ISSN: 2581 – 3633
PubMed - National Library of Medicine - ID: 101745081

International Journal of Medical Science and Advanced Clinical Research (IJMACR)

Available Online at:www.ijmacr.com

Volume – 7, Issue – 5, September - 2024, Page No. : 218 – 242

Use of Peroneus Longus Tendon for Anterior Cruciate Ligament Reconstruction among Adults

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How to citation this article: Dr. C Likhitha, Dr. V. Nageswara Rao, Dr Chintha Venkatesh, Dr. C Supradeeptha, "Use of Peroneus Longus Tendon for Anterior Cruciate Ligament Reconstruction among Adults", IJMACR- September - 2024, Volume – 7, Issue - 5, P. No. 218 – 242.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Introduction: ACL injuries are prevalent, with over 400,000 occurring annually in the United States alone. They lead to various long-term issues like meniscal tears and osteoarthritis. Treatment options include conservative methods with knee braces and physical therapy or surgical interventions like ACL repair or reconstruction. Anatomic ACL reconstruction aims to restore stability and function. Graft choice is crucial, considering factors like patient activity level and comorbidities. Common grafts include auto grafts (like BPTB or hamstring tendon) and allografts, each with its advantages and disadvantages. Recently, the use of Peroneus longus tendon (PLT) auto graft has emerged, showing promise due to its strength, size, and ease of harvesting, though more research is needed. PLT grafts offer advantages like larger diameter and potentially fewer complications, making them a potential alternative in ACL reconstruction.

Materials & methods: Study conducted at GSL General Hospital. Prospective study. The study will be carried out over a period from OCT 2019 to MARCH 2021. A sample size of 36 patients assigned blindly into the study. Patients for the study ranged in age from 18 to 50, with a mean age of 34.1 years, and included 25 men and 11 women. The follow-up lasted between six and twelve months. The International Knee Documentation 2000 score(IKDC) and Lysholm Knee Scoring Scale were used for evaluation at knee joint and the functional outcome of ankle joint is assessed by AOFAS score and FADI score.

Results: Knee and ankle outcome were evaluated using lysholm, IKDC, AOFAS and FADI scores.91.6%

patients had excellent functional outcome while 5.56% patients had good outcome. The remaining 15% patient had a fair outcome according to Lysholm knee score. The Mean pre op lysholm score was 60.31 ± 10.01 while the mean post op score at final follow up was 95.7 ± 5.16.The Mean pre op IKDC score was 56.36 ± 8.20 while the mean post op score at 6months follow up period was 96.54 ± 5.01.There was significant improvement in post op scores when compared to pre op scores.

The average mean AOFAS score preoperatively was 98.86±0.42 and posoperatively was 94.92 ± 2.10.The average mean FADI score preoperatively was 98.86±0.89 was 94.62 ± 1.70 with minimal donor site morbidity.

Conclusion: Peroneus longus tendon has more thickness and length, requires less graft harvesting time, has little donor site morbidity, and has good functional and knee stability scores, making it an effective and safe auto graft option for ACL reconstruction.

Keywords: Anterior cruciate liagament, peroneus longus, Arthroscopy, GRAFT

Introduction

Anatomy of Anterior Cruciate Ligament

Embryology: At around 6.5 weeks, the ACL emerges as condensation in the blastema. It starts as a ventral ligament and eventually invaginates with the creation of the intercondylar gap. It appears long before joint cavitation and is always extra synovial.

Microanatomy[6]: On the ultrastructural level, ACL is composed of longitudinally oriented fibrils[41] of mostly Type I collagen tissue and surrounding the entire ligament is the Paratenon.

Gross Anatomy[6]: (FIG-1)

- The ACL is a band of dense connective tissue that runs from the femur to the tibia.[6] The ACL's length spans from 22 to 41mm (mean, 32mm) and its width from 7 to 12mm. The narrowest region of the ACL is at the mid-substance level[4] (35 mm2). Functionally, Girgis et al[6] split the ACL into two bundles based on its attachment to the tibia. Anteromedial(AM) bundle b. The PL (posterolateral) bundle.
- On the lateral femoral condyle, it's near the posteromedial aspect of the intercondylar notch. The AMB fascicles originate at the femoral attachment's most anterior and proximal aspect and are inserted at the anteromedial end of the tibial attachment. The fascicles of the PLB, on the other hand, originate at the posterolateral aspect of the tibial attachment and insert at the postero-distal aspect of the femoral attachment. In flexion, the AMB lengthens and tightens, whereas the PLB shortens and becomes slack, according to Hollis et al.
- As they approach their tibial insertion, just medial to the attachment of the anterior horn of the lateral meniscus, the ACL fibres fan out. The ACL FOOTPRINT (FIG-2) is a more oval insertion site that measures approximately 11mm in width and 18mm in the anteroposterior direction.
- In the coronal plane, the average angle between the Tibial plateau and the intact ACL is roughly 71°[43]. The ACL's centre of tibial attachment is 7 mm lateral to the Medial Tibial spine. The centre of postero-lateral fibres is discovered 7mm from the anterior margin of PCL INSERTION, while the anterior horn of the lateral meniscus is defined as the centre of anteromedial fibres.

Fig. 1: Gross anatomy of the knee joint.

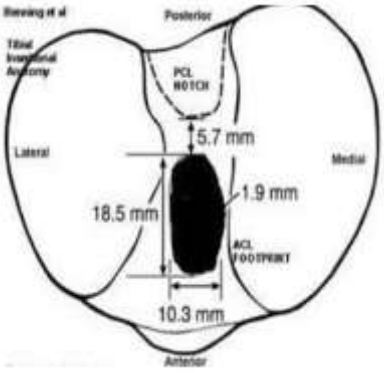


Fig. 2: ACL Foot Print

Composition[6]: The ACL is made up of fibroblasts surrounded by water and an extracellular matrix (collagen, elastin, proteoglycans, and glycoproteins).

Blood Supply[6,44]: The peri ligamentous plexus within the synovial sheath is formed primarily by branches from the middle genicular artery[6], which leaves the popliteal artery and directly pierces the posterior capsule; inferior, medial, and lateral genicular arteries also contribute through the fat pad. A few terminal branches of the Lateral Inferior geniculate artery may also contribute to some vessels. The osseous connection contributes very little to vascularity.[44]

Nerve Supply: The posterior articular nerve, a branch of the tibial nerve, provides nerve supply. With age and disease, the number of mechanoreceptors in the ACL decreases.[45]

Notch Anatomy and its relation to ACL injury

A narrow intercondylar notch is associated with ACL tears.[46] Anteromedial bundle fibres of ACL come in contact with the roof of the Intercondylar notch during full extension and may lead to rupture at the middle 1/3 region of the fibres when the Knee is forced into Hyperextension.

Functions of Acl:[2,3,6,7]

The ACL is the primary stabiliser of the knee, limiting anterior translation of tibia. It prevents hyperextension of the knee primarily through soft tissue buttress action in the posterior intercondylar shelf. It also provides rotatory control by preventing internal axial rotation. The ACL provides secondary restraint to excessive varus and valgus loads.

Incidence of ACL Injury

The incidence of ACL tears depends on the type of sport. The injury risk is 4 to 9 times higher for female athletes compared to male athletes competing in similar activities.[47]. Meniscal tears are frequently paired with ACL ruptures, and the two can result in degenerative changes in the knee.[48] MCL rupture is also frequently combined with an ACL rupture.

Injury Mechanism[4]

Direct contact, indirect contact, and noncontact are the three basic mechanisms of ACL damage. When a person or something impacts the knee directly, a direct contact injury occurs. When a person or object impacts a section of the body other than the knee, excessive stresses are passed via the knee (for example, a direct blow to the thigh, translating the femur posterior in relation to the tibia), resulting in indirect ACL tear. When a deceleration or change in direction (pivot) force is delivered to the knee, noncontact injuries occur. These injuries frequently include an ill-timed neuromuscular

firing of tissues around the knee, resulting in translation of the tibia onto the femur, resulting in ACL collapse. Noncontact mechanisms are responsible for 60–70% of ACL injuries.[4]

History and Clinical Evaluation

The mechanism of injury is important in the classic history of an anterior cruciate ligament injury. The position of the knee at the time of injury, the weight-bearing status, the force applied, either direct and external or indirect and generated by the patient's momentum, and the position of the extremity after the injury are all important. Pain and giving way of the knee joint are common symptoms at presentation. ACL tears are more common in non-contact accidents, whereas numerous ligaments are injured in contact injuries. Meniscal injuries are indicated by locking episodes, clicks, or clunks. Swelling is present at the moment of injury, and aspiration of the joint indicates hemarthrosis.It's also necessary to examine the unaffected knee.

Physical Examination

includes inspection, palpation, measurements and movements of the knee joint.Then testing for cruciate ligaments, collateral ligaments, and menisci are performed, which aid in the diagnosis and treatment strategy.

Cruciate Ligaments Tests: Lachman's test, Anterior drawer tests, Pivot shift test, locum Anterior Rotary Drawer Test, Jerk Test of Hughston and Loose, Lateral Pivot Shift Test of Macintosh, Flexion-Rotation Drawer Test

Meniscal tests: McMurray's test, Apley's Grind Test, the Steinmann I sign (tenderness shifting from anterior to posterior with increasing flexion), and the Fouche sign (reversed McMurray sign with internal rotation of the tibia) are among the most important tests for meniscal lesions,

Collateral ligament tests: Varus stress test, valgus stress test.

The main tests performed for instability due to ACL are:

Anterior Drawer test

The subject is IN SUPINE POSITION with his hips flexed at 45 degrees and his knees flexed at 90 degrees. With hands behind the proximal tibia and thumbs on the tibial plateau, the examiner sits on the subject's foot. The proximal tibia is subjected to an anterior force. To ensure relaxation, the hamstring tendons were palpated with the index fingers. An ACL tear is indicated by increased tibial displacement when compared to the opposite side.

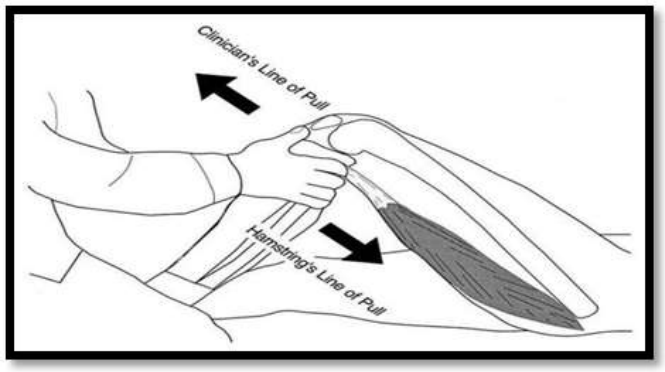


Figure 3: Anterior drawer test

Lachman Test: [17]

The Lachman's[17] test is the most sensitive. In an acutely painful knee, the anterior drawer test is impossible to perform since 90o flexion is not possible. In this case, the Lachman test could be utilised. The patient is supine, with the knee between 15 degrees of flexion and full extension. The femur is stabilised with one hand while the proximal tibia is pushed forward and translated anteriorly with the other. The hand holding the proximal tibia should be positioned so that the thumb is on the anteromedial joint margin, and the degree of translation

and end point quality are compared to the contralateral side. ACL damage is indicated by anterior tibial translation with a soft end point. The translation grades are: 0 - negative, 1 - 0 to 5mm, 2 - 5 to 10mm, and 3 - >10mm.

Pivot Shift Test: The patient is positioned supine, and the examiner lifts the lower limb from the table by grasping the foot, rotating it internally. Gravity forces the femur to fall posteriorly when the ACL is damaged, resulting in anterior subluxation of the tibia over the femur. The examiner's second hand is placed on the lateral side of the proximal part of the leg, and a valgus force is delivered while the knee is flexed. With a quick jump or movement, the anteriorly subluxated tibia reduces into normal position in 20 to 30 degrees of knee flexion. Grade I (slip), grade II (glide), and grade III (clunk) are the three levels of the test.[50]

Figure 4: Lachman Test

Figure 5: Pivot Shift Test

Radiographic Evaluation

X-ray of the knee:

The AP and lateral radiographs of the knee are necessary to look for fractures, degenerative changes, bony avulsion, subtle fractures of the Posterior tibial plateau, associated osteochondral fractures, segond‘s fracture(an avulsion of the lateral tibial rim), haziness in Hoffa's fat, joint effusion, impaction of the lateral sulcus, Tibial spine avulsion fractures (more common in skeletally immature patients). Postoperatively, for radiological evaluation of the location of the bone tunnels.

MRI of the knee

The use of magnetic resonance imaging (MRI) as a diagnostic technique has grown in popularity. Because of its superior soft-tissue contrast and multiplanar imaging capabilities, MRI allows for direct observation of the ACL

and its rupture during the preoperative phase, as well as visualisation of the repaired ACL graft during the postoperative period.

In a sagittal image - ACL (Fig 6A) appears as solid or striated band with slight divergence distally; straight, sometimes mild convex inferior sagging; Signal intensity is higher than PCL. When compared to the sagittal plane, coronal sections are frequently attenuated and less bulky.

Signs of ACL Tear in MRI (Fig.6B)

Poor or non-visualization of the ACL on sagittal image. (Fig 6D), On T2 weighted image, amorphous edematous mass with focally increased signal, Wavy redundant fibers with an irregular contour, Interruption of fibres with tears seen mid-substance or at any site, Non-linearity / angulation, Flattened axis of distal ACL (Fig 6E)(Abnormal ACL axis). The ACL axis is considered abnormal if it is more horizontal than Blumensaat line on a sagittal image. (Blumensaat line – line along the intercondylar roof), Redundant PCL(unusually arched PCL)(Fig 6F), Second fracture (Fig 6G),Uncovered menisci sign, anterior tibial translation(Fig 6C)

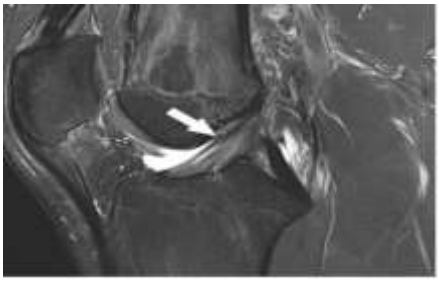


Figure 6A: Normal ACL

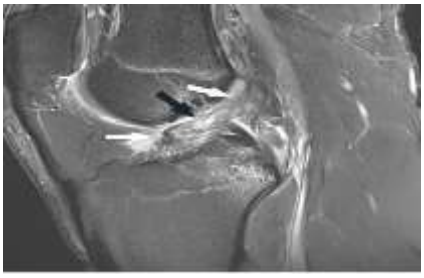


Figure 6B: ACL tear

Figure 6C: Anterior tibial translation

Figure 6 D: Non visualisation of ACL

Figure 6 E: Flattening of distal Acl

Figure 6 F :Redundant PCL

Figure 6 G: Segond fracture in ACL tear

Persistent knee instability, knee stiffness or pain, a new injury to the knee, infection, graft complications[51], arthrofibrosis, impingement, any unsatisfactory outcome[52], and preoperative evaluation for revision of a clinically apparent failed ACL graft are all indications for MRI after ACL reconstruction.[53] The postoperative ACL imaging planes include oblique sagittal images parallel to the graft plane, coronal views, and axial images.

MRI is not accurate in differentiating complete from a partial tear of ACL and also chronic tears. Tears that involve 50 – 75 % of ACL have a high chance of

progression to complete tears[55]. Using direct signs, the sensitivity of MRI for detecting ACL injuries vary from 92 – 94 % and specificity ranging from 95 – 100%[56]

Anatomy of Peroneus Longus

- The peroneus longus muscle is situated in the lateral compartment of the lower leg.[36] The common peroneal nerve divides the proximal attachment of the long peroneal muscle into two parts.
- Origin: The superficial head begins on the head of the fibula, the lateral condyle of the tibia, and the capsule of the tibiofibular syndesmosis, whereas the deep head begins on the proximal of the lateral surface of the fibula, from appropriate parts of the anterior and posterior intermuscular sseptum of the leg, as well as deep fascia of the leg.
- Insertion[11]: Base of first metatarsus and medial cuneiform bone.
- Blood supply: The peroneal artery is the main source of blood supply. The medial tarsal arterial branches supply the distal part of the peroneus longus tendon.
- Nerve: Superficial peroneal nerve
- Action: The peroneus longus helps to stabilise the lateral ankle by everting and plantar-flexing the foot. Also plantar flexes the first ray.

Treatment of ACL Injuries

The main goal of ACL reconstruction is to restore the knee to its pre-injury state in order to prevent further damage to the joint. Recurrent injury, deterioration to the menisci and articular cartilage, and osteoarthrosis can all result from instability. In 60 percent to 90 percent of patients 10 to 15 years after the primary injury, non-operative therapy of ACL injuries may result in radiographic evidence of osteoarthritis.

Graft Materials

Autografts, allografts, and synthetic polymers are all options for ACL reconstruction. The ideal graft material would replicate the complex anatomy of the native ACL, provide the same biomechanical properties as the native ACL, allow for secure fixation, promote rapid biologic incorporation for accelerated rehabilitation, and minimise donor-site morbidity.

Advantages of Autograft and Allograft

Autograft: Higher normal stability rate, lower graft failure rate, Lower infection rate, No risk of disease transmission, No risk of immune reaction, Lower cost, Faster graft incorporation/faster return to full activities

Allograft: Faster immediate postoperative recovery, Less postoperative pain, Graft harvest not part of surgery, No donor site morbidity, Larger grafts available for double-bundle reconstruction, Improved cosmesis.

Synthetic Polymers

The ideal synthetic ligament would be tissue compatible, biochemically competent, not cause an aberrant inflammatory response, have no systemic side effects, and be non-mutagenic. If it does cause a reaction, it should ideally be directed toward fibrous tissue ingrowth Augmentation devices[32] and permanent replacement grafts[32] are examples of synthetic grafts[32]. 1.Autografts are initially protected by augmentation devices until they mature and revascularize. 2.Carbon fibres and polymer fibres are two types of permanent replacement grafts (poly-tetraflfluoroethylene, polyester etc.).Due to a high rate of rupture, carbon particle deposition in the liver tissues, and an inflammatory response in the surrounding tissues, the products failed to make an impact.The reasons for the polymeric grafts' failure were leaching effects, low biocompatibility, and poor abrasion and

torsion resistance, resulting in higher rupture rates and wear debris-causing complications.

Tissue Engineered Solutions For Acl Reconstruction

- The optimal ACL replacement scaffold should be biodegradable, porous, and biocompatible, as well as possess sufficient mechanical strength and stimulate ligamentous tissue growth. It must not cause a permanent foreign body reaction and is gradually reabsorbed and replaced by natural tissue.[58]
- In vitro neoligament culture using biodegradable scaffolds seeded with cells and growth factors is one tissue engineering technique. Collagen, silk, hyaluronic acid, chitosan, and alginate are the most common bioderived scaffold materials used. Scaffolding made of synthetic materials has also been used[32]. Fibers were created by braiding polymeric filaments, which were then interwoven to create grafts. n the recent times, bridge-enhanced ACL repair conceived and developed by Murray[32] and her team is gaining popularity. The team uses polypropylene suture as a guide and collagen-platelet rich plasma (PRP) hydrogel as a bridge (containing cells and growth factors).

Graft Fixation: Fixation methods for the ACL graft are widely debated. The optimum graft attachment must give sufficient graft strength and stiffness to allow immediate complete ROM and full weight bearing of the knee, as well as be compatible with today's fast rehab approach to deliver a near-normal knee. It must also be anatomic, biocompatible, safe, and repeatable, allowing for undisturbed post-operative MRI of the knee, without complicating any revision surgery, and restoring the transition from soft tissue to fibrocartilage, to calcified fibrocartilage, and bone.

Figure 7: Different Screws for Graft Fixation

The various fixation options available are Fig 7):

- Direct: Interference screws, Staples, Washers, Crosspins etc.
- Indirect: Polyester tape, titanium button, Suture post

Interference screw (Fig 8A): These are direct fixation devices that help in holding the graft. It is inserted between the graft and bone tunnel. The various types available are

1. Titanium interference screw.
2. Bioabsorbable interference screw.

- The advantages of interference screw are - Low profile and allows intra-articular placement
- The disadvantages are - Risk of injury to the graft and risk of losing the screw in the posterolateral recess during insertion.

Fig 8A: Titanium Interference screw

Fig 8B: Biodegradable screw

Biodegradable screws (Fig 8B): These have a fixation strength comparable to that of metal screws. The advantages of bioscrews are that they do not require removal and do not interfere with radiological investigations such as MRI. The disadvantages are that they can cause foreign body reactions and that they can cause viscoplastic deformation, which can reduce the implant's fixation strength.

Objectives

- To assess the clinical outcome of the knee joint after arthroscopic management.
- To assess the clinical outcome of the ankle, joint after harvesting peroneus longus tendon.
- Early mobilization of the knee joint.

Materials and Methods

Study Design: The present study is a prospective study.

Study Setting: The study was carried out from 1st October 2019 to 31st March 2021 in the department of Orthopaedics at GSL Medical College and General Hospital, Rajahmundry, Andhra Pradesh.

Study Population: During this period 36 patients with ACL tear were arthroscopically treated with Peroneus longus tendon auto graft.

Study Variables: Out of 36 patients, 25 were males and 11 were females. The age group varied from minimum of 18 years to maximum of 50 years with an average age of 34.61 years. The common mechanism of injury was road traffic accidents and sports.

Ethical Clearance: After getting institute ethical committee (IEC) clearance.

Consent: Informed and written consent from the patients and attenders, was obtained before initiating the study.

Inclusion Criteria

1. Patients between 18-50 age group
2. Patients who gave consent for surgery
3. Patients with a near-total or total tear of the anterior cruciate ligament
4. Patients with an isolated anterior cruciate ligament tear or associated meniscal tear5.No previous surgeries to the included knee6.Contralateral normal knee.

Exclusion Criteria

1. Patients with comorbid conditions and medically not fit for anaesthesia
2. Patients associated with fractures around the knee and other ligament injuries
3. Patients with generalized ligamentous laxity
4. Patients who have had surgery on the same knee in the past.
5. Patients with overlying skin infections over the knee or the ankle.
6. Patients with pre-existing flat foot, ankle deformity, paralytic conditions, poliomyelitis or previous significant injuries to ankle.

Data was collected according to the proforma

A total of 36 individuals have been enrolled in the trial, 25 of whom are men and 11 of whom are women. Patients with acute ACL damage are treated with a knee immobiliser prior to reconstructive surgery. Once the inflammatory period has passed, the patient is scheduled for surgery.

ACL repair was performed arthroscopically using ipsilateral peroneus longus tendon autograft in this study.

Data Collection

Initial Assessment

Arthroscopes: It is a light-transmitting optical instrument. A rod-lens system is surrounded by numerous lights conducting glass fibril. There are three varieties based on the angle of inclination, which is the angle between the axis of the arthroscope and a line perpendicular to the surface of the lens: 30°, 70°, and 90° arthroscopes (Fig 9).

Fiber optic Light Source: It consists of a tungsten, halogen, or a xenon arc light source that produces 300 to 350 watts and the fiber optic cable consists of a bundle

of specially prepared glass fibres encased in a protective sheath. The light source is connected to one end of the fiber optic cable, while the other end is connected to the arthroscopes.

Television Camera: It is a small, solid state camera which can be sterilized and connected directly to the arthroscopes.

Television: To view the output from the camera and for recording.

Arthroscopic ACL Reconstruction Set: Arthroscopic ACL Reconstruction with Soft Tissue Grafts necessitates a unique and specialised set of tools, which is available as a complete kit with all necessary jigs. Except for the television and light source, all of these instruments are sterilised with ethylene oxide or formalin gas.

Figure 9: Arthroscopes

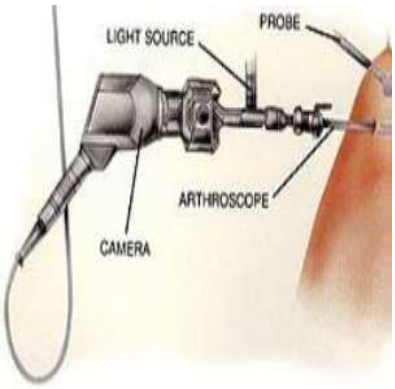


Figure 10: Parts of an Arthroscopes

Portals: Key to success in arthroscopy is the placement of portals

STANDARD PORTALS	OPTIONAL PORTALS
1. Anterolateral (AL)	1. Posterolateral portal
2. Anteromedial (AM)	2. proximal midpatellar portal
3. Posteromedial (PM)	3. central transpatellar tendon portal
4. Superolateral (SL)	

Table 1: Portals used in Arthroscopy of Knee

Once inside the knee the following compartments are viewed methodically.

1. Suprapatellar pouch and patellofemoral joint
2. Medial gutter
3. Medial compartment
4. Intercondylar notch – ACL is visualized here.
5. Posteromedial compartment
6. Lateral compartment
7. Lateral gutter and posterolateral compartment

Instrumentation

Many specialised instruments are required for arthroscopic anterior cruciate ligament reconstruction. An arthroscopic system consists of : Television monitor, Camera, Light source and fibre optic light source cable, Arthroscope ,Shaver system and hand piece , 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: Interference screws - Titanium or biodegradable.

Figure 11: Instruments and Implants

Examination under anaesthesia and patient positioning

All the patients in this 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. After soft padding, a pneumatic tourniquet is applied and positioned in the upper thigh. The limb is scrubbed. The patient is positioned supine, with the knee joint slightly away from the standard operating table's distal breakpoint. In all cases, a prophylactic antibiotic, usually 1 g ceftriaxone, is given before the tourniquet is inflated. Before inflating the tourniquet, the limb is held upright to exsanguinate it.

Graft harvesting

A single longitudinal incision (Fig 12 A, B), given starting 2 to 2.5 cm proximal to the most distal point of the lateral malleolus, through the skin and subcutaneous tissue. After the subcutaneous tissue is separated, the PL is identified (Fig12C) and isolated with the aid of a hemostatic forceps after it is distinguished from the peroneus brevis (Fig12D). Distal cut end of Peroneus longus tendon sutured with intact Peroneus brevis muscle to prevent retraction and removed to its proximal insertion with the aid of a tendon stripper (Fig12E), up to about 5 cm from the fibular head, avoiding any injury to the common peroneal nerve. Graft's total length measured (Fig12F). Absorbable subcutaneous sutures and staples were used to close the incision. On a tendon board, the harvested graft was prepared. The graft was then looped to form a triple graft (Fig12G). A double Krackow-type whipstitch is placed at both ends of each tendon with No. 2 Ethibond. To get the correct diameter, the looping Graft length was measured as well as passed through cylindrical sizers. (Fig12H)

Fig12A: Boundaries of lateral malleoli

Fig12B: Incision 2-2.5cm above lateral malleoli

Fig :12C Peroneus longus

Fig12D: Peroneus longus along with Peroneus brevis

Fig12E: PLT harvested with tendon stripper

Fig12F: length of PLT

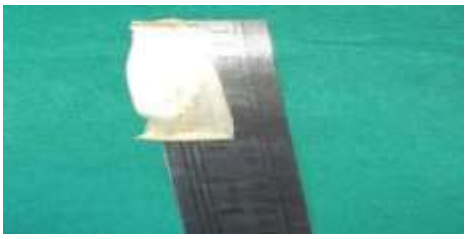


Fig 12G: measuring the length of graft

Fig 12H: Thickness of graft

Surgical Procedure

Diagnostic Arthroscopy: Before the harvesting of graft, diagnostic arthroscopy was done first.Standardized anterolateral and anteromedial portals were used. In 90 degrees of knee flexion, anterolateral portal(viewing) is made using 11 blade at the level of inferior pole of patella just lateral to the patellar tendon.An arthroscopic evaluation of the knee is performed.The knee was divided routinely into the following compartments for arthroscopic examination :Suprapatellar pouch and patella femoral joint,Medial gutter,Medial compartment ,Intercondylar notch,Postero-medial compartment ,Lateral compartment ,Lateral gutter and posterolateral compartment

Tunnel Placement And Site Preparation:

The ACL remnant is routinely removed from the notch with a shaver or a radiofrequency ablation device, with the anatomic footprint of the femoral and tibial sides noted for reconstruction.To allow adequate identification of the anterior cruciate ligament origin and insertion, a tiny piece of the footprint should be left intact.Precautions should be made to avoid injuring the posterior cruciate ligament.

Tunnels:[2]

The knee is flexed to 90 degrees to create the tibial tunnel. On the anteromedial side of the proximal tibia, a 3 cm longitudinal skin incision is created. 4–5 cm distal to the medial joint line, 2–3 cm medial to the tibial tuberosity, 1 cm superior to the pes anserinus attachment, and immediately anterior to the superfcial medial collateral ligament, the tibial tunnel is produced. A guide pin is inserted at an angle of 55° or 60° to the tibial plateau, aimed at the centre section of the ACL distal remnant, using a tibial drill guide. A cannulated reamer is used to create a 10 mm tibial tunnel along the guiding pin. A 7 mm offset femoral drill guide is directed through the tibial tunnel with the knee fexed to 90° and applying an anterior drawer force to the proximal tibia, a varus force, and an external rotation force to the lower leg to create the femoral tunnel (the lateral bifurcate ridge on the inner wall of the lateral

femoral condyle: around the 10:30 clock position on right knee/1:30 clock position on left knee) . The femoral targeting guide is rotated laterally if necessary to attain the desired femoral location. With the thigh fxed to the leg holder, applying a varus force to the lower leg results in lateral expansion of the knee joint, allowing the femoral guide to be aimed towards the anatomical footprint. Then, using a cannulated reamer and a 10-mm-diameter, 20- or 25-mm-long femoral tunnel guide pin, a 10-mm-diameter, 20- or 25-mm-long femoral tunnel is drilled through the tibial tunnel.

Fixing the Graft:[2]

The graft is mounted to the eyelet guidewire and inserted through the tibial tunnel and femoral tunnel. A long looped leading suture is pulled out of the lateral aspect of the distal thigh to guide the graft through the tunnels. The graft's integration inside the tunnel was confirmed via arthroscopy at the same time. The knee was placed through a range of motion and any signs of impingement were noticed. Once satisfied, the femoral plug was fixed with an interference screw that was introduced on a guide wire through a plastic sleeve (to avoid graft attrition by the screw). Pre-tensioning of the graft is done by flexing and extending the knee through a range of motion, as well as checking arthroscopically for any impingement in full extension.Tibial side fixation with other screw done.Graft was checked for the tightness and stability during ROM

- Anterior drawer test performed.
- Tourniquet was deflated and return of the distal pedal pulses was checked.
- Wound is closed over a negative suction drain

Post-operative management:

Immobilisation with knee brace and limb elevation was done in the immediate post-surgical time. Intravenous antibiotics were given postoperatively for 3days. Wound was evaluated on 2ndpost-operative day and xray postoperatively checked. Wound was evaluated on 2nd , 7 th post-operative day. The sutures were removed on 10th post-operative day.

Rehabilitation was started from day one.

Evaluation

All patients had post-operative anteroposterior and lateral radiographs to determine the tunnel placement and position of interference screws, and their functional outcomes were assessed at 6 weeks, 3 months, and 6 months.

The International Knee Documentation 2000 score(IKDC) and Lysholm Knee Scoring Scale were used for evaluation at knee joint and the functional outcome of ankle joint is assessed by AOFAS score and FADI score.

Statistical Analysis

Data extraction and analysis was done using Microsoft Excel 2007 and SPPS version 2.0. Results were expressed as percentages for categorical variables. Continuous variables were expressed as mean and standard deviation. Paired ‘t’ test was applied to compare the mean scores at every follow–up. A ‘P’ value of <0.05 is considered as statistically significant.

Results and Discussion

A total of 36 out of 39 patients were enrolled for final analysis. Two patients were omitted due to multiple ligament injuries, and one patient was lost to follow up at 3 months postoperatively.

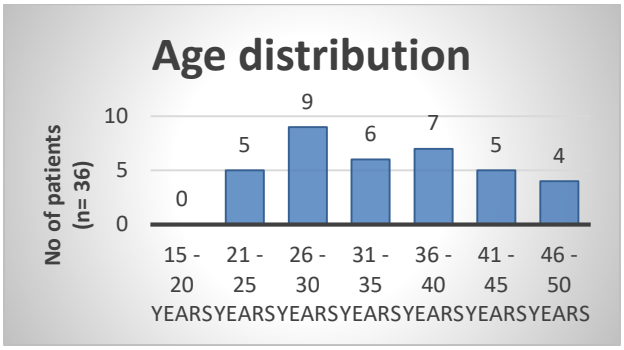
The peroneus longus tendon autograft was used in all of the patients' arthroscopic ACL reconstructions. The patients were followed for 6 weeks, 3 months, and 6 months after surgery.

Age Distribution

Table 2: Age Distribution

The mean age in this study was 34.61± 7.77years.The youngest patient in this study was 22 years old and the oldest patient was 49 years

Graph 1: Age Distribution



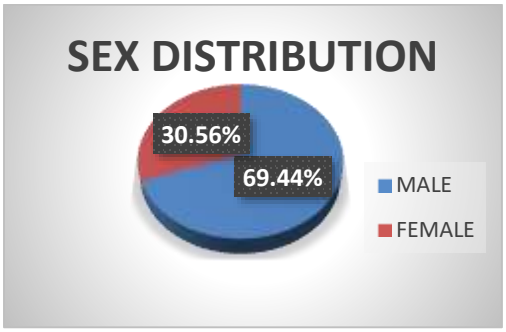
Sex Distribution:

Table 3: Sex Distribution

Gender	Frequency	Percentage
Males	25	69.44%
Females	11	30.56%
Total	36	100%

Of the 36 patients included in this study, 25 (69.44%) were Male patients and 11 (30.56%) were female.

Graph 2: Sex Distribution



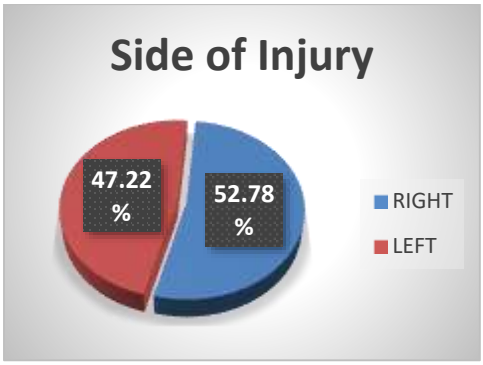
Side of Injury:

Table 4: Side of Injury

Side	Frequency	Percentage
Right	19	52.78%
Left	17	47.22%
Total	36	100%

In this study, the right anterior cruciate ligament was more commonly injured (52.78%) than the left side (47.22%).

Chart 3: Side of Injury



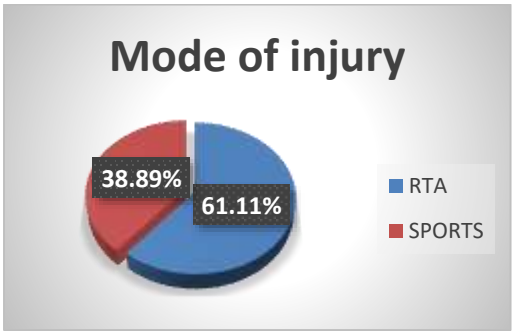
Mode of Injury

Figure 5: Mode of Injury Distribution

Mode	Frequency	Percentage
Rta	22	61.11%
Sports	14	38.89%
Total	36	100 %

The most common mode of injury in this study was Road Traffic Accidents (61.11%) followed by sports (38.89%)

Chart 4: Mode of Injury Distribution



Time Interval between Injury and Surgery

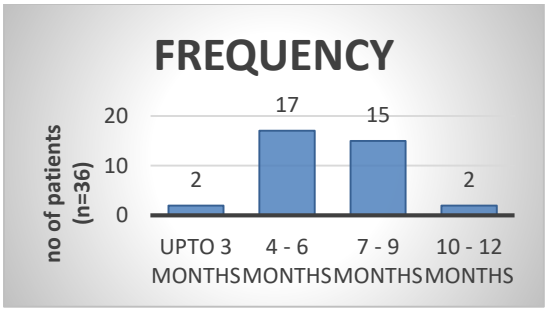
Table 6: Duration between injury and surgery

Duration	Frequency	Percentage
Upto 3 Months	02	05.56%
4 - 6 Months	17	47.22%
7 - 9 Months	15	41.66%

10 - 12 Months	02	05.56%
Total	36	100%

In this study, most of the patients (41.66%) presented 4 to 6 months after injury. The Mean is 6.47 with standard deviation of 2.02

Graph 5: Distribution of Time Interval Between Injury and Surgery



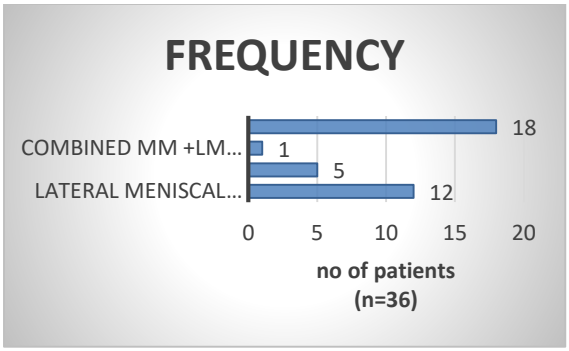
Associated Meniscal injuries:

Table 7: Associated Meniscal Injuries Distribution

Associated Injuries	Frequency	Percentage
Lateral meniscal tear	12	33.33%
Medial meniscal tear	05	13.89%
Combined MM +LM tear	01	02.78%
Isolated ACL tears	18	50%

In this study, there was associated meniscal injury in 50 % of patients. The most commonly injured was lateral meniscus (33.33%). Isolated ACL tear was present in 50% patients.

Graph 6: Associated Meniscal Injuries Distribution



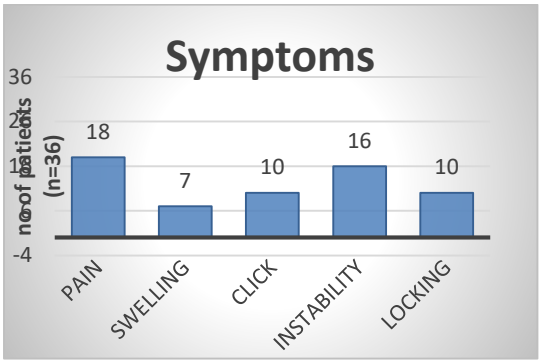
Symptoms at presentation

Table 8: Symptoms at Presentation Distribution

Symptoms	Frequency	Percentage
Pain	18	50%
Swelling	7	19.4%
Click	10	27.78%
Instability	16	44.44%
Locking	10	27.78%

The most common symptom at presentation was knee pain (50%) followed by instability (44.44%)

Graph 7: Symptoms at Presentation Distribution



Post Op Complications

1. One patient in this study had superficial infection at the donor site which subsided with intravenous antibiotics. By Day 12, the donor site was healthy and sutures were removed.

Post op outcome: **Lysholm Knee Score**

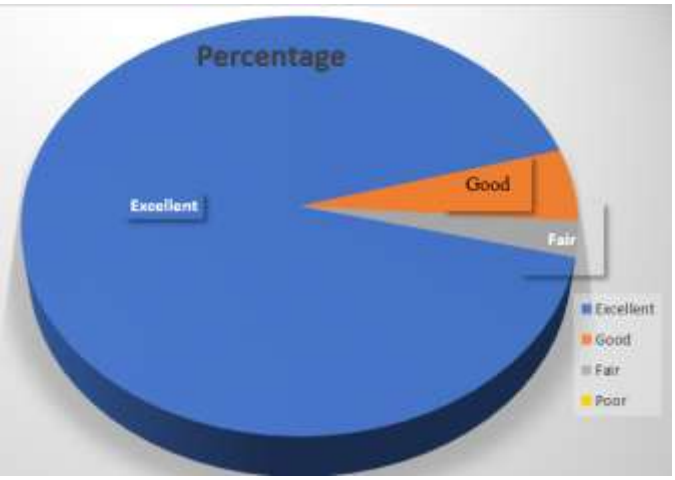
Table 9: Lysholm Score Outcome

Results	**Frequency**	**Percentage**
Excellent	33	91.67%
Good	2	5.56%
Fair	1	2.77%
Poor	0	0
Total	36	100%

91.6% patients had excellent functional outcome while 5.56% patients had good outcome. The remaining 15%

patient had a fair outcome according to Lysholm knees score

Graph 8: Lysholm Score Outcome



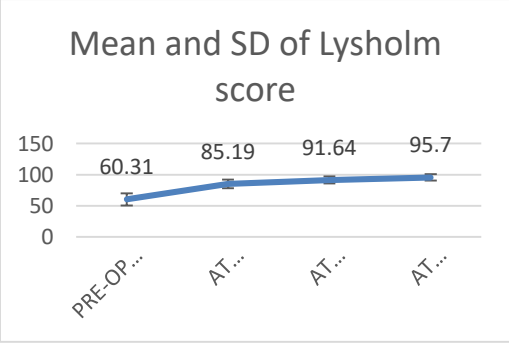
Lysholm Subjective Score

Table 10: Lysholm Subjective Scoring

Pre-Op Mean (Sd)	At 6 weeks Mean (Sd)	At 3 months Mean (Sd)	At 6 months Mean(Sd)
60.31(10.01)	85.19(6.82)	91.64(5.78)	95.7(5.16)
P VALUE = 0.001			

The Mean pre op lysholm score was 60.31 ± 10.01 while the mean post op score at final follow up was 95.7±5.16. There was significant improvement in post op score when compared to pre op score (p value = 0.000).

Graph 9: Mean and Sd of Lysholm Score



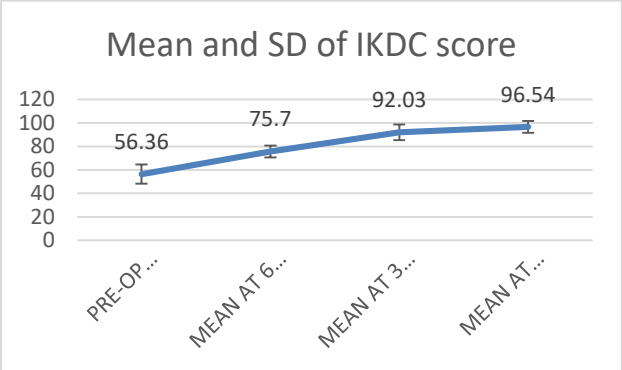
IKDC Subjective Score

Table 11: IKDC Subjective Scoring

PRE-OP MEAN(SD)	MEAN AT 6 WEEKS(SD)	MEAN AT 3 MONTHS(SD)	MEAN AT 6MONTHS(SD)
56.36±8.20	75.70±5.99	92.03±6.62	96.54±5.01
P VALUE = 0.001			

The Mean pre op IKDC score was 56.36±8.20 while the mean post op score at final follow up was 96.54±5.01. There was significant improvement in post op score when compared to pre op score (p value < 0.001).

Graph 10: Mean and SD of IKDC Scores



Postop Aofas Score:

Table 12: Aofas Scores

	Mean (Sd) Preop	Mean (Sd) (6months Post Op)
Aofas Score	99.86±(0.42)	94.92±(2.10)

AOFAS scores was calculated preoperatively and at final follow up(6months post-operative period).The average mean AOFAS score preoperatively was 99.86 ± 0.42. The average mean AOFAS score during final follow up period was 94.92 ± 2.10.

Postop Fadi Score

Table 13: Mean Fadi Scores

	Preop	6 months Post Op
Fadi Score	98.86±0.90	94.62±1.70

FADI scores was calculated at final follow up (6months post-operative period)

The average mean FADI score was 94.62 ± 1.70.

The aim of this study is to evaluate the use of peroneus longus tendon for anterior cruciate ligament reconstruction. The ligaments that surround the knee joint, particularly the cruciate ligaments, play a major role in its stability (anterior and posterior cruciate). The anterior cruciate ligament is commonly injured in road traffic accidents and athletic activities, with the most common mechanism being a powerful valgus and external rotation movement of the knee. Arthroscopic reconstruction of an injured ACL has become the gold standard, and it is one of the most common procedures performed in orthopaedics. As a result, it has been thoroughly studied, and the outcomes of ACL reconstruction have received a lot of attention. ACL injuries are now arthroscopically repaired with autografts and allografts.

Bone-patellar tendon-bone complex, hamstring tendon autograft, and allografts are some of the graft choices available. However, there is debate concerning which graft is best for ACL reconstruction. Patellar tendon rupture, patellar/tibial fracture, quadriceps weakness, loss of complete extension, anterior knee soreness, difficulties kneeling, and numbness due to injury to the infra-patellar branch of the saphenous nerve are all complications of bone patella tendon bone graft. As a result, it should be avoided in patients whose jobs or lifestyles need regular kneeling. The use of the hamstring tendon might result in a considerable alteration in the strength of the hamstring muscle. After ACL surgery, hamstring function is critical in order to protect the reconstructed ACL from anterior drawer force, which is caused by quadriceps contraction.

The exorbitant expense of allografts, as well as their scarcity, disease transmission, and immunological reactivity, have limited their usage. Early breaking and elongation (wear and tear), carbon deposition, inflammatory synovitis, cross-infections, immunological reactions, tunnel osteolysis, femoral and tibial fractures, foreign-body synovitis, and knee osteoarthritis are all disadvantages of synthetic polymers.

In this study peroneus longus tendon was used to replace the injured ACL.

Age Incidence

In this study, the youngest patient was 22 years old and the oldest patient was 49 years old with maximum number of patients in age group 26 to 30 years. The mean age of the patients in this study is 34.61, with a standard deviation of 7.769.

Similar findings are seen in the study by chung-ting-lu et al,[27] where the mean age of patients were 31.4 years.

According to Mingguag et al[39].(2020), the average age in his study was 28.9 ± 5.95 years.

In a study by sholahuddin Rhatomy et al[37], the average age of the 24 patients was 23.4 years, with a standard deviation of 8.1.

Mingguang Bi et al conducted a prospective randomised controlled study in 2018 to compare the outcome of acl reconstruction between the anterior half of the peroneus longus tendon and semitendinosis. The mean age of one group was 29.1 with a standard deviation of 6.5, while the mean age of the other group was 27.9 with a standard deviation of 6.7.

In a study by Xiaoxia Song et al[35], 156 individuals with an average age of 29.5 years were assessed.

Sachin Joshi et al.[5] calculated a mean age of 27.2 with a standard deviation of 4.4 in their investigation.

In contrast to this study, fU-DONG et al[34] found that the average age was 42 years.

Table 14: Comparison Of Mean Age With Other Studies

Studies	No Of Patients	Mean Age
Present Study	36	34.61±7.769
Mingguang Et Al,	21	28.9±5.95
Rhatomy Et Al	24	23.4±8.1
Xiaoxiao Et Al	156	29.5
Sachin Joshi Et Al.	24	27.2±4.4

The average age, according to most research, is between 25 and 35 years old. This is because these age groups are more active age group and likely to be involved in sports and road traffic accidents.

Sex Incidence:

In the current study, 25 of the 36 patients are males (69.44 percent) and 11 are females (30.56 percent). Previous investigations also have shown that males outnumber females.

In a study published in 2019, Kumar vk et al[2] out of 25 patients, 19 were males (76%) and 6 were females (24 percent)

Similarly, according to the Mingguang et al[39]. study, there were 13 (61.9 percent) males and 8 (38.1 percent) females in 2020.

The majority of the cases in the Dhruv sharma et al[9], study were 7 males (70 percent) and only 3 females (30 percent).

Males are more commonly affected than females in the Xiaoxiao et al[35]. study, with 118 patients (75.64 percent) affected compared to 38 patients for females (24.36 percent percent).

In the 2018 Mingguang et al. study, there were 34 males and 28 females in the peroneus longus tendon group, and 31 males and 31 females in the semitendinosis group.

The majority of cases in Sachin Joshi et al[5] study were males (75%), with females accounting for 25% of the total.

Table 15: Comparison of Gender Distribution

Studies	No Of Patients	Percentages Of Male And Female
Present study	36	Males 69.44% and Females 30.56%
Kumar vk et al	25	Males 76% and Females 24%
Mingguang et al,	21	Males 61.9% and Female
Dhruv sharma et al	10	Males 70% and Females
Xiaoxiao et al	156	Males 75.64% and Fema
Sachin Joshi et al	48	Males 75% and Females

The study population was predominantly male dominated, which probably reflects the largely prevalent gender bias in sports participation in our country. Although females have a higher risk of sustaining ACL tears due to various intrinsic risk factors, such as a smaller notch size[6], higher Q-angles, increased foot pronation and tibial internal rotation, differences in the hamstring- to - quadriceps strength ratio, and kinematics of the lower extremity, the prevalence of ACL tears among males was most likely due to the higher risk exposure among males.

Side of Injury

The right knee was affected in 52.78 percent of patients and the left knee was affected in 47.22 percent of patients in this study.

Comparably, ACL tears were identified in 60 percent of patients on the right side and 40 percent on the left side in another investigation by Kumar V K et al[2].

In study conducted by Mingguang et al the findings were different from this study. The left side was more injured with percentage of 57.14% when compared to right side of 42.86%.

Table 16: Comparison of Side Involved

Study	Right Side	Left Side
Present Study	52.78%	47.22%
Kumar V K Et Al.	60%	40%
Mingguang Et Al	42.86%	57.14%

The affected side is determined by which side the impact of the injury occurred on at the time of the trauma. In this study more individuals had impact on right knee.

Mode of Injury

Road traffic accidents were the most common cause of injury in this study. It was the leading cause of death (61.11 percent), followed by sports (38.89 percent). Similar findings were also noted in other 2 studies.

Road traffic accidents were likewise the most common mode in a study by Kumar V K et al[2]. Out of 25 patients, it was discovered that 19 patients were involved in car accidents,4 in sports, 2 patients who have suffered a fall from height.

According to a recent study by Sachin Joshi et al[5], road traffic accidents are the most common cause of injury (39.58%) followed by Sports (35.41%), Assault (14.5%), Domestic accident (10.41%)

But**,** Sholahuddin Rhatomy et al. conducted a study on two groups. In the group where ACL reconstruction is planned using the peroneus longus tendon, 22 of the 24 patients in that group had a history of sports injury(91.67%)

Table 17: Comparison of Mode of Injuries

Study	**Rta %**	**Sports%**	**Others %**
This Study	61.11%	38.89%	0.00%
Kumar Vk Et Al	76%	16%	8%
Sholahuddin Et Al	0.00%	91.67%	8.33%
Sachin J Et Al	39.58%	35.41%	24.91%

Due to higher participation in sports in western countries, sports activity is the most common mode of injury, whereas in India, road traffic accidents are the most common mode of injury due to lower participation in sports in India compared to the western world and a higher prevalence of road traffic accidents occurrence in India.

Injury Surgery Interval

In this study, most of the patients (41.66%) presented 4 to 6 months after injury. The mean Duration-Surgery interval is 6.47months with a standard deviation of 2.02.

In 2018, Mingguang Bi, MD et.al, compared the Anterior Half of the Peroneus Longus Tendon (AHPLT) to the Semitendinosus Tendon for All-Inside Single-Bundle Reconstruction of the Anterior Cruciate Ligament. One group had mean duration surgery interval of 6.1 months with standard deviation of 6.5. The other group had mean Duration-surgery interval of 5.7 months with standard deviation of 6.3 months.

Table 18: Comparison of Means of Injury Surgery Interval

Study	Mean Duration Surgery Interval	Standard Deviation
Present study	6.47	2.02
Mingguang Bi group 1	6.1	6.5
Mingguang Bi group 2	5.7	6.3

The mean duration between injury and presentation to this hospital was 6.47months; this is on the higher side, as this hospital is a tertiary care referral centre.

Associated meniscal injuries

In this study, there was associated meniscal injury in 50 % of patients. Isolated ACL tear was present in 50% patients. The most commonly injured menisci was lateral meniscus (33.33%) .

Hagino et al investigated the causes of concomitant meniscal injuries in ACL injuries. The individuals were separated into two groups based on whether they had acute or persistent symptoms. Arthroscopic examination revealed meniscal tears in 79.2 percent (437 of 552 knees) of all participants, 72.7 percent (186 of 256 knees) in the acute group, and 84.8 percent (251 of 296 knees) in the chronic group, with the chronic group being considerably higher. Only 20 knees (10.8 percent) in the acute group (186 knees) had medial meniscal tears, 129 knees (69.4%) had lateral meniscal tears, and 37 knees had bilateral (medial and lateral) meniscal tears (19.9 percent). Only 62 of the 251 knees in the chronic group exhibited a medial meniscal tear.

In a prospective observational study undertaken by Diego Costa Astur et al[29], the majority of the patients (44.58 percent) had an isolated ACL tear, followed by medial meniscal tears (30.2 percent)

Table: 19 Comparisons of Associated Injuries

Study	Present study	Hagino et al(acute group)	Diego et al
Medial meniscus	13.89%	10.8%	30.2%
Lateral meniscus	33.33%	69.4%	0.00%
Combined medial and lateral menisci	2.78%	19.9%	0.00%

Meniscal injuries occur in 50 to 70 per cent of acute ACL tears, with the lateral meniscus being the most usually damaged. Because of the anomalous loading and shear forces, late meniscal damage is common in ACL torn knees. Because of its tight attachment to the capsule, the medial meniscus is the one most typically affected in chronic ACL tears. Previous studies have shown that lateral meniscal tears are more common in acute injuries, but as the injury becomes more chronic, medial meniscal tears become more common while lateral meniscal tears remain stable.

Symptoms at the time of presentation

In this study, 50 percent of patients complained of knee joint discomfort, 44.44 percent of patients complained of instability, 27.78 percent of patients complained of knee locking, 27.78 percent of patients complained of click, and 19.4 percent of patients complained of swelling.

Lysholm Score

91.6 percent of patients in this study had an outstanding functional outcome, while 5.56 percent had a good outcome. The remaining 15% of patients had a positive outcome. The average lysholm score before surgery is 60.31, with a standard deviation of 10.01.

At 6 weeks, 3months and 6months after surgery, the mean post-op lysholm score were 85.19,91.64 and 95.7

with standard deviations of 6.82, 5.78 and 5.16 respectively.

Comparison of Lysholm Score with Other Studies

Sachin Joshi et al[5], in his prospective interventional study on "Peroneus Longus Tendon Autograft for Anterior Cruciate Ligament Reconstruction: A Safe and Effective Alternative in Nonathletic Patients: conducted study on 48 non athletic patients. The study showed 91.67±8.37 mean post op lysholm score.

Mingguang Bi et al[33], studied on "All-Inside Anterior Cruciate Ligament Reconstruction Using an Anterior Half of the Peroneus Longus Tendon Autograft". The mean pre-op lysholm score was 50.9 with a standard deviation of 8.50. The mean post-op lysholm score at final follow up was 95.2 with a standard deviation of 2.64.P value is < 0.05 and is statistically significant.

In a study by Dhruv sharma et al[8], 80% of patients had an excellent lysholm score and 20% had a good score. They concluded that the peroneus longus tendon is the most promising autograft for ACL repair because of its ease of harvesting, bigger graft diameter, and fewer graft problems. Proper harvesting procedure does not impact ankle function, which helps to avoid difficulties linked with other autografts.

Sholahuddin Rhatomy et al conducted research on single bundle ACL reconstruction using the peroneus longus tendon and hamstrings. The study's preop lysholm score was 70.8 with a standard deviation of 10.2, and the study's final follow up postop score was 94.9 with a standard deviation of 5.6 using the peroneus longus tendon. The pre-op Lysholm score for the hamstings tendon was 69.8, with a standard deviation of 15.9, and the post-op Lysholm score was 93.1, with a standard deviation of 7.3. Single-bundle ACL reconstruction using peroneus longus tendon autografts had excellent functional results and was comparable to four-strand hamstring tendon reconstruction, according to the study.

In a study titled "Peroneus Longus Tendon Autograft is a Safe and Effective Alternative for Anterior Cruciate Ligament Reconstruction", Fu-Dong Shi et al[34] compared the anterior half of the peroneus longus tendon to the semitendinosis. In his research, he discovered that with double stranded peroneus longus tendon, the mean post-operative score at 6 months was 94, with a standard deviation of 6.02, and with four stranded hamstrings tendon, the mean post-operative score was 95, with a standard deviation of 2.35.

Table 20: Comparison of Lysholm Scores

Study	Final follow up (MEAN)	Final follow up(Standard deviation)
Present study	95.7	5.16
Sachin Joshi et al	91.67	8.37
Mingguang Bi et al	95.2	2.64
Rhatomy s et al	94.9	5.6
Fu-Dong Shi et al	94	6.02

After reconstruction with peroneus longus tendon, the LYSHOLM scores improved significantly in the postoperative period. The mean Lysholm score at the last follow-up was 95.7± 5.16, which showed improvement from the preoperative scores 60.31± 10.01. This supports the use of peroneus longus for anterior cruciate ligament reconstruction.

The post-operative mean scores at 6months of this study when compared to four stranded hamstrings tendon in study by Fu-Dong et al (95 ±2.35) are in near range signifying peroneus longus tendon is a good substitute for ACL reconstruction.

Comparing IKDC Scores with Other Studies

In the present study, at initial visit the mean pre op IKDC score was 56.36±8.20. After surgery the patient was evaluated till 6 months. The mean IKDC Score showed mild increase in 6 weeks (75.70 ±5.99) and significant increase in the 3th month (92.03±6.62) and 6th month (96.54±5.01) respectively.

In a study conducted by Mingguang Bi et al[33] in 2018, he compared the Anterior Half of the Peroneus Longus Tendon (AHPLT) to the Semitendinosus Tendon for All-Inside Single-Bundle Reconstruction of the Anterior Cruciate Ligament. The study compared the outcome of knee joint with peroneus longus tendon and semitendinosis. Total of 124 patients are randomly assorted to 2 groups. One group underwent reconstruction with the peroneus longus muscle, while the other underwent reconstruction with semitendinosis. In the peroneus longus tendon group, the mean IKDC score pre-operatively was 52.6 ±6.2 and the mean IKDC score post-operatively at final follow up was 89.3 ±8.4.In the semi-tendinosis group, the mean IKDC score pre-operatively was 51.2 ± 5.9 and the mean IKDC score post-operatively at final follow up was 90.4 ± 7.1.

Sholahuddin Rhatomy et al conducted research on single bundle ACL reconstruction using the peroneus longus tendon and hamstrings. His preop IKDC score was 58.7 with a standard deviation of 11.2, and his final follow up postop score was 92.5 with a standard deviation of 6.2 using the peroneus longus tendon. His pre-op IKDC score was 56.9 with a standard deviation of 15.7, and his final follow-up IKDC score was 88.8 with a standard deviation of 9.7, using the hamstings tendon. Single-bundle ACL reconstruction using peroneus longus tendon autografts had excellent functional results and was comparable to four-strand hamstring tendon reconstruction, according to the study.

According to a study by Sachin et al[5], 6months post-surgery, the mean IKDC score was 78.16 ± 6.23.

Fu-Dong Shi et al[34], compared the anterior half of the peroneus longus tendon to the semitendinosis in a study titled "Peroneus Longus Tendon Autograft is a Safe and Effective Alternative for Anterior Cruciate Ligament Reconstruction. "They calculated the ikdc scores at 6 months, 12 months, and 2 years after surgery in both groups. The average mean IKDC values in patients who received a peroneus longus autograft were 89.45 ± 2.89 at 6 months and 90.48 ± 2.36 at 12 months.The average mean IKDC values in patients who received hamstings autograft were 90.12 ± 4.56 at 6 months and 90.17 ± 4.32 at 12 months.

Table 21: Comparison of IKDC Scores

Scores	Mean	Standard Deviation
Present study	96.54	5.01
Mingguang et al(2018)	89.3	8.4
Sholahuddin et al	92.5	6.2
Sachin et al	78.16	6.23
Fu-Dong Shi et al	89.45	2.89

After reconstruction with peroneus longus tendon, the IKDC scores improved significantly in the postoperative period. The mean IKDC score at the last follow-up was 96.54± 5.01, which showed improvement from the preoperative scores 56.36± 8.20,. This supports the use of peroneus longus for anterior cruciate ligament reconstruction.

The post-operative mean scores at 6months of this study when compared to four stranded hamstrings tendon in study by Fu-Dong et al is higher signifying peroneus longus tendon is a good substitute for ACL reconstruction.

Aofas Score

At 6 months postoperative follow up, the average mean AOFAS score in this study was 94.92 ± 2.10

Preoperative and Postoperative Clinical Outcomes at the Ankle Donor Site were observed in a study conducted by Mingguang Bi et al[33], 2018.The mean Preop AOFAS score was 98.4 ± 2.01 and 91.6 ± 3.61 in 1st year post-operative follows up and 96.2 ± 2.88 in 2nd year post op follows up. The p value is <0.05.

In their study, Dhru sharma et al[7] found that the average AOFAS at 6months was 94.5 ± 1.5 .P value <0.01

In a study conducted by Sholahuddin Rhatomy et al[37],the average mean was found to be 97.3 ± 4.2 in a one-year follow-up period.

Mingguang Bi, MD in 2021, conducted a study on "All-Inside Single-Bundle Reconstruction of the Anterior Cruciate Ligament with the Anterior Half of the Peroneus Longus Tendon Compared to the Semitendinosus Tendon: A Two-Year Follow-Up Study". The pre-op AOFAS score was 99.4 ± 1.14 and post op AOFAS score was 99.1 ± 1.40.

In Sachin joshi et al[5], study ,post op AOFAS was 98.4 ± 1.23.

Table 22: Mean Afoas Scores at Final Follow Up Period

Study	**Mean Aofas**
Present study	94.92 ± 2.10
Mingguang Bi et al,2018	96.2 ± 2.88
Sharma et al	94.5 ± 1.5
Sholahuddin Rhatomy et al	97.3 ± 4.2
Mingguang Bi,2021	99.1 ± 1.40
Sachin joshi et al	98.4 ± 1.23

AOFAS score post-operatively at final follow-up was 94.92 ±2.10, indicating little donor site morbidity and no substantial deteoriation in ankle function in this study.

FADI score

At 6 months postoperative follow up, the average mean FADI score in this study was 94.62± 1.70.

Preoperative and Postoperative Clinical Outcomes at the Ankle Donor Site were observed in a study conducted by **Mingguang Bi et a**l, 2018.The mean Preop FADI score was 97.9 ± 2.19 and 93.5 ± 4.11 in 1st year post-operative follows up and 97.0 ± 2.85 in 2nd year post op follows up. The p value is <0.05.

In their study, Dhru sharma et al[7], found that the average AOFAS at 6months was 94.2 ± 1.1 .P value <0.01.

In a study conducted by Sholahuddin Rhatomy et al,the average mean was found to be 98 ± 3.4 in a one-year follow-up period.

Table 23: Mean Fadi At Final Post Op Follow Period

Study	Fadi Score At Final Follow Up
Present study	94.62± 1.70
Mingguang Bi et al	97.0 ± 2.85
Dhru sharma et al	94.2 ± 1.1
Sholahuddin Rhatomy et al	98 ± 3.4

FADI post-operatively at final follow-up was 94.62, indicating little donor site morbidity and no substantial deteoriation in ankle function in this study.

Complications

In the present study, out of 36 patients- 1 patient complained of post-operative serous discharge at the donor site. Patient was treated with intravenous antibiotics. Regular sterile dressings done. The serous discharge subsided on day 4. On post-operative day 12 scar was healthy and suture removal done. It was superficial infection.

Similarly, In Sachin Joshi et al[5] study, among the 48 patients, there was one patient with superficial infection (Staphylococcus aureus) at the graft donor site which

was treated with oral antibiotics (cefoperazone). None of the patients had any neurovascular deficit.

From statistical analysis in a comparative study done by Sholahuddin Rhatomy et al,there was a significant difference in thigh hypotrophy between the hamstring and peroneus longus groups, where the hamstring group had a significantly greater thigh hypotrophy (mean 11.4±3.6 mm), compared with the peroneus longus group, with a mean of 2.5±0.5 mm.Six patients (21.4%) in the hamstring group had anterior kneeling pain, while no such complication noted in peroneus longus tendon group.

While, Mingguang Bi et al conducted a study on "All-Inside Anterior Cruciate Ligament Reconstruction Using an Anterior Half of the Peroneus Longus Tendon Autograft". A total of 21 patients with an isolated ACL injury were treated and none of them showed any complications. They concluded that there was no fixation failure, infection, or graft rupture was found on MRI scans and clinical follow-up.

In Mingguang Bi, MD et al,2021[39] study there were no associated complication during post op follow period.

Hence Peroneus longus is safe to use with nil or minimal donor site complications

Table 24: Functional Outcome of Peroneus Longus Tendon On Acl Reconstruction:

	Preop	6weeks	3Months	6Months
Lysholm	60.31±10.01	85.19±6.82	01.64±5.78	95.7±5.16
Ikdc	56.36±8.20	75.70±5.99	92.03±6.62	96.5±45.01
Aofas	99.86±0.42	-	-	94.92±2.10
Fadi	98.86±0.90	-	-	94.62±1.70

The final follow-up results show that the knee joint has had a positive outcome. Every value has a statistical significance. Similarly, no donor site morbidity and no significant deteoriation in ankle function are indicated by ankle scores.

Conclusions

Peroneus longus tendon has more thickness and length, requires less graft harvesting time, has little donor site morbidity, and has good functional and knee stability scores, making it an effective and safe autograft option for ACL reconstruction.

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