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Functional Outcome of Arthroscopic Reconstruction of ACL Tear Using Peroneus Longus Tendon Autograft Vs Hamstring Tendon Autograft: A Randomised Control Study

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Abstract
BACKGROUND: *Anterior cruciate ligament reconstruction is one of the most common arthroscopic surgery. It is performed using different grafts, the most common being the Hamstring tendon (HT) and the Bone patella bone tendon(BPBT) grafts. The choice of autograft that can be chosen as a new alternative is the Peroneus Longus Tendon(PLT).The advantages of this graft are its strength and mean thickness, which is nearly same as that of the native ACL.The study was mainly to determine the tensile strength of the PLT and to assess donor ankle morbidity and compare it with HT.*
MATERIALS AND METHODS: *The study included 40 patients, 20 each in Hamstring group and Bone Patella Bone group. Patients of age 15-50 years with ACL injury were chosen for the study. Patients were then subjected to MRI to confirm the diagnosis. Reconstruction was done arthroscopically followed by similar physiotherapy protocol for both the groups. The result of the study was assessed at 3,6 and 12 months using Lysholm & Gillquist score and ankle stability was assessed by FADI (Foot and ankle disability index) score with the normal side as control.*
RESULTS: *Cases were followed up for 6 months to 12 months. Results of our study showed that both PLT and HT graft could effectively improve knee stability and functions. At follow up evaluation, both groups had similar subjective outcomes.*
CONCLUSION: *PLT graft is similar to the native ACL both in terms of thickness and strength. It can be an appropriate autograft option for ACL reconstruction without compromising ankle function and avoiding potential complications of hamstring and BPTB autograft obtained from the knee region. Our study shows that there is no difference in functional outcome whether peroneus longus tendon graft or hamstring autograft was used.*

Keywords: *ACL, PLT, HT, Arthroscopy, Autograft*

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I. Introduction

Soft tissue injuries, basically ligaments and tendons, are the very common injuries in sports, accounting for more than 50% of all injuries and often require orthopedic intervention.[1] The treatment option of ACL injury cases include physiotherapy exercise and reconstruction surgery. Anterior cruciate ligament (ACL) reconstruction is performed using different types of grafts. Allografts, autografts and synthetic grafts have been used with variable rates of success.[2] The autografts have been tested in due course of time and are consistently associated with good clinical results. The hamstring and the bone patella bone tendon grafts are the harbingers among the autografts with huge acceptability. The other autografts being quadriceps, patellar tendon, fascia lata etc. [5] The choice of autograft that can be chosen as a new alternative is the peroneus longus tendon. Currently, there are very few biomechanical studies on peroneus longus graft and its strength as an alternative option of autograft in ACL reconstruction. The study to determine the tensile strength and graft site morbidity of the peroneus longus tendon was conducted in the Department of Orthopaedics,Gauhati Medical College and Hospital that could bring new perspective for future studies**.** Use of peroneus longus tendon (PLT) autograft as an alternative to the prevailing autograft is a recent development in the field of ACL reconstruction. The main advantages are that its mean thickness and strength is nearly same as that of the native ACL.[3,4] The aim of our study is to assess the functional outcome of arthroscopically reconstructed ACL with Peroneus Longus Tendon autograft and to study its effect on ankle stability.

II. Materials And Methods

The study will be conducted in Department of Orthopaedics, Gauhati Medical College & Hospital, Guwahati, on in-patient basis and the sample size was 40. The patients were divided into two groups, Hamstring group and Paroneus group, each group consisting of 20 patients.

All patients with symptoms of knee instability attending Orthopaedics OPD were examined and patients with clinical diagnosis of ACL tear were enrolled in this study in inpatient basis after taking an informed consent. Routine blood investigations, X-ray knee and MRI of affected knee is done. A detailed physical examination specifically for ACL tear is done generally under anesthesia like Lachman test, anterior drawer test, classic pivot shift test. All the above data are documented in the study proforma.

All the evaluated patients are subjected for post-operative anteroposterior and lateral radiographs to determine the position of endobutton in femur and interference screw/BIOSCREW in the tibia and the tunnel placement. Patients are followed up at 2 weeks, 6 weeks, 3 months, 6 months and once in 6 months thereafter. All patients are then evaluated with ***Lysholm & Gillquist scoring.***

Donor site morbidities were assessed with thigh circumference measurements and ankle scoring with the FADI(Foot and ankle disability index).

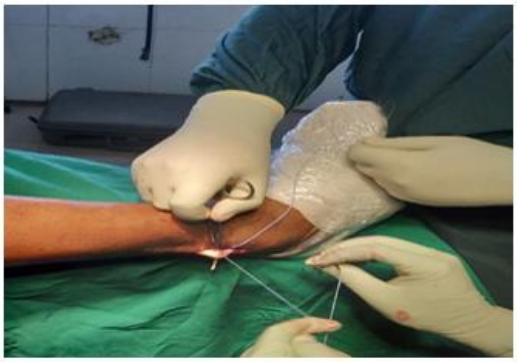

Fig1 : Identification of Peroneus longus tendon

Fig 2: Marking on PLT graft

III. Results And Observations

It has been found in our study that the most common age group for ACL tear was between 25 to 35 years and there was a male preponderance constituting about ninety percent cases. It has been found that the left knee was more commonly involved than the right. Road traffic accident was the most common cause accounting for ACL injury. RTA is the most common mode of injury in males and sports being most common cause of injury in females.

The 40 Cases of arthroscopic assisted Anterior cruciate ligament reconstruction using peroneus longus tendon graft vs hamstring autograft was followed up for 6 months to 12 months. The mean duration of follow up was 8.75 months. It has been found that most of the patients returned to their pre-functional level at 5-6 months.

SCORING ANALYSIS

40 patients of arthroscopic ACL reconstruction using peroneus longus tendon graft group VS hamstring autograft was followed for a minimum period of 6 months and maximum period of 1.5 years. All patients are evaluated with Lysholm and Gillquist scoring at the end of 6 months. The maximum score achieved was 100 and minimum score was 65.

Outcome	**Peroneus longus tendon graft gp.no of patients(20))**	**Percentage**	**Hamstring autograft gp. No of patients(20)**	**Percentage**
Excellent	8	40	6	30
Good	9	45	8	40
Fair	3	15	6	30
Poor	0	0	0	0

By Mann-Whitney U-test, $U^{stat}= 7$, $U^{critical}= 0$

So, $U^{critical} < U^{stat}$ at $\alpha = 0.05$; we accept the null hypothesis i.e performance of newer method(Peroneus longus tendon autograft) is equivalent to previous method(hamstring tendon autograft).The clinical outcome was nearly equal in both the groups.

ANKLE MORBIDITY ASSESSMENT

The donor site morbidities in the Paroneus Longus group were assessed with FADI(Foot and ankle disability index) score.It has been found that there was no flexion or extension loss at the end of 6-9 months of follow up. In our study we found that the ankle functions were grossly preserved in almost all the patients. However, on clinical evaluation ankle eversion function was found to be moderately compromised(rest within normal limit) at 4 weeks in 4 patients and mild discomfort in 4 patients on range of motion. But following physiotherapy it has considerably improved at 8 weeks.(FADI Score increased from 78%,82% and 79% to 90%,101% and 96% respectively.)

FADI Score	**Postperative at 2 weeks**	**Postoperative at 8 wks (following physiotherapy)**
>90%	12	19
<90%	08	01

IV. Discussion

ACL has been realized to have an important role in maintaining the stability of the knee along with the other ligaments. Its rupture most commonly occurs during sports injuries or during road traffic accidents.[6] Forceful valgus-external rotation is the most common mechanism of injury.[7] ACL reconstruction is a commonly performed procedure. However, bone-patellar tendon-bone complex(BPTB), hamstring tendon autografts, and allografts are commonly used as the graft sources, but which graft is the most suitable has still been controversial.

In our study it has been found that there was no extension or flexion loss of the knee joint. Furthermore, no patella-femoral pain was reported by our patients. The results of our study was encouraging as it provided with some excellent Lysholm and Gillquist scoring. There was no ankle dysfunction related to graft harvest, pressure pain could be elicited in only 2 patients. Cao HB et al also found the peroneus longus a good substitute of anterior cruciate ligament reconstruction and its resection has no major influence for ankle joint.[8] The function of the donor ankle was excellent after harvesting the peroneus longus tendon. This is probably because the peroneus brevis is still intact in the donor ankle. Previous studies have mentioned that the peroneus brevis is a more effective evertor of the ankle, which will maintain the eversion function of the ankle after harvesting the peroneus longus tendon. Even though previous studies, like that by Angthong and Chernchujit, have mentioned a reduction in ankle peak torque eversion and inversion, we found that the functional outcome was still excellent.[9]

In our study 42.5% of patients had meniscal injury at presentation and medial meniscus injury predominated lateral meniscus injury like other studies. None of our patients had significant chondral damage at diagnostic arthroscopy. D W Lewis reported 58% meniscal injury associated ACL tear at presentation.[10] Medial meniscus was involved more than the lateral meniscus in his study and he also proposed meniscal repair or resection did not alter the outcome and chondral lesions are a better predictor of functional outcome. Stephen Lyman reported more than 50% meniscal procedures with ACL reconstructions in 2009.

We found that there was a significant difference in graft diameter between the hamstring and peroneus longus tendons, with a mean difference of 0.6 mm in favour of the peroneus graft. Previous studies have concluded that a graft diameter of 8.5mm had a 1.7% revision rate. Furthermore, the risk of a patient needing a revision ACL reconstruction was 0.82 times lower with every 0.5 mm increase in graft diameter between graft thicknesses of 7 mm and 9 mm. The effect of the autograft diameter on the re-rupture and revision rate of the reconstructed ACL of the knee has been studied extensively. Some authors have shown that a reduction in autograft (hamstring) diameter is related to a higher revision rate, especially in younger patients.[11]

In our study there was no pull outs or graft fixation site failures and endobutton was able to withstand the post-operative rehabilitation. Though there are concerns about the bungee effect of the graft while using endobutton causing movement of graft in the tunnel, tunnel widening and interference to graft incorporation. But a recent study had reported tunnel widening was more with interference screw than the endobutton and attributed tunnel widening to biological factors rather than mechanical factors of the fixation device.[12] Young Ho oh showed that a hybrid fixation with a endobutton and a bio screw in femoral tunnel provided adequate stability and stiffness. Andreas Weiler published his results of bioabsorbable round contoured screw to be better than the regular titanium interference screws.[13]

As overall conclusion several factors influence the functional outcome in arthroscopic ACL reconstruction. Factors like graft choice, graft fixation, tunnel placement and graft tensioning play a vital role in altering the final outcomes.

With the result of this study, the use of the peroneus longus as the graft of choice in single-bundle ACL reconstruction can be encouraged in clinical practice, because it shows comparable functional scores compared with the hamstring tendon with less donor site morbidity, especially in groups of patients who frequently kneel in their daily activities, as they do in our country and it can be a good alternative in multi-ligament injury of knee.

The limitation of our study was that our aim was time bound, the patients were followed up for a minimum of 6 months and maximum of 1 year. Therefore, the long-term effects of this intervention remain unknown in our study. Single bundle reconstruction was done but now the focus is shifting towards anatomical double bundle reconstruction which is thought to be more physiologic and stable. Objective measurements of ankle evertor strength could also be used to evaluate donor site morbidity after peroneus longus harvesting and its relationship with the functional ankle score could be evaluated. Although the results are very encouraging, a longer follow up are required to further establish these observation and results conclusively

V. Conclusion

The results of our study were comparable with already published reports of comparative study done using Peroneus longus tendon graft vs hamstring graft. Our study shows that there is no difference in functional outcome whether peroneus longus tendon graft or hamstring autograft was used. The success of ACL reconstruction depends on the correct technique used for the surgery, precise placement of graft and rehabilitation methods.

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