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A STUDY OF THE OUTCOME OF "LIGAMENT CROISE ANTERIEUR" (ACL) RECONSTRUCTION USING AUTOLOGOUS HAMSTRING GRAFT

Orthopaedics

Dr.Arun Kumar C Assistant Professor, Department of Orthopaedics, Chettinad Hospital and Research Institute.

Dr. Ashwanth Narayan B Postgraduate, Department of Orthopaedics, Chettinad Hospital and Research Institute.

Dr.Rahul Vijay Gussain Postgraduate, Department of Orthopaedics, Chettinad Hospital and Research Institute.

Dr.Venkatachalam K* Professor and HOD, Department of Orthopaedics, Chettinad Hospital and Research Institute. *Corresponding Author

Ms. Harshiga Balasubramaniam MPT CRRI, Department of Orthopaedics, Chettinad Hospital and Research Institute.

ABSTRACT

ACL injury is a widely recognized injury affecting the Genu-Joint Male to female ratio of "Ligament Croise Anterieur"(ACL) injuries are, as high as 9 :1. "Ligament Croise Anterieur" (ACL) reconstruction with Hamstring grafts, is currently one of the most commonly used method nowadays. This Prospective study of 30 subjects treated by surgicalarthroscopic technique, wherein, Quadrupled Graft of Hamstring was used,for the femoral fixation, an endo-button was used, and for the tibial fixation, screw of the interference variety was used. Patients were on routine follow up,for at least a period of one year. All the subjects were subjected to post-operative AP and LAT X-rays, to ear mark the placement of the tunnel and positioning of the endo-button in the femoral sector and the interference screw in the tibial sector. Subjects were,upon a follow-up program, at 1,2,3months and there again at the end of 6 months and later on twice in a year. All subjects were evaluated with Tegner and Lysholm Knee Scoring Scale. The major Goal of "Ligament Croise Anterieur (ACL)" recon, is towards re-establishing the stability of the knee. Successful functional outcomes following "Ligament Croise Anterieur (ACL)" reconstruction,with a Semi-tendinosus Gracilis Graft, has been reported in the literature. The optimal fixation methodology for "Ligament Croise Anterieur (ACL)" reconstruction is still evolving and the existing fixation devices which has been extensively used are the Endo-button and the "Biological Interference Screws, which has led to a better rehabilitation program post-operatively. In our study, all subjects were ordained to a proper rehabilitation protocol. 10% (n=3) subjects in the present study, had excellent results, 80% (n=24) of the subjects had good results and 10% (n=3) of the subjects had fair results. No subjects were reported to be, in the poor outcome category. Treatment of "Ligament Croise Anterieur"(ACL) injuries necessitates, cautious pre-operative planning, selection of patients, radiological evaluation, selection of graft thickness, planning of timing of surgery, careful intra-operative care, good technique and post-operative rehabilitation, including thorough counselling for a good functional outcome.

KEYWORDS

Acl reconstruction, Ligament Croise Anterieur, Semi-tendinosus Gracilis Graft,Tegner and Lysholm Knee Scoring

INTRODUCTION:

Knee joint trauma is increasingcurrently, because of an exponential increase in RTA, and also due to greater indulgence, in sporting activity, by young people in recent years. ACLinjury, is widely known to be a cause of common injuries around the"Genu Joint"[1].Male to female ratio of this injury is 9:1[2]. ACL has a significant role in the function and stability of the "Genu Joint",together with all other ligamentous structures.Being a primary stabilizer, in preventing the anterior gliding of tibia, over the femurand italso restricts valgus and rotational strain, to a considerable extent[3]. Acute ACLinjury, not only causes pain, but also leaves the knee joint unstable. ACL injury, may be accompanied with injury to the semi-lunar cartilages, in the knee joint and result in the early onset of "Genu Arthrosis"[4]. Arthroscopic techniques have been advanced to a great extent and have been fine tuned to assist in the surgical repair of the Posterior and Anterior Cruciate Ligaments. The arthroscopic technique has the benefits of a smaller skin and capsular incisions, enhanced vision of the "Encoche Intercondylienne" (IC notch) for the creation of the tunnel,relatively less post-operative pain, minimal adhesions.These permit earlier "Range Of Movement" exercises,which eases rehabilitation [5]. "Ligament Croise Anterieur"(ACL) surgical repairwith hamstring grafts ismost commonlyused method nowadays[6]. The Semi-Tendinosus tendon and Gracilisauto-graft (STG) has emerged as the graft of choice in ACL reconstruction. Quadrupled STGhas a distinct advantage, over the osseous patellar tendon osseous (BPTB) graft, as its mechanical resistance is not only higher, but the tensile strength superior.There are no compromise, to the bio-mechanics of the Quadriceps Mechanism, and thereby also considerably reducing instances of Anterior Knee Pain (AKP). The advantages with hamstring grafts, are theirease of availability, of a superiorcross-sectional area, and unaltered integrity of the knee extension mechanism. Quadrupled hamstring graft, sometimes not only matches, but behaves superior to the natural ACL, with regard to its tensile strength[7]. Many studies have found that the rate of return to pre-surgical levels of activity, was more than 60 percentage,after this procedure, within a year and the incidence of other post-operative problems like surgical site infection, anterior pain in the knee and loss of knee extension are far fewer than, in grafts of BPTB procedure[8]. Various implants have been demonstrated, to hold the graft in the tunnel of tibia, and that of the femur,like a suspensory device, posts, screws, and suture buttons. We have used the endo-button, on the femoral side,and a bio-absorbable screw, in the tunnelof the tibial end[9]. The objective of this survey was to analyse,their functional outcomes, in arthroscopically assisted, ACL reconstruction with a "Hamstring Quadrupled Graft".

AIM:

To assess the functional outcome of Arthroscopically assisted "Ligament Croise Anterieur " (ACL) Reconstruction, using the four layeredHamstring Graft, with an Endo-button as theFemoral End Fixation device, and a Bio-absorbable Interference Screw as theTibialEndFixation device.

MATERIALS AND METHODS:

This Prospective study of 30 patients treated with arthroscopically assisted"Ligament Croise Anterieur" (ACL) reconstruction with a four layered Hamstring Graft, with Endo-button as the Femoral End Fixation device and a Bio-absorbable interference Screw as the TibialEndFixationdevice,at Chettinad Hospital and Research Institute, Kelambakkam from July 2017 to July 2020. Recruitment of cases stopped in July 2019, so that the follow up time isatleast for a period of one year. Hence, the study lasted 3 years, while the recruitment of patients was for 2 years. All the patients had given a written consent for publication of their clinical and radiological data.

INCLUSION CRITERIA:

1. Age between 21 to 45 years.
2. Primary ACL surgery, with or without, associated PCL or meniscal injury/ injuries.

EXCLUSION CRITERIA:

1. Additional ligamentous laxity, in the ipsilateral knee.
2. Previous ACL surgery of the ipsilateral knee.
3. Chronic muscle disorder, localized or generalised.
4. Any co-morbid medical conditions like active articular infection, inflammatory joint disease.
5. Metabolic bone disease.
6. Neoplastic disease.
7. Associated tibial plateau or femoral condylar fracture of the ipsilateral side.
8. Pre-existing conditions like Congenital/Developmental/Collagen diseases.
9. Septic arthritis of knee joint, past history.

INSTRUMENTATION:

Many a specialized instrument, are required for arthroscopically assisted"Ligament Croise Anterieur" (ACL) reconstruction.
An arthroscopic system which consists of a

1. Television monitor.
2. Camera.
3. Light source and Fibre Optic Light Source Cable.
4. Arthroscope (30 degrees).
5. A Shaver system and a hand piece.
6. Pneumatic tourniquet set.

Equipment needed for surgery are:

1. A 2.4mm drill tip guide pins.
2. A Trocar
3. A Cannula
4. An ACL probe.
5. A Meniscus punch.
6. A 3.5 and 4.5 shaver blades.
7. A Tibial aiming guide.
8. Cannulated headed reamers of size 5mm to 10mm.
9. Trans-tibial femoral ACL drill guide (usually of 7 mm offset tip).
10. Extra-long 2.4 mm guide pin with a suture eye (Beath – type of guide pin).
11. 4.5 mm cannulated reamer, for passage of endobutton.
12. A Depth gauge.
13. A Sizing block.
14. Cannulated interference screws.
15. Endo-Button.
16. 1.5 mm guide wire, with screw driver, for the passage of the Bio-Absorbable Interference Screw.

METHODS:

PRE-OPERATIVE WORK UP:

Patients diagnosed with "Ligament Croise Anterieur"(ACL) trauma confirmed with clinical tests and radiological(MRI) investigations were admitted. Baseline investigations like CBC, ESR, Random Blood Sugar, Renal parameters, Chest X-ray, ECG were done and anaesthetist assessments for regional or general anaesthesia were done. Static and dynamic Quadriceps Exercises, were taught to the patients, while awaiting surgery.

ANAESTHESIA AND PATIENT POSITIONING:

All the patients were subjected to, appropriate Spinal or General anaesthesia. In the supine position, under anaesthesia, drawer test(Anterior and Posterior), Lachman's test, shift of pivot tests were done. With the patient supine and with the knee in flexion of 90 degrees and with a removable side support being placed at the side of the table in order to support the same side thigh, a stopper was placed at the foot end after achieving 90 degrees of knee flexion. The cases in our series were done under tourniquet control, for the lower limb. The inflation of tourniquet was carried out after three minutes of limb elevation, for exsanguination of the lower limb. Limb was prepped and draped after betadine scrubbing, A pre-operative antibiotic cover of Cefotaxime 1g was given, after a test dose.

Figure 1: Patient position: With the patient supine and with the knee in flexion of 90 degrees

ARTHROSCOPIC PROCEDURE:

For the arthroscopic intervention, an antero-medial and antero-lateral portal was chosen, which were on either side of patellar tendon, and also midway between the inferior edge of the patellar bone and the upper end of tibia. Antero-lateral portal gives copious saline insufflation from 3 litre pressurised saline bottle in order to obtain adequate distension of joint which allows to visualize both medial and lateral semilunar cartilages, the suprapatellar pouch, articular surface of the patella and the inter-condylar notch. Meniscal injuries if accompanied, are addressed by partial meniscectomy. Anterior cruciate ligament is probed to analyse the amount of tear. If unstable meniscal injuries, are found they are treated with partial meniscectomy and debridement depending on the site and the type of the tear.

GRAFT HARVEST AND PREPARATION:

The Semimembranosus and Gracilis tendon identified in the Antero-Medial surface of proximal tibia by palpation and a 3-4 cm oblique incision made over it to visualize it. Identifying these tendons are a primary step in our endeavour towards graft harvesting. Upon opening of the incision, skin and subcutaneous tissue are retracted, the Sartorius Fascia is incised with a number 15 blade. One by one, the tendon insertions of Sartorius, Semitendinosis and Gracilisare identified. Within a centimetre of the tendon insertion of the tibia, they are secured with a number 1 vicryl and with blunt dissection they are proximally released from any soft tissue attachments after securing with the vicryl. After making the incision and identifying the tendon insertion, the tendon stripper is passed gently until it reaches the Tendino-Muscular junction. At the juncture of securing the harvest of the graft, the knee is kept in 70 degrees of flexion. The preparation of the tendons depicted in the figures below. The ends of the grafts are secured with a whipstitch with a polybraided non absorbable suture material number 2 and are manually tensioned and measured with the sizer. The tensioned graft complex is guided through the specific loop of the pertinent Endo-Button with number 5 non absorbable suture material (ethibond). The graft is then quadrupled in a fashion as depicted in the sequential pictures as shown below. The free ends of Gracilis and Semitendinosus graft combination are whip-stitched with non-absorbable suture material of size number two. The prepared graft is then preserved in a moist soft cotton linen pad.

Figure 2: The gracilis and semitendinosus tendons are identified and localised using a right angle forceps.

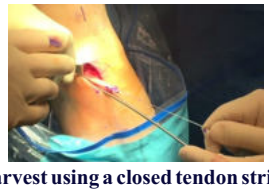


Figure 3: Graft harvest using a closed tendon stripper.

Figure 4: Graft preparation.

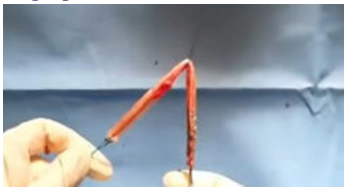


Figure 5: Quadrupling of the graft, in the OT.

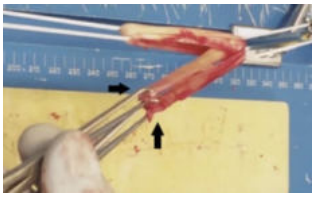


Figure 6: Pre tensioning of the graft, in the OT.

Figure 7: Graft size is measured with a sizer by pulling the graft through the sizer.

INTRA-ARTICULAR PREPARATION:

For the intra-osseous preparation, the scope is directed along the Antero-Lateral portal and with 3.5 shaver blade being inserted via the Antero-Medial portal, the genu joint is thoroughly debrided of the fat pad, the reflections of the synovium, and plicae ligamentalle, which would otherwise hinder a clear vision of the medial aspect of the Lateral Femoral Condyle. At the superior point lies the tibial print of the foot of the ACL. Native ACL remnants are cleared and shaved and the top position identified, then the ACL foot print in the tibia is prepared. Throughout this joint debridement,great care is taken, in orderto avoid injury to the native Posterior Cruciate Ligament.

THE TIBIAL TUNNEL PREPARATION:

The Tibial guide or the guide pin targeting tibial jig is used to create the tunnel in the Tibial bone. The guide is adjusted at fifty-five degrees or by N+7 rule where N is the effective length of the tendon. With the guide adjusted in 55 degrees,the guide pin's tip is then positioned in the ACL foot print in the posterior half. The guide can also be placed using various land marks, like posterior rim of the anterior horn of the Lateral Semilunar Cartilage, Antero-Lateral part of the medial Tibial Inter-Condylar Eminence, 8 mm anterior to the posterior cruciate ligament. After establishing the proper spot of the guide pin,tip sleeve of the guide pin is then inserted and advanced to the Antero-Medial surface of the tibia. The sleeve of the guide pin is flushed with the Antero-Medial cortex of the proximal tibia midpoint between the Tibial bump called as protuberance and the hind edge of the Proximal Tibia. The sleeve of the guide pin is inserted and advanced through the incision made for harvesting the Graft by retracting the skin edges. Before drilling the Tibial Tunnel, the arm of the Tibial side guide is ensured to be parallel with the Tibial Plateau. Then the 2.4millmeter tip of the drill wire guide is advanced to theTibial Cortex to exit intra-articularly which is visualized with the arthroscope. When the 2.4 millimeter tip of the drill wire guide had been placed intra-articularly, the tibial guide and the guide sleeve is removed. Serial reaming of the Tibial Side tunnel upon the pin of the guide wireis done with Cannulated Calibrated reamers up to the desired size of the graft. During all these drilling a small curved curette is placed intra-articularly to prevent the summit of the pin guideor the reamers from damaging the articular surface of the joint. Once the Tibial Tunnel has been created the posterior end or the Intra-Articular exit of the tibial side tunnel is shaved of the soft tissues and bone particles from obstructing the Graft passage. Even a sharp dissection can be used for this purpose and a rasp is used to smoothen the tunnel walls for easy graft passage and to avoid graft damage.

THE FEMORAL TUNNEL PREPARATION:

The osseous tunnel femorale, is created by Trans-Tibial technique in most of the patients and trans-portal technique in rest of the patients in our study. In Trans-Tibial technique, the tunnel femorale is drilled via the tunnel of the Tibia and in Transportal technique, Femoral Tunnel is created through a separate Medial portal with the help of femoral offset. The femoral aimer is positioned in the notch between two Femoral Condylesat 1'O clock position for the left knee and 11'O clock position for the right knee. The 7 mm offset aimer is placed so that it is positioned above the hind edge of the notch to avoid blow out and to leave atleast 2mm of intact posterior cortex. If the diameter of the graft is exceeding 10mm, then the offset guide may need to be placed little more Anteriorly to avoid Posterior blow out. Having placed the aimer, the long drill tip guide wire is drilled via the Lateral Condyle of the Femur to exit in the Latero-Anterior side of the lower thigh. The Intra-Articular length of the graft is measured and the lateral condyle of the Femur is drilled with 4.5 mm reamer until the Antero-Lateral cortex is breached to create a passing tunnel for the Endo-Button. After reaming the Lateral Condyle, a depth gauge is utilized to quantify the Femoral Condyle. Having known the Intra-Articular length of the harvested graft and the whole extent of the graft, the extent of the graft to be in the Femoral Condyle can be desired and marked, which is usually half the extent of the remaining graft after subtracting the intraarticular length from the total length. Having known the extent of the condyle of the Femorale and the desired length of the Graft in the femur, the loop length to be adjusted in the Endo-Button is calculated and the loop is created or an adequate length looped Endo-Button CL ultra is chosen. The Femoral Condyle is reamed with an appropriate size reamer as of the graft to a length of around 5 to 6 mm greater than the Desired Graft Length for the turning radius of the Endo-Button. The tunnel is smoothened with a rasp or the shaver blade and the soft tissue Interposition for the Graft Passage is removed adequately.

GRAFT-PASSAGE AND FIXATION:

In the Peripheral Holes of the Endo-Button, two 5 number suture material is passed and taken through the eyelet of the guide pin so that it can used as a leading suture and as a toggle suture. The guide pin is proceeded through the tunnel and pulled through the tunnel and extracted along with the suture material in the Latero-AnteriorAspect of the Distal Thigh. The leading suture is pulled so that the Transplanttraverses'tunnel, headed by the ending of the Endo-Button to which the leading suture is passed. The graft is traversed until the desired length of the graft is pulled in to the Femoral Condyle and the trailing suture is dragged to flip the endobutton. Once the Endo-Button is flipped and confirmed by arthroscope in the Latero-Anterioraspect of the Femur, the distal part of the transplant is pulled down to seat the Endo-Button in order to secure the Femoral Fixation. With manual tension to the Distal Graft the knee is taken through range of motion to cyclically tension the Graft and to look for Impingement. If there is impingement of the Graft, the notch is slightly enlarged to avoid Impingement. After tensioning the graft, the Tibial Site is fixed with appropriate size Titanium Interference screw or Bio-Absorbable interference screw depending on the allocated study group and ensured Endoscopically that the screw has not breached the articular surface.

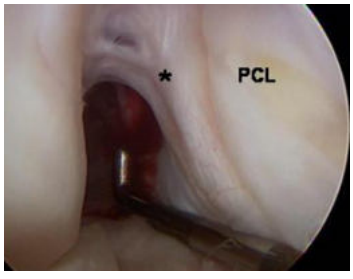


Figure 8: Arthroscopic view of a chronically ACL-deficient knee.

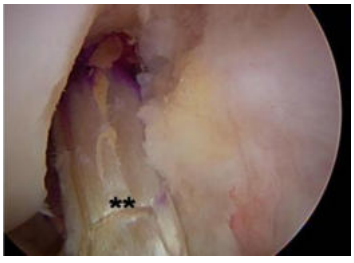


Figure 9: Arthroscopic view of the ACL, reconstructed with a hamstring autograft.

CLOSURE:

The wound is then closed layer by layer, after through wash. The portals are closed with single sutures with non-absorbable suture material after placing anIntra-Articular suction drain. Sterile dressing applied over the wound and knee Brace applied in extension after Tourniquet is released.

PEARLS:

- After passing the transplant unit via the suture construct, we proceed to clamp one end first, then tension each of the tendon one by one and clamp the latter end.
- Wethen placed a Whip-Stitch at the tendon ends, it is critical that each pass gothrough all the 4 tendon ends.

PITFALLS:
- Care is taken to achieve tension that is equivalent within both the Graft Tendons, which otherwise will nullify the benefit of the second tendon.
- Care is taken not to puncture the construct of the suture, in the centre with a Whip-Stitch needle, as it can potentially weaken the suture, and be liable for later graft loosening.

POST-OPERATIVE MANAGEMENT:
1. Immobilisation in knee brace. Limb elevation immediate postoperatively.
2. Intravenous antibiotics for 3 days.
3. Drain Removal on POD 2.
4. Wound Examination on POD 2, 5 and 7.
5. Suture removal on POD 12.
6. Gradual physical rehabilitation, as tolerated by the patient.
7. Follow up at 4, 8 weeks and thereafter at 3, 6 and 12 months.

POST-OPERATIVE REHABILITATION:
The general Post-Operative protocol for "Ligament Croise Anterieur " (ACL) reconstruction is followed and progression of the rehabilitation is individualized for each patient. Emphasis to prevent Arthrofibrosis, Joint Contracture and Joint Laxity has been made.

Goals: Full range of motion (ROM), normal gait pattern, stable knee joint, pain free movement.

POD 1:
- Rest in extension in long knee brace.
- Static quadriceps exercise.
- Ankle and foot movement and limb elevation.

0 – 2 Weeks:
- Full knee extension ROM exercises.
- 90 degrees knee flexion ROM exercises.
- Strong QS/SLR exercises without extension lag.
- Emphasize normal gait pattern.
- Passive, active, and active – assisted ROM knee flexion exercises.
- Partial weight – bearing 50% to 75% with walker or weight bearing upto pain tolerance with knee immobilizer with walker support.

2 – 4 weeks:
- Full extension to 120 degrees flexion to be achieved.
- Full weight bearing without walker support.
- Progress SLR with weights, emphasis on normal gait.

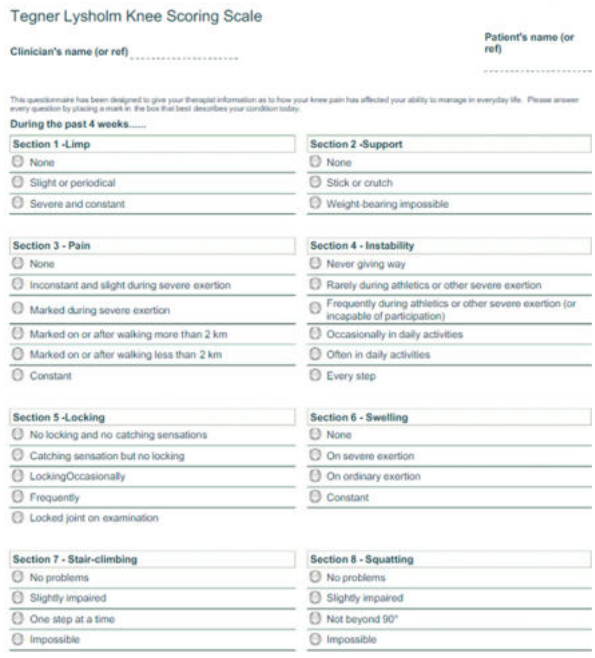
4 – 10 Weeks:
- Progress to full ROM by 6 weeks.
- Progress closed chain exercises.
- Progress all the exercises.

12-14 Weeks:
- Initiate full range knee extension exercises, light weight and high repetition.
- Initiate jogging program.

16 –18 weeks:
- Isokinetic strength test for Quadriceps and Hamstrings Agility training and Sport-Specific training.

EVALUATION:
Post-operative X rays(AP and Lateral views) were done for all the patients in order to visualize the position of Tunnel placement and Endo-Button position in femur and that of the interference screw in tibia. Follow up of patients were done at 1,2,3 and 6 months and twice a year thereafter.

All 30 subjects were followed-up for a bare minimum time period of 12 months. All patients were evaluated by the**Knee Scoring Scale of "Tegner and Lysholm"**scoring at the end of 12 months.


Tegner Lysholm Knee Scoring Scale

Clinician's name (or ref) .....

Patient's name (or ref) .....

This questionnaire has been designed to give your therapist information as to how your knee pain has affected your ability to manage in everyday life. Please answer every question by placing a mark in the box that best describes your condition today.

During the past 4 weeks.....

Section 1 -Limp	Section 2 -Support
None	None
Slight or periodical	Stick or crutch
Severe and constant	Weight-bearing impossible

Section 3 - Pain	Section 4 - Instability
None	Never giving way
Inconstant and slight during severe exertion	Rarely during athletics or other severe exertion
Marked during severe exertion	Frequently during athletics or other severe exertion (or incapable of participation)
Marked on or after walking more than 2 km	Occasionally in daily activities
Marked on or after walking less than 2 km	Often in daily activities
Constant	Every step

Section 5 -Locking	Section 6 - Swelling
No locking and no catching sensations	None
Catching sensation but no locking	On severe exertion
LockingOccasionally	On ordinary exertion
Frequently	Constant
Locked joint on examination	

Section 7 - Stair-climbing	Section 8 - Squatting
No problems	No problems
Slightly impaired	Slightly impaired
One step at a time	Not beyond 90°
Impossible	Impossible

Grading the TegnerLysholm Knee Scoring Scale	
Excellent	>90
Good	84-90
Fair	65-83
Poor	<65

RESULTS:
There were in all 30 patients, with "Ligament Croise Anterieur " (ACL) reconstruction with quadrupled STG graft with Femoral Fixation done with Endo-Button and Tibial Fixation done with Bio-Absorbable interference screw in our study. The follow up period was for atleast 12 months. There were in all 26 male patients and 4 female patients.

Figure10: Pre-Op X ray(AP view) of Left knee.

Figure 11: Pre-Op X ray(Lateral view) of Left knee.

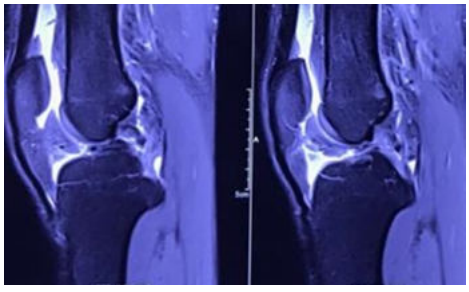


Figure 12: MRI (sagittal View) depicting complete tear in the ACL with the buckling of PCL.

Figure 13: Post ACL reconstruction X ray (AP view) showing Endo-Button (femoral fixation device in situ).

Figure 14: Post ACL reconstruction X ray (Lateral view) showing Endo-Button (femoral fixation device).

Table 1: Sex and Demographic Profile:

S.No	Age group	Male	Female	Total ('n' % age)
1	21-25	11	2	13 (43.33%)
2	26-30	7	1	8 (26.66%)
3	31-35	3	0	3 (10%)
4	36-40	3	0	3 (10%)
5	41-45	2	1	3 (10%)
6	**Total**	**26**	**4**	**30 (100%)**

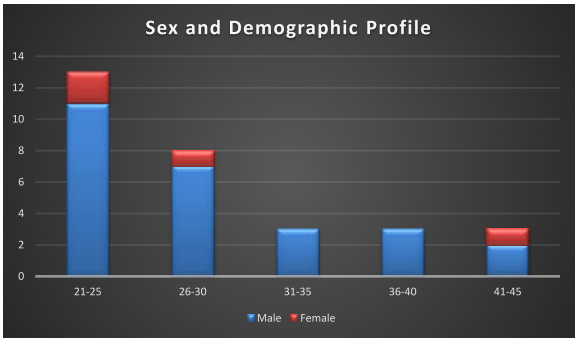


Table 2: Sidedness of Injury:

S.No	Side of Injury	Male	Female	Patients ('n' % age)
1	Right	19	2	21(70%)
2	Left	7	2	9(30%)
3	**Total**	**26**	**4**	**30(100%)**

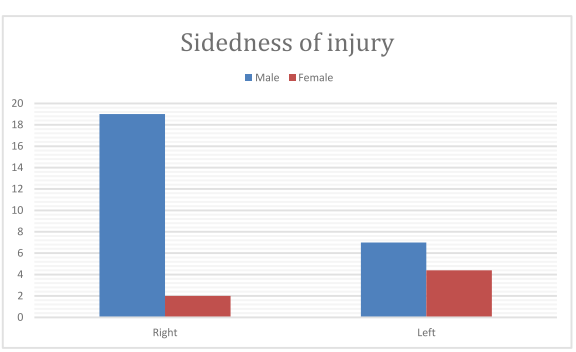


Table 3: Mode of Injury:

S.N0	Mode of injury	Male	Female	Patients ('n' % age)
1	RTA	19	2	21(70%)
2	Sports	4	1	5(16.7%)
3	Twisting Fall	3	1	4(13.3%)
4	**Total**	**26**	**4**	**30(100%)**

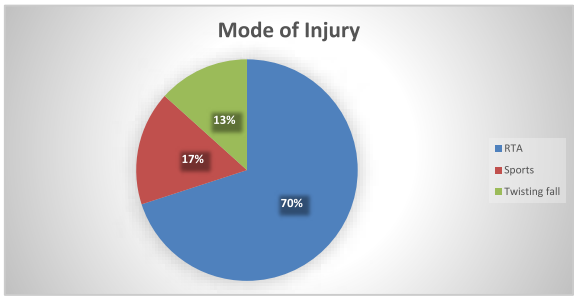


Table 4: Delay from Time of Injury:

S.No	Delay from injury	Male	Female	Patients ('n' % age)
1	Less than 10 days	16	1	17(56.7%)
2	11-20 days	6	2	8(26.3%)
3	21-30 days	4	1	5(17.6%)
4	**Total**	26	4	30(100%)

Table 5: Associated injury:

S.No	Associated injury	Male	Female	Patients ('n' % age)
1	Isolated ACL tear	8	1	9(30%)
2	Associated PCL tear	2	0	2(6.67%)
3	Associated meniscus tear	16	3	19(63.33%)
4	**Total**	26	4	30(100%)

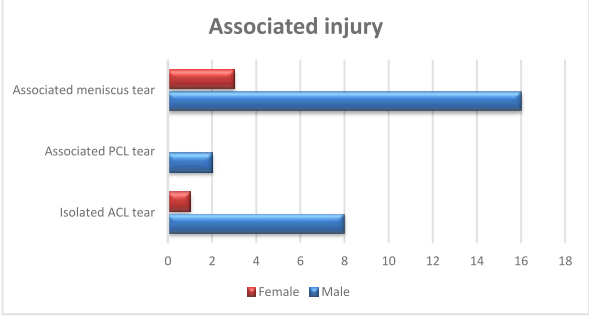
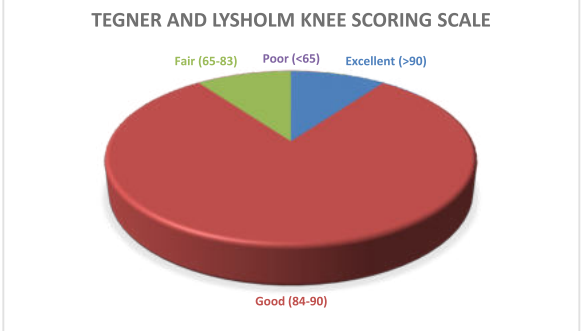


Table 6: Tegner and Lysholm Knee Scoring Scale:

S.No	Outcome	Male	Female	Patients ('n' % age)
1	Excellent (>90)	1	2	3(10%)
2	Good(84-90)	22	2	24(80%)
3	Fair(65-83)	3	0	3(10%)
4	Poor(Less than 65)	0	0	0(0%)
5	Total	26	4	30(100%)



In all there were 30 patients that had quantified clinic radiologically proven ACL injury with or without PCL injury and with or without an associated uni/bi meniscal injury, ipsilaterally that satisfied our inclusion criteria all the 30 patients were systematically followed up for a period of 12 months post operatively. At the expiry for 12 months their clinic functional outcome was tabulated, analysed and deduced

using the Tegner-Lysholm knee scoring scale. All fixation of the ACL ligament were accomplished with the help of quadrupled STG graft where in the femoral fixation was done with the help of an Endo-Button and its counterpart, the Tibial fixation was achieved with a Bio-absorbable interference screw.

With regard to the demographics among the 30 patients, the male subjects constituted 86.87% (n=26) and the remaining 13.33% (n=4) constituted the female subjects. Among the 30 of the total patients 70% (n=21) had a right sided injury and the remaining 30% (n=9) had a left sided ACL disruption. With regard to the mode of injury 70% (n=21) were as a result of RTA, 16.7% (n=5), were as a result of sports injury. The remaining 13.3% (n=4) constituted various other types of twisting falls. Surgical interventions in 56.67% (n=17) were in less than 10 days, 26.27% (n=8) surgical interventions were carried on between the 11th and 20th day after injury. The remaining 17.06% (n=5) were surgically intervened upon between 21st and 30th day. No cases in our series were entertained after a delay of time of injury to surgical intervention in excess of 1 month. In our series 30% (n=9) of the cases were cases of isolated ACL tear. 6.67% (n=2) had an additional PCL tear too in the ipsilateral knee. However 63.33% (n=19), of our cases had a uni/bi meniscal injury of various grades, in the very same ipsilateral knee.

At the end of 12 months (1 year), the Tegner and Lysholm knee scoring scale was utilized to assess, the clinic-functional outcomes of all our patients. We were able to demonstrate10% (n=3), 80% (n=24), and another 10% (n=3) of excellent, good and fair outcomes. None of our patients (n=0), had a poor outcome.

DISCUSSION:

The major goal of "Ligament Croise Anterieur " (ACL) recon is to re-establish the stability of the knee joint. Successful functional outcomes following "Ligament Croise Anterieur" (ACL) reconstruction with a semitendinosus gracilis graft has been reported[11]. The optimal fixation technique in "Ligament Croise Anterieur" (ACL) reconstruction is still evolving and the existing fixation devices which has been extensively used are the Endo-Button and the Biological interference screws, which has led to better and swifter rehabilitation program post operatively [12]. All patients in our study underwent Arthroscopic ACL reconstruction with quadrupled Semitendinosus Gracilis tendon autograft, from the ipsilateral limb using the Femoral Fixation Device as an Endo-Button and BiologicalInterference Screw as the Tibial Fixation Device.

DEMOGRAPHIC PROFILE AND SIDE OF INJURY:

Brown et al. [13] studied the occurrence of the sidedness of lower extremity injury and gender incidence and stated that even though their study concluded that females are more predisposed to this injury, the incidence is nevertheless, more common in males owing to their increased exposure to RTA, Sporting activities, Workplace injuries. In our study, 86.67% (n=26) of the patients were Maleand 13.33% (n=4) of the patients were Females. Our Male:Female ratio of 13:2 compares to 9:1 of Tau et al. They also proposed that limb sidedness have no effect in both during injury or during the post op period. In our study, 70% (n=21) of the subjects had injury on the right knee and 30% (n=9)of the subjects had injury on the left knee. We however found that the rehabilitation was quicker and Tegner and Lysholm knee scoring scale at 12 months to be superior with right sided injuries rather than left sided injuries by a factor of 22%.

Table 7: Side of Injury:

AUTHORS	RIGHT	LEFT
D Chaudhary et al.[14]	56.41%	43.59%
N.M. Jomha et al.[15]	45.76%	54.24%
D.J. Deehan et al.[16]	61%	39%
Arun Kumar.C et al study	70%	30%

Our statistical data matches close to that of D.J.Deehan et al study [16]

Mode of Injury:

D Chaudhary etal.[14] in their study concluded that injury instigated by sporting events accounted for 66.7% of the patients, while Road Traffic Accidents and Household Injuries accounted for 30.8% and 2.5% respectively. Patond et al.[17] proposed that sporting events to be the major cause of "Ligament Croise Anterieur " (ACL) injuries. In our study, RTA was the most common mode of injury accounting for 70% of the patients, followed by sporting activities (16.7%) and twisting falls (13.3%). Our statistics are in confirmation with the study of Vinoth KR et al.

Table 8: Mode of Injury:

AUTHORS	RTA	SPORTS	TWISTING FALLS/HOUSEHOLD INJURIES
D Chaudhary et al.[14]	30.8%	66.7%	2.5%
Vinoth KR, Reddy VV[18]	76.7%	6.6%	16.7%
Mishra AK, Girish S[19]	16.7%	65.8%	17.5%
Arun Kumar C et al. study	70%	16.7%	13.3%

Lag time from Injury to Surgery:

There is no clear agreement on the timing of surgery, even though much has been studied about the timing of surgery in the literature. Most authors have suggested to wait for a minimum of 3 weeks prior to "Ligament Croise Anterieur" (ACL) reconstruction from the point of injury [20,21]. In our study, 56.67% (n=17) of the subjects underwent surgery less than 10 days from injury, 26.27% (n=8) of the subjects were surgically intervened upon between 11-20 days from injury and 17.06% (n=5) of the subjects were surgically intervened upon between 21-30 days from injury. It was our observation that intervention within a period of 1 month in the above 3 categories had no significant data mismatch**.**

Associated injury:

The occurrence of meniscal tear accompanying Anterior Cruciate Ligament tear is higher in chronic cases. The incidence of medial meniscal tears is predominantly high, most of which need meniscectomy. Timely "Ligament Croise Anterieur" (ACL) reconstruction is suggested to prevent secondary meniscal tear[22]. In our study, 63.33% (n=19) of the subjects had an associated meniscus tear,30% (n=9) of the subjects had an isolated ACL tear, 6.67%(n=2) of the subjects had an associated PCL tear.

Functional outcome:

H. E. Bourke et al. [23]stated the outcome of 'isolated' anterior cruciate ligament tears managed with endoscopicnear anatomical reconstruction with Semitendinosus Gracilis autograft at a mean of 15 years. A sum of 152 patients were submitted to subjective assessment at 15 years. The averageTegner andLysholm knee score at 15 years was found to be 93.

Daniel B. O'Neill et al.[24]assessed 125 subjects with "Ligament Croise Anterieur " (ACL) injuries after a mean duration of 42 months. 40 patients(Group 1) were managed with double incision reconstruction using Semitendinosus Gracilis autograft, 40 patients(Group 2) were managed with double incision reconstruction using autogenous BPTB graft and 45 patients (Group 3) were managed with single incision endoscopic reconstruction using autogenous BPTB graft. Tegner andLysholmknee score was greater than 90 in 88% of the patients in group 1, 90% of the patients in group 2 and 93% of the patients in group 3.

Williams et al.[25] stated that the average score of the functional outcome improved from 55 points to 91 points post-surgery followed up for 2 years ($p<0.01$)

Fareed et al. [26]suggested that the outcomes of a retrospective study on subjects with "Ligament Croise Anterieur" (ACL) injuries who were treated with arthroscopic "Ligament Croise Anterieur" (ACL) reconstruction. The subjects were followed up for a mean duration of 25.4 months. 96% of the subjects had a satisfactory outcome.

Cooley et al.[27] stated that "Ligament Croise Anterieur" (ACL) reconstruction using quadrupled SemitendinosusGracilis tendon autograft.In accordance to Tegner andLysholmscore, about 85% of the subjects had normal to near normal score in their study.

Gulick et al.[28] in 2002 studied a group of 57 patients and stated that 84% of the patients returned to near normal level of function.

Table 9: Functional Outcome:

AUTHORS	Excellent (>90)	Good (84-90)	Fair (65-83)	Poor (Less than 65)
Vinoth KR, Reddy VV[18]	0%	86.67%	13.33%	0%
Mishra AK, Girish S[19]	45%	50%	5%	0%
Arun Kumar.C et al study	10% (n=3)	80% (n=24)	10% (n=3)	0% (n=0)

In our study, all subjectswere ordained to proper rehabilitation protocol. In our study, 10% (n=3) of the subjects had excellent results, 80% (n=24) of the subjects had good results, 10% (n=3) of the subjects had fair results, none of the subjects (n=0) had poor results. Our statistical data matches close to the data presented by Vinoth KR,Reddy VV et al study.

Numerous factors impact the functional outcome in arthroscopic "Ligament Croise Anterieur "(ACL) reconstruction like graft choice, graft fixation, tunnel placement and graft tensioning. In our study, there was however no comparisons done between various choices of graft and all the 30 patients were operated by autologous Quadripled STG graft obtained by the ipsilateral thigh. Hence, we have nothing to discuss with the superiority of one type of graft over the other.

CONCLUSION:

We studied 30 patients with"Ligament Croise Anterieur" (ACL) injury in the age group of 21 - 45 years, with a minimum of 12 months of follow-up. The aim of the study was toanalyze the functional outcome of "Ligament Croise Anterieur" (ACL) reconstruction,using quadrupled(four layered) hamstring graft with Endo-Button as FemoralEndFixation Device and Bio-Absorbable Interference Screw as TibialEndFixation Devices.

From this study, we infer that "Ligament Croise Anterieur " (ACL) injuries are more common in patients belonging to younger age group. Road Traffic Accidents(RTA) were found to be the most common mode of injury followed by sports injuries and twisting falls.

Arthroscopic"Ligament Croise Anterieur " (ACL) reconstruction using Semitendinosus Gracilis tendon autograft offers a stable knee, decreases post-operative morbidity and permits foran early rehabilitation. Graft fixation withEndo-Button andBioabsorbable Interference Screw, will assist the graft to easeincorporation of the graft into the bony tunnel.

The functional outcome is Excellent to good predominantly with nil poor results. This enables the subjects to return to near normal activity, enables the subjects to squat, sit cross legged and climb stairs without strain.

Arthroscopic"Ligament Croise Anterieur "(ACL) reconstruction with quadrupled Semitendinosus Gracilis tendon autograft with Femoral Fixation Device as Endo-Button and Tibial Fixation Device as Bioabsorbable Interference Screw,is an acceptable and functionally reproducible treatment option for Anterior Cruciate Ligament injuries. Revision surgery rates, are minimal and articular surface degeneration are a rare case scenario in arthroscopy assisted "Ligament Croise Anterieur" (ACL) reconstruction.However, with our mean minimum follow-up period of 18.3 months (range 35m – 12m) is too short the follow-up period for us to comment upon any long-term complication or deterioration of functional stability.

Treatment of"Ligament Croise Anterieur" (ACL) injurie snecessitatescautious pre-operative planning, selection of patients, radiological evaluation, selection of graft thickness, planning of timing of surgery, careful intra-operative care, good technique, good post-operative rehabilitation anda thorough counselling is a guarantee for achieving a good functional outcome.

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