DOI: https://doi.org/10.54393/pjhs.v6i12.3008

PAKISTAN JOURNAL OF HEALTH SCIENCES
(LAHORE)
https://thejas.com.pk/index.php/pjhs
ISSN (E): 2790-9352, (P): 2790-9344
Volume 6, Issue 12 (December 2025)

Original Article

OPEN ACCESS

Functional Outcome of Arthroscopic Anterior Cruciate Ligament Reconstruction Using Hamstring Tendon Autograft

Farman Ul Haq[1,2*], Faraz Ahmad Khan[1], Hazrat Akbar[1,3], Rahmat Khan[1,4], Waheed Altaf[1,5], Zain Naseer[1], Latif Khan[1] and Hafiz Umair Hussain[1]

[1]Department of Orthopaedics, Ghurki Trust Teaching Hospital, Lahore, Pakistan
[2]Department of Orthopaedics, Niazi Welfare Foundation Hospital, Sargodha, Pakistan
[3]Department of Orthopaedics, Pakistan Ordinance Factory Hospital, Wah Medical Hospital, Wah Cantt., Pakistan
[4]Department of Orthopaedics, Hayatabad Medical Complex, Peshawar, Pakistan
[5]Mohi-ud-Din Islamic Medical College, Mirpur, Azad Jammu and Kashmir

ARTICLE INFO

Keywords:
Anterior Cruciate Ligament, Reconstruction, Hamstring Tendon Autograft, Functional Outcome, Lysholm Score, IKDC Score

How to Cite:
Haq, F. U., Khan, F. A., Akbar, H., Khan, R., Altaf, W., Naseer, Z., Khan, L., & Hussain, H. U. (2025). Functional Outcome of Arthroscopic Anterior Cruciate Ligament Reconstruction Using Hamstring Tendon Autograft: Arthroscopic ACL Reconstruction Using Hamstring Tendon Autograft. Pakistan Journal of Health Sciences, 6(12), 53-57. https://doi.org/10.54393/pjhs.v6i12.3008

***Corresponding Author:**
Farman Ul Haq
Department of Orthopaedics, Niazi Welfare Foundation Hospital, Sargodha, Pakistan
farmanaffaq8824@gmail.com

Received Date: 25th March, 2025
Revised Date: 22nd November, 2025
Acceptance Date: 10th December, 2025
Published Date: 31st December, 2025

ABSTRACT

Anterior cruciate ligament (ACL) injuries are among the most common knee injuries, particularly in active individuals and athletes. Untreated ACL tears can lead to joint instability, meniscal damage, and early osteoarthritis. **Objectives:** To assess the efficacy of hamstring tendon autografts in arthroscopic ACL reconstruction. **Methods:** A longitudinal descriptive study was undertaken from July 2023 to January 2024, including 70 patients with ACL rupture with an arthroscopic ACL reconstruction using hamstring autografts. Patients were assessed through Lysholm knee scoring and International Knee Documentation Committee (IKDC) scores at 6 weeks, 3 months, and 6 months postoperatively. Demographic data, clinical characteristics, and outcomes were analyzed using statistical methods, using a p-value≤0.05 as significant. **Results:** Participants were predominantly male (80%), with a mean age of 35.6 years (SD 5.76). Causes of ACL injury included road traffic accidents (40%), sports activities (31.4%), and falls (28.6%). Preoperative IKDC scores improved significantly from 52.6 (95% CI: 50.9–54.3) to 89.6 (95% CI: 88.8–90.4) postoperatively (p<0.001, Cohen's d = 5.2). Lysholm scores indicated excellent outcomes (90–100) in 44.3% (SD 4.1), good (80–89) in 38.6% (SD 3.8), fair (65–79) in 12.9% (SD 2.5), and poor (<65) in 4.3% (SD 1.2). Right-sided injuries showed better outcomes (p<0.001). Sports-related injuries had superior outcomes (p<0.001). **Conclusions:** The study contributes valuable insights into demographic factors influencing results, emphasizing the importance of graft choice in achieving favorable postoperative knee function.

INTRODUCTION

The anterior cruciate ligament (ACL) is one of the four primary knee joint ligaments. It is crucial for preserving joint stability when performing daily tasks [1, 2]. A frequent injury among soccer and basketball players, it is the most often injured ligament in the knee [3]. Female athletes have a three to ten times higher risk of this ligament disruption than male athletes [4]. One in 3,500 people in the general population is thought to get ACL damage each year [3]. Untreated cases have a markedly increased incidence of osteoarthritis in the knee, meniscus tears, and functional instability [5]. Treating ACL injuries is essential. ACL repair is the standard course of therapy for those with ACL injuries who wish to return to sports [6]. Following an ACL injury, operative and non-operative treatment modalities are employed. Management is influenced by objectives, goals, concurrent injuries, risk factors, and patient activity

DOI: https://doi.org/10.54393/pjhs.v6i12.3008

levels [7]. The primary treatment options for ACL injury as first-line are ACL reconstruction and post-operative rehabilitation, followed by ACL reconstruction and post-operative rehabilitation, and rehabilitation (followed by ACL reconstruction in patients who develop functional instability) [8]. ACL reconstruction surgery is performed under arthroscopic guidance, and the torn ACL can be replaced either with an autograft, which is a tissue from the patient's own body, such as a hamstring tendon or an allograft, which can be a cadaveric ligament, or a well-managed tendon. However, synthetic grafts have recently been used [9, 10]. The ideal option for ACL restoration is a graft that is comparable biomechanically to the original torn ligament, easy to harvest, has lower morbidity at the harvest site, can be secured reliably, and has good integration with bone [10]. The most often employed graft for ACL restoration surgery was the bone-patellar tendon-bone (BPTB) graft for a very long period. That said, issues including the knee joint's ineffective extensor mechanism, decreased motion, subsequent patellar fractures, and anterior knee discomfort compelled surgeons to develop alternative graft retrieval sources for ACL restoration. The hamstring graft is an excellent substitute as it does not endanger the extensor apparatus, as the BPTB transplant did. It has shown outstanding outcomes when patients with ACL tears undergo reconstruction using hamstring tendon transplants and proper patient selection. The cells of a quadrupled hamstring graft likely live longer and produce better effects than those of a BPTB transplant because the surrounding synovial fluid feeds the hamstring tendon graft. A meta-analysis undertaken by Biau et al. in 2007 to gather subjective data on whether hamstring graft or BPTB results in a more functioning knee as determined by the overall IKDC rating, and the return to daily and athletic activity to pre-injury status. Comparing the outcomes in terms of functionality of the hamstring and BPTB grafts revealed no discernible variations [11]. Despite the growing use of hamstring tendon autografts, there is a need for further investigation into their functional outcomes and factors influencing success. Understanding the functional outcomes associated with hamstring tendon autografts is essential for orthopedic surgeons, as it guides clinical decision-making and improves patient counseling. By conducting this study, we aim to provide evidence-based data that can enhance the understanding of factors influencing the success of ACL reconstruction using hamstring autografts, ultimately contributing to improved patient care and outcomes in orthopedic surgery.

This study aimed to contribute a valuable understanding of the efficacy of ACL reconstruction using hamstring autografts, shedding light on demographic variables such as gender, side of injury, and the cause of injury that may impact postoperative functional outcomes.

METHODS

This longitudinal descriptive study, approved by the Ethical Committee of Ghurki Trust Teaching Hospital, Lahore (Ref. No 2023/06/R-22). The study included isolated anterior cruciate ligament (ACL) ruptures that underwent arthroscopic reconstruction with hamstring tendon autografts. By using the WHO sample size estimation formula, $n=Z^2.P.(1-P) / E^2$. A sample size of 70 was calculated by using the following values: expected proportion (p=0.85), confidence interval (z=95%), and precision (d=0.09) [12]. From July 2023 to January 2024, the study ensured relevance to both American and international orthopedic settings. A convenient sampling technique was used to collect the data from patients, so easily available participanst were added according to the convenience of the researchers. Eligible patients were over 18 years with a normal contralateral knee, excluding those with fractures, multiple ligament injuries, knee osteoarthritis, or intra-articular pathologies requiring revision surgery. Written informed consent was taken. Demographic and clinical data, including age, gender, injury side, and cause (road traffic accidents, sports activities like soccer or basketball, or falls such as from height or tripping), were extracted from electronic patient records at the hospital. Preoperative assessments included standard tests, complete blood count, erythrocyte sedimentation rate, C-reactive protein, blood glucose, and renal function tests, to confirm surgical eligibility, alongside Lachman and pivot-shift tests to evaluate knee instability. A single experienced orthopedic surgeon performed all procedures using a single-bundle technique, harvesting ipsilateral semitendinosus and gracilis tendons with a tendon stripper, quadrupling the graft, and fixing it with an EndoButton (Smith and Nephew) on the femoral side and a bioabsorbable interference screw on the tibial side, with anatomic tunnel placement achieved via an anteromedial portal under arthroscopic visualization. Patients followed a standardized postoperative rehabilitation program, starting with immediate weight-bearing as tolerated, quadriceps strengthening, and range-of-motion exercises on day 1, with pre-operative rehabilitation recommended only for significant swelling or stiffness, and progressive return to sports allowed at 6–9 months based on functional milestones. Functional outcomes were assessed at 6 weeks, 3 months, and 6 months postoperatively using the Lysholm knee scoring scale (0–100, excellent: 90–100, good: 80–89, fair: 65–79, poor: <65), which evaluates eight patient-reported items like pain and instability (ICC = 0.88, high validity for ACL outcomes) [13], and the IKDC subjective knee form (0–100), assessing symptoms, sports activities, and function (ICC = 0.94, validated for ACL reconstruction) [14], with higher scores indicating better

DOI: https://doi.org/10.54393/pjhs.v6i12.3008

function and a minimum score of 0 (severe disability) to a maximum of 100 (normal function). Data were analyzed using IBM SPSS Statistics version 27.0, with descriptive statistics (means, standard deviations, frequencies) for quantitative variables (e.g., age, IKDC scores) and qualitative variables (e.g., gender, injury cause). Normality of data was tested using Kolmogorov-Smirnov's test, after which parametric tests were applied. paired t-tests for pre- and postoperative IKDC score comparisons, chi-square tests for Lysholm score stratification by demographics, and 95% confidence intervals, using a 95% confidence level and p≤0.05 as the significance threshold.

RESULTS

The study presents a detailed overview of the demographic and clinical characteristics of the 70 patients included in the study. Most participants were male (80%), with a mean age of 35.6 years, reflecting a diverse adult population undergoing arthroscopic anterior cruciate ligament (ACL) reconstruction. The distribution of ACL injuries on either side, with 55.7% on the right and 44.3% on the left, sheds light on the lateralization of these injuries. Causes of ACL injury varied, with road traffic accidents (RTAs) accounting for 40%, sports activities for 31.4%, and falls for 28.6% (Table 1).

Table 1: Descriptive Statistics of Qualitative Variables (n=70)

Parameters	n (%)
Gender	
Male	56 (80%)
Female	14 (20%)
Side	
Right	39 (55.7%)
Left	31 (44.35%)
Cause	
RTA	28 (40%)
Sports activity	22 (31.4%)
Fall	20 (28.6%)

** statistically significant at 0.05, 0.01

The preoperative International Knee Documentation Committee (IKDC) score indicated a baseline functional status (52.6 ±7.2), significantly improving postoperatively to 89.6 ± 3.75. The postoperative Lysholm scores were categorized into Excellent (44.3%), Good (38.6%), Fair (12.9%), and Poor (4.3%), providing a detailed breakdown of functional outcomes (Table 2).

Table 2: Descriptive Statistics of Quantitative Variables (n=70)

Parameters	n (%)	Mean ± SD (Range)	p-value
Age (Years)	–	35.6 ± 5.76 (20-60)	–
IKDC Score	–	–	–
Pre	–	52.6 ± 7.2 (95% CI: 50.9-54.3)	**<0.001
Post	–	89.6 ± 3.75 (95% CI: 88.8-90.4)	–
Lysholm Score			
Excellent (90-100)	31 (44.3%)	94.2 ± 4.1	**<0.05
Good (80-89)	27 (38.6%)	84.5 ± 3.8	
Fair (65-79)	9 (12.9%)	70.3 ± 2.5	
Poor (<65)	3 (4.3%)	60.1 ± 1.2	

** statistically significant at 0.05, 0.01

Results offer a nuanced analysis by stratifying Lysholm scores based on demographic factors. While male patients tended to have more Excellent and Good outcomes than female, the difference was not statistically significant (p-value=0.152). However, the side of injury significantly influenced outcomes, with right-sided injuries demonstrating better results than left-sided injuries (p-value=0.0003). Moreover, the cause of injury played a significant role, with sports-related injuries showing the most favorable outcomes compared to RTAs and falls (p-value<0.001). These tables provide a comprehensive understanding of the study population, highlighting the diverse factors contributing to functional outcomes following arthroscopic ACL reconstruction with hamstring grafts (Table 3).

Table 3: Stratification of Lyshlom Score According to Demographic Profile

Variables	Excellent	Good	Fair	Poor	p-value
Gender					
Male	29	22	7	1	0.152
Female	5	5	3	2	
Side					
Right	20	19	0	0	**0.0003
Left	11	8	9	3	
Cause					
RTA	22	4	2	0	**<0.001
Sports activity	6	15	1	0	
Fall	3	8	6	3	

** statistically significant at 0.05, 0.01

DISCUSSION

Patients who suffer from knee impairment due to an ACL injury that is neglected and not treated promptly may experience joint complications if the damage worsens. Patients' goals to regain their pre-injury levels have increased significantly due to developments in surgical techniques and better results. A significant factor in meeting and exceeding these objectives is graft choice, with hamstring grafts becoming increasingly popular, particularly the quadrupled hamstring graft. Compared to patellar tendon grafting, the four-string or quadruple hamstring graft has demonstrated superior strength and tension. During the research period, hamstring autograft was used for ACL restoration in all 70 patients. Among these, 56 were male, while 14 were female. The research included 12 male and three female, most of whom had right

DOI: https://doi.org/10.54393/pjhs.v6i12.3008

knee injuries. According to research by Brown *et al.* although women are more likely to get hurt, men are more likely to get hurt because of restricted exposure to conditions related to the manner and cause of injury. Additionally, it was concluded that the affected limb's side had no bearing on the functional result [15]. The anatomic placement of the tunnel during the single-bundle technique likely enhanced graft stability, thus preventing tunnel widening as well as fixation failures. The usual time frame for graft maturation spans 6–12 months, but the results we obtained at 6 months support this timeline. Additional research is necessary to understand biomechanical factors that affect long-term stability, including how tunnel widening and graft healing processes affect results [4]. The study results showed improved outcomes in sports-related injuries, possibly because patients involved in sports are often younger with better pre-injury health; however, the results lack adjustment for these variables. Future trials need to consider these confounding variables for their analyses. Our study results are consistent with a previous study: 44.3% of patients had excellent outcomes, 38.6% had good, 12.9% had fair, while 4.3% of cases were found with poor outcomes using the knee scoring scale by Lysholm. 94% of participants in a comparable investigation by Bourke *et al.* which comprised 143 patients, had an outstanding Lysholm score at the end of the study's 1-year follow-up [16]. According to the same research conducted by Jeyaraman, 27% of cases had great outcomes, 53% had good results, 13% had fair results, and 7% had bad results [17]. In our study, the mean operative IKDC score was 52.6 ± 7.2, and the postoperative score was 89.6±3.75. A study was conducted by Lind *et al.* The IKDC scores at baseline, 6 months, and 1 year following ACL reconstruction surgery were found to have mean values of 50.6 (19%), 70.8 (1.6)%, and 73.7 (1.9%), respectively, according to their research [18]. The findings of another study showed that the IKDC scores were 51.4 (3.00%) at baseline and 92.1 (2.36) at six months [3]. The results of another study indicate that the mean IKDC score pre-operatively of 38.95 ± 5 increased to 67.92 ± 2 in the 6th month and to 90.73 ± 7 at 12 months. The mean Tegner-Lysholm score pre-operatively was 51 (poor), which increased to 87 (good) in the 6th month and 97 (excellent) in the 12th month [19, 20]. Recent Cochrane reviews emphasize the need for standardized rehabilitation and surgeon expertise, which our single-surgeon design addressed [8].

CONCLUSIONS

Arthroscopic ACL reconstruction with hamstring tendon autografts yielded patients achieving excellent or good Lysholm scores (44.3% excellent, 38.6% good), indicating successful knee function restoration. Sports-related and right-sided injuries showed superior results, though further studies are needed to address potential biases.

Authors Contribution

Conceptualization: FUH, HA, HK
Methodology: FUH, FAK, HA, RK, WA, ZN, HUH
Formal analysis: FUH
Writing review and editing: FUH

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

Source of Funding

The author received no financial support for the research, authorship and/or publication of this article.

REFERENCES

[1] McLean SG, Mallett KF, Arruda EM. Deconstructing the Anterior Cruciate Ligament: What We Know and Do Not Know About Function, Material Properties, and Injury Mechanics. Journal of Biomechanical Engineering. 2015 Feb; 137(2): 020906. doi: 10.1115/1.4029278.

[2] Duart J, Rigamonti L, Bigoni M, Kocher MS. Pediatric Anterior Cruciate Ligament Tears and Associated Lesions: Epidemiology, Diagnostic Process, and Imaging. Journal of Children's Orthopaedics. 2023 Feb; 17(1): 4-11. doi: 10.1177/18632521231153277.

[3] Dash SK, Mishra D, Sahu H, Moharana AK, Angrish S, Ts D. Functional Outcomes Following Arthroscopic Anterior Cruciate Ligament (ACL) Reconstruction Using the Sironix Titanium Button and the Polyetheretherketone (PEEK) Button: A Retrospective Observational Study. Cureus. 2023 Sep; 15(9). doi: 10.7759/cureus.46186.

[4] Musahl V, Nazzal EM, Lucidi GA, Serrano R, Hughes JD, Margheritini F *et al.* Current Trends in the Anterior Cruciate Ligament Part 1: Biology and Biomechanics. Knee Surgery, Sports Traumatology, Arthroscopy. 2022 Jan; 30(1): 20-33. doi: 10.1007/s00167-021-06826-y.

[5] Gupta R, Singhal A, Sharma AR, Shail S, Masih GD. Strong Association of Meniscus Tears with Complete Anterior Cruciate Ligament (ACL) Injuries Relative to Partial ACL Injuries. Journal of Clinical Orthopaedics and Trauma. 2021 Dec; 23: 101671. doi: 10.1016/j.jcot.2021.101671.

[6] Satora W, Królikowska A, Czamara A, Reichert P. Synthetic Grafts in the Treatment of Ruptured Anterior Cruciate Ligament of the Knee Joint. Polimery w Medycynie. 2017 Jan; 47(1): 55-9. doi: 10.17219/pim/76819.

DOI: https://doi.org/10.54393/pjhs.v6i12.3008

[7] Diermeier TA, Rothrauff BB, Engebretsen L, Lynch A, Svantesson E, Senorski EA *et al.* Treatment After ACL Injury: Panther Symposium ACL Treatment Consensus Group. British Journal of Sports Medicine. 2021 Jan; 55(1): 14-22. doi: 10.1136/bjsports-2020-102200.

[8] Filbay SR and Grindem H. Evidence-Based Recommendations for the Management of Anterior Cruciate Ligament (ACL) Rupture. Best Practice and Research Clinical Rheumatology. 2019 Feb; 33(1): 33-47. doi: 10.1016/j.berh.2019.01.018.

[9] Beyer J, Jones R, Igo I, Furyes AR, Liu J, Sohn DH. Comparison of Graft Type and Fixation Method in Anterior Cruciate Ligament Reconstruction: A Systematic Review and Meta-Analysis Based on Randomized Control Studies. Journal of Bone and Joint Surgery Reviews. 2024 Apr; 12(4): e23. doi: 10.2106/JBJS.RVW.23.00222.

[10] Dhammi IK and Kumar S. Graft Choices For Anterior Cruciate Ligament Reconstruction. Indian Journal of Orthopaedics. 2015 Mar; 49(2): 127. doi: 10.4103/0019-5413.152393.

[11] Hadi H, Bagherifar A, Tayebi F, Ansaria M, Shahsavaripour A, Qomashi I *et al.* Anterior Cruciate Ligament Reconstruction with Hamstring Tendons Has No Deleterious Effect on Hip Extension Strength. Archives of Bone and Joint Surgery. 2019 May; 7(3): 278.

[12] Karampudi A, Imrose MS, Harish DC, Md S. Functional Outcome After Arthroscopic Anterior Cruciate Ligament Reconstruction Using Quadrupled Hamstring Graft-A Prospective Analysis. Journal of Dental and Medical Sciences. 2021; 20: 27-39.

[13] Itthipanichpong T, Moonwong S, Thamrongskulsiri N, Prasathaporn N, Kuptniratsaikul S, Tegner Y *et al.* Validity and reliability of the Thai versions of the Lysholm knee scoring scale and Tegner activity scale. Orthopaedic Journal of Sports Medicine. 2023 Feb; 11(2): 23259671221149785. doi: 10.1177/23259671221149785.

[14] Abumadini AA. Reliability and Validity of International Knee Documentation Committee Subjective Knee Form Arabic version among Knee Osteoarthritis patients (Doctoral dissertation, KING ABDULAZIZ UNIVERSITY). 2023.

[15] Brunetti C, Rabello R, Adragna F, Silva Zandonato L, Zucchetti A, Bertozzi F *et al.* Customized Landing Task for ACL Injury Risk Assessment: Kinematic Sex-Related Differences. Sports Health. 2025 Mar; 17(2): 252-61. doi: 10.1177/19417381241236893.

[16] Bourke HE, Gordon DJ, Salmon LJ, Waller A, Linklater J, Pinczewski LA. The Outcome at 15 Years of Endoscopic Anterior Cruciate Ligament Reconstruction Using Hamstring Tendon Autograft for 'Isolated'Anterior Cruciate Ligament Rupture. The Journal of Bone and Joint Surgery British Volume. 2012 May; 94(5): 630-7. doi: 10.1302/0301-620X.94B5.28675.

[17] Jeyaraman M. Functional Outcome of Arthroscopic Anterior Cruciate Ligament Reconstruction with Autologous Hamstring Graft. Indian Journal of Orthopaedics. 2021; 7(2): 113-7.

[18] Lind M, Nielsen T, Sørensen OG, Mygind-Klavsen B, Faunø P, Leake-Gardner S. Bone Ingrowth into Open Architecture PEEK Interference Screw After ACL Reconstruction. Journal of Experimental Orthopaedics. 2020 Sep; 7(1): 68. doi: 10.1186/s40634-020-00285-z.

[19] Iqbal J, Khan ZA, Hassan F, Sidhwa B, Khan Z, Butt U. Functional outcome of Arthroscopic Anterior Cruciate Ligament Reconstruction Using Hamstring Autograft and Endo button with Supervised Physical therapy Rehabilitation. Journal of Pakistan Orthopaedic Association. 2021 Apr; 33(01): 25-30.

[20] Monk AP, Davies LJ, Hopewell S, Harris K, Beard DJ, Price AJ. Surgical Versus Conservative Interventions for Treating Anterior Cruciate Ligament Injuries. Cochrane Database of Systematic Reviews. 2016; (4). doi: 10.1002/14651858.CD011166.pub2.