



FUNCTIONAL OUTCOME OF HAMSTRING VS PERONEUS LONGUS TENDON AUTOGRAFT IN ARTHROSCOPIC ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION - A COMPARATIVE STUDY

Orthopaedics

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ABSTRACT

Background: Anterior cruciate ligament (ACL) reconstruction improves knee stability and function with many graft types, either autografts or allografts, which have already been studied extensively. Among these grafts, bone-patellar tendon-bone (BPTB) and four strand hamstring autografts are the two most common autografts used for ACL reconstruction and each has its advantages and disadvantages. The Anterior Cruciate Ligament is the weaker of the two cruciate ligaments and therefore may be it tears easier than the Posterior Cruciate Ligament. Orthopedic surgeons are attempting to use peroneus longus tendon as a graft. The purpose of this study is to compare the functional outcome between the peroneus longus tendon and hamstring tendon in ACL Reconstruction. **Material And Methods:** In our study we took 40 cases of ACL tear fulfilling inclusion and exclusion criteria. Patient selection was randomised and patients were operated by using hamstring autograft and peroneus longus autograft. Patients were in the age group of 18 to 60 years. The PLT/HT ratio is 25PL and 15H. **Results:** Patients were followed at 6 weeks, 3 and 6-months post operatively for clinical and functional evaluation and results at end of 6 months were calculated by using Lysholm knee score. The functional outcome is similar in both groups. **Conclusion:** Peroneus longus grafts offer superior outcomes compared to hamstring grafts for ACL reconstruction. They provide enhanced graft strength and stability, potentially reducing the risk of re-injury. In addition, their use can lead to quicker recovery times and improved functional results for patients. prevention of potential complications of HT autograft obtained from the knee region, the current study demonstrated that PLT autograft might be considered a safe and practical autograft source.

KEYWORDS

Arthroscopy, Anterior cruciate ligament reconstruction, hamstring tendon autograft, peroneus longus tendon autograft

INTRODUCTION

Knee joint is the largest joint of the body and stabilized by various ligamentous structures around the joint. It is one of the most commonly injured joint and out of all ligamentous injury Anterior Cruciate ligament is one ligament which is commonly injured around knee and requires surgical intervention too.

Thus patients, who have knee symptoms related to ACL deficiency, may consider ligament reconstruction as a means of stabilizing the tibio-femoral joint and restoring high level function of the knee joint.

Different techniques have been described for Anterior Cruciate Ligament Reconstruction from open to arthroscopic technique. The bone- patellar tendon- bone was the most commonly used graft in ACL reconstruction. However, concerns regarding problems with the extensor mechanism of the knee, loss of motion, infra patellar pain, patellar fracture and the development of chronic anterior knee pain have promoted surgeons to seek other graft materials for use in ACL reconstruction. As such, the semitendinosus, Gracilis and peroneus tendons represent an alternative auto graft donor material that may be used for reconstruction of the ACL without disturbance of the extensor mechanism^[1]. The present study was aimed to study the functional outcome of arthroscopic ACL reconstruction using Hamstring and Peronei grafts with the follow-up of patients to evaluate functional improvements in both.

The procedure ACLR involves several key steps. Firstly, the damaged ACL is surgically removed. Following this, a graft is obtained and meticulously prepared. Subsequently, tunnels are created in both the femoral and tibial regions. The graft is then positioned in a manner that closely resembles the original anatomical location of the ACL. Finally, the graft is firmly secured in place, ensuring its stability and functionality.

The semitendinosus and gracilis tendon can be used to harvest hamstring tendon (HT) auto grafts. Graft configurations for HT autografts can vary greatly, with the most popular being quadrupled hamstring^[2].

Lukman et al found no difference between the shear strengths of the hamstring tendon and the peroneus longus in their bio mechanical study^[3]. Keyhani et al found that ACLR with the peroneus longus tendon worked better than ACLR with the hamstring tendon^[4]. In their study comparing the peroneus longus and hamstring tendons, Agarwal et al indicated that the peroneus longus can be a safe autograft^[5]. Similar results were found by Saeed et al, who found that ACLR with peroneus longus allowed people to return to sports earlier^[6].

We postulated that an appropriate graft for arthroscopic ACL

reconstruction would be the peroneus longus tendon. Therefore, it would be especially helpful for athletes who depend on their hamstring muscles or for patients who spend a lot of their time kneeling when engaging in social or religious activities. We believed that similar knee scores could be achieved with fewer complications using the peroneus longus tendon. Therefore, this study aimed to compare outcomes of anterior cruciate ligament reconstruction in 40 patients using peroneus longus tendon and hamstring tendon autografts.

MATERIALS AND METHODS:

It was a prospective study carried out in patients who had ACL injury and underwent arthroscopic reconstruction of ACL after getting a prior informed consent.

Patients who were diagnosed and admitted in the Department of Orthopedics, Sahasra ortho & neuro center with ACL injury and underwent arthroscopic reconstruction of ACL were included in the study. Patients were subjected to X-ray, MRI and routine investigations. On viewing, the X-ray and MRI next modality was decided. The study duration was 6 months. 40 patients satisfying the inclusion criteria. Patients were informed about the study in their vernacular language. All the patients were followed up postoperatively.

Inclusion Criteria

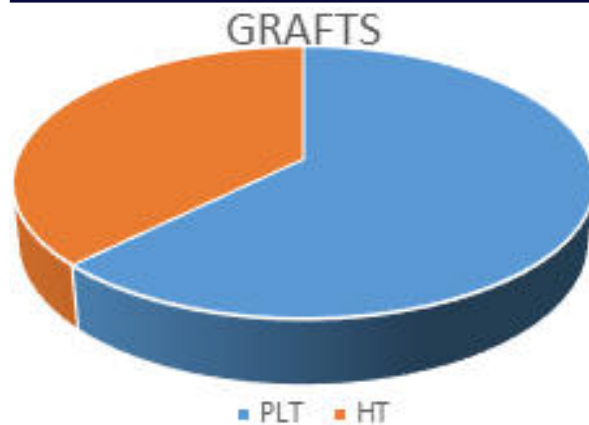
- 1) Adults between 18 and 60 years of age who had ACL tear
- 3) Patients medically fit for surgery
- 4) Patients willing for surgery and have given written informed consent

Exclusion Criteria

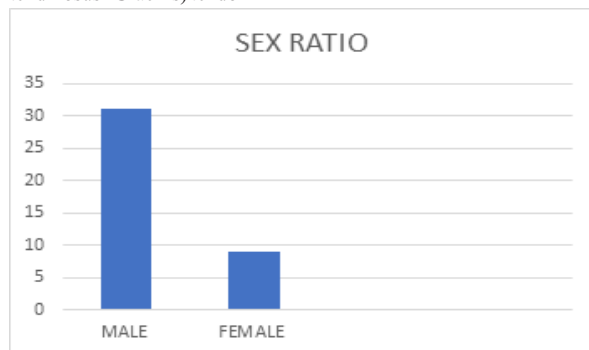
- 1) Patients below 18 years age
- 2) Anterior cruciate ligament tear with Concomitant posterior cruciate ligament, collateral ligament injuries requiring surgery
- 3) Patients with Anterior Cruciate (ACL) Ligament avulsion injury.
- 4) Anterior cruciate ligament tear associated with the bony injury around the knee.
- 5) Patients undergoing revision anterior cruciate ligament reconstruction
- 6) Patients not willing for surgery

RESULTS:

In our study we took 40 cases of ACL tear fulfilling inclusion and exclusion criteria. Patient selection was randomised, patients were operated by using hamstring autograft and the other by using peroneus longus autograft. Patients were in the age group of 18 to 60 years. The PLT/HT ratio is 25PL and 15H with Sex ratio 31M/9F.

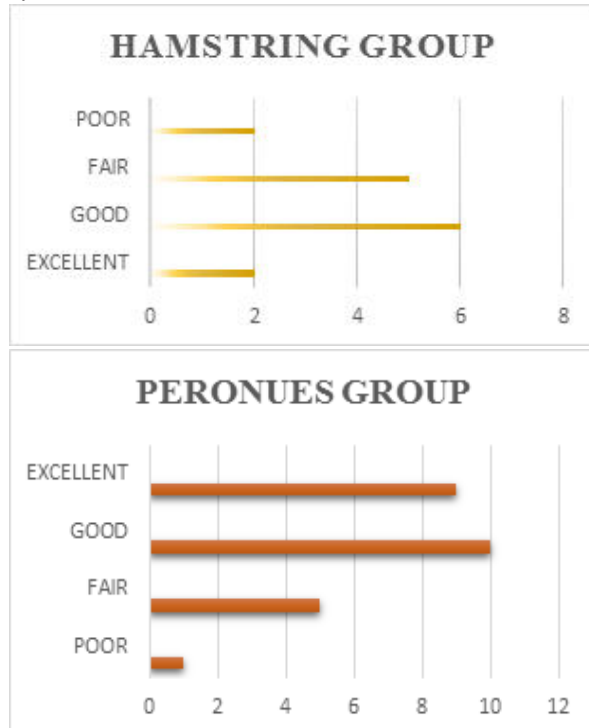


Total patients operated 40 .out of them 25 people operated with peroneus longus tendon,15 operated with Hamstrings(Semi tendinosus+Gracilis)tendon



31Male patients & 9 Female patients.

Lysholm score



Hamstrings group(15):

<65 poor ---2
65-83 Fair---5
84-90 Good---6
>90 Excellent-- 2

Peroneus Longus group(25):

<65 poor ---1

65-83 Fair---5
84-90 Good---10
>90 Excellent-- 9

In our study by using Lysholm knee scoring :

Hamstring group -- we achieved 2 excellent functional outcome,6 good and 5 fair response.2 patients were showing poor outcomes.

Peroneus group-- we achieved 9 excellent functional outcome,10 good and 5 fair response,1 patients were showing poor outcomes.

COMPLICATIONS:

Hamstrings group:

5 patients showing complications like Sensory disturbance, Thigh pain and weakness, Anterior kneeling pain, Knee stiffness.

Peroneus Longus group:

3 patients showing complications like Wound dehiscence, difficulty in ankle movements,wound swelling.

INTRA OPERATIVE:

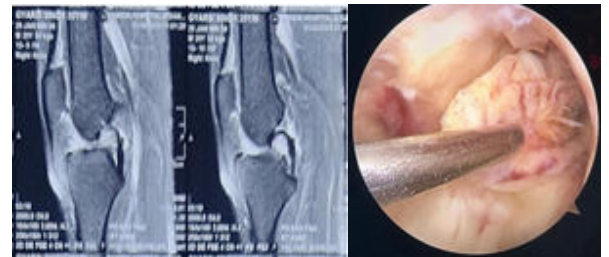
Surgical Procedure

Patients were positioned supine under regional anaesthesia. A tourniquet was applied to the thigh and inflated after exsanguination. Standard anterolateral and anteromedial portals were created. Diagnostic arthroscopy was conducted to confirm the ACL rupture, followed by harvesting of either the peroneus longus or hamstring tendon.



Position

Anterior drawer test



Pre op MRI

Arthroscopic ACL tear

Peroneus Longus Tendon Harvesting

The procedure of extracting the peroneus tendon was performed on the ipsilateral side leg. Incision at a distance of 2-3 cm above and 1 cm posterior to the lateral malleolus. The incision was made through the skin, subcutaneous tissue, and superficial fascia. The tendons of peroneus brevis and peroneus longus were recognized. The peroneus longus tendon's distal segment was sutured using an end-to-side technique to Peroneus brevis. To protect the peroneal nerve, the tendon of the peroneus longus was stripped proximally with a tendon stripper to approximately 4-5 cm below the fibular head. To create a 2-strand autograft, the tendon was folded over longitudinally through the middle, and its ends were stitched using Ethibond 5-0 suture.



Peroneus longus tendon harvesting



Peroneus.Longus Tendon + Endobutton

Hamstring Tendon Harvesting

A 3-cm oblique skin incision was performed over the pes anserinus and anteromedial side of the proximal tibia in the hamstring group. An closed tendon stripper was used to remove the gracilis and semitendinosus tendons. After that, the tendons were folded into a 4-strand hamstring graft, and Ethibond 5-0 suture was used to secure both ends.

To prevent graft loosening in the future, a graft tendon was implanted and tensioned by hand. The process of graft tendon fixation involves the use of bioabsorbable screws for graft fixation on the tibial side and endo button with loop (adjustable or fixed) for graft fixation on the femoral side.



Hamstring (ST+G) graft with endobutton

Femoral tunnel preparation

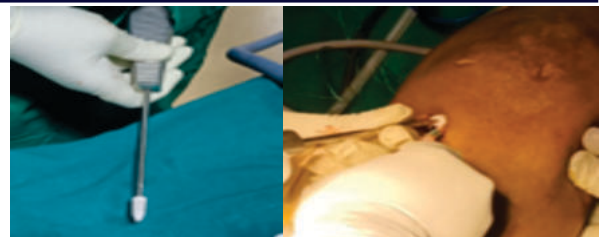
The medial side of the lateral femoral condyle was also cleared, and the posteromedial edge of the lateral condyle was identified (Residents ridge).Femoral footprint was identified, and midpoint of the footprint was marked, and the guide wire was passed with knee in maximum flexion and at 10,2 O' clock position for right and left knees respectively.



Endo button with graft passing through femoral tunnel

Tibial Tunnel Preparation

After visualizing the stump at the tibial ACL footprint, with the knee flexed at 90°, tibial tunnel drill guide/zig was placed at an angle of 55° in the sagittal plane and 20° in the frontal plane to allow the guide pin to enter intra-articularly in the center of the tibial ACL stump. The tibial tunnel was drilled over the guide wire with the appropriate size reamer as per the graft size. The graft was transfixed, while maintaining appropriate tension, in the femoral and tibial tunnel using endo button with loop and bioabsorbable screw.



Bio absorbable interference Screw insertion

Autograft Fixation

The primary aim of graft fixation is to provide stability of the graft within the bone tunnel until graft-to-bone incorporation is accomplished. Optimal graft fixation minimizes graft elongation, longitudinal ("bungee effect"), and transverse ("windshield wiper") graft movement, as well as influx of synovial fluid into the bone tunnel by maximizing strength, stiffness, stability, and durability.

Several direct and indirect methods of graft fixation have been described. Direct methods include absorbable and non-absorbable interference screws, cross pins, staples, washers, or hardware-free press-fit fixation, whereas indirect devices include fixed or adjustable suspensory cortical button fixation. At this point, there is no clear consensus regarding the "best" graft fixation method, as each option has advantages and disadvantages. Several recent meta-analyses and network meta-analyses have demonstrated no superiority in clinical or patient-reported outcomes of any particular fixation method.

Advantages of suspensory fixation include the ease and simplicity of technique, the possibility of a thicker graft with higher graft-to-bone contact area resulting in superior graft incorporation, as well as excellent fixation strength and stiffness. When comparing fixed loop-to adjustable loop suspension, superior biomechanical results have been observed for fixed-loop devices. Compared to interference screws, less tunnel widening is seen when using suspensory fixation or cross pins, which becomes relevant in revision cases. Graft elongation as well as longitudinal and transverse movements appears to be lower using interference screws, especially when screws are placed close to the joint surface. Hardware-free press-fit techniques have been reported, showing promising outcomes comparable to traditional techniques with low rates of tunnel enlargement.



Reconstructed ACL

Post op x ray

Post.op Rehabilitation:

Both groups were treated with the standard post-operative protocol for ACL-R. Full weight-bearing walking with brace and walker, static quadriceps, and ankle pump exercises began immediately after surgery. The first 2 weeks allowed a ROM 0–60°. Full flexion was obtained after >3 weeks after the surgery. Running was permitted after 3–4 months, and returning to sports activity was recommended after completing functional outcome tests 6–9 months after the operation.



Dressing pics of Hamstrings graft patient



Dressing pics of Peroneus longus graft patient

At 6 months follow up :
Hamstrings group pt



Peroneus longus group pt :



DISCUSSION:

Arthroscopic reconstruction of the injured ACL has become the gold standard and is one of the most common procedures done in orthopedics and thus it has been extensively studied and outcomes of ACL reconstruction have gained considerable attention.

The various graft options include bone patellar tendon bone graft, hamstrings auto graft, peroneus longus tendon graft, quadriceps tendon, various synthetic grafts and allograft. The BPTB graft was considered as a gold standard for ACL reconstruction because of its strength, consistency of the size of the graft; ease of harvesting and most importantly because of bone to bone healing within the tibial and femoral tunnel⁷.

Complications of bone patella tendon bone graft include patellar tendon rupture, patella/tibia fracture, quadriceps weakness, loss of full extension, anterior knee pain, difficulty in kneeling. Hence it is to be avoided in patients whose occupation or lifestyle requires frequent kneeling⁸.

The hamstring tendon grafts have greater mechanical strength than a bone-patellar tendon-bone graft⁹. Patients treated with hamstring tendon grafts are less likely to suffer patella femoral pain and extension loss. Using the hamstring tendon can cause a significant hamstring muscle weakness and medial instability of the knee joint. Hamstring function is very important after ACL reconstruction in order to protect the reconstructed ACL from anterior drawer force, which is exerted by quadriceps contraction¹⁰.

In our study we observed the best outcomes with peroneus grafts. Li et al concluded that ACL reconstruction with PT or Hamstring auto grafts achieved similar postoperative effects in terms of restoring knee joint function, graft failure and incidence of re-operations related to the meniscus. HS auto grafts were inferior to PT grafts for restoring knee stability, but were associated with fewer postoperative complications¹¹.

The choice of graft is the most crucial operative plan consideration. In our study, we used peroneus longus tendon graft to replace the injured ACL to evaluate it as an alternative to hamstring autograft and compared the two graft options in terms of functional outcome.

There were 15 patients in Group HT (Hamstring tendon graft) and 25 patients in Group PLT (Peroneus Longus tendon graft). Both the groups were comparable in terms of age, sex and side involved.

In both groups, the mean Lysholm score showed an improvement over the period of follow-ups, from preoperative to 6 months. Comparative functional outcome analysis on the use of hamstring tendon and peroneus longus tendon grafts showed no significant differences between the pre- and 6-month post-surgery, based on the Lysholm Knee Scoring Scale. Many studies have reported good results after ACL reconstruction with the peroneus longus tendon, in terms of both functional outcome and knee stability.

Some studies found that peroneus longus tendon graft was more superior because it provides larger graft diameter and less thigh hypotrophy with excellent ankle function. Trung et al¹² reported that ACLR using anterior half peroneus longus tendon graft showed no complications in ankle and foot post-surgery. Another study revealed enhancement on knee functionality based on the Lysholm, leaving no ankle functionality differences.

He et al¹³ concluded that the peroneus longus tendon graft is suitable as an autograft harvested outside the knee to avoid the complication of quadriceps-hamstring imbalance that may occur after harvesting the graft from the knee.

Some Surgeons have worries that if a PT graft is taken, it will reduce the strength of plantar flexion eversion and, which may cause ankle instability. However, Kerimoglu et al. found that taking a graft from the peroneus longus tendon had minimal or no effect on the foot and ankle function¹⁴. Shi et al. in their study found that the ankle function before and after PT graft had no significant difference in both strength and range of motion of the ankle joint¹⁵.

The graft harvesting time was significantly shorter in the peroneus longus tendon group. Additionally, we believe that the graft harvesting method was easier¹⁶. In the hamstring group, complications such as pain and paraesthesia at the graft site were significantly more common compared to patients who underwent peroneus longus harvesting. The incisions made to harvest the graft appeared more cosmetically pleasing in the peroneus longus group.

The surgeon's preferences frequently determine the kind of harvested graft used. Preoperative autograft selection should take into account factors such as autograft size, strength, morbidity at the donor-site, availability, activity level of the patient, and lifestyle¹⁷.

Patients who underwent ACL reconstruction with the peroneus longus tendon returned to sports earlier than those who underwent reconstruction with the hamstring tendon¹⁸.

The literature indicates that the autograft diameter is a critical factor influencing the rate of revision and re-rupture¹⁹. According to recent research, graft diameters smaller than 8 mm are unacceptable²⁰.

The aforementioned outcome demonstrates that once the peroneus longus tendon was harvested, the donor's ankle functioned flawlessly. This is most likely due to the donor ankle's peroneus brevis still being present. According to earlier research, the peroneus brevis is a more capable ankle evorter that will keep the ankle's eversion function intact once the peroneus longus tendon has been harvested²¹.

Due to the short follow-up period, we were unable to assess clinical efficacy or consequences in a long term. The limited sample size might make the outcomes not applicable to a wider population. The current study concluded that the peroneus longus tendon can be an alternate graft in ACL reconstruction as it performs better functionally than the hamstring tendons especially in post-operative rehabilitation and has a very little ankle morbidity. Our recent study showed that PL tendon might be considered a safe, effective and a technically easy graft option for ACLR due to its larger diameter, strength, and no donor site morbidity.

CONCLUSION:

Graft choice has a considerable influence on post-operative outcomes and remains an easily adjustable surgical factor affecting graft rupture and reoperation rates. When comparing anatomical, histological, and morphological features of commonly used grafts to the native ACL,

none can perfectly replicate the complex characteristics of the native ACL. Results achieved with hamstrings as well as peroneus longus graft are excellent.

Peroneus longus graft harvesting technique is relatively simple and less time-consuming and has advantage of producing a larger graft diameter. The most crucial finding of this study was that the peroneus longus tendon seemed to be an appropriate autograft option for ACL-R, provided good functional results, prevented potential complications of the autograft harvested from the knee region, and did not significantly affect the ankle joint.

The clinical relevance of the current study is that the peroneus longus as an alternative graft in ACL-R can be recommended because it shows good functional results with respect to its strength, larger graft diameter, satisfactory ankle function, compared to the hamstring tendon with less donor site morbidity.

Conflict Of Interest:

There are no Conflict of Interest.

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