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Comparing Functional Outcome of Arthroscopic ACL Reconstruction Using Autologous Hamstring Vs. Peroneus Longus Graft

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Abstract
Introduction: *Anterior Cruciate Ligament (ACL) injury is the most common ligamentous injury around the knee and has been studied extensively all over the world in the past 20yrs.The Anterior Cruciate Ligament is the weaker of the two cruciate ligaments and therefore may be it tears easier than the Posterior Cruciate Ligament.Anterior knee instability associated with rupture of the ACL is a disabling clinical problem. In this study we used different graft options for reconstruction of ACL tear using Hamstringand Peroneus longus graft and their functional outcome was compared.*
Material & Methods*: In this Prospective Study total 40 patients with ACL tear were included. 20 patients underwent Arthroscopic reconstruction using Hamstring graft while in other 20 patient'speroneus longus graft was used. All operated patients tookLysholm knee scoring questionnaire and were reviewed with pre and post op Clinical examination at 6 weeks, 3 months, 6 months and 1 year for assessment.*
Results: *At the end of 1 year post op by clinical examination &Lysholm knee scoring,30% patient achieved excellent Result (14% Hamstring & 16% peroneus graft group) after ACL Reconstruction while 20% showed Fair outcome (10% each). Outcome was good (40%) in 18% of hamstring graft patients & 22% patients who received Peroneus Graft. Total 10% patients also reported poor Outcome.*
Conclusion: *We found that all two methods had shown equal potential in present study keeping in mind proper patient selection and an immense role of the physiotherapy.*
Keywords: *Arthroscopy, ACL, HS,Hamstring, Peroneus, PT,*

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I. 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.[1]An intact ACL prevents the posterior translation of femur on tibia as well as helps in managing valgus and rotational forces on knee joint.[2] Anterior knee instability associated with rupture of the ACL is a disabling clinical problem. The ACL has a poor capacity for intrinsic repair. 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. Ideally, a graft used for surgical ACL reconstruction should be one that, as far as possible, recreates the anatomical and biomechanical properties of the native ligament, that guarantees safe fixation, and that provides rapid biological integration, reducing recovery time and donor site morbidity[3]. Various studies have shown good outcomes after an ACL reconstruction using auto grafts and allografts as well [4].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 [5]. 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.

II. Material and Methods:

The study was conducted in the department of Orthopedics Gandhi Medical College Bhopal after ethical clearance. Patient coming with complaint of knee pain and swelling after injury were thoroughly examined and informed written consent to participate in study was taken. Patients were subjected to X-ray, MRI and routine investigations. On viewing, the X-ray and MRI next modality was decided.

Inclusion criteria

1. All skeletally mature patients with anterior cruciate ligament tear confirmed by Lachman and Anterior Drawer test were included in the study, provided that they were permitted to undergo rehabilitation after Anterior Cruciate Ligament reconstruction involving full weight – bearing gait and unrestricted non-weight bearing range of motion.

Exclusion criteria

1. Patients with Anterior Cruciate (ACL) Ligament avulsion injury.
2. Anterior cruciate ligament tear with Concomitant posterior cruciate ligament, collateral ligament injuries requiring surgery or postero lateral corner injury.
3. Anterior cruciate ligament tear associated with the bony injury around the knee.
4. Patients undergoing revision anterior cruciate ligament reconstruction

At the follow up patientswere assessed radiologically and clinically for functional activity. Patients were evaluated using MRI during follow-up.The data analysis was performed using IBM SPSS ver. 20 software. Age and other quantitative data were expressed as mean and standard deviation whereas categorical data were expressed as numbers and percentages. Mean was compared using independent sample t test one way ANOVA. Categorical data was compared using the Chi-Square test. P-value of <0.05 was considered significant.

Pre-Op MRI

Figure 1

Exposure of hamstring tendon

Figure 2

Exposure of peroneus longus tendon

Figure 3

Graft Fixation

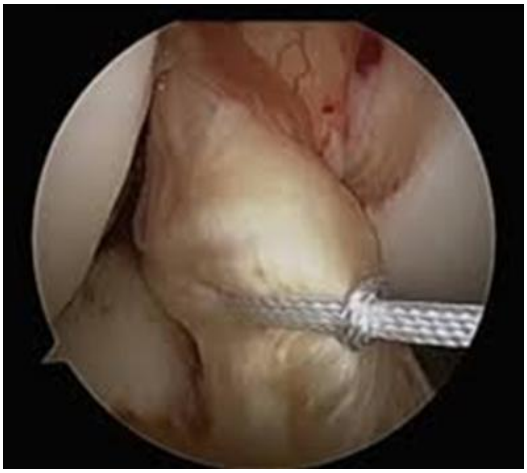

Figure 4

III. Results:

32 males and 6 females were included in the study. Most of the patients who came with complaints of knee pain have sustained injuriesduring sports activity (79.2%) followed by RTA (20.8%). After surgery result were compared with various parameters like comparing Anterior Drawer test, Lachman Test &Lysholm Scoring.

Table 1: Demographical Data

Age (Years)	Frequency	Percent
≤25	18	45
>25	22	55
Total	40	100.0

Table 2: Ant. Drawer test results with Graft Type

Anterior Drawer Test		Hamstring	Peroneus	Total	Percentage
Pre-op	Grade I	1	2	3	7.5
	Grade II	7	6	13	32.5
	Grade III	12	12	24	60
Post op	Grade 0	19	18	37	92.5
	Grade I	1	2	3	7.5

As shown in table 2 during pre op evaluation, total 3out of 40(7.5%) patients were found to have grade I tear on Anterior Drawer test. There were a total of 13 patients who were of grade II on ant drawer. Out of them, 7 patients received hamstring grafts while 6 received peroneus graft. 24 patients showed grade III on pre op evaluation. Out of them, 12 patients received hamstring grafts while 12 received peroneus graft. There were majority of the patients (92.5%) who turned out to be grade 0 after the operation.

Table 3:Lachmantest results with Graft Type

Lachmantest		Hamstring	Peroneus	Total	Percentage
Pre-op	Grade I	3	4	7	17.5
	Grade II	17	16	33	82.5
Post op	Grade0	18	17	35	87.5
	Grade I	2	3	5	12.5

As shown in table 3, during pre-operativeevaluation, total of 7 patients were found to have grade I tear in Lachman test Out of them 4 were operated with peroneus graft while 3recieved Hamstring Graft. Post operatively only 5 patients were having GradeILachman test. 33 Patients showed grade IILachman test Pre operatively. Out of these 17 received hamstring grafts, 16 received peroneus graft. During post-operative evaluation, majority of the patients (35) were observed to be at grade 0 on Lachmantest evaluation.

Table 4:Lysholm Score with graft types

Graft Type	Pre op		Post op		P value
	Mean	Std. Deviation	Mean	Std. Deviation	
Hamstring	38.80	8.929	84.30	8.111	<0.001
Peroneus	32.00	9.226	85.00	7.040	<0.001
P value	0.083		0.972		

As depicted in table 4, during pre op evaluation, the mean Lysholm score in patients who received Hamstring and peroneus grafts were 38.8 and 32 respectively. Whereas, after operation, the same scores for these grafts were 84.3 and 85 respectively. This difference in grafts was statistically significant.

Table 5:Mid-Thigh Girth difference with graft type

Mid Thigh Girth difference(cm)	Hamstring	Peroneus	Total
0.5	4	0	5
1	3	0	3
2	6	1	7
2.5	3	0	3
3	2	1	3
No difference	2	18	20

As shown in table 5, the mid-thigh girth difference of 0.5 cm was seen in the 4 patients who received hamstring graft. Three patients who received hamstring graft showed 1 cm of mid-thigh girth difference. 7 patients showed the difference of 2 cm. Out of these, 6 received hamstring grafts whereas one patient received peroneus graft. There were 3 patients who showed the mid-thigh girth difference of 2.5 cm. Two patients from hamstring and 1 from peroneus graft group showed mid-thigh girth difference of 3 cm. A total of 20 patients showed no mid-thigh girth difference. The observed difference was statistically significant with mid-thigh girth circumference difference more in hamstring grafts than in peroneus longus grafts.

Post-operative complications were seen in 30% patients as superficial infection (5%), knee stiffness (12%), post op knee pain (10%) & deep infection in 3% patients. Knee pain & stiffness was more common in hamstring group. Final outcome for ACL reconstruction was graded as Excellent, Fair, Good and poor. 30% patient achieved excellent Result (14% Hamstring & 16% peroneus graft group) after ACL Reconstruction while 20% showed Fair outcome (10% each). Outcome was good (40%) in 18% of hamstring graft patients & 22% patients who received Peroneus Graft. Total 10% patients also reported poor Outcome.

IV. 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 choice of graft is a topic of great debate in recent years.

The various options include bone patellar tendon bone graft, hamstring 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 tunnel [6]. 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 kneeling [7].The hamstring tendon grafts have greater mechanical strength than a bone-patellar tendon-bone graft [8]. Patients treated with hamstring tendon grafts are less likely to suffer patella-femoral pain and extension loss. Using the hamstring tendon can cause a significanthamstring 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 contraction [9].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 complications [10]. Romanini et al reviewed 30 studies and demonstrated that PT grafts appeared superior to HS grafts in terms of stability, return to pre-injury level activity and flexion strength. HS autograft was associated with less anterior knee pain and less risk of extension loss compared with PT autograft [11]. Xie et al showed that PT autograft might be superior in resuming rotation stability of the knee joint and allow patients to return to higher levels of activity in comparison to HS autograft after ACL reconstruction [12]. 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 function [13]. 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 joint [14]. In our study we found that there is no major significant difference in the tensile strength of PT graft over HS tendon graft. Similar results were found in the study conducted by Phatama et al. [15]while Rhatomy S et al.found greater tensile strength in PT graft [16]. He et al. concluded that the PLT 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 [17].

V. **Occlusion:**

Peroneus longus tendon (PT) can be preferred for ACL reconstruction. It can be considered as the first choice graft in ACL reconstruction as it demonstrated the absence of significant post-operative morbidity at donor site and it showed similar biomechanical and tensile strength to other grafts. Regardless of all the advantages of PT grafts in ACL reconstruction, the graft preference must be decided based on various clinical considerations by the surgeons. In achieving an excellent result, the consideration of the appropriate graft usage depends on many factors, including the associated meniscal and ligament lesions, high or low demand patient's activities, medical condition or comorbidities, pre-surgical status, patient decision, and the post-operative rehabilitation protocol. Further studies comparing the grafts in future clinical settings is still needed to gain an optimal function and stability of the knee joint after ACL reconstruction.

References:

[1]. Paschos NK, Howell SM. Anterior cruciate ligament reconstruction: principles of treatment. *EFORT Open Rev*. 2016;1(11):398–408. doi:10.1302/2058-5241.1.160032.

[2]. Mader K, Pennig D, Dargel J, Gotter M, Koebke J, Schmidt-Wiethoff R. Biomechanics of the anterior cruciate ligament and implications for surgical reconstruction. *Strateg Trauma Limb Reconstr*. 2007;2:1–12. doi:10.1007/s11751-007-0016-6.

[3]. Cerulli G, Placella G, Sebastiani E, Tei MM, Speziali A, Manfreda F. ACL Reconstruction: Choosing the Graft. Joints. 2013;1(1):18-24. Published 2013 Jun 12.

[4]. Acaulay AA, Perfetti DC, Levine WN. Anterior Cruciate Ligament Graft Choices. *Sports Health*. 2012;4(1):63–8.doi:10.1177/1941738111409890

[5]. F. Anterior Cruciate Ligament Reconstruction with Hamstring Tendons Has no Deleterious Effect onHip Extension Strength. *Arch Bone Jt Surg*. 2019;7(3):278–83.

[6]. Hospodar SJ, Miller MD: Controversies in ACL reconstruction: bone patellar tendon-bone anterior cruciate ligament reconstruction remains gold standard. Sports Med Arthrosc. 2009;17(4):242-6.

[7]. Poehling-Monaghan KL, Salem H, Ross KE, Secrist E, Ciccotti MC, et al. Long-Term Outcomes in Anterior Cruciate Ligament Reconstruction: A Systematic Review of Patellar Tendon Versus Hamstring Autografts. Orthop J Sports Med. 2017;5(6):2325967117709735.

[8]. Chee MY, Chen Y, Pearce CJ, Murphy DP, Krishna L, Hui JH, et al. Outcome of Patellar Tendon Versus 4-Strand Hamstring Tendon Autografts for Anterior Cruciate Ligament Reconstruction: A Systematic Review and Meta-analysis of Prospective Randomized Trials. Arthroscopy. 2017;33(2):450- 63

[9]. Kartus J, Movin T, Karlsson J. Donor-site morbidity and anterior knee problems after anterior cruciate ligament reconstruction using autografts. Arthroscopy. 2001;17:971-80.

[10]. Li S, Chen Y, Lin Z , et al. A systematic review of randomized controlled clinical trials comparing hamstring autografts versus bone-patellar tendon-bone autografts for the reconstruction of the anterior cruciate ligament. Arch Orthop Trauma Surg 2012;132:1287–97.doi:10.1007/s00402-012-1532-5
[11]. Romanini E, D'Angelo F, De Masi S et al. Graft selection in arthroscopic anterior cruciate ligament reconstruction. J OrthopTraumatol 2010;11:211–9.doi:10.1007/s10195-010-0124-9
[12]. Xie X, Liu X, Chen Z , et al. A meta-analysis of bone–patellar tendon–bone autograft versus four-strand hamstring tendon autograft for anterior cruciate ligament reconstruction. Knee 2015;22:100–10
[13]. Kerimoglu S, Aynaci O, Saracoglu M, Aydin H, Turhan AU. [Anterior cruciate ligament reconstruction with the peroneus longus tendon]. *ActaOrthopTraumatolTurc*. 2008;**42**(1):38–43. Turkish. doi: 10.3944/aott.2008.038. [PubMed: 18354276].
[14]. Shi FD, Hess DE, Zuo JZ, Liu SJ, Wang XC, Zhang Y, et al. Peroneus Longus Tendon Autograft is a Safe and Effective Alternative for Anterior Cruciate Ligament Reconstruction. *J Knee Surg*. 2019;**32**(8):804–11. doi: 10.1055/s-0038-1669951. [PubMed: 30206913].
[15]. Phatama KY, Hidayat M, Mustamsir E, Pradana AS, Dhananjaya B, Muhammad SI. Tensile strength comparison between hamstring tendon, patellar tendon, quadriceps tendon and peroneus longus tendon: A cadaver research. *J ArthroscJt Surg*. 2019;**6**(2):114–6. doi: 10.1016/j.jajs.2019.02.003.
[16]. Rhatomy S, Chaniago H, Rasyid FA, Phatama KY. Comparing the Stiffness of Peroneus Longus Tendon Versus Hamstrings in Anterior Cruciate Ligament Reconstruction: A Biomechanical Study. Asian Journal of Sports Medicine. 2021 Dec 31
[17]. J. He, Q. Tang, S. Ernst, M.A. Linde, P. Smolinski, S. Wu, F. Fu, Peroneus longus tendon autograft has functional outcomes comparable to hamstring tendon autograft for anterior cruciate ligament reconstruction: a systematic review and meta-analysis, Knee Surg. Sports Traumatol. Arthrosc. (2020) 1–11.

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