ORIGINAL RESEARCH PAPER
Volume-9 | Issue-2 | February-2020 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

STUDY OF OUTCOME OF ANTERIOR CRUCIATE LIGAMENT RECONSTRCUTION USING HAMSTRING GRAFT

Orthopaedics

Dr. K. P. Saravanakumar M.S (Ortho), Associate Professor, Department of orthopaedics, Government Theni medical college, Theni

Dr. Karthik Asthi* M.S (Ortho), Assistant professor, Department of orthopaedics, Panimalar Medical College Hospital& Research Institute , Chennai *Corresponding Author

ABSTRACT

The anterior knee instability due to tear of the ACL is an important clinical problem. The intrinsic repair capacity of ACL is very poor. The patients with knee symptoms of ACL deficiency, must consider ligament reconstruction for stabilizing the knee joint for achieving better function of the knee joint. Our study is designed for analyzing the outcome of arthroscopic ACLR with hamstring autograft fixed in femoral tunnel using endobutton and in the tibial tunnel using interference screw and additionally anchored with a cancellous screw or suture wheel if necessary. The Lysholm Knee Scoring Scale comprised of eight parameters for evaluation. The parameters evaluated are– limp, use of support on walking, locking episodes, instability, pain, swelling, stair climbing and squatting. All patients had instability of knee in the formof giving way evaluated by Lachman test and confirmed by arthroscopy. ACLR reduces postoperative morbidity and enables early rehabilitation The functional outcome of anterior cruciate ligament reconstruction with quadrupled hamstring autograft is excellent to good (80%) with mild laxity at the end of 6 months. 67% of the patients were able to return to pre injury level of activity

KEYWORDS

Anterior cruciate ligament, injury, repair,arthroscopy, ligament reconstruction

1.INTRODUCTION

The knee joint is very commonly injured and the Anterior Cruciate Ligament (ACL) is the most commonly injured ligament requiring surgery [1]. The modern high speed vehicular trauma and sporting life style has led to increased ligament injuries of the knee. The ACL forms the pivot in the functional congruence and stability of the knee in association with the other ligaments, capsule, muscles and bone [2, 3].The ACL primarily stabilizes the knee and aids in preventing the knee against anterior translation [4]. It is also important in counteracting rotational and valgus stress. The anterior knee instability due to tear of the ACL is an important clinical problem. The intrinsic repair capacity of ACL is very poor. The patients with knee symptoms of ACL deficiency, must consider ligament reconstruction for stabilizing the knee joint for achieving better function of the knee joint. Several studies have elaborated successful reconstruction of the ACL using autograft (bone patellar tendon, hamstring tendon, quadriceps tendon) and allograft (patellar tendon, hamstring tendon, tibialis anterior, achilles tendons [5]. To date several different techniques have been described for Anterior Cruciate Ligament Reconstruction (ACLR) from open to arthroscopic technique [6]. The Bone patellar tendon bone (BPTB) graft was the most commonly used graft in ACL reconstruction. However problems due to the extensor mechanism of the knee, motion loss, patella infra, fracture of patella and the persistence of anterior knee pain has made surgeons to think of other graft materials for use in ACLR. The hamstring's graft represent an alternative autograft material that may be used for ACLR without much trouble for extensor mechanism.In 1954, successful arthroscope was developed and brought many possibilities for treating knee injuries. Since 1982, the ACLR has often been performed arthroscopically [7]. Arthroscopically assisted ACLR has the advantage of being minimally invasive, accurate graft placement, less damage of normal tissue resulting in quicker wound healing and rehabilitation, minimal hospital stay and very less infection rate.

ACLR with Hamstring tendon has become in popular in patients with symptomatic instability and in appropriately chosen patients yields successful results [8]. The cells of a quadrupled hamstring tendon graft probably survive intra articular implantation, but the cells of a BPTB graft do not. The quadrupled hamstring tendon graft is enriched by synovial fluid initially for its nourishment. There are a wide variety of fixation devices for the quadrupled hamstring tendon graft; however only a few provide better strength and stiffness than interference screw fixation of a BPTB graft at implantation. Aggressive rehabilitation is safe with both types of autograft as long as strong, stiff fixation methods are used. The meta-analysis was performed Biau, et al, in 2007 to provide qualitative data to ascertain whether BPTB or hamstring graft provided superior knee function as determined by final overall IKDC evaluation and return to pre injury level of activity. No difference was found in the patients restoring to full activity after hamstring tendon graft and BPTB graft reconstruction [9]. There is fair evidence that patients reconstructed with hamstring graft report less morbidity than those reconstructed with BPTB graft. The stability improvement with BPTB graft compared withfour strand hamstring graft remains debatable for most patients. Our study is designed for analyzing the outcome of arthroscopic ACLR with hamstring autograft fixed in femoral tunnel using endobutton and in the tibial tunnel using interference screw and additionally anchored with a cancellous screw or suture wheel if necessary.

2. AIM

To study the outcome of Anterior Cruciate Ligament Reconstruction using Hamstring autograft.

3.MATERIALS AND METHODS

MATERIAL

The prospective study consists of 15 patients who had undergone Arthroscopic ACL reconstruction using Hamstring autograft at the Department of Orthopaedics &Traumatology, Government Rajaji Hospital, Madurai.

Age and sex criteria:
20-50 years of both sex

INCLUSION CRITERIA

- ACL tear diagnosed clinically and by MRI
- Willingness to participate and follow up
- Normal contralateral knee

EXCLUSION CRITERIA

- Revision ACL reconstruction
- ACL injuries with associated intra articular fractures
- previous knee surgery
- Anterior cruciate ligament tear with posterior cruciate ligament, collateral ligament requiring surgery, posterolateral complex injuries
- Osteoarthritis of knee

Preoperative Assessment

- Blood investigations
- Hemoglobin
- TC, DC, ESR
- Random blood sugar, Urea, Cretinine
- ECG
- Knee X rays- AP and Lateral view
- Knee MRI

Implants Required
Endobutton with loop- 15, 20, 25 mm

INSTRUMENTATION

Specialized instruments are required for arthroscopic ACL reconstruction. The fluid medium used is Normal Saline and 3 litres bottles are used for the purpose as it exerts more pressure and also does not need frequent changing.

The instrumentation needed is:

1. TV/Monitor
2. Arthroscopy Camera system
3. Light source
4. Shaver System
5. Knee Arthroscopic Instruments Trocar, Cannula, 4mm *30 degree arthroscope, probe, hand instruments
6. ACL Reconstruction Instruments Tibial Guide, Guide Wire, Reamers, Graft Sizer, Femoral Aimer, Beath Pin, Notch Curette, 4.5mm drill bit
7. Pneumatic Tourniquet

Surgical technique

Initial arthroscopy

The patient is given IV antibiotics preoperatively. After spinal anesthesia, the patient is positioned supine and a tourniquet applied on the upper thigh of the operative leg.

An examination under anesthesia is performed. Diagnostic arthroscopy is performed through an anteromedial and anterolateral portals, and meniscal lesions if present are addressed first.

Graft harvest and preparation

Make a 3 - 4 cm incision anteromedial on the tibia starting 4 cm distal to the joint line and 3 cm medial to the tibial tuberosity. The pes anserinus insertion is exposed with subcutaneous dissection. The borders of the Sartorius tendon is palpated, and identify the semitendinosus and gracilis tendon 3 to 4cm medial to the tendinous insertion. Short incision is made in line with the upper border of the gracilis tendon .Care taken to avoid injury to the underlying medial collateral ligament. With the pes retracted medially, the gracilis and semitendinosus tendons are visible on the medial side. The gracilis is more proximal and thicker and inferior to it is the more horizontal semitendinosus tendon.

After the tendons have been positively identified, the semitendinosus tendon is pulled forward with a curved artery clamp and is released from its tibial insertion including the periosteum. All sides of the tendon are palpated to confirm there are no fibrous extensions before releasing it with open tendon stripper. Accessory insertions and fascial bands known as vincula have to be released before the tendon is stripped. The vincula is seen approximately 10 cm proximal to insertion of hamstring. If vincula is not released properly then this may end up in premature tendon amputation and short graft. Applying controlled tension on the tendon, advance the stripper proximally and the muscle should slide off the tendon easily. Similarly the gracilis tendon is stripped.

The harvested tendons are debrided from muscle tissue. Each tendon is doubled to create a total of 4 strands, looped with endobutton and running interlocking whipstitch sutures with No 2 ethibond is done. The graft is sized with the help of a sizer. This prepared graft is placed under tension covered by a wet saline gauze.

Tibial and femoral tunnel preparation

When placing the tibial guide, be aware of the intended tunnel length and direction so that the graft can be secured in a physiometric, impingement free position. The inner edge of the anterior horn of the lateral meniscus, ACL stump, 7 mm anterior to PCL and the medial tibial spine are used as intraarticular reference points. The reamer's diameter used for the tibial tunnel is determined by graft sizing. . The cannulated reamer of the appropriate diameter is advanced over the guide pin to make tibial tunnel.

The femoral tunnel is drilled through the transtibial approach. The knee is flexed to > 90°. The 'Femoral Aimer' is brought through the tibial tunnel and with over the top positioning to maintain the posterior cortical wall to 2 mm. The guide pin is positioned at 10' clock - 11'O clock for the right knee and 1'0 clock to 2'0 clock for the left knee. The 'Beath Pin' is drilled through the femoral aimer and exits at the anterolateral aspect of the thigh. The femoral tunnel is drilled over the Beath pin with appropriate size reamer upto 35-40mm in length. The roof of the tunnel is further drilled with 4.5 mm drill bit until it pierces and exits the lateral femur cortex.

Graft passage and fixation

The pre tensioned graft with endobutton and its threads are passed through the beath pin tibial end loop and is pulled out of the femoral tunnel, so that the endobutton thread is out of the thigh.

Under arthroscopic visualization in the joint, the threads of the endobutton is pulled using the principle of flipping the endobutton. The femoral fixation is confirmed by dancing movement of the endobutton. 15 to 20 cycles of complete flexion and extension of the knee joint is done to tension the graft before fixation. The tibial side of the graft is fixed with an interference screw. Additional fixation using an anchoring 4.5 cancellous screw with washer or suture disc at tibial end is done if necessary. Excess graft at tibial end is cut.

Wound Closure

Thorough lavage of the joint is done to clear off the debris. Romovac size no 12 drain kept in position. Graft harvest site is sutured in layers with no1-0 vicryl. Skin sutured with silk / skin staples. Compression bandage dressing done and long knee extension brace is applied.

Postoperative management

All patients were initiated on postoperative ACL rehabilitation protocol on postoperative day 1.

Drain removal after 48 hours. Suture removal on 12-14th day.

EVALUATION: Postoperative X rays - AP and Lateral views were taken on the operated knee. The tunnel positioning and screw placement were analyzed. All patients were reviewed periodically at 6 weeks, 3 months, 6 months and 1 year for assessment. Clinically Lachman test, anterior drawer test and pivot shift test was performed. Range of movements of the operated knee clinically examined. Patients subjected to Lysholm knee scoring scale questionnaire.

The Lysholm Knee Scoring Scale comprised of eight parameters for evaluation. The parameters evaluated are– limp, use of support on walking, locking episodes, instability, pain, swelling, stair climbing and squatting. The individual parameters were allotted specific scores depending on the functional ability of the patient. The maximum possible knee score was 100 points. Based on the outcome scores they were divided into Excellent, Good, Fair and Poor.

Figure 1: Preop MRI With ACL Rupture

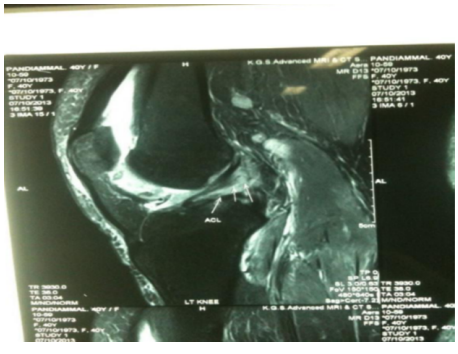

Figure2: Post OP X RAY

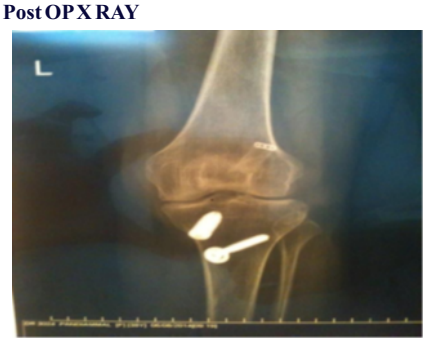

Figure 3: Post OP X Ray –lateral View

4.RESULTS

The mean age in our study was 29.2years. The youngest patient was 22yrs and the oldest patient was 40 years old. The maximum number of patients were in the age group of 26-30yrs (53%) followed by the age group 21-25yrs (27%).In our series of 15 patients, 12 patients (80%) were males and 3 patient (20%) female, (Male Predominance). It may be because of the involvement of males in outdoor activities like sports and road traffic accidentsMost of the ACL tears were caused by RTA (40%). Next common cause was sports activities like kabadi. Some patients (27%) got injured while doing daily activities like slip and fall while walking/ climbing down stairs6 weeks-3months27%3 months-6 months47%6 months –1 yr13%>1yr13%

Majority of the patients who were operated had a time interval from injury to surgery between 3months – 6 months (47%) followed by 6weeks- 3 months (27). All patients presented with complaints of giving way of the knee. 80% of the patients were able to appreciate the clicking of knee. 27% cases were having swelling and 80% cases presented with complaint of pain. 60% gave history of locking of knee which was correlated with associated injuries in the knee. Diagnostic arthroscopy prior to ACL reconstruction confirms the medial meniscal tear in 53% cases and 20% lateral meniscal tear. 20% were isolated ACL injuries. Only one case had osteochondritis dissecans. There was no PCL injury in our study. 3 patients (20%) had pain at the graft site at the end of 6 months. Infection was present in 2 cases (13%) of which one case developed septic arthritis immediate postoperative period and another patient developed infection at endobutton site after 3 months postoperative. Majority of the patients (53%) were having grade I laxity at the end of 6 months but with hard end point. 2 patient (13%) had flexion difficulty beyond 60 degrees due to noncompliant physiotherapy. Around 80% of the patients reported outcome as excellent and good with scores above 95 and 84-94 respectively. 2 patients (13%) scored >65 & <83 and were grouped as fair outcome. One patient had poor outcome77% of patients were compliant to postoperative rehabilitation protocol and 23% were Non-compliant40% of patients were involved in light office/house work, 33% were recreational sports persons and 27 % were labour workers. 67% of patients were able to return to pre-injury level and 33% did not return to pre-injury level

5.DISCUSSION

ACL tear if not treated leads to knee disability, which can become severe and devastating long term consequences. With improving surgical techniques, results and favorable outcomes, patient and physician expectations are evolving to include the expectancy of return to activities and sports at normal or near normal levels. In-spite on many graft choices for ACLR, hamstring auto grafts have gained popularity in the past decade. Several studies proved that 4 strand hamstring tendon ACLR have better strength, stiffness, and cross-sectional area compared with patellar tendon grafts.

Hamstring tendon autograft harvest site yields less donor site morbidity than BPTB graft and also has no risk of patellar fracture. Technical factors, specifically the absence of adequate fixation techniques, initially limited the use of hamstring grafts for ACL reconstruction. New techniques using Endobuttion, cross pin fixation focus on optimizing graft strength and stiffness.

The success of ACLR using hamstring autograft needs stable initial graft fixation and, ultimately, graft- to- bone healing. Hamstring reconstruction using femoral endobutton fixation has shown to have excellent initial mechanical properties, including pullout strength.

In our study all the 15 patients underwent ACL reconstruction using hamstring autograft during the study period in Government Rajaji Hospital, Madurai. suture disc or anchoring screw with a washer if necessary. Arthroscopic ACL reconstruction was done as an in-patient procedure in all patients under spinal anaesthesia. 12 (80%) were male patients and 3 female patients (20%), all aged between 20 and 40 years of age The side of injury was distributed accordingly – 53% [8 patients] to right knee while 47% [7 patients] injured their left knee. Brown et al studied the incidence of sex and limb differences in anterior cruciate ligament injury and stated that even though females are prone for injury, due their less exposure to strenuous environment makes the incidence of males more than females. They also concluded that limb differences have no influence either during injury or in the recovery period.

Majority of our patients (40%) are office goers/house workers, followed by recreational sports people (33%) and the rest (27%) are labor workers. Once the day to day activities of walking, squatting and climbing stairs returned, after following patients according to rehabilitation protocol for 6 months during immediate postoperative and follow up period, it was observed that adherence to physiotherapy gradually waned in most of the patients. 77% were compliant for physiotherapy.

Vassilios S Nikolaou et al, in June 2008, after a retrospective analysis of MRI efficiency in diagnosing internal lesions of the knee, reported that the accuracy for tears to the medial, lateral meniscus, ACL, PCL and articular cartilage was 81%, 77%, 86%, 98% and 60% respectively . The clinical examination reliability was less when compared to MRI in the detection of these injuries and concluded that MRI aids in diagnosing soft tissue injuries of the knee. The arthroscopy still remains the gold standard for definitive diagnosis.

In the Lysholm knee scoring scale 27% of the patients reported outcome as excellent, 53% good, 13% fair and 7% poor. In Bourke et al a total of 143 patients (94%) had a good or excellent Lysholm score at one year and 134 (88%) had good or excellent scores at 15 years.

In our study 67% of patients returned to pre-injury level and 33% did not return to pre-injury level.

6.CONCLUSION

Anterior cruciate ligament injuries are common in younger age group individuals. Males are more prone for ACL injuries. Giving way of the knee is the main presenting symptom (100%) in our study Medial meniscus was the commonest associated injury All patients had instability of knee in the formof giving way evaluated by Lachman test and confirmed by arthroscopy. Arthroscopic anterior cruciate ligament reconstruction with hamstring graft is an excellent treatment option for anterior cruciate ligament injured knees. Arthroscopic ACL reconstruction using hamstring autograft provides a stable knee with minimal complications. ACLR reduces postoperative morbidity and enables early rehabilitation The functional outcome of anterior cruciate ligament reconstruction with quadrupled hamstring autograft is excellent to good (80%) with mild laxity at the end of 6 months. 67% of the patients were able to return to pre injury level of activity

7.REFERENCES

1. Butler, D.L., F.R. Noyes, and E.S. Grood, Ligamentous restraints to anterior-posterior drawer in the human knee. A biomechanical study. J Bone Joint Surg Am, 1980. 62(2): p. 259-70.-
2. Haimes, J.L., et al., Role of the medial structures in the intact and anterior cruciate ligament-deficient knee. Limits of motion in the human knee. Am J Sports Med, 1994. 22(3): p. 402-9
3. Markolf, K.L., D.C. Wascher, and G.A. Finerman, Direct in vitro measurement of forces in the cruciate ligaments. Part II: The effect of section of the posterolateral structures. J Bone Joint Surg Am, 1993. 75(3): p. 387-94.-
4. Frank, C.B. and D.W. Jackson, The science of reconstruction of the anterior cruciate ligament. J Bone Joint Surg Am, 1997. 79(10): p. 1556-76
5. Romanini, E., et al., Graft selection in arthroscopic anterior cruciate ligament reconstruction. J Orthop Traumatol, 2010. 11(4): p. 211-9.
6. Strobel MJ, editor. Anterior cruciate ligament. In: Textbook of manual of arthroscopic surgery. 1st ed. Heidelberg Berlin; Springer-Verlag 1998:p.67-9.-
7. Dandy, D.J. and J.L. Hobby, Anterior cruciate ligament reconstruction. J Bone Joint Surg Br, 1998. 80(2): p. 189-90.
8. Khan, R.M., et al., Anterior cruciate ligament reconstruction in patients over 40 years using hamstring autograft. Knee Surg Sports Traumatol Arthrosc, 2010. 18(1): p. 68-72 Biau, David J MD, Tournoux, Caroline MD, Katsahian, Sandrine MD, et al. Anterior Cruciate Ligament Reconstruction: A meta - analysis of functional scores. Clin Orthop and related research 2007 May;458:180-7.-
10. Bonnet A. Traite des maladies articularis. 2nd ed. Bailliere Paris 1853:p.354-7
11. Bonnet A. Traite des maladies des articularis vol 1&2 Avec atlas. Bailliere Paris 1845.
12. Robert H Miller: Knee injuries; In Campbell's Operative Orthopaedics. Vol-3 11th ed. Mosby Elsevier Philadelphia 2008.
13. Mayo Robson A.W. Ruptured cruciate ligaments and their repair by operation. Ann Surg 1903;37:716-8.
14. Lange F. Uber die Schnenplastik. Verh Dtsch Orthop Ges 1903;2:10-2
15. Hey Groves EW. Operation for the repair of cruciate ligament. Lancet 1917;2:674-5.
16. Campbell WC. Repair of the ligaments of the knee: report of a new operation for the

repair of the anterior cruciate ligament. Surg Gynecol Obstet 1936;62:964-8.
17. Macey HB. A new operative procedure for repair of ruptured cruciate ligament of the knee joint. Surg Gynecol Obstet 1939;69:108-39.
18. 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.
19. Jones KG. Reconstruction of the anterior cruciate ligament. A technique using the central one third of the patellar ligament. J Bone Join Surg 1963;45A:925-32.
20. Lemaire M. Instabilite chronique du genou: technique et resultants des plasties ligamentaires en traumatologie sportive. J Chir (Paris) 1975;110:281-94.