

FUNCTIONAL OUTCOME OF KNEE JOINT AFTER ARTHROSCOPIC ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

SHAHZAD GULZAR¹, SYED BAQIR JAFREE², MUHAMMAD ABDUL HANAN³, TAHIR MAHOOD⁴, MUHAMMAD SIDDIQUE HAMID⁵, MUBASHIR FARHAN⁶, MUHAMMED ZAFAR IQBAL SHAHID⁷.

¹Postgraduate Resident of Orthopedic, Jinnah Hospital Lahore, ²Assistant Professor of Orthopedics, Allama Iqbal Medical College Lahore ³Associate Professor of Orthopedics, Khawaja Muhammad Safdar Medical College Sialkot, ⁴Assistant Professor of Orthopedics, Postgraduate Medical Institute/ Ameer-ud-Din Medical College/ Lahore General Hospital, Lahore, ⁵Senior Registrar of Orthopedics, Jinnah Hospital Lahore, ⁶Senior Registrar of Orthopedics, Lahore General Hospital, Lahore, ⁷Professor of Orthopedics, Allama Iqbal Medical College Lahore

ABSTRACT

Background: Anterior cruciate ligament (ACL) is a common ligamentous injury of knee joint. Graft selection for ACL is a controversial subject. Despite of clinical outcomes with Patellar tendon bone graft (PTB), donor site morbidity and patellar fractures are of great concern with this technique. Peroneus Longus tendon is an alternative technique with promising results. It has greater tensile strength as compared to Patellar tendon (PTB) and quadriceps tendon graft and has a potential with minimal or no donor site morbidity.

Methods: This prospective observational study was carried out at Department of Orthopedic Surgery Jinnah Hospital, Lahore from Aug 2024 to Dec 2025. A total number of 24 patients with age between 20-60 years having isolated ACL tear were enrolled in the study after clinical and MRI evaluation. All patients underwent ACL reconstruction with double bundle Peroneus Longus tendon graft. We assessed the knee function preoperatively & postoperatively with Tegner-Lysholm and International Knee Documentation Committee (IKDC Score) score. Similarly, ankle joint functional status was assessed with American Orthopedic Foot and Ankle society score (AOFAS) and foot and ankle disability index (FADI) Score preoperatively and postoperatively after 03 months, 06 months and at the end of final follow up of one year after the surgery.

Results: There was a significant difference between preoperative and post-operative IKDC and Tegner-Lysholm score after ACL reconstruction with Peroneus Longus tendon graft. There was also no donor site morbidity and AOFAS Score and FADI Score were almost equal at the ankle joint preoperatively and postoperatively.

Conclusion: Peroneus Longus tendon is most advantageous for ACL reconstruction in terms of graft harvesting technique, large graft diameter, adequate graft length and lower rate of complication at the donor site. Moreover, ankle function is not deteriorated if proper graft harvesting technique is used. It has a greater tensile strength with minimal or no donor site morbidity.

Key words: Anterior Cruciate ligament, Peroneus Longus tendon graft, Knee Arthroscopy

How to cite this article: Gulzar S, Jafree SB, Hanan MA, Mahmood T, Hamid MS, Farhan M, Shahid MZI. Functional Outcome Of Knee Joint After Arthroscopic Anterior Cruciate Ligament Reconstruction. Pak postgrad med j 2026;37(3): 140-143

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/3.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Correspondence to: Muhammed Zafar Iqbal Shahid
Professor of Orthopedics, Allama Iqbal Medical College Lahore, Pakistan.

Email: dr.zafar2014@gmail.com

Received: May 07, 2026; Revised: Aug 12, 2026

Accepted: Sep 08, 2026

DOI: <https://doi.org/10.51642/ppmj.v37i03.899>

INTRODUCTION

Orthopedic conditions especially Anterior cruciate ligament (ACL) is the most common knee joint

ligamentous injury that can significantly impact on individual quality of life and physical functionality.¹ It is commonly seen in basketball, hand ball, football, Cricket and in soccer players.² However, the ACL rupture can also occur during work and road traffic accidents. Most commonly involved mechanism is sudden cutting maneuver during athletic activities after jumping and deceleration followed by cutting maneuver of ACL with valgus collapse of the Knee. This happens during terminal knee extension with valgus collapse and external rotation of knee joint. At the time of injury there is a sudden POP followed by swelling of Knee joint within an hour. ACL is essential to maintain the normal kinematics of the knee joint and is a primary restraint to

anterior translation of Tibia.³ It also stabilizes the knee in Valgus and varus secondarily in extension of the knee joint. Moreover, it limits the coupled internal rotation which can be examined by Pivot shift test and anterior drawer test with internal and external rotation of knee joint. The anteromedial portion is tight in flexion while posterolateral portion provides resistance during extension. Its spatial orientation is affected by its viscoelastic and tensile properties.⁴

Epidemiologically athletes whose knees have significant inter condylar notch stenosis and if the inter condylar notch width index was one standard deviation below the mean, they have more chances of ACL rupture. In addition to intrinsic factors joint laxity, limb alignment, hormonal influences, ligament size, the extrinsic factors like muscle strength, shoe surface interface, body movements and performance levels are also important factors for injury to ACL. An increase in anterior Tibial slope is another factor for ACL tear.

The exact incidence is unknown. In United States, it is 100,000-200,000 ACL ruptures per year. 50% of knee injuries are globally associated with ACL rupture, out of which 50% of ACL tears occur concurrently with meniscal rupture in acute presentation while 80% of meniscal rupture occur in chronic ACL deficient knee if left untreated. At the time of injury there is a sudden pop followed by swelling at the knee joint.⁵

ACL is an Intra capsular, extra synovial ligament being composed of multiple collagen fibers. It connects the femur with tibia by a fibro cartilaginous Bone –Tendon interface. It originates from the medial surface of lateral condyle of Femur in a semicircular or circular fashion and it is inserted on the inter condylar ridge on the Tibial Spine in an oval or Triangular fashion. Injuries to ACL are classified as Grade 1, 2 and 3 injuries while in adolescents there is avulsion of ACL from its Tibial attachment, resulting in instability of knee joint if not managed properly.⁶

If ACL injury is left untreated, it would end up on osteoarthritis of knee joint especially in the presence of multi ligamentous, articular cartilage and meniscus injuries. It is as high as 80% in different studies.⁷

A lot of treatment options are available to treat ACL tear varying from surgical to non- surgical management.⁸ Surgical treatment varies from ACL repair to reconstruction. When primary repair is done, it can either be performed with sutures and screw or with augmentation.⁹ Goals of surgical treatment is to obtain stability with minimal invasive techniques and to allow the patient to regain the preoperative level of physical activity.¹⁰

ACL reconstruction is an excellent and reliable surgical procedure used to reconstruct the torn ACL. It can be done with extra articular procedures using iliotibial band tenodesis but these are associated with high failure rate.¹¹ Intra-articular arthroscopic reconstruction has dramatically improved the results compared with open ACL reconstruction. Reconstruction is performed when inflammation of knee has resolved usually 03 weeks after the injury. Different graft options are available each having its own advantages and disadvantages. These are

Quadriceps, peroneus Longus, patellar tendon graft and Semitendinosus with Gracilis tendon grafts.¹²

Allografts are also options for low demand athletes. These are processed and sterilized.¹³ However, failure rate is high if allograft is used for ACL reconstruction.¹⁴ It can be used in multi ligamentous injuries and in patients with ACL revision surgery.¹⁵

METHODS

After permission from Institutional Review Board, a total number of 24 patients with ACL tear on MRI and clinical examination basis were included in the study. The sample size was selected on non-probability sampling technique. After written consent and fitness for surgery, each patient was given spinal anesthesia. All patients were examined for anterior draw test and Pivot shift test under anesthesia before taking the Peroneus Longus tendon graft.

After a longitudinal incision in the posterolateral aspect of distal Fibula was given, Peroneus Longus tenodesis was done with Peroneus Brevis Tendon. A whip stitch was applied to Peroneus Longus tendon and it was passed through the stripper. While pushing the stripper proximally, a gentle traction was maintained on the Peroneus Longus with whip stitch. It was continued till the tendon of peroneus Longus was freed and during this process, care was taken to avoid damage to superior peroneal retinaculum. Each graft was fixed with Endo button on the Femur side while it was fixed with bio absorbable screw on the Tibial side. After reconstruction, each patient was assessed immediately with anterior draw test. After surgery, Quadriceps and Knee range of motion exercises for knee joint and ankle foot pump exercises were started. Each patient underwent X-rays of Knee joint to see the position of Endo button and bio absorbable screw.

Follow up: Each patient was followed after 03 weeks, at 06 weeks, after 03 months and then at interval of 03 months for one year. At each follow up, knee function was assessed with Tegner- Lysholm score and International Knee Documentation Committee (IKDC). Likewise graft donor site morbidity was assessed with AOFAS Score and FADI Score.

RESULTS

our study included 24 patients, out of which 14 were males while remaining 10 were females. Right knee was involved in 16 patients while left knee in 08 patients. Mode of injury in 18 patients was road traffic accident while in remaining 06 patients, it was sports injury. Ten patients were operated 03 weeks after the injury while the remaining 14 patients were operated 3-6 months after the injury.

For all patients we used Peroneus Longus tendon graft. It was 8.3+/-0.2mm in diameter and length of tendon graft was 114+/-3.2mm. Anterior draw test was positive in 23 patients and was negative in one patient preoperatively. It was normal in 22 patients while 02 patients had grade 1 laxity post operatively at the final follow up. Similarly Pivot shift test was positive in 20 patients and was negative in remaining 04 patients preoperatively while it

was negative in all the patients post operatively after one year of follow up. There was significant improvement in Tegner-Lysholm Score after one year. It was 87.15+2.90 after 06 months while 96.22+1.75 at the end of final follow up after one year. Likewise, IKDC International knee documentation committee score (IKDC) was 85.24+3.80 at the end of 06 months and 96.55+2.19 after one of surgery and AOFAS Score was 97+4 and FADI Score at final follow up was 92 to 96%.

The mean time to return to their job was 196+28.62 days. The professional athletes returned to their sports activities earlier than working class group (22.4 days earlier).

Limitations of study: Our study included small number of patients. This requires a bigger Cohort with long follow up for conformation of our findings and its application on larger group.

DISCUSSION

ACL Reconstruction with Peroneus Longus tendon showed good to excellent functional outcomes of Knee joint. The most common factor ACL reconstruction is graft size and its diameter. A good functional outcome of knee joint is expected if its diameter is more than 8mm and length of more than 70mm. Peroneus Longus tendon has got all these characteristics which make it as a potential source ACL Reconstruction. Similarly, donor site morbidity and knee hypotrophy was also minimal as compared to Quadriceps, hamstring and tendo Achilles tendon grafts.¹³

Our study shows excellent Tegner-Lysholm (96.22+1.75) and IKDC (96.55+2.19) of knee joint while AOFAS and FADI Score was 97.4 and 92%-96% at the end of final follow up after one year of surgery. Similarly, there was no hypotrophy of knee joint and both knees were comparable at the end of final follow up. The functional outcomes of donor site was also comparable to the non-grafted side as shown by the excellent AOFAS and FADI Score. It was probably that distal Peroneus Longus tenodesis was done with peroneus Brevis which maintains the effective eversion of ankle after harvesting Peroneus Longus tendon graft. A lot of studies are consistent with our study in term of functional outcomes of knee joint and donor site morbidity.¹⁴

In a study conducted by S.Rhatomy et al on 75 patients who presented by ACL injury. All patients underwent ACL Reconstruction with Peroneus Longus tendon graft. All patients showed excellent IKDC and Tegner-Lysholm scores after 2 years of follow up of surgery. It was also advantageous graft diameter, thigh muscles hypotrophy and excellent outcomes in terms of AOFAS (98.93+3.10) & FADI (99.78+0.59) Scores.¹⁶

In a prospective study conducted by N. Islam on 18 patients who underwent ACL Reconstruction, using Peroneus Longus Tendon graft. There was no significant difference in Lachman & Pivot shift test (reduced from 100% to 5.6). Likewise functional outcomes were also excellent with p less than 0.001. They came to the conclusion that Peroneus Longus Tendon graft revealed

high load to failure with excellent biomechanical & functional outcomes having little or no disability.¹⁷

Kusumastutia AH et al; also assessed the functional outcomes of knee joint and donor site morbidity one year after ACL reconstruction with Peroneus Longus graft. In their patients Tegner-Lysholm and IKDC Score was 89.71+8.35 and 96.69+3.36 after follow up of one year after the surgery. The functional aspects of ankle joint were assessed with AOFAS & FADI Score and it was 98.13+1.11 & 99.80+0.59 respectively after one year after the surgery. According to their views Peroneus Longus tendon harvested graft for ACL reconstruction is an ideal graft with good functional outcomes with minimal donor site morbidity.¹⁸

In a systematic review and meta-analysis for 10 years from 2012 to 2022 through PUBMED, AH Khater et al; came to the conclusion that Peroneus Longus tendon auto graft has promising and excellent functional and bio-mechanical outcomes. It is easy to harvest with minimal or no donor site disability.¹⁹

All these studies are consistent with our study in terms of functional & bio-mechanical outcomes of knee joint & in terms of donor site disability.²⁰

CONCLUSION

Peroneus Longus tendon is most advantageous for ACL reconstruction in terms of graft harvesting technique, large graft diameter, adequate graft length and lower rate of complication at the donor site. Moreover, ankle function is not deteriorated if proper graft harvesting technique is used. It has a greater tensile strength with minimal or no donor site morbidity.

Conflict of interest:

ETHICAL APPROVAL

Ethical approval of article was granted by the Institutional Review Committee of Allama Iqbal Medical College vide reference No, 143/2024 dated: 8 August, 2024.

AUTHOR'S CONTRIBUTIONS

SG: Concept, design, manuscript writing, statistical analysis

SBJ: Data collection, data analysis, manuscript writing

MAH, TM, MF: Manuscript writing, critical review,

MSH: Manuscript writing, statistical analysis

MZIS: Critical review, proof reading, supervision

All Authors: Approval of the final version of the manuscript to be published

CONFLICT OF INTEREST

Authors declare no conflict of interest.

FUNDING SOURCE: None

REFERENCES

1. Longo U.G, De Salvatore S, D Orrico F, Bella M, Corradini A, Rizello G. et al. The impact of Psychological factors on return to sports after Anterior Cruciate Ligament Reconstruction: A Systematic Review. *Osteo.* 2023;3(3):78-93. <https://doi.org/10.3390/Osteology.3030009>

2. Evans J , Mabrouk A , Nielson J.I.. Anterior Cruciate Ligament Knee Injury. [Updated 2023 Nov 17]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-Available from: www.ncbi.nlm.nih.gov/books/NBK499848/
3. Super J.T, Spalding T, Jackson K, Jackson W, Bowditch M, Bailey M et al; Anterior Cruciate Ligament Reconstruction.who is responsible for implementation and what are the challenges? Bone J Open2026; 7(4):491-498. doi:10.1302//2633-1662.74.BJO-2026-0019.
4. Rekik R.N, Bahr R , Cruz F , Read P , Whiteley R, D'hooghe R et al; .Mechanisms of ACL injuries in men's football: A systematic video analysis over six seasons in the Qatari professional league. Biol Sport. 2023 Apr;40(2):575-586. doi: 10.5114/biolSport.2023.118024. Epub 2022 Jul 21. PMID: 37077782; PMCID: PMC10108748.
5. Muhammad S.M, Jasim A.M . Anatomy of Anterior Cruciate Ligament: Three-bundle concept with an apparent twist- A Cadevaric Study.J Arthrosc Surg Sports Med.2026;7(1); doi 10.25259/JASSM38-2025.
6. Komnos G.A, Hantes M.H, Kalifis G, Gkekios N.K,Hante A, Mentrev J et al. Anterior Cruciate Ligamen Tear: Individualized indications for Non-OperativeManagement.J.Clin.Med.2024;13(20):62 33;doi.org/10.3390/jcm13206233.
7. Binyong Y.E , Gongju L, Zhanyang H , Xu J, Pan H, Zhu H. Biomechanical mechanisms of anterior cruciate ligament injury in the ierk dip phase of clean and jerk: A case study of an injury event captured on-site,Heliyon,Volume 10, Issue 11, 2024,e31390, ISSN 2405-8440. www.sciencedirect.com/science/article/pii/S2405844024074218doi.org/10.1016/j.heliyon.2024.e31390.
8. Moscon A.C, Cardoso F.L, de Almeida Braga D.R, Gattas C . Primary Arthroscopic Repair of Anterior Cruciate Ligament with Femoral Fixation using Adjustable EndoButton and Dynamic Reinforcement with High-Strength Suture. Re Bras Ortop2026;6(1): <https://doi.org/101055/s-0045-181443>.ISSN0102-3616
9. Y.Raikar, S. Pai. "anterior cruciate ligament". Encyclopedia Britannica, 16 Aug. 2024, <https://www.britannica.com/science/anterior-cruciate-ligament>. Accessed 7 September 2024.
10. Ozbek E.A, Runer A,Dinenna M . Biomechanical Comparison of ACL-R Using an Iliotibial Autograft Reinforcement and Bone-Patellar Tendon Tendon-Bone Graft with and without Lateral Extra-articular Tenodesis. The Orthop J Sports Med 2025;13(10): doi:101177/23259671251366680.
11. Cohen D, Slawaska-Eng D , Almasri M ,Sheean A , de Sa D . Quadricep ACL Reconstruction Techniques and Outcomes: an Updated Scoping Review of the Quadricep Tendon. Curr Rev Musculoskelet Med. 2021 Dec;14(6):462-474. doi: 10.1007/s12178-021-09726-3. Epub 2021 Nov 10. PMID: 34755275; PMCID: PMC8733128.1.
12. K.Kuliński , MK.Waśko , E.Tramś , K.Malesa , S.Pomianowski , R.Kamiński . Anterior Cruciate Ligament Reconstruction Using a 4-Strand Semitendinosus Tendon Graft or a Doubled Semitendinosus and Gracilis Tendon Graft: A 4.5-Year Prospective, Randomized, Double-Blind, Parallel-Group Study. The Am J Sports Med. 2023;51(3):615-626. doi:10.1177/03635465221149738.
13. Y.Levy , L.Gousopoulos , GP.Hopper , C.Grob , TD.Vieira , JM.Favard et al; Anterior Cruciate Ligament Reconstruction Using Bone-Patella Tendon-Bone Autograft With Press-Fit Femoral Fixation: The Original Chambat Technique. Arthrosc Tech. 2022 Oct 20;11(11):e1889-e1895. doi: 10.1016/j.eats.2022.07.001. PMID: 36457406; PMCID: PMC9705405.
14. N. Zunayed , M. Mustafiz, A. Wafee, M. S. Hossain, A. I. Ahmed, S. Talukder et al; Peroneus Longus Tendon Autograft for Primary Arthroscopic Reconstruction of the Anterior Cruciate Ligament. J Orthop &Sports Med. 2024; 6: 112-119.
15. K.Shah , D.Sharma , Agarwal A, Shah R, Shah H (2019) Peroneus longus: Most promising autograft for arthroscopic ACL reconstruction. Ind J of Orthop Surg 2019; 5(3):172–175. <https://doi.org/10.18231/j.ijos.2019.033>
16. S.Rhatomy , L.Hartoko , R.Setyawan , NR.Soekarno, AI.Z. Asikin , P. D. Mustamsir . Single bundle ACL reconstruction with peroneus longus tendon graft: 2-years follow-up. J Clin Orthop Trauma. 2020 May;11 (3):S332-S336. doi: 10.1016/j.jcot.2019.09.004. Epub 2019 Sep 6. PMID: 32523289; PMCID: PMC7
17. N. Islam, G.S.Firdous, D.Dey, M.Rehman, A.N.R.Diba, A.R.Rasul.Peroneus Longus Tendon Autgraft in ACL Reconstruction- Clinical and Biomechanical Outcomes.The Insight 2025 ;12 : 514-8.www.bdjournal.org/insight/article/view/799
18. AH.Kusumastutia ,T. Rukmoyo , S.Rhatomy ,YM. Sakti . Anterior Cruciatel Ligament Reconstruction with Peroneus Longus Tendon Autograft: Functional Outcome and Donor Site Morbidity. Orthop J Sports Med. 2020 ;8(5):2325967120S00084.doi:10.1177/2325967120S00084. PMCID: PMC7262856.
19. A.H.Khater , M.A.Hemida , S.S.E.Ghonim . Anterior cruciate ligament reconstruction using Peroneus Longus auto graft (Systematic Review and meta-analysis). QJM: An int J Med 2024; 117(1).Hcae070.407,doi.org/10.1093/qjmed/hcae070.407.
20. S. Agrawal, A.S. Hegda, B.S. Rao et al; Peroneus Longus Tendon autograft for Primary Arthroscopic Reconstruction of Anterior Cruciate Ligament. Nr2023;13(2):252258.doi:10.32098/mltj.02.2023.08