending on wound condition. ROM knee brace was given post operatively. Patients were followed post operatively at 6,10 and 14 weeks thereafter every 3 months up to 1 year.

At follow up detailed clinical examination was done and patients were assessed subjectively for pain, laxity of knee and range of movements (Fig. 5).



**Fig. 5: Hip range of movements**

Knee function assessed using Lysholm score for subjective evaluation using following criterion like Limp (5 points), Support (5 points), Stair climbing (10 points), Squatting (5 points), Instability (30points), Pain (30 points), Swelling (10 points) and Atrophy of thigh (5 points). In our study Lysholm score was done at 3 months, 6 months, 1 year.

## Results

The present study consists of 30 cases of complete ACL tear treated surgically with arthroscopic ACL reconstruction. In age distribution, 10 (33.3%) patients were between 18-24 years, 13(43.3%) were between 25-31 years and 7(23.3%) were between 32-38 years. In sex distribution, there were 27 (90%) males and 3(10%) females. Left lower limb was involved in 12 (40%) cases and right lower limb in 18 (60%) cases. All the cases were operated electively on regular operation theatre days. ACL associated with medial meniscus injury in 8(26.6%) and ACL associated with lateral meniscus injury in 2(7.2%). Chronic ACL injury in 22(73.33%) and acute ACL injury in 8(26.6%). Post operative complications like Anterior knee pain in three patients(10%) treated with analgesics, Infection (Superficial)in one patient (3.3%) treated with intravenous antibiotics, deep Infection in one patient (3.3%) treated with intravenous antibiotics with debridement, finally hardware removal and extensor lag in one patient (3.3%) treated with rehabilitation.

**Table 1: Age group (n=30)**

Age Group (Yrs)	No. of Pts	Percentage
18-24	10	33.33%
25-31	13	43.33%
32-38	07	23.33%

**Table 2: Sex incidence**

Sex	Number of patients	percentage
Male	27	90%
Female	3	10%

**Table 3: Side incidence**

Side	Number of patients	percentage
Right	18	60%
Left	12	40%

**Table 4. Acute vs Chronic**

Presentation	No. of cases	Percentage
Chronic	22	73.33%
Acute	08	26.66%

**Table 5: Associated injuries**

Injury	No. of pts	Percentage
Isolated ACL	20	66.6
ACL +medial meniscus	8	26.6%
ACL +lateral meniscus	2	7.2%

**Table 5: Complications**

Complications	No. of cases	Treatment given
Anterior knee pain	03	NSAIDS
Infection (Superficial)	01	Intravenous antibiotics
Infection (Deep)	01	Intravenous antibiotics+ debridement finally hardware removal
Extensor Lag	01	Rehabilitation

## Discussion

Anterior cruciate ligament (ACL) injuries are most often a result of low-velocity, noncontact, deceleration injuries and contact injuries with a rotational component secondary to twisting, valgus stress, or hyperextension.

ACL injury more common among young individuals compared to elder. With average age among the sports 31.34 years while in non-sports 37.43 shows younger people more involved in a sports. Mall NA et al which showed a ACL reconstruction incident among less than 20 years and more than 40 years in the study.

There are 97% male patients involved in our study compared to others of which the non-sports category highest numbers. According to Jay Coakley gender differences were found in the ways sport experiences. Young and adult men had somewhat more favorable physical activity patterns than adult women. In a comparison of international data, Stephens and Caspersen have shown that physical activity levels generally decrease with increasing age although tending to be higher among men than women.

Arthroscopic ACLR technique practiced in our center is the Quadrapled hamstring (semitendinosus and gracilis) auto graft reconstruction with meniscus preservation. All our fixations used titanium interference screw (femoral and /or tibial) and endobutton (femoral) as like majority of surgeon's preference across the globe. However a meta-analysis that compared between bio absorbable and metallic screws in ACL reconstruction found no significant differences in functional outcomes or stability. Few articles reported that metal screws, compared with bioabsorbable screws, had higher rates of graft laceration in hamstring ACL reconstruction but affordability also come into play as is in our general hospital.

Renström<sup>3</sup> suggested that the patient's perspective of the ACLR outcome should be the primary outcome measure used by surgeons. Studies reporting the outcome using International Knee Documentation Committee (IKDC) subjective score shows that a normal value for IKDC subjective would be in the range of 86%–89.4% which is comparable to our result

that non-sports have 88% and 90.8% had normal to nearly normal knee.

Patients with a higher Lysholm score<sup>4</sup> probably have better clinical and functional conditions prior to surgery. A tendency towards faster progression in the early rehabilitation phases was also observed in this group than other patients. Even though there is an increase in the functional outcome among the sports patients compared to non-sports individuals however there is no statistical significant elevation in the outcome. This may be due to gradual decrease in following physiotherapy in most of the patients once the day to day activities of walking, squatting and climbing stairs returned. More number of highly active and productive individuals in the non-sports category contributes to increase in the score levels that equals to sports injuries.

The factors such as Lifestyle changes for occupational demands may also play significant role in determining whether an individual continues to participate in the specified activity in the longer time after surgery an injury level after surgery.

In fact Devgan et al. found that at five years follow up, in the group which had not returned to sport, reported fear of re-injury being the biggest single factor in not returning to sport. Lentz et al found that 45% of patients, who had not returned to sport reported fear of re-injury/lack of confidence as a reason; this group also had significantly greater fear of movement.

There is no statistical significance in the functional outcome among the isolated ACL injuries and ACL with associated injuries in our study which shows a better functional outcome can be achieved in both type of patient observed by Clement et al.,<sup>5</sup> whose study group had 69% of non-sports injuries which were comparable to our study. However there occurs an increased incidence of medial meniscal injuries at the base line studies in our study while they included both BPTB graft and hamstring groups which are against our studies. The high incidence of medial meniscus injury comparable to the Papatogiou et al and Kennedy et al.

In our study about 33% patients underwent partial meniscectomy. According to in vitro studies the increase in peak stresses on the tibial plateau after removal of meniscal tissue was directly correlated with the amount of tissue removed. This would mean that the less the resection of meniscal tissue without leaving unstable parts which may give rise to symptoms, the better the mechanical situation of the joint after partial meniscectomy. On the other hand, according to Seedhom & Hargreaves solely transecting around the whole periphery of the meniscus or one of the insertional ligaments without removal of any tissue would lead to a complete loss of the load distribution function of the meniscus.

Paxton et al.<sup>6</sup> recently published a systematic review comparing re-operation rates and clinical outcomes after meniscal repair and partial

meniscectomy surgery demonstrated a lower re-operation rate (3.9%) and meniscal repairs were associated with better clinical outcomes.

The medial meniscus is an important structure in the knee, involved in stabilizing the joint and spreading loads. It has been demonstrated that meniscectomy plays a role in knee instability, and some authors have suggested that it plays a role in ACL graft failure. It is also very important to consider the bi-directional relationship between the ACL and the medial meniscus and their biomechanical interdependence is involved in stabilizing the joint. It has been shown that after ACL rupture, tibial translation increases and the resultant forces on the medial meniscus are doubled. The literature reports that total meniscectomy leads to increased AP instability of the knee and chances of failure of ACL reconstruction.

### Conclusion

Clinical outcome after arthroscopic anterior cruciate ligament reconstruction using autologous quadrupled hamstrings graft with post operative rehabilitation is excellent to good and patients will have near normal pre injury activity level.

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