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STUDY OF FUNCTIONAL OUTCOMES OF ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION USING DIFFERENT AUTOGRAFTS IN ADULTS AT TERTIARY CARE HOSPITAL- PROSPECTIVE STUDY

Orthopaedics

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ABSTRACT

Introduction-The Anterior Cruciate ligament (ACL) is the primary stabilizer of the knee and prevents the knee joint mobility against anterior tibial translation. It is also important in counteracting rotational and valgus stress. Anterior cruciate ligament rupture is the most common knee ligament injury. Anterior cruciate ligament (ACL) reconstruction is performed using different grafts. Allografts, autografts and synthetic grafts have been used with variable success rates **Materials and Methods:** In this prospective observational study a total of 15 patients who underwent ACL reconstruction at orthopedics department at new civil hospital surat during the period of 1 year where taken. **Results:** The Lysholm Knee Scoring Scale of pre and post operative patients taken and compared and found excellent outcome **Conclusion:** Overall peroneus graft outcome is also better for ACL injury repair as well as Hamstring graft.

KEYWORDS

ACL Reconstruction, Hamstring graft, Peroneus Graft.

INTRODUCTION

The Anterior Cruciate ligament (ACL) is the primary stabilizer of the knee and prevents the knee joint mobility against anterior tibial translation. It is also important in counteracting rotational and valgus stress. The anterior cruciate ligament (ACL) is one of the most frequently injured ligaments in the human body. Estimated incidences of 0.24 to 0.34 ACL injuries per 1000 population per year have been reported. The anterior cruciate ligament (ACL) rupture is the most common serious injury of the knee.

The development of symptomatic knee instability after ACL injury ranges from 16% to almost 100%. There have been significant technical advances during recent decades to treat ACL insufficiency and many studies have documented the successful results of contemporary arthroscopic ACL reconstruction.

Anterior cruciate ligament (ACL) reconstruction is performed using different grafts. Allografts, autografts and synthetic grafts have been used with variable success rates. The autografts have been time-tested and consistently associated with good clinical results. The hamstring and the bone patellar tendon bone grafts are the forerunners among the autografts with wide acceptability.

The other autografts being quadriceps, patellar tendon, fascia lata, peroneus etc. Although, these grafts are used commonly, disagreements regarding suitable graft choice still persist because of some disadvantages like the slow soft tissue–to–bone healing, with delayed healing and incorporation of the graft. Use of PeroneusLongus Tendon (PLT) autograft as an alternative to the conventional autograft is a recent development in field of ACL reconstruction. The advantages are that its strength and mean thickness is nearly same as that of the native ACL. Removing the PLT has no effect on stability of the ankle.

Three autograft options are commonly used. The Bone–Patellar Tendon–Bone (BPTB) allows for bone-to-bone healing within the tibial and femoral tunnels and has theoretical advantages of faster healing. Semitendinosus and gracilis tendons (quadrupled hamstring tendon [HT]) minimize donor site morbidity compared with the BPTB autograft and thus theoretically cause less anterior knee pain. A third option is the Quadriceps Tendon (QT), which can include a bone block from the patella (BQT).

So, present study was conducted to gain more information regarding the ideal graft as all these grafts are being used.

Aims and Objectives

a) To study the functional outcomes of ACL reconstruction using autografts viz. peroneuslongus and semitendinosus, gracillis(hamstring)graft.
b) To assess clinical and radiological outcomes (clinically/ radiologically).
c) To study donor site morbidity/complications.
d) To study the benefits of one graft over the other and modification according to given scenarios (athlete vs non athlete

MATERIALS AND METHODS

Study Design: Prospective observational Study.
Study Duration: One year
Study Place: Department of Orthopaedics of tertiary care Hospital.
Study Population: All patients who had ACL Injury and admitted at Department of Orthopaedics, of tertiary care Hospital.
Sample Size: 15 (7 hamstring Group A and 8 peroneous graft Group B) (last year 50 cases operated in NCHS in all units of orthopedic dept., also statistically significant number of cases for study).
Sampling Method: Convienent Sampling

Inclusion Criteria

a) All cases of ACL TEAR presented to department of orthopaedics , new civil hospital, surat and requiring surgery for the same
b) Adult patients of age 18-50 years (male and female).
c) Patients gave consent for operative management and are medically fit for surgery.
d) Those who gave informed written consent.

Exclusion Criteria

a) Symptomatic osteoarthritis with or without radiological changes
b) Patients not giving consent for operative management.
c) Patients of age 50.
d) Patients had other causes of knee pain .
e) Patients had history of previous knee surgery. Complete history including history of injury, Physical examination, and clinical parameters was taken. All patients were evaluated by Knee Society score. Also various test as well as radiological investigations were noted. [10]

Pre-operative Work Up

Patients with ACL tear proven clinically and radiologically are admitted in Department of Orthopaedics, govt. Medical College and New Civil Hospital, Surat. Routine investigations like haemoglobin, total and differential counts, platelet count, chest X ray, ECG were taken and anaesthetic assessment for regional and general anesthesia was done

Surgical Technique

Instrumentation: Many specialised instruments are required for arthroscopic anterior cruciate ligament reconstruction. An arthroscopic system consists of

1. Television monitor 2. Camera 3. Light source and fibre optic light source cable 4. Arthroscope 5. Shaver system and hand piece 6. Tourniquet (pneumatic)

Equipments Needed for Surgery Include

- 2.4 mm drill tip guide pins
- Trocar, cannula, ACL probe
- Meniscus punch
- 4mm/5mm shaver burr
- Tibial aiming guide
- Cannulated headed reamers (5 to 10 mm)
- Femoral entry point aimer (6mm / 7mm offset)
- Extra long 2.4 mm guide pin with suture eye (beath type guide pin)
- 4.5 mm cannulated reamer for passage of endobutton
- Depth guage
- Sizing master board Implants:

The various fixation options available for soft tissue grafts can be classified into direct methods and indirect methods.

The commonly used direct fixation devices are Interference screws , Staples, Washers and Crosspins

Indirect fixation devices used are Polyester tape/titanium button and Suture post

Examination Under Anaesthesia And Patient Positioning:

All the patients in our study were operated under spinal anaesthesia in supine position. The following tests were done under anaesthesia – anterior drawer test, posterior drawer test, Lachman test and pivot shift test. A pneumatic tourniquet is applied which is positioned in the upper thigh after soft padding. The limb is scrubbed from the ankle upto the tourniquet. The patient is positioned supine and the knee joint is placed slightly away from the distal breakpoint of the standard operating table. The uninvolved limb is placed in a well-leg support. In all the cases, prophylactic antibiotic usually 1 g ceftriaxone is given pre operatively before inflation of the tourniquet. The limb is held upright to exsanguinate the limb before inflation of the tourniquet

Surgical Technique

The technique of single bundle ACL reconstruction was done with one tibial tunnel and one femoral tunnel with their centres corresponding to the centre of the native ACL tibial and femoral attachment sites respectively. The femoral tunnel was made using the anteromedial portal thereby creating an anatomic femoral tunnel position. The graft was fixed at the tibial side using bioscrew / titanium interference screw and at the femoral side using endobutton.

Diagnostic Arthroscopy

Before the harvesting of graft, diagnostic arthroscopy was done first. In 90 degrees of knee flexion, anterolateral port (viewing portal) is made using 11 blade at the level of inferior pole of patella just lateral to the patellar tendon. Then the scope is introduced and knee is examined in a sequential manner of the following: Suprapatellarpouch, Patellofemoral joint, Medial gutter, Medial meniscus, Intercondy larnotch, Patient Positioning. Lateral meniscus, Lateral gutter, Posterolateral compartment

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.

Hamstring Graft Harvest And Graft Preparation:

A 3cm oblique skin incision is made starting 5 cm below the medial joint line and 1 cm medial to the tibialtuberosity. The oblique incision is preferred because it gives a wider exposure of pesanserinus and there is less chance of injury to the infrapatellar branch of the saphenous nerve. It is planned to do the graft harvest and tibial tunnel drilling through the same incision. The superior border of the pesanserinus is identified using the fingers. This superior border is lifted and fascia incised. The tendons can be felt with fingers running from above downwards. The lowest one felt is the semitendinosus tendon. After the hamstring tendons are identified, the sartorius fascia is divided along the course of the tendons (gracilis and semitendinosus), taking care to preserve the deep layer containing the Medial Collateral Ligament. With the help of right angled artery forceps, the gracilis and then the semitendinosus are hooked out. The tendon ends were tied with double loop knot to aid in traction. The knee is placed in 90 degrees of flexion and proximal dissection of the tendons were done using blunt dissection by fingers till the musculotendinous junction thereby releasing adhesions and accessory bands, while continuous traction was being applied through the threads. The main band which connects the medial head of gastrocnemius is usually cut with the help of scissors. It is confirmed that as the tendon is pulled distally, there should be no dimpling posteriorly over the gastrocnemius. The distal end of the tendon is freed with the scissors. Then a tendon stripper is advanced over the tendon in line with it maintaining firm, steady and gentle pressure and at the same time applying traction by holding the threads. If there is any resistance felt, then the stripper is withdrawn, adhesions removed and again the stripper is advanced and tendon harvested. The gracilis is usually more muscular appearing than the semitendinosus. The harvested graft is then placed on Graftmaster board. The tendons are removed of any residual muscle fibres with the help of blunt end of the blade. The tendon ends are trimmed to achieve uniform size. A whipstitch is placed at both ends of the tendons. Around 3-4 cm of both the ends of the tendon were stitched together. The two tendons are looped over a umbilical tape. The composite graft is then passed through the graft sizer. The diameter of the tunnel to be made is equal to the smallest sizing sleeve through which the quadrupled graft passed with minimum friction. The graft length to be placed inside the femoral tunnel is marked to ensure correct placement of graft within the femoral tunnel while being viewed arthroscopically.

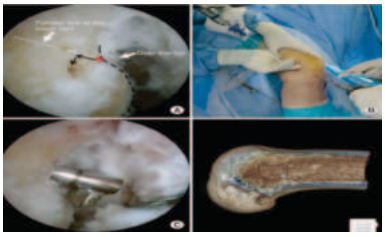
Peroneus Graft Harvest

Identification of anatomical landmarks is performed, including the distal aspect of the fibula and the posterior border of the fibula, 2 cm above the tip of the bone. A longitudinal incision is made along the posterior border of the fibular bone, from 2cm above the tip of the fibula. Care is taken to identify the tendon sheath that covers the longus and brevis approximately 2 cm above the superior extensor retinaculum, and the peroneuslongus is stitched to the peroneusbrevis. The proximal aspect of the peroneuslongus tendon is whipstitched, after which the peroneuslongus tendon and surrounding soft tissues are incised. The peroneuslongus tendon is then released with use of a

tendon stripper, and the graft is prepared.

Femoral Tunnel Preparation

The ACL footprint is visualised on the medial surface of the lateral femoral condyle in 90 degrees of knee flexion and the entry point is marked. Then with the femoral offset aimer device inserted through the anteromedial port, the entry point is drilled with a guide wire in 120 degrees of knee flexion. The drilling is continued till the tip of the guide wire emerges on the lateral side of the distal thigh at the level of epicondyle of femur. Then using the 4.5 mm cannulated drill bit, the femoral tunnel was made by drilling both the near and far cortices. Then the length of the tunnel was measured using a depth guage. Then the femoral tunnel was reamed with a reamer corresponding to the diameter of the graft. The reaming was stopped 15 – 20 mm from the lateral cortex depending on the length of the graft. After the femoral tunnel is made, the beath pin with ethibond at its end was passed via the femoral tunnel to aid in easy passage of prepared graft.



Tibial Tunnel Preparation

The tibial tunnel is made with the help of the tibial guide. With the knee in 70 – 90 degrees of knee flexion, the tip of of the tibial guide is placed 2 – 3mm anterior to the (posterior margin of) anterior horn of lateral meniscus and slightly medial to the midline of the ACL tibial attachment area. Then the tibial tunnel is made by reaming over the guide pin using cannulated drill bit with diameter equal to the diameter of the graft. The edges of the tunnel are smoothened using shaver leaving the remnants at the site of ACL tibial attachment site for better proprioception.

Graft Preparation, Passage And Fixation

After the graft had been prepared, based on the length, the graft is quadrupled, the loop part of the quadrupled graft is attached to the endobutton with loop (the length of the loop in the endobutton depends on the graft length and the length of the unreamed femoral tunnel). The Ethibond suture already present within the joint is pulled out through tibial tunnel. Then the passing sutures for the ACL graft are passed through the suture loop and are taken out of the lateral thigh. With the help of these sutures, the graft is pulled via the tibial tunnel into the joint and then into the femoral tunnel. Once the estimated length of the graft is within the the tunnel, the endobutton is flipped. Then cyclical tensioning of the graft is done by repeated knee flexion and extension (around 20 – 30 times) with sustained pull on the graft via the tibial tunnel. Then the arthroscopic visualisation of the graft is done to look for any signs of graft impingement, alignment, etc. The tibial side of the graft is fixed with interference screw (titanium or bioscrew) of appropriate length. The ports and the graft harvest site wound are closed in layers. Sterile compressive dressing is then applied. The limb is immobilised with the use of knee brace.

Post-operative management: Immobilisation in knee brace and limb elevation was done in the immediate post op period. Intravenous antibiotics were given post-operatively for 3 days. Wound was inspected on 2nd post-operative day. The sutures were removed on 12th post-operative day. Rehabilitation was started from day one.

Evaluation

All patients were subjected to post operative anteroposterior and lateral radiographs to determine the tunnel placement and position of endobutton and interference screw. Patients were followed at 2 weeks, 6 weeks , 6 months and functional outcomes assessed.

The Lysholm Knee Scoring

Scale consists of eight parameters for evaluation. The parameters evaluated are 1. Limping 2. Aided walking 3. Episodes of knee locking 4. Knee instability 5. Knee pain 6. Knee swelling 7. Climbing of stairs 8. Squatting

The individual parameters were allotted specific scores depending on the patient's functional ability. The maximum possible knee score was 100.

Based on the outcome scores they were divided into Excellent, Good, Fair and Poor.

- Excellent – 95 – 100
- Good – 84 – 94
- Fair – 65 – 83
- Poor – 64 or less

RESULTS AND DISCUSSION

In our study, majority of study participants, were belonged to age group in between 31 40 years followed by 5 cases from 21-30 years of age group. Only one case found in 41- 50 years of age group. In this study, Males were more affected than females. There was no significant difference found between mean age groups of both groups. Therefore 40 patients (12 female, 28 male) were available for clinical and radiological investigation and the median age at surgery was 29 years (range, 18–52 years).

Post-operative Knee Rotation	Group A(%)	Group B(%)	TOTAL (%)
< 125	2 (13.4)	5 (33.3)	7 (46.7)
>125	5 (33.3)	3 (20)	8 (53.3)
TOTAL (%)	7 (46.7)	8 (53.3)	15 (100)

In the study, among Group A and In Group B 5 and 3 no. of Patients had more than 125 degree angle rotation of knee, respectively. Only 1 patient in Group A had Graft site morbidity.In group A patients developed Mucoid degeneration of graft and in Group B patient developed Endobutton in soft tissue. Lewis D.W et aL, in their study on incidence of meniscal injuries at the time of ACL reconstruction found that 58% of patients had meniscal injuries and that medial meniscus was most commonly injured. They also concluded that meniscal repair or resection did not alter the final outcome. Williams et al in their study of 2500 cases of arthroscopic ACL reconstruction, reported an infection rate of 0.3%.. Muneta et al. reported two cases of posterolateral femoral drill hole breakage. Therefore, one should avoid drilling the tunnel too far posterior. One can also check that a tunnel has not blown-out via direct visualization of tunnel with the scope before graft insertion. If a blow-out has occurred, one can use a larger, extended endobutton. Rafik Yassa et al study found that The HKA

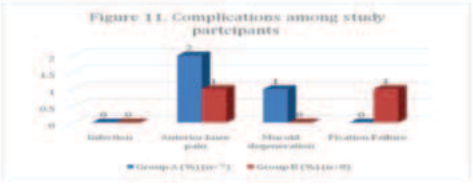
angle on the treated side was 184° versus 180.5° contralaterally. Alignment in the sagittal plane was unchanged. As the patient did not complain of pain.

Graft Site morbidity	Group A(%)	Group B(%)	TOTAL (%)
Present	1 (6.7)	0(0)	1 (6.7)
Absent	6(40)	8(53.3)	14 (93.3)
TOTAL (%)	7 (46.7)	8(53.3)	15 (100)

Complications

Table 13. Presence of complications among study participants

Complications	Group A (%) (n=7)	Group B (%) (n=8)
Infection	0(0)	0(0)
Anterior knee pain	2 (28.5)	1 (12.5)
Mucoid degeneration	1(14.2)	0(0)
Fixation Failure	0(0)	1 (12.5)



CONCLUSIONS

- In present study, majority of study participants, were belonged to age group in between 31-40 years followed by 5 cases from 21-30 years of age group. Only one case was found in the age group of 41-50 years.
- In this study, Males were more affected than females.
- There was no significant difference found between mean age groups of both groups.
- Among the study participants, in group A, 6 were males and in group B , 7 were males. Each female in both groups.
- In both groups, majority type of injury occurred due to fall down history , followed by RTA and one patient was injured because of assault.
- In the study, among group A 40% patients were affected on Left side , while in group B majority patients were affected on Right side.
- In the study, among Group A and In Group B, respectively, 5 and 3 no. of Patients had more than 125 degree angle rotation of knee.
- Only 1 patient in Group A had Graft site morbidity.
- In group A patients developed Mucoid degeneration of graft and in Group B patient developed Endo button in soft tissue.
- There was a statistically significant difference found between preoperative and postoperative score among both groups.
- On assessing, the outcome of patients, 1 patient in Group A and 2 patients in Group B had excellent outcome.

CASE 1: 18 /M with h/o fall down with grade 3 ACL tear operated with Hamstring Graft.

Figure: Post-operative Radiograph Showing Endo Button At Femoral End And Interference Screw On Tibial Side

CASE 2 : 32/M with h/o fall down with grade 3 ACL year operated with peroneus graft

Figure: Post-operative Radiograph Showing Interference Screw On Both Tibial And Femoral Side

REFERENCES

[1] Dr. Anil Kumar Mishra and Dr. Girish S.A prospective study of functional outcome of ACL reconstruction with quadrupled semitendinosus tendon autograft using Endobutton and bioabsorbable interference screw.International Journal of Orthopaedics Sciences 2018; 4(3): 47-55.

[2] Jagtap V, Gorgile N, Shah Y, Rokade V, Bartakke G. Functional outcome of an arthroscopic anatomical single bundle anterior cruciate ligament reconstruction using semitendinosus graft with fixation using endo-button on femoral side and suture disc on tibial side: a prospective clinical study. Int J Res Orthop 2017;3:1175-9.

[3] KhajotiaBL, ChauhanS, SethiaR, ChopraBL.Functional outcome of arthroscopic reconstruction of anterior cruciate ligament tear using peroneus longus tendon autograft.IntJ Res Orthop2018;4:898-903.

[4] Gordon MD, Steiner ME: Anterior cruciate ligament injuries: Orthopaedic Knowledge Update Sports Medicine III, Garrick JG (Ed), American Academy of Orthopaedic Surgeons, Rosemont; 2004: 169.

[5] Vijay C, Santosh MS, Avinash C, Adarsh T. Is Peroneus longus autograft a better alternative to the Hamstring autograft for anterior cruciate ligament reconstruction? – A randomised control study. Journal of Orthopaedics, Trauma and Rehabilitation. 2022;29(1). doi:10.1177/22104917221088335

[6] Jennifer Evans; Jeffery Nielson .Anterior Cruciate Ligament Knee Injuries.NCBI Bookshelf. A service of the National Library of Medicine, National Institutes of Health. StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan

[7] Banu J, Sontakke Y, Tamgire D, Suma HY. Histological Structure of Anterior Cruciate Ligament - Review. Acad.Anat. Int. 2019;5(1):16-20. 10. Davey A, Endres NK, Johnson RJ, Shealy JE. Alpine Skiing Injuries. Sports Health. 2019 Jan/Feb;11(1):18-26. Raikin SM, Elias I, Dheer S, et al. Prediction of midfoot instability in the subtle Lisfranc injury. Comparison of magnetic resonance imaging with intraoperative findings. J Bone Joint Surg [Am] 2009; 91 (4): 892–899.

[8] EricS.Milletein.https://www.millsteinorthopedics.com/blog/types-of-acl-reconstructiongrafts. [online] [accessed on 01/10/2022]Nunley JA, Vertullo CJ. Classification, investigation, and management of midfoot sprains: lisfranc injuries in the athlete. Am J Sports Med 2002; 30 (6): 871– 878.

[9] Duthon, V. B., Barea, C., Abrassart, S., Fasel, J. H., Fritschy, D., and Ménétrey, J. (2006). Anatomy of the Anterior Cruciate Ligament. Knee Surg. Sports Traumatol. Arthrosc. 14 (3), 204–213. doi:10.1007/s00167-005-0679-9.

[10] Qin, J., Hou, Z.-Q., Wang, H., Wang, X.-L., Liu, Y.-Y., Gao, X.-H., et al. (2013). Effects of Gene-Activated Matrix on Autograft Healing of Anterior Cruciate Ligament. Mol. Med. Rep. 7 (2), 679–683. doi:10.3892/mmr.2012.1211.

[11] Yunes, M., Richmond, J. C., Engels, E. A., and Pinczewski, L. A. (2001). Patellar versus Hamstring Tendons in Anterior Cruciate Ligament Reconstruction. Arthrosc. J. Arthroscopic Relat. Surg. 17 (3), 248–257. doi:10.1053/jars.2001.21242.