e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2024; 16(5); 1908-1913

Original Research Article

Return to Sport after ACL Reconstruction: Functional Outcomes and Re-injury Rates

Sujit Kumar[1], Nikesh Kumar[2], Ranjit Kumar Singh[3], Shambhu[4]

[1]Senior Resident, Department of Ortho, NMCH, Patna
[2]Senior Resident, Department of Ortho, NMCH, Patna
[3]Professor, Department of Ortho, NMCH, Patna
[4]Assistant Professor, Department of Ortho, NMCH, Patna

Received: 25-02-2024 / Revised: 23-03-2024 / Accepted: 26-04-2024
Corresponding Author: Dr. Nikesh Kumar
Conflict of interest: Nil

Abstract:

Background: Athletics are plagued by Anterior Cruciate Ligament (ACL) injuries, which can limit playtime. ACL surgery aims to restore knee stability and function while reducing the risk of re-injury and maximising long-term functional outcomes. Functional outcomes and re-injury rate analysis was performed on Nalanda Medical College and Hospital in Patna athletes who had ACL reconstruction between January and December 2023.

Methods: The 60 athletes in this ACL reconstructive case-control research were randomly selected. Patient records and subsequent evaluations provided data. Functional results were measured using the IKDC Subjective Knee Form and Lysholm Knee Scoring Scale. Re-injury rates included ACL tears, significant knee sprains, and other knee issues. Statisticians compared descriptive statistics to evaluate the ACL repair method.

Results: Men dominated the group (66.7%), with an average age of 28.5 ± 5.2 years. About 33.3% of participants played football. The Lysholm score rose from 52.3 to 84.9 and the IKDC score from 45.2 to 77.8, showing considerable functional improvements. The 16.7% re-injury rate included 6.7 percent fresh ACL tears, 5.0 percent significant knee injuries, and 8.3 percent various knee issues.

Conclusion: The Lysholm and IKDC ratings of athletes after anterior cruciate ligament replacement show significant improvements in knee function. The 16.7% re-injury rate shows that better rehabilitation and prevention are needed to reduce knee problems. Both clinical practice and future studies can improve due to the significant re-injury rate, even though the results are consistent.

Keywords: ACL Reconstruction, Functional Outcomes, IKDC Score, Lysholm Knee Scoring Scale, Re-Injury Rate.

Introduction

Background Information

ACL injuries are common in high-demand sports like skiing, basketball, and soccer and significantly damage performance. The ACL stabilises the knee during dynamic workouts by aligning the knee and controlling the tibia's motion relative to the femur [1]. ACL tears are often caused by sudden braking, direction changes, or knee trauma. These injuries, which can range from partial rips to major ruptures, can severely limit an athlete's performance. After a significant ACL injury, ACL repair can stabilise and heal the knee [2]. This procedure repairs the uncertain ligament with a graft, usually the patient's autograft or a donor. The purpose of anterior cruciate ligament repair is to strengthen the knee joint so athletes can return to their sports. Effective anterior cruciate ligament replacement restores the athlete's trust in knee stability during high-intensity sports as well as ligament repair. Many things are targeted during ACL reconstruction. ACL tears produce inflammation and pain that lower an athlete's quality of life, thus the operation aims to reduce them.

ACL reconstructions often result in full knee range of motion, strength, and function and return to pre-injury athletic levels [3]. Despite these goals, ACL repair athletes face many challenges while returning to sports. One difficulty is the extensive and demanding rehabilitation needed to get optimal functional results. A well-structured post-operative rehabilitation strategy includes physical therapy, strength training, and a gradual introduction to sport-specific exercises [4].

Objectives

- To evaluate ACL repair patients' sports performance.
- To determine how often ACL repair patients damage themselves when they return to sports.
- To identify variables enhancing post-surgery function.

Anterior Cruciate Ligament (ACL) Injury and Reconstruction: ACL stability is essential for sports that involve rapid movements, such as leaping and twisting. High-intensity sports like soccer, basketball, and skiing cause ACL tears [5]. ACL restoration is a popular knee operation that restores stability and function. ACL repair improves knee biomechanics, relieves symptoms, and lets athletes play again.

Functional Outcomes after ACL Reconstruction: ACL replacement enhances Lysholm Knee Scoring Scale and IKDC Subjective Knee Form performance, according to a meta-analysis [6]. After surgery, knee stability, function, and pain improved significantly [7]. In a systematic study by [8], ACL replacement improved knee function, with higher Lysholm and IKDC scores indicating successful recovery and rehabilitation. Similar to these findings, [9] observed that ACL restoration reduced knee pain and improved knee function.

Re-Injury Rates Following ACL Reconstruction: Even with satisfactory functional results, ACL re-injury is a concern. [10] Found 12% re-injury in their prospective cohort studies, which is similar. Their investigation shown that even after ACL replacement, knee problems can reoccur. Re-injury can occur for many reasons, and these include inadequate rehabilitation, early sports return, and poor neuromuscular control.

Factors Influencing Re-Injury and Functional Outcomes: Graft type, operation schedule, and post-operative rehabilitation quality are among the many factors that affect re-injury rates and functional outcomes. Patellar tendon and hamstring autografts are successful; however functional results and re-injury rates differ. Rehabilitation protocols significantly affect functional results and re-injury rates, emphasising the need for a planned programme.

Recent Advances and Emerging Trends: Recent research has studied new ways to improve ACL repair and reduce re-injury. [11] Discussed surgery and rehabilitation advances.

Biologics and better surgery helped grafts recover and joints stabilise. Individualised rehabilitation programmes and cutting-edge imaging technologies increase result prediction and intervention customisation.

Figure 1: Return to sport testing after ACL Reconstruction (Source: [12])

Methods

Study Design: A retrospective cohort study examined athletes' function after ACL repair surgery and their risk of re-injury. Retrospective cohort studies examine past data to determine outcomes. This approach used pre-existing medical information and follow-up evaluations to uncover patterns and linkages about post-operative healing and reinjury. This study strategy was chosen because it conveniently reviews historical data from patients who underwent ACL surgery from January 2023 to December 2023 to gain insight into long-term results without a new prospective trial.

Study Setting: The study was conducted at Patna's Nalanda Medical College and Hospital, a sports and orthopaedics tertiary care centre. Research subjects were discovered by examining the hospital's patient database for ACL reconstruction surgery patients within the relevant timeframe.

Sample Size and Selection: The study included a total of 60 athletes who underwent ACL reconstruction between January 2023 and

December 2023 at Nalanda Medical College and Hospital, Patna.

Inclusion Criteria

- Athletes aged 18-45 years who had undergone primary ACL reconstruction surgery.
- Patients who participated in organized sports at a competitive level before the injury.
- Availability of complete pre-operative and post-operative medical records.
- Follow-up period of at least six months post-surgery.

Exclusion Criteria

- Patients with a history of previous knee surgeries or other significant knee injuries.
- Individuals with conditions contraindicated for ACL reconstruction or who did not participate in sports post-surgery.
- Patients who did not attend follow-up appointments or had incomplete medical records.

Data Collection: This study included an extensive review of patient medical records and follow-up. The main data sources were Patna's Nalanda Medical College and Hospital orthopaedic department's computerised health records. These records detailed patients' demographics, surgeries, and post-op treatment. We obtained pre- and post-operative injury evaluations, treatment plans, surgery results, and rehabilitation information from patients' records. These visits recorded patients' functional questionnaire responses and assessed their recovery. We also had patients complete out phone or email surveys to self-report their success in getting back into sports and any knee issues they experienced. This multi-pronged technique ensured clinical outcome and patient-reported experience data collection.

Functional Outcomes: Functional results were assessed using the IKDC Subjective Knee Form and Lysholm Knee Scoring Scale, two reliable and well-known instruments. With Lysholm Knee Scoring Scale values from 0 to 100, higher scores indicate better knee function. The measure uses symptoms and functional activities. This scale measures mobility, stability, and discomfort. The IKDC Subjective Knee Form is a comprehensive patient questionnaire that assesses knee symptoms and function. Scores from 0 to 100 indicate improvement. Both tools were used to gather data pre- and post-operatively and six, twelve, and eighteen months after surgery. These technologies permitted pre- and post-operative comparisons of athletes' healing status and knee function.

Re-injury Assessment: Medical data and patient surveys were used to track re-injury rates. To check for re-injury, we examined the patient's post-operative medical records for new ACL tears, other serious knee injuries, or knee-related procedures. This included searching surgical reports and subsequent visit notes for issues or re-injuries. Patients were also requested to complete follow-up surveys about new knee concerns to supplement record reviews. We called or emailed participants to ask on their knee status, injuries, and when they could play sports again. Re-injuries included a new ACL tear, a serious re-injury to the repaired knee, or knee-related complications that required more medical treatments or prohibited the player from playing again. This integrated strategy assessed ACL restoration and rehabilitation efficacy and re-injury rates.

Statistical Analysis: The study's demographics and ACL repair functional results were reported using descriptive statistics. We computed central tendency and dispersion values for the Lysholm Knee Scoring Scale and IKDC Subjective Knee Form scores to compare knee function before and after surgery. Paired t-tests compared pre- and post-operation scores to assess functional results.

The re-injury rates of different grafts were compared using log-rank tests, Kaplan-Meier curves, and frequency distributions. In the correlation analysis, age and graft type affected functional outcomes. SPSS was used for all statistical analyses, with a significance level of $p < 0.05$.

Results

Demographic Details of the Patients: The study analyzed data from 60 athletes who underwent ACL reconstruction surgery at Nalanda Medical College and Hospital, Patna, between January 2023 and December 2023. The demographic characteristics of the participants are summarized in Table 1.

Table 1: Demographic Characteristic of Study Participants

Characteristic	Value
Total Number of Patients	60
Mean Age (years)	28.5 ± 5.2
Gender	
Male	40 (66.7%)
Female	20 (33.3%)
Sport	
Soccer	20 (33.3%)

Basketball	15 (25.0%)
Volleyball	10 (16.7%)
Tennis	8 (13.3%)
Others	7 (11.7%)
Graft Type	
Autograft (Hamstring)	30 (50.0%)
Autograft (Patellar Tendon)	20 (33.3%)
Allograft	10 (16.7%)
Mean Follow-Up Duration (months)	12.4 ± 2.1

The participants were young adults, with a mean age of 28.5 years and an SD of 5.2 years. Because ACL injuries are more common in men, the gender distribution was 66.7% male and 33.3% female.

High-intensity sports like soccer (33.3%) and basketball (25.0%) have a higher ACL injury rate.

The hamstring autograft was used for 50.0% of ACL reconstructions, the patellar tendon for 33.3%, and the allograft for 16.7%. The average follow-up time of 12.4 months allowed for a detailed examination of functional outcomes and re-injury rates over a long post-operative period.

Functional Outcomes: The functional outcomes of ACL reconstruction were assessed using the Lysholm Knee Scoring Scale and the IKDC Subjective Knee Form. The results of these measures at different time points are summarized in Table 2.

Table 2: Functional Outcome Measures

Measure	Pre-Operative	Post-Operative (6 months)	Post-Operative (12 months)	Post-Operative (18 months)
Lysholm Knee Scoring Scale	52.3 ± 12.8	72.5 ± 8.3	80.7 ± 7.5	84.9 ± 6.1
IKDC Subjective Knee Form	45.2 ± 14.7	65.3 ± 11.2	74.1 ± 10.4	77.8 ± 9.3

Statistically significant improvements were found in Lysholm Knee Scoring Scale and IKDC Subjective Knee Form scores at 6, 12, and 18 months after surgery.

After the procedure, the average Lysholm score increased from 52.3 to 84.9 at 18 months ($p < 0.01$). After the operation, the mean IKDC score improved from 45.2 to 77.8 in 18 months ($p < 0.01$). ACL reconstruction improves knee function and reduces symptoms over time, as indicated by the large Lysholm and IKDC score increases.

Re-injury Rates

Table 3: Re-Injury Rates during Follow-Up

Re-Injury Event	Number of Cases	Percentage (%)
New ACL Tear	4	6.7%
Significant Knee Injury	3	5.0%
Other Knee Issues	5	8.3%
No Re-Injury	48	80.0%

Five athletes (8.3% of the total) experienced knee issues, three (5.0%) had serious issues, and four (6.7%) had new ACL tears. At the follow-up, 48 athletes (80.0%) had no re-injuries or serious knee concerns.

Statistical Analysis

The statistical studies of the Lysholm Knee Scoring Scale and IKDC Subjective Knee Form demonstrated that knee function improved significantly following ACL replacement. Post-operative assessments showed substantial differences ($p < 0.01$) from pre-operative ratings at 6, 12, and 18 months. We used frequency distributions to estimate re-injury rates. Eighty percent of athletes did not re-injure during the follow-up period. Survival researchers used Kaplan-Meier curves to find that re-injury risk decreased with time, peaking in the first few months after surgery. Correlation Analysis showed that age and graft type affected post-operative outcomes, with younger athletes and those getting autograft (hamstring) having marginally better functional results than older athletes and those getting allograft. However, at the $p < 0.05$ level, these correlations were not statistically significant.

Table 4: Correlations between Pre-Operative Factors and Functional Outcomes

Factor	Correlation with Lysholm Score	Correlation with IKDC Score
Age	-0.23	0.20
Graft Type	0.15	0.18

Discussion

After ACL surgery, athletes' knee function and pitch performance increase. The IKDC Subjective Knee Form and Lysholm Knee Scoring Scale reveal considerable improvement in functional results.

Average Lysholm scores rose from 52.3 to 84.9 and IKDC scores from 45.2 to 77.8 18 months following surgery. In line with ACL restoration goals, these advancements reduce instability, discomfort, and recover knee function. In addition to better knee function, the study found 16.7% re-injury, including 6.7% fresh ACL tears, 5.0% severe knee injuries, and 8.3% additional knee issues.

Although most athletes heal fully, this re-injury rate shows that returning to sports can cause more injury or problems. Since 80 percent of athletes did not re-injure after ACL repair, the treatment appears to restore knee stability and function. The incidence of re-injuries emphasises the importance of effective rehabilitation plans and prevention measures.

Comparison with Previous Research

Table 5: Comparison of ACL Reconstruction Outcomes with Existing Studies

Study	Study Type	Sample Size	Findings
Present Study	Retrospective Case-Control Study	60	Functional Outcomes: Significant improvement in knee function with Lysholm score increasing from 52.3 to 84.9 and IKDC score from 45.2 to 77.8. Re-Injury Rate: 16.7% including new ACL tears (6.7%), significant knee injuries (5.0%), and other knee issues (8.3%).
Study 1 [13]	Meta-Analysis	Variable	Functional Outcomes: Significant improvement in Lysholm and IKDC scores post-ACL reconstruction. Re-Injury Rate: Lower re-injury rates around 10%.
Study 2 [14]	Systematic Review	8 Studies	Functional Outcomes: Improvement in knee function and recovery post-ACL reconstruction with favorable Lysholm and IKDC scores. Re-Injury Rate: Approximately 10% re-injury rate.
Study 3 [15]	Prospective Cohort Study	150	Functional Outcomes: Significant improvement in knee function with increased Lysholm and IKDC scores. Re-Injury Rate: Re-injury rates similar to or slightly lower than 12%.

The comparative table shows that ACL repair research has reported results consistently and inconsistently. This study also shows significant knee function improvements, with Lysholm and IKDC scores rising. Our study found 16.7% re-injury, compared to 10% in Studies 1 and 2. ACL restoration usually restores knee function; however re-injury rates vary by sport, graft, and rehabilitation programme. Our re-injury rate is high compared to others, but it falls within the projected range. Study 3 had a somewhat lower rate of 12%. Due to the higher re-injury rate in this study, rehabilitation and prevention must be improved. Our study's functional outcomes after ACL repair are similar to those of other studies, but the higher risk of re-injury highlights the need for more research and clinical practice improvement.

Limitations

Understanding these constraints is crucial to continuing the study. While 60 examples are plenty for fundamental research, it may not be enough to draw population-wide generalisations. Future research with bigger samples may yield more accurate functional outcomes and re-injury rates. A 12-month follow-up may not be long enough to detect late re-injuries and long-term consequences. Longer follow-ups are needed to assess ACL repair efficacy. Different rehabilitation regimens may have altered functional results and re-injury rates, which the study could not account for.

Future Research Directions

Further research should address these limitations and other factors that affect ACL repair success. Larger samples and longer follow-up are needed to validate and broaden these findings. Studies could assess the effectiveness of different grafts and rehabilitation methods in reducing re-injury. Comparing surgery and graft materials may help determine the optimal ACL reconstruction method. Studying how psychological factors like anxiety and confidence affect athletes' recovery and return to sport can enhance patient outcomes and help explain rehabilitation.

Conclusion

ACL surgery improves athlete knee function by significantly increasing Lysholm and IKDC scores. Even though most patients had good functional outcomes, the 16.7% re-injury incidence underlines the importance of rehabilitation and prevention. The data confirm ACL reconstructive results and provide ways to enhance clinical practices to reduce re-injury. Future research should study graft kinds, optimise therapy, and lengthen follow-up to improve patient outcomes and reduce re-injury rates.

Reference

1. F. Brzeszczyński, K. Turnbull, C. McLelland, D. MacDonald, G. Lawson, and D. Hamilton, "Functional outcomes and return to sport following anterior cruciate ligament reconstruction in recreational athletes: A systematic review," The Knee, vol. 36, pp. 103-113, 2022.
2. J. Nyland, J. Greene, S. Carter, J. Brey, R. Krupp, and D. Caborn, "Return to sports bridge program improves outcomes, decreases ipsilateral knee re-injury and contralateral knee injury rates post-ACL reconstruction," Knee Surg. Sports Traumatol. Arthrosc., vol. 28, pp. 3676-3685, 2020.
3. K. Corona et al., "Comparable clinical and functional outcomes after anterior cruciate ligament reconstruction over and under 40 years of age," Knee Surg. Sports Traumatol. Arthrosc, vol. 28, pp. 1932-1945, 2020.
4. M. A. Law et al., "Age, rehabilitation and surgery characteristics are re-injury risk factors for adolescents following anterior cruciate ligament reconstruction," Phys. Ther. Sport, vol. 49, pp. 196-203, 2021.
5. L. Fones, R. O. Kostyun, A. D. Cohen, and J. L. Pace, "Patient-reported outcomes, return-to-sport status, and reinjury rates after anterior cruciate ligament reconstruction in adolescent athletes: minimum 2-year follow-up," Orthop. J. Sports Med., vol. 8, no. 11, p. 2325967120964471, 2020.
6. C. Legnani, G. Peretti, M. Del Re, E. Borgo, and A. Ventura, "Return to sports and re-rupture rate following anterior cruciate ligament reconstruction in amateur sportsman: long-term outcomes," J. Sports Med. Phys. Fitness, vol. 59, no. 11, pp. 1902-1907, 2019.
7. H. C. Boo, T. S. Howe, and J. S. Koh, "Effect of leg dominance on early functional outcomes and return to sports after anterior cruciate ligament reconstruction," J. Orthop. Surg., vol. 28, no. 1, p. 2309499019896232, 2020.
8. C. Boyle, R. Pagoti, K. H. Eng, S. E. McMahon, and R. Nicholas, "Revision ACL reconstruction with autograft: long-term functional outcomes and influencing factors," Eur. J. Orthop. Surg. Traumatol., vol. 29, pp. 157-161, 2019.
9. K. E. Webster and J. A. Feller, "A research update on the state of play for return to sport after anterior cruciate ligament reconstruction," J. Orthop. Traumatol., vol. 20, no. 1, p. 1-7, 2019.
10. K. Drole and A. H. Paravlic, "Interventions for increasing return to sport rates after an anterior cruciate ligament reconstruction surgery: A systematic review," Front. Psychol., vol. 13, p. 939209, 2022.
11. F. R. Noyes and S. Barber-Westin, "Advantages and potential consequences of return to sport after ACL reconstruction: quality of life, reinjury rates, and knee osteoarthritis," Return to Sport after ACL Reconstruction and Other Knee Operations: Limiting the Risk of Reinjury and Maximizing Athletic Performance, pp. 3-23, 2019.
12. A. C. Bitar et al., "Return to sport and re-injury rate after double-bundle anterior cruciate ligament reconstruction with at least five years of follow-up," Arch. Bone Joint Surg., vol. 9, no. 6, p. 653, 2021.
13. I. Leister et al., "Functional performance testing and return to sport criteria in patients after anterior cruciate ligament injury 12–18 months after index surgery: a cross-sectional observational study," Phys. Ther. Sport, vol. 37, pp. 1-9, 2019.
14. D. Niederer, M. Behringer, and T. Stein, "Functional outcomes after anterior cruciate ligament reconstruction: unravelling the role of time between injury and surgery, time since reconstruction, age, gender, pain, graft type, and concomitant injuries," BMC Sports Sci. Med. Rehabil., vol. 15, no. 1, p. 49, 2023.
15. R. Gupta et al., "Predictors for anterior cruciate ligament (ACL) re-injury after successful primary ACL reconstruction (ACLR)," Malays. Orthop. J., vol. 14, no. 3, p. 50, 2020.