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Dr. Praveen Manoharan
Post-Graduate, Department of Orthopaedics, KAHER, JNMC Belagavi, Karnataka, India

Dr. Ravi S Jatti
Professor, Department of Orthopaedics, KAHER, JNMC Belagavi, Karnataka, India

Dr. Puneet H Chamakeri
Assistant Professor, Department of Orthopaedics, KAHER, JNMC Belagavi, Karnataka, India

Dr. Sahil D Kale
Senior-Resident, Department of Orthopaedics, JNMC Belagavi, Karnataka, India

Corresponding Author:
Dr. Praveen Manoharan
Post-Graduate, Department of Orthopaedics, KAHER, JNMC Belagavi, Karnataka, India

Functional outcome of anatomical reconstruction of anterior cruciate ligament with hamstring graft: A one year hospital based - observational study

Dr. Praveen Manoharan, Dr. Ravi S Jatti, Dr. Puneet H Chamakeri and Dr. Sahil D Kale

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Abstract
Background: Knee injuries are more common in the modern era due to increase in the road traffic accidents and more involvement in sports related activities by young people. Anterior cruciate ligament is the often injured ligament around knee joint. Anterior cruciate ligament has a pivot role in function and stability of the knee joint, being the primary stabilizer preventing the anterior translation of tibia over femur. Arthroscopic anterior cruciate ligament reconstruction has become the gold standard in the management of these injuries.
Objective of the study: To assess the functional outcome of anatomical reconstruction of ACL with quadrupled hamstring graft.
Materials and Methods: Patients with post traumatic anterior cruciate ligament injury admitted to the Department of Orthopaedics at the Kle's Dr. Prabhakar Kore Hospital and Medical Research Centre and Charitable Hospital, Belagavi in between 1st January 2019 to 31st December 2019, over a period of one year – hospital based observational study.
Results: The study group comprised of 30 patients. In our study the most common mode of injury was found to be Road traffic accident followed by sports. Abundant of the patients were in the age group of 18-25yrs. In our study 13 patients had isolated ACL injury, 11 pts had medial meniscus injury, 4 patients had lateral meniscus injury and 2 patients had both the meniscus injured. It is found that 57% of them associated meniscal injury. Functional outcome was assessed using LYSHOLM and GILLQUIST SCORE. At the end of 9th month follow up 80% of the patient had excellent score which were 57% at the 3rd month. 13% of patient had good score at the end of 9th month and 7% of patient had fair score. None of the patient had poor score.
Conclusion: Anatomical reconstruction of ACL with quadrupled hamstring graft gives better clinical outcomes. The advantage of using hamstring graft are reduced donor site morbidity and less anterior knee pain in long term follow up. It has better subjective and objective functional outcome with low graft rejection or failure rate.

Keywords: Arthroscopic ACL reconstruction, hamstring graft, endobutton, quadrupled hamstring graft, lysholm and gillquist score

Introduction
The knee joint is composite and prodigious joint which is contrived by three bones and immense network of ligaments and muscles. As Knee joint is one of the weight bearing joint, it plays a vital role in supporting the body in dynamic and static situation and is also subjected to tremendous forces during meticulous activities. Out of other joints in our body, knee is the often injured joint and ACL is commonly injured ligament. In this competitive world many teenagers and young adults who are obsessed with the sports and so the occurrence of ACL injury is more among them. The disruption of ACL will influence the normal kinematics of the knee leading to the instability of the knee during acceleration, deceleration and rotational activities which may end up in mechanical failure and swaying away.
Until late 1890, ACL injury was considered as end of the career in a sports person. Therefore, reconstruction of ACL is necessary and techniques are crucial and have evolved over a few decades in terms of choice of the graft and in surgical techniques.

ACL injuries are frequently associated with meniscus and osteochondral injuries which need to be considered during the surgical repair else the person will progress towards degenerative changes of the knee [1].

Open reconstruction of ACL which has complications like post operative knee pain, stiffness, prolonged period of rehabilitation. Considering these complications and time consuming procedure, Arthroscopic reconstruction of ACL has become the gold standard procedure in recent times [2].

If surgery is indicated for reconstruction of ACL, then the use of autologous tendon grafts for the substitution of the injured ligament is endorsed [3]. But the graft of choice is still in altercation.

Arthroscopic ACL reconstruction, with both BPTG and hamstring graft has gained popularity in recent times.

Rehabilitation following ACL reconstruction has emerged with time and is more emphasized on strengthening of the muscles and joint kinematics. An ACL deficient knee must be reconstructed to an ACL efficient knee by all means.

Materials and Methods

This observational study include 30 patients who had undergone Anterior Cruciate Ligament reconstruction using quadrupled Hamstring graft at Department of Orthopaedics, KLE'S Dr. Prabhakar Kore Hospital and Medical Research Centre, Belagavi. Period of study 1st January 2019 to 31st December 2019**.**

Inclusion Criteria: Both genders above 18yrs of age. 1. Symptomatic unilateral ACL rupture 2. ACL injury associated with meniscus injury 3. Chondral lesion (type1&2).

Exclusion Criteria: 1. ACL rupture associated with posterior cruciate ligament injury, 2. Lateral collateral ligament injury, previous ligament reconstruction, 3. Stage 3 & 4 chondral lesion and advanced osteoarthritis of knee, 4. Patient with history of concurrent fracture, 5. Patient with history of operation on either knee. After all pre-operative patient was taken to operation theatre, under combined spinal and epidural anesthesia patient positioned supine on a standard operating table with knee joint little further from the distal breakpoint of the table. 1 liter saline bottle is placed below the injured knee to allow easy mobilization during the procedure. Uninjured limb is placed on a well-padded support. The following tests are performed under anesthesia ADT, PDT, LT & PST. The tourniquet is placed on the upper thigh. The limb is then scrubbed from the foot till the tourniquet and drapped with sterile aseptic precautions. Illumination of the scope and monitor brightness ensured in advance before making a skin incision. Diagnostic arthroscopy was performed to detect any associated meniscal lesion. Before the harvesting of graft, diagnostic arthroscopy was done first. In 90 degrees of knee flexion, anterolateral port (viewing portal) is made using 11 number blade at the level of inferior pole of patella just lateral to the patellar tendon. After all the pathologies have been recorded, the anteromedial (working) portal is then established. The associated pathologies are dealt accordingly such as partial / total meniscectomy for meniscal tears and loose body removal. A 4cm skin incision is taken 3cm medial to tibial tuberosity and 4cm below the joint line. Subcutaneous dissection done. Hemostasis achieved and insertion of pes anserinus is exposed.

The superior and inferior border of Sartorius tendon is palpated and gracilis and semitendinous tendon are identified 3-4 cm medial to tendinous insertion.

A small incision is made in line with the superior border of the gracilis tendon and the underlying medial collateral ligament is protected with care. Staying in the same plane adequate exposure is maintained by retracting without injuring the saphenous vein and nerve.

The tendons are identified and with aid of right angled artery forceps gracilis, semitendinous are released from its fibrous extension to gastrocnemius and semimembranous muscle.

Keeping the knee in 90 degree flexion, dissection is done using finger upto musculo-tendinous junction, in order to release adhesion with persistent traction applied through the double loop knot in end of tendon with threads.

Now the distal part of the tendon is dissected subperiosteally and released from its origin

Before releasing the tendon with stripper, the tendon carefully palpated to ensure that it is free from any adhesions and fibrous extension, then the tendon is stripped with controlled traction. In the same manner semitendinous tendon is also stripped.

The Harvested graft is then soaked in a saline bowl and its residual muscle fibres are carefully removed.

The second graft is then folded and quadrupled and placed on graft master. The graft is then trimmed to same size, looped to form quadrupled graft and stitched together with whip stitch pattern. The graft length and diameter measured.

Through Anterolateral port scope is inserted and shaver introduced through the anteromedial port. Joint is debrided of reflections of synovial fat and torn ACL. Femoral and tibial footprints are visualized and marked.

To gain access to the medial aspect of lateral femoral condyle notchplasty is done. It has a significance in chronic ACL tear where osteophytes intrude the notch and it presents the impingement of graft in full extension of knee. Notchplasty restricted to anterior intercondylar notch, excess lateral notchplasty is refrained, else lateralization of graft will occur in the femoral attachement site.

Femoral Tunnel Preparation: The native ACL footprint is marked keeping knee in 90 degrees of flexion and entry point is marked with aid of femoral offset aimer the marked point is drilled till the tip of guide wire pierces the lateral side of thigh. Now with drill bit the femoral tunnel is established by drilling both the cortices. Later the tunnel is reamed according to the diameter of the graft. The reaming is limited to 20mm from the far cortex.

Tibial Tunnel: With the aid of tibial guide, the tibial tunnel is established by keeping the knee in 70-90 degree flexion. The tibial guide placed 55-60 degree to tibial plateau to obtain accurate angle of native ACL. For stable fixation it should have a minimum of 20mm bone to secure the graft. With the rasp the tunnel is contoured and confirmed the outer portion tunnel is free of any soft tissues.

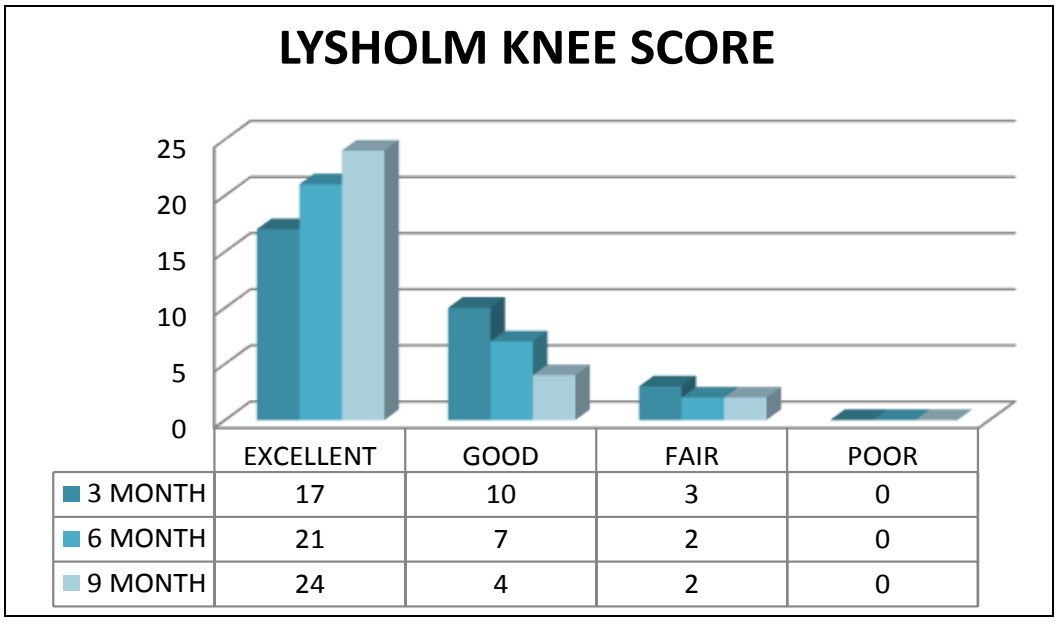
Graft Fixation: Graft is then passed through the femoral tunnel through arthroscopic guidance and the endobutton in flipped, cyclical tensioning of the graft is done by flexion and extension of the knee joint and then fixed with interference screw on the tibial side. The excess graft is trimmed and the stability of the knee is assessed by Lachman and pivot shift test. The incision is closed in layers.

Postoperative Management: Rehabilitation protocol initiated from POD 1. Dressing done on POD 2, 5, 7 and suture removed on 12th day. The patients were evaluated by

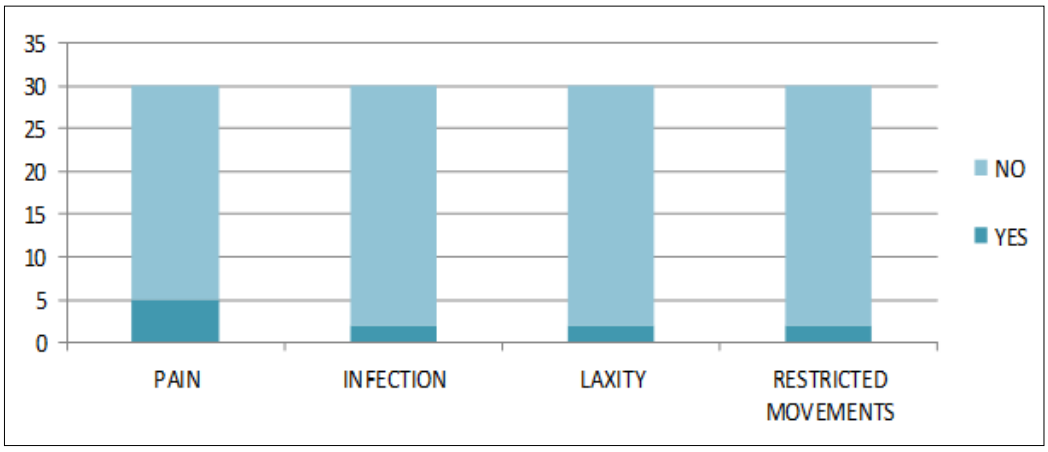
ADT, PST & LT and Lysholm knee scoring scale.

Results

The youngest patient was 21 yrs and the oldest patient was 52 years old. The maximum number of patients were in the age group of 18-25 (40%) followed by the age group 26-29yrs (27%). The mean age was 29.2yrs. In our series of 30 patients, 25 patients (83%) were males and 5 patients (17%) female, (Male Predominance). It may be because of the involvement of males in outdoor activities like sports and motor vehicle accidents. Right knee was injured in 24 patients (80%) and left knee was injured in 6 patients (20%). Most of the ACL tears were caused by RTA (70%). Next common cause was sports activities (17%). Some patients (13%) got injured while doing daily activities like slip and fall. Majority of the patients who were operated had a time interval from injury to surgery between 6 weeks – 3 months (33%) followed by 3 months- 6months (30%). 40% Patients were having instability and 27% cases presented with knee pain. 13% gave history of locking of knee, 20% presented with instability and knee pain. Diagnostic arthroscopy prior to ACL reconstruction confirms the medial meniscal tear in 37% cases and 13% lateral meniscal tear. Both the menisci were injured in 7%. 43% were isolated ACL injuries. 5 patients (17%) had pain. Infection was present in 2 cases (7%). patients (7%) were having grade I laxity. 2 patients (7%) had flexion difficulty. 57% of patients were compliant to postoperative rehabilitation protocol and 43% were Non-compliant. 40% of the study population were actively involved in sports activities. At the 9th month follow up 80% of the patient had excellent score which were 57% at the 3rd month. 13% of patient had good score at the end of 9th month and 7% of patient had fair score. None of the patient had poor score.



Graph 1: Distribution of cases based on lysholm knee score



Graph 2: Distribution of cases based on postoperative complications

Table 1: Distribution of cases based on presenting symptoms

Symptoms	Number	Percentage
Instability	12	40
Knee pain	8	27
Locking	4	13
Instability and knee pain	6	20
Total	30	100

Table 2: Distribution of cases based on associated injuries

Number	Associated injury	Frequency	Percentage
1	Isolated ACL tear	13	43
2	MM Tear	11	37
3	LM Tear	4	13
4	MM and LM tear	2	7
	Total	30	100

Discussion

In the past, ACL tear was contemplated to be of faintly a tiny importance to the extensive function of the knee. The concept of ACL reconstruction and evolution of the surgery over the period of years had made awareness among young surgeons and led to a riveting transformative path and now it is considered as one of the common procedures in Orthopaedics. As the technique of ACL reconstruction progressed in the last few decades and secured infallible results. Exchange of views on the choice of graft has become a altercation in the recent years. The options of graft for ACL reconstruction comprehend Hamstring auto graft, bone patellar tendon graft, quadriceps graft, allograft and various synthetic graft. Out of these frequently used grafts are Hamstring graft and bone patellar tendon graft.

The use of hamstring graft had credence as panacea for the problems with bone patellar tendon graft and has advantage in spite of having a reduced strength of the native ACL.

Our study is to assess the functional outcome of reconstruction of ACL using quadrupled HS autograft. This observational study was conducted in Jawaharlal Nehru Medical College, Dr. Prabhakar Kore Hospital, Belagavi to clinically assess the efficacy of arthroscopic reconstruction of ACL with quadrupled hamstring graft. The study group comprised of 30 patients. In our study the most common mode of injury was found to be Road traffic accident followed by sports. Among sports football was the commonest cause of ACL injury. Male form most part in our study. Abundant of the patients were in the age group of 18-25 (40%) patients underwent ACL reconstruction 6 weeks to 3 months after initial injury.

Tetsuo Hagino et al. [4] commented that in acute group medial meniscus tear was found in 69.4%, lateral meniscus was 10.8% and both meniscus in 19.9%, whereas in chronic group medial meniscus 33.9%, lateral meniscus in 24.7% and both the meniscus in 41.4%. The study concluded that meniscal tear associated with ACL injury is more in chronic cases and medial meniscus predominantly higher. In our study associated meniscal injury is found to be 50%. 13 patients had isolated ACL injury, 11 pts had medial meniscus injury and 4 patients had lateral meniscus injury and 2 patients had both the meniscus injured. Commonly injured was isolated ACL which was in commiserating with the other studies [10]. In our study among the patients with meniscal injury 3 patients were treated by partial meniscectomy and meniscus repair was done for 6 patients and rest were managed conservatively. We have tried to avoid doing meniscectomy since that accelerates the degenerative changes the knee joint. So this in commiserate with the functional outcome of isolated ACL injury.

All patients are evaluated with Lysholm and Gillquist scoring at the end of 6 months. The maximum score achieved was 100 and minimum score was 80. Initial follow up at 3rd month, out of 30 only 17 (57%) patients had excellent score, at 6th month 21 (70%) had excellent score, it improved to 80% at 9th month follow up. 13% of patient had good score at end of 9th month and 7% of patient had fair score. None of them had poor score.

The fixation of the graft has been proved to be the site of failure rather than the graft itself irrespective of the type of graft especially in the early rehabilitation phase when the graft integration has not taken place and the fixation is of little significance after 8 to 12 weeks when graft has integrated with the bone as proposed by Dawn T Gulick [5]. There has not been a single graft failure in our study from early rehabilitative phase to 9 months of follow up [6].

There was no significant patellofemoral pain noticed in the patients in our study. This is similar to the study by Railey *et al*. [8]. Who did not observe any clinically relevant patellofemoral pain in patients in whom arthroscopic ACL reconstruction using hamstring graft was done?

Williams et al in their study of 2500 cases of arthroscopic ACL reconstruction, reported an infection rate of 0.3%. In our study 2 patients had superficial infection which subsided with IV antibiotics [7].

The rehabilitation programme followed in our study ensured from preventing the complication due to ACL reconstruction like pain, inflammation, swelling, restoring normal range of motion, preventing muscle atrophy [9].

Conflict of interest: No potential conflicts of interest relevant to this article were reported.

Authors contribution: All the authors have contributed equally in developing the manuscript

Acknowledgment: Nil

Fig 1: Tensioning the graft

Fig 2: Graft fixation in tibia with interference screw

Conclusion

Anatomical reconstruction of ACL with quadrupled hamstring graft gives better clinical outcomes. The advantages of using hamstring graft are reduced donor site morbidity and less anterior knee pain in long term follow up. It has better subjective and objective functional outcome with low graft rejection or failure rate. The success of the Anterior Cruciate Ligment Reconstruction depends of experience of the surgeon in arthroscopic technique, exact placement of the graft and patients compliance on rehabilitation protocol.

References

1. David Simon, Randy Mascarenhas, Bryan M. Saltzman, Meaghan Rollins, Bernard R. Bach Jr., and Peter MacDonald, The Relationship between Anterior Cruciate Ligament Injury and Osteoarthritis of the Knee, Advances in Orthopedics.
2. Frank CB, Jackson DW. The science of reconstruction of the anterior cruciate ligament. J Bone Joint Surg Am, 1997.
3. Romanini E, *et al*. Graft selection in arthroscopic anterior cruciate ligament reconstruction. J Orthop Traumatol, 2010.
4. Tetsuo Hagino *et al*. Meniscal tears associated with anterior cruciate ligament injury PMID: 26286641 DOI: 10.1007/s00402-015-2309-4
5. Rachel Frank M, Jason Hamamoto T, Gregory Cetanvich, Nikhil Verma ACL, Dawn Gulick T. Reconstruction Basics: Quadruple (4-Strand) Hamstring Autograft Harvest. Doi: 10.1016/j.eats.2017.05.024
6. Vivek Morey M, Buddhadev Chowdhury, Sukesh Rao Sankineani, Sameer Naranje M. Prospective comparative study of clinical and functional outcomes between anatomic double bundle and single bundle hamstring grafts for arthroscopic anterior cruciate ligament reconstruction. PMID: 26253848 10.1016/j.ijsu.2015.07.699
7. Kurosaka M, Yoshiya S, Andrish IT. A biomechanical comparison of different surgical techniques of graft fixation in anterior cruciate ligament reconstruction. Am J Sports Med. 1987;15:225-9.
8. Beynnon Pope, Wertheiner Railey. The effect of functional knee braces on strain on the anterior cruciate ligament in vivo. J Bone Joint Surg. 1992;74(A):1298-1312.
9. Paulos LE, Cherf J, Rosenberg TD. Anterior cruciate ligament reconstruction with autograft. Clin Sports Med. 1991;10:469-485.
10. Jones KG. Reconstruction of the anterior cruciate ligament using the central one third of the patellar ligament- a follow-up report. J Bone Join Surg. 1970;52A:1302-8.