International Journal of Science and Research (IJSR)
ISSN: 2319-7064
Impact Factor 2024: 7.101

A Prospective Observational Study for the Assessment of Functional Outcome in Patients Undergoing Arthroscopic Anterior Cruciate Ligament Reconstruction with Concurrent Meniscus Repair Surgery

Dr. Devarsh Goyal[1], Dr. Vicky Kumar[2], Dr. Tej Pratap Khuteta[3], Dr. Harshit Kumar[4], Dr. R. P. Assat[5]

[1]Post Graduate Resident, Department of Orthopaedics, S.M.S. Medical College & Attached Hospitals, Jaipur, Rajasthan, India
Corresponding Author Email: *goyal.devarsh[at]gmail.com*

[2]Post Graduate Resident, Department of Orthopaedics, S.M.S. Medical College & Attached Hospitals, Jaipur, Rajasthan, India

[3]Post Graduate Resident, Department of Orthopaedics, S.M.S. Medical College & Attached Hospitals, Jaipur, Rajasthan, India

[4]Senior Resident, Department of Orthopaedics, S.M.S. Medical College & Attached Hospitals, Jaipur, Rajasthan, India

[5]Senior Professor & Unit Head, Department of Orthopaedics, S.M.S. Medical College & Attached Hospitals, Jaipur, Rajasthan, India

Abstract: ***Background**: Anterior cruciate ligament (ACL) injuries frequently coexist with meniscal tears, particularly in young and active individuals. Meniscal preservation during ACL reconstruction is increasingly favored due to its critical role in joint stability, load distribution, and long-term chondroprotection. This study evaluates the early functional and clinical outcomes following arthroscopic ACL reconstruction with concurrent meniscal repair. Aim: To assess the functional outcomes, knee stability, patient satisfaction, and return-to-activity rates following arthroscopic ACL reconstruction combined with meniscal repair. Materials and Methods: This hospital-based, prospective observational study included 40 patients undergoing arthroscopic ACL reconstruction with concomitant meniscal repair. Preoperative and postoperative assessments included Lachman and pivot-shift tests, WOMAC, Lysholm, Tegner, and IKDC scores recorded preoperatively, and at 3 months, and at 6 months. Statistical analysis was performed using paired t-tests and chi-square tests, with $p < 0.05$ considered significant. Results: Patients demonstrated significant improvement across all stability and functional parameters. Lachman and pivot-shift grades normalized in more than 85–90% of patients by 6 months ($p < 0.001$). Mean WOMAC scores improved from 55.30 ± 8.41 preoperatively to 12.88 ± 4.92 at 6 months ($p < 0.001$). Lysholm scores increased from 54.88 ± 6.39 to 93.13 ± 5.00, while IKDC scores improved from 48.23 ± 6.56 to 88.73 ± 5.36 ($p < 0.001$). Tegner activity levels rose from 2.98 ± 0.77 to 7.25 ± 1.03, reflecting substantial return to sports and physical activity. Patient satisfaction was high, with all patients satisfied at 3 months and 37.5% reporting complete satisfaction at 6 months. At final follow-up, 95% of patients had resumed pre-injury activity levels. Conclusion: Arthroscopic ACL reconstruction with concurrent meniscal repair provides excellent early clinical and functional outcomes. Significant improvements in stability, pain, activity level, and patient satisfaction were observed within 6 months. Meniscal preservation enhances knee biomechanics and facilitates rapid return to activity, making it a preferred approach in young, active individuals with repairable meniscal tears.***

Keywords: ACL reconstruction, meniscal repair, arthroscopy, knee stability, functional outcomes, Tegner score, IKDC, Lysholm score

1. Introduction

The knee joint is a complex, weight-bearing structure essential for locomotion and routine physical activity.[1] Its stability and functional integrity depend on multiple anatomical components, including the anterior cruciate ligament (ACL), posterior cruciate ligament (PCL), medial and lateral collateral ligaments (MCL, LCL), and the menisci.[2] Injuries to these stabilizing elements are common, particularly among individuals engaged in sports and high-demand physical activities, typically resulting from mechanisms such as twisting, pivoting, sudden deceleration, or direct impact trauma.[3] Among these, combined ACL and meniscal injuries constitute a significant subset, presenting diagnostic and therapeutic challenges, that demand a careful clinical judgement.[4]

The coexistence of ACL tears and meniscal injuries has been well established, with reported rates ranging from 41% to 81% depending on demographic and temporal factors.[5] Within this spectrum, meniscal root tears and ramp lesions are gaining recognition for their biomechanical importance, especially in ACL-deficient knees.[6] These patterns are often missed during initial assessment due to subtle imaging characteristics, in contrast to more overt injuries like bucket-handle or radial tears.[7] Although Magnetic Resonance Imaging (MRI) is widely utilized as a non-invasive diagnostic modality, its sensitivity for ramp and root lesions remains limited, necessitating arthroscopic evaluation as the diagnostic gold standard.[8]

Meniscal root tears may be present in up to 17% of ACL-injured patients, while ramp lesions can be found in as many as 41% of ACL-deficient knees, particularly following contact trauma.[9] Furthermore, over 60% of radial tears and a substantial proportion of bucket-handle tears are associated with chronic ACL injuries.[10] These lesions significantly compromise joint stability and predispose the knee to

degenerative changes, including early osteoarthritis, when left untreated.[11]

Overlapping symptoms and lack of definitive signs often complicate clinical diagnosis. While physical examination findings such as a Grade 3+ Lachman or pivot-shift test suggest significant laxity, they cannot reliably identify root or ramp lesions.[12] Diagnostic arthroscopy remains essential for accurate assessment and simultaneous repair.[13] In routine practice, MRI continues to play a role in preoperative evaluation; however, its diagnostic accuracy remains operator-dependent and variable across imaging systems and radiologists.[14] These limitations underscore the importance of thorough intraoperative inspection during ACL reconstruction.[15]

The biomechanical interaction between the ACL and the menisci is well documented. The menisci- particularly the posterior horn of the medial meniscus- act as secondary stabilizers of the knee.[16] Untreated meniscal lesions can lead to continued instability, graft overloading, and progressive cartilage degeneration.[17] Consequently, concurrent meniscal repair during ACL reconstruction has become the preferred approach, offering anatomical restoration, stabilization, and improved long-term outcomes.[18]

Despite increasing global evidence supporting combined surgical management, there remains a scarcity of prospective clinical data evaluating functional outcomes following arthroscopic ACL reconstruction with concurrent meniscal repair in the Indian population. This gap limits the ability to establish region-specific treatment benchmarks and postoperative rehabilitation protocols. Addressing this deficiency requires robust clinical evidence using standardized assessment tools to evaluate postoperative function and patient satisfaction.

The present study aims to evaluate functional outcomes following arthroscopic ACL reconstruction with concurrent meniscal repair using validated functional scoring systems and objective stability tests. It seeks to determine the extent of postoperative recovery at three- and six-month intervals and to generate clinically relevant data that may help guide future surgical and rehabilitative strategies in patients with complex ACL–meniscal injuries.

2. Materials and Methods

Study Design and Ethical Approval

This hospital-based, prospective, observational study was conducted in the Department of Orthopaedics, S.M.S. Medical College and Attached Hospitals, Jaipur. The objective was to evaluate functional outcomes following arthroscopic anterior cruciate ligament (ACL) reconstruction with concurrent meniscal repair. Approval was obtained from the Institutional Ethics Committee (IEC/461/MC/EC/2023, dated 02 February 2024), and written informed consent was taken from all participants.

Study Duration and Setting

The study was carried out over twelve months (January–December 2024). All patients presenting with ACL tears associated with meniscal injuries during this period were screened and enrolled. Follow-ups were conducted at standard postoperative intervals.

Study Population and Sample Size

A total of 40 patients with clinically and radiologically confirmed ACL rupture and associated meniscal tear were included. All underwent the same operative and rehabilitation protocol. As an observational study, no randomization or grouping was performed.

Eligibility Criteria

Inclusion criteria were age 15–50 years, ACL tear with repairable meniscal injury, and willingness to participate. Exclusion criteria included fractures, collateral or multi-ligament injuries, significant osteoarthritis (Kellgren–Lawrence Grade III–IV), prior knee surgery, active infection, or medical contraindications for anesthesia. These criteria ensured a homogenous population with isolated ACL–meniscus injuries.

Preoperative Assessment and Data Collection

Data were recorded using a structured proforma documenting demographics, injury mechanism, and symptoms. Clinical knee stability was assessed using the Lachman and pivot-shift tests. Standard radiographs ruled out fractures, and MRI confirmed ACL rupture and characterized meniscal tear morphology. Routine blood tests, ECG, and other investigations were obtained as needed for operative fitness.

Surgical Technique

All surgeries were performed arthroscopically under spinal or general anesthesia. After diagnostic arthroscopy, the semitendinosus–gracilis hamstring graft was harvested and prepared as a quadrupled construct. Anatomical femoral and tibial tunnels were created, and the graft was fixed with interference screws or cortical suspensory devices. Meniscal tears were repaired using all-inside, inside-out, or outside-in techniques based on tear pattern and zone. Procedures were completed by experienced arthroscopy surgeons to maintain uniformity.

Postoperative Management and Follow-Up

A standardized rehabilitation protocol was followed, initiating early mobilization and quadriceps strengthening from day one. Flexion was progressed gradually, with partial weight-bearing from 2–3 weeks and full weight-bearing at 6–8 weeks depending on tear stability. Patients were reviewed at 3 and 6 months. Clinical stability was reassessed, and functional outcomes measured using WOMAC, Lysholm, Tegner, and IKDC scores. Patient satisfaction was rated on a 0–10 numerical scale. Complications such as stiffness, infection, or re-injury were documented.

Outcome Measures

Primary outcomes included knee stability and functional improvement. Secondary outcomes were patient satisfaction and postoperative complications, providing a comprehensive overview of recovery following ACL reconstruction with meniscal repair.

Statistical Analysis

Data were analyzed using Microsoft Excel. Continuous variables were summarized as mean ± standard deviation, and

categorical data as frequencies and percentages. Pre- and postoperative comparisons were performed using paired statistical tests, with $p < 0.05$ considered statistically significant.

3. Results

Baseline Patient Characteristics

A total of 40 patients undergoing arthroscopic ACL reconstruction with concomitant meniscus repair were included in the study. The majority of participants were young adults, with a mean age concentrated in the 26–30 years age group (37.5%). Males predominated the sample (75%), reflecting the known epidemiological pattern of ACL injuries. Sports-related trauma accounted for half of all injuries (50%), followed by road traffic accidents (37.5%). Left-side knee involvement was more frequent (62.5%) than right. Baseline demographic characteristics, including age distribution, gender, mode of injury, and laterality, were uniform and representative of typical ACL–meniscal injury patterns.

Table 1: Baseline Demographic Characteristics of Study Participants (n = 40)

Variable	Category	Number (%)
Age Group (years)	15–20	5 (12.5%)
	21–25	10 (25.0%)
	26–30	15 (37.5%)
	31–40	6 (15.0%)
	41–50	4 (10.0%)
Gender	Male	30 (75.0%)
	Female	10 (25.0%)
Mode of Injury	Sports	20 (50.0%)
	Road traffic accident	15 (37.5%)
	Domestic fall	3 (7.5%)
	Others	2 (5.0%)
Laterality	Right knee	15 (37.5%)
	Left knee	25 (62.5%)

The above demographic distribution demonstrates that ACL and associated meniscal injuries primarily affect physically active young males, consistent with global epidemiological data.

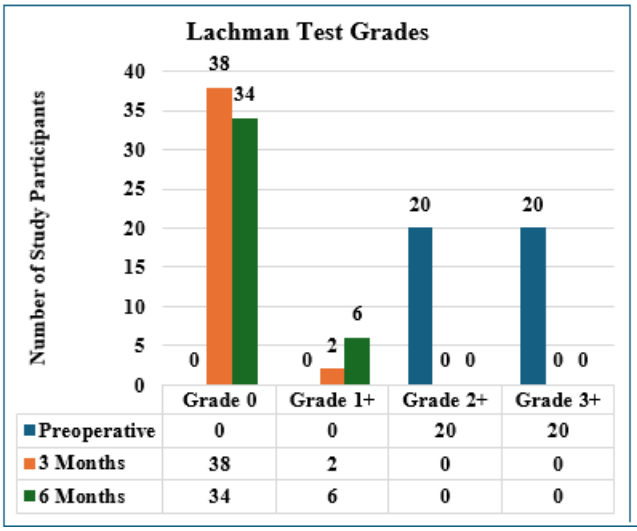
Clinical Knee Stability Outcomes

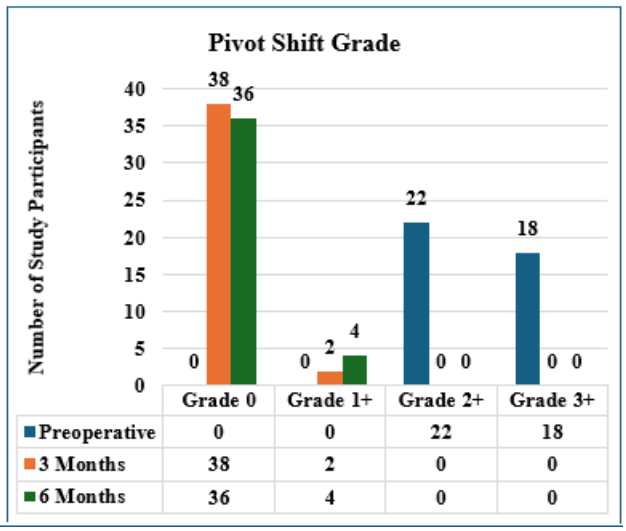
Preoperatively, all patients had significant anterior and rotational instability, with all Lachman and Pivot shift grades documented as either Grade 2+ or Grade 3+. A marked improvement was observed postoperatively. By the 3-month follow-up, 95% had Grade 0 stability on both tests, and by 6 months, all patients demonstrated stability grades of 0 or 1+.

Table 2: Clinical Stability Outcomes (Lachman and Pivot Shift Tests) at Preoperative, 3-Month, and 6-Month Follow-Up

Test	Grade	Pre-op	3 Months	6 Months
Lachman	Grade 0	0	38	34
	Grade 1+	0	2	6
	Grade 2+	20	0	0
	Grade 3+	20	0	0
Pivot Shift	Grade 0	0	38	36
	Grade 1+	0	2	4
	Grade 2+	22	0	0
	Grade 3+	18	0	0

There was a statistically significant improvement in both Lachman ($p = 0.002$) and Pivot shift grades ($p < 0.001$), confirming effective restoration of anterior and rotational stability following surgery.





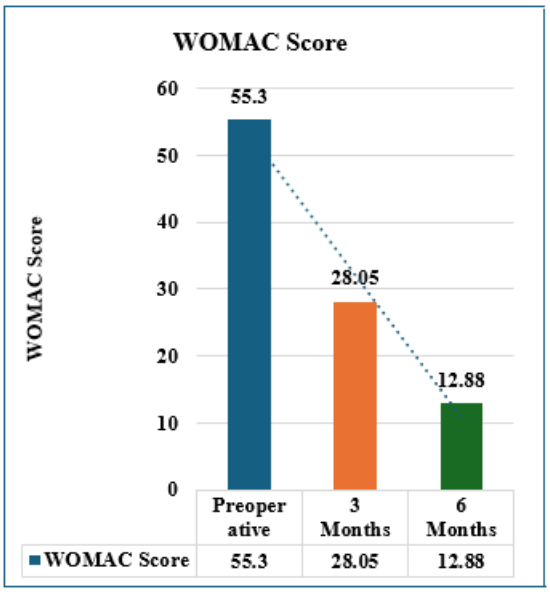
Functional Outcome Scores

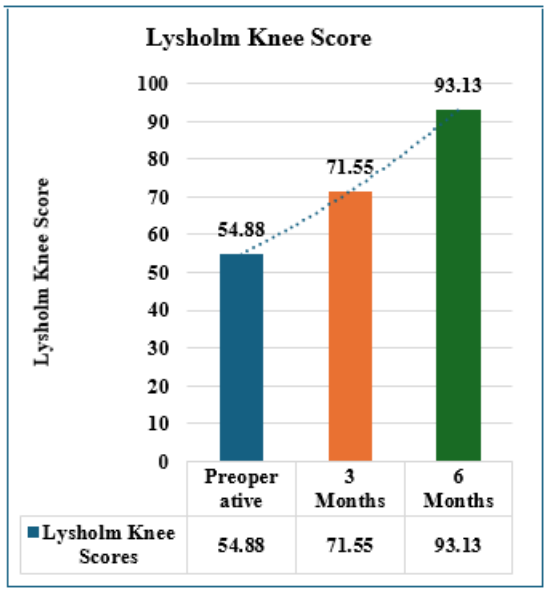
Functional recovery was assessed using WOMAC, Lysholm Knee Score, Tegner Activity Scale, and IKDC Subjective Knee Evaluation. All four scoring systems demonstrated progressive and statistically significant improvement from preoperative values to 3 months and further to 6 months postoperatively.

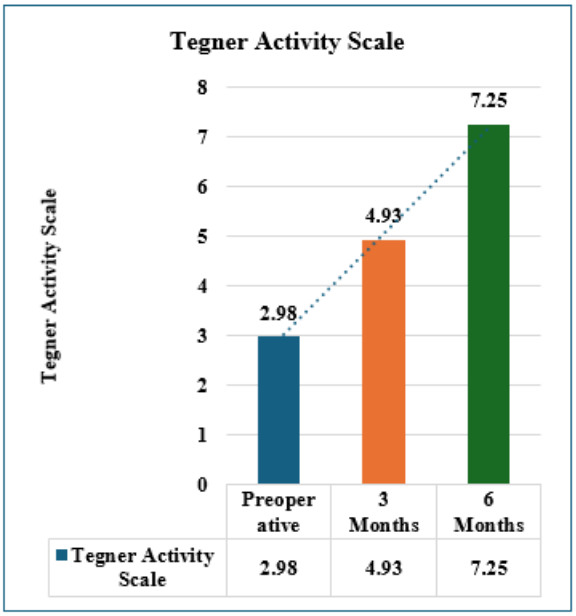
Table 3: Functional Outcome Scores at Preoperative, 3-Month, and 6-Month Follow-Up

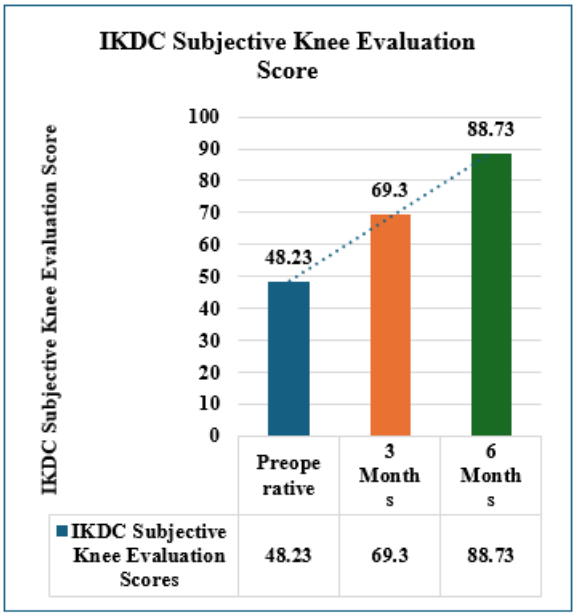
Score	Pre-op (Mean ± SD)	3 Months (Mean ± SD)	6 Months (Mean ± SD)
WOMAC	55.30 ± 8.41	28.05 ± 4.99	12.88 ± 4.92
Lysholm	54.88 ± 6.39	71.55 ± 4.83	93.13 ± 5.00
Tegner	2.98 ± 0.77	4.93 ± 0.76	7.25 ± 1.03
IKDC	48.23 ± 6.56	69.30 ± 5.72	88.73 ± 5.36

All improvements in functional scores from preoperative to 6 months were statistically significant ($p < 0.001$), indicating substantial gains in pain relief, mobility, and knee function.









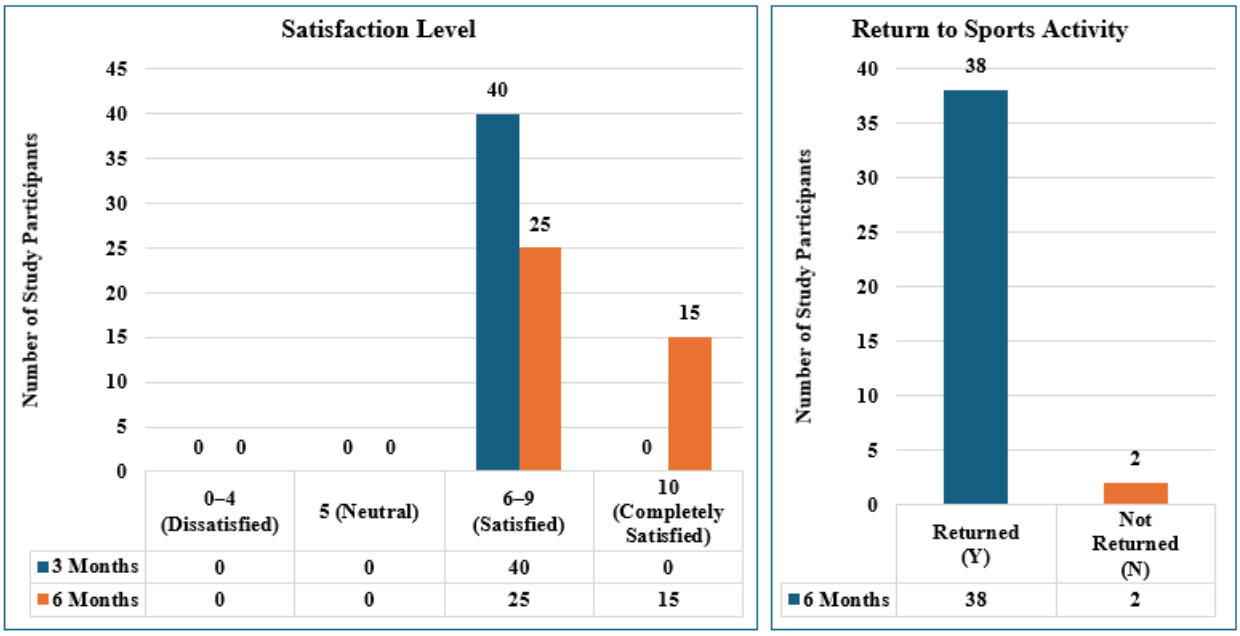
Patient Satisfaction

Patient satisfaction was assessed using a numerical rating scale at 3 and 6 months. At 3 months, all patients reported being satisfied (scores 6–9). At 6 months, 37.5% achieved complete satisfaction (score = 10).

Table 4: Patient Satisfaction Scores at 3-Month and 6-Month Follow-Up

Satisfaction Level	3 Months	6 Months
0–4 (Dissatisfied)	0	0
5 (Neutral)	0	0
6–9 (Satisfied)	40	25
10 (Completely Satisfied)	0	15
Mean ± SD	7.73 ± 1.18	9.15 ± 0.77

Satisfaction levels correlated strongly with improvements in functional and stability outcomes, reflecting the overall success of the intervention.



Return to Sports and Physical Activity

All patients returned to routine daily activities by 3 months. By 6 months, 95% resumed sports and high-demand activities, representing excellent rehabilitation progression.

Table 5: Return to Sports Activity at 6 Months

Status	Number (%)
Returned to sports	38 (95.0%)
Not returned	2 (5.0%)
Total	40

Statistical Analysis of Improvements

Comparison of preoperative and final 6-month scores for all functional and clinical stability parameters revealed a high level of statistical significance ($p < 0.001$).

Table 6: Statistical Comparison of Key Clinical and Functional Parameters (Pre-op vs 6 Months)

Parameter	Pre-op Mean	6M Mean	p-value
Lachman (Grade 2+/3+ → 0/1+)	40	0	0.002
Pivot Shift (Grade 2+/3+ → 0/1+)	40	0	<0.001
WOMAC	55.30	12.88	<0.001
Lysholm	54.88	93.13	<0.001
Tegner	2.98	7.25	<0.001
IKDC	48.23	88.73	<0.001

These findings confirm that arthroscopic ACL reconstruction combined with meniscus repair results in clinically meaningful, statistically significant improvements in knee stability, function, and patient-reported outcomes within six months.

4. Discussion

In this study of 40 patients undergoing arthroscopic ACL reconstruction with concomitant meniscal repair, the majority belonged to the 26–30-year age group, consistent with previous reports by Pathak et al.[19], Bhardwaj et al.[20], Melton et al.[21], Phillips et al.[22], Yang et al.[23] and DePhillipo et al.[24], all of whom documented peak incidence of combined ACL–meniscal injuries in the third decade of life. A clear male predominance (75%) was observed, similar to findings by Westermann et al.[25], Melton et al.[21], Phillips et al.[22], Pathak et al.[19], Bhardwaj et al.[20] and DePhillipo et al.[24]. This trend likely reflects higher participation of males in contact sports and high-risk physical activities.

Sports injuries were the most common cause of ACL–meniscal trauma (50%), followed by RTAs (37.5%), a pattern consistent with DePhillipo et al.[24], Rodriguez et al.[26], Westermann et al.[25], Yang et al.[23], Pathak et al.[19] and Bhardwaj et al.[20]. Left knee involvement (62.5%) mirrored distributions reported by Pathak et al.[19] and Yang et al.[23], although literature does not consistently show a strong laterality bias.

There was significant postoperative improvement in anterior knee stability, with Lachman grades improving from exclusively Grade 2+/3+ preoperatively to 85% Grade 0 and 15% Grade 1+ at 6 months ($p = 0.002$). Similar improvements have been reported by DePhillipo et al.[24], Sarraj et al.[27], Yang et al.[23], Melton et al.[21] and Pathak et al.[19]. Pivot shift grades also showed marked improvement, resolving all Grade 2+/3+ instability by 6 months ($p < 0.001$), consistent with the outcomes described by DePhillipo et al.[24], Sarraj et al.[27], Yang et al.[23] and Bhardwaj et al.[20]. These findings reaffirm the biomechanical importance of meniscal preservation in restoring both anterior and rotational stability.

Functional outcomes demonstrated substantial improvement across all validated scoring systems. WOMAC scores improved significantly from 55.30 to 12.88, aligning with findings by Pathak et al.[19], Sarraj et al.[27] and Seo et al.[28]. Lysholm scores increased from 54.88 to 93.13, consistent with postoperative improvements documented by Melton et al.[21], Pathak et al.[19], Bhardwaj et al.[20], Yang et al.[23] and Seo et al.[28]. Tegner activity scores rose from 2.98 to 7.25, comparable to the recovery described by Pathak et al.[19], Melton et al.[21], Westermann et al.[25], DePhillipo et al.[24] and Phillips et al.[22]. IKDC scores improved from 48.23 to 88.73, mirroring the findings of Melton et al.[21], Yang et al.[23], Pathak et al.[19], Seo et al.[28] and Bhardwaj et al.[20]. These consistently significant improvements (all $p < 0.001$) highlight the

effectiveness of combined ACL reconstruction and meniscal repair in restoring knee function.

Patient satisfaction was uniformly high, increasing from a mean of 7.73 at 3 months to 9.15 at 6 months, consistent with reports by DePhillipo et al.[24], Pathak et al.[19], Bhardwaj et al.[20], Seo et al.[28], Melton et al.[21] and Yang et al.[23]. Return to activity was achieved in 95% of patients by 6 months, a rate comparable to that reported in the studies by Westermann et al.[25], Melton et al.[21], Pathak et al.[19], Bhardwaj et al.[20], DePhillipo et al.[24] and Seo et al.[28].

Overall, the findings of this study align closely with global evidence demonstrating that meniscal preservation during ACL reconstruction enhances knee stability, functional recovery and patient satisfaction. Differences among studies may be attributed to variations in tear morphology, surgical technique, rehabilitation protocols and population characteristics. Nonetheless, the consistent improvement across all parameters reinforces the reliability and clinical value of combined ACL and meniscal repair.

5. Clinical Implications

The findings of this study demonstrate that arthroscopic ACL reconstruction combined with meniscal repair provides excellent restoration of knee stability, function, and activity levels within six months. Significant improvements in Lachman and pivot-shift grades, alongside marked gains in WOMAC, Lysholm, Tegner, and IKDC scores, confirm that meniscal preservation offers substantial biomechanical and functional advantages over meniscectomy. Early repair supports rotational stability and reduces the risk of secondary cartilage damage, thereby promoting a more physiologic joint environment.

Given the strong functional recovery and high satisfaction rates, our study supports early surgical intervention with concurrent meniscal repair in young, active individuals. The procedure is especially beneficial in sports-related injuries where restoring pre-injury performance is a priority. Routine meniscal preservation should be encouraged when repairable tissue is present, while meniscectomy should be reserved for irreparable tears. Adoption of standardized rehabilitation protocols further enhances outcomes and facilitates early return to activity.

6. Limitations and Future Directions

This study is limited by its single-center design and modest sample size (n = 40). The follow-up period of six months, although adequate to evaluate early outcomes, may not reveal long-term complications such as repair failure, degenerative changes, or late instability. Tear morphology, chronicity of injury, tunnel positioning parameters, graft selection, and rehabilitation adherence were not stratified, a factor that may have influenced outcomes. The study did not incorporate objective tools such as KT-1000 or MRI-based healing assessments.

Future research should include larger multicenter cohorts with extended follow-up of at least 24–36 months to evaluate durability of repair, re-tear rates, and progression toward osteoarthritis. Studies comparing different repair techniques (all-inside vs inside-out), graft types, biological augmentation, and early vs delayed repair may further optimize treatment strategies. Randomized controlled trials and cost-effectiveness analyses would contribute valuable evidence to guide clinical decision-making and resource allocation.

7. Conclusion

The present study demonstrates that arthroscopic ACL reconstruction with concomitant meniscal repair leads to significant improvements in knee stability, function, pain, and activity levels within six months. All patients achieved substantial restoration of anterior and rotational stability, with excellent progress in WOMAC, Lysholm, Tegner, and IKDC scores. Patient satisfaction and return-to-activity rates were remarkably high, reflecting the effectiveness of the combined surgical approach. Preserving the meniscus demonstrably enhances functional outcomes and should be prioritized whenever anatomically feasible, given its critical role in knee biomechanics and long-term joint health. While short-term results are highly favourable, longer follow-up is necessary to assess repair durability and long-term chondroprotection. Overall, ACL reconstruction with meniscal repair remains a reliable and effective intervention for restoring knee function and enabling early return to daily and sports activities in young, active individuals.

Conflict of Interest: The authors declare that they have no conflicts of interest related to this study.

Source of Funding: This study was conducted as part of the academic requirements at S.M.S. Medical College & Attached Hospitals, Jaipur. No external funding was received for this research.

References

[1] Zhang L, Liu G, Han B, Wang Z, Yan Y, Ma J, Wei P. Knee Joint Biomechanics in Physiological Conditions and How Pathologies Can Affect It: A Systematic Review. Appl Bionics Biomech. 2020 Apr 3; 2020: 7451683.

[2] It is composed of multiple anatomical elements, among which the anterior cruciate ligament (ACL), posterior cruciate ligament (PCL), medial collateral ligament (MCL), lateral collateral ligament (LCL) and menisci play pivotal roles in maintaining joint stability, proprioception, and shock absorption.

[3] Evans J, Mabrouk A, Nielson Jl. Anterior Cruciate Ligament Knee Injury. [Updated 2023 Nov 17]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK499848/

[4] Beynnon BD, Fiorentino N, Gardner-Morse M, Tourville TW, Slauterbeck JR, Sturnick DR, Argentieri EC, Imhauser CW. Combined Injury to the ACL and Lateral Meniscus Alters the Geometry of Articular Cartilage and Meniscus Soon After Initial Trauma. J Orthop Res. 2020 Apr;38(4):759-767.

[5] Keyhani S, Esmailiejah AA, Mirhoseini MS, Hosseininejad SM, Ghanbari N. The Prevalence, Zone,

and Type of the Meniscus Tear in Patients with Anterior Cruciate Ligament (ACL) Injury; Does Delayed ACL Reconstruction Affects the Meniscal Injury? Arch Bone Jt Surg. 2020 May;8(3):432-438.

[6] Bae BS, Yoo S, Lee SH. Ramp lesion in anterior cruciate ligament injury: a review of the anatomy, biomechanics, epidemiology, and diagnosis. Knee Surg Relat Res. 2023 Aug 25;35(1):23.

[7] Simonetta R, Russo A, Palco M, Costa GG, Mariani PP. Meniscus tears treatment: The good, the bad and the ugly-patterns classification and practical guide. World J Orthop. 2023 Apr 18;14(4):171-185.

[8] Khalid D, Iqbal J, Mustafa K, Altaf R, Fatima R. Diagnostic Accuracy of Magnetic Resonance Imaging in the Detection of Meniscal Injury in Patients with Knee Trauma: Keeping Arthroscopy as a Gold Standard. Cureus. 2024 Oct 24;16(10): e72343.

[9] Chahla J, Dean CS, Moatshe G, Mitchell JJ, Cram TR, Yacuzzi C, LaPrade RF. Meniscal Ramp Lesions: Anatomy, Incidence, Diagnosis, and Treatment. Orthop J Sports Med. 2016 Jul 26;4(7):2325967116657815.

[10] Feucht MJ, Bigdon S, Bode G, Salzmann GM, Dovi-Akue D, Südkamp NP, Niemeyer P. Associated tears of the lateral meniscus in anterior cruciate ligament injuries: risk factors for different tear patterns. J Orthop Surg Res. 2015 Mar 18; 10: 34.

[11] Anderson DD, Chubinskaya S, Guilak F, Martin JA, Oegema TR, Olson SA, Buckwalter JA. Post-traumatic osteoarthritis: improved understanding and opportunities for early intervention. J Orthop Res. 2011 Jun;29(6):802-9.

[12] Jain DK, Amaravati R, Sharma G. Evaluation of the clinical signs of anterior cruciate ligament and meniscal injuries. Indian J Orthop. 2009 Oct;43(4):375-8.

[13] Crimmins IM, Mulcahey MK, O'Brien MJ. Diagnostic Shoulder Arthroscopy: Surgical Technique. Arthrosc Tech. 2019 Apr 11;8(5): e443-e449.

[14] Zappia M, Sconfienza LM, Guarino S, Tumminello M, Iannella G, Mariani PP. Meniscal ramp lesions: diagnostic performance of MRI with arthroscopy as reference standard. Radiol Med. 2021 Aug;126(8):1106-1116.

[15] Trentacosta N, Fillar AL, Liefeld CP, Hossack MD, Levy IM. Avoiding Complications and Technical Variability During Arthroscopically Assisted Transtibial ACL Reconstructions by Using a C-Arm with Image Intensifier. Orthop J Sports Med. 2014 Apr 25;2(4):2325967114530075.

[16] Mameri ES, Dasari SP, Fortier LM, Verdejo FG, Gursoy S, Yanke AB, Chahla J. Review of Meniscus Anatomy and Biomechanics. Curr Rev Musculoskelet Med. 2022 Oct;15(5):323-335.

[17] Samitier G, Marcano AI, Alentorn-Geli E, Cugat R, Farmer KW, Moser MW. Failure of Anterior Cruciate Ligament Reconstruction. Arch Bone Jt Surg. 2015 Oct;3(4):220-40.

[18] Rodríguez-Roiz JM, Sastre-Solsona S, Popescu D, Montañana-Burillo J, Combalia-Aleu A. The relationship between ACL reconstruction and meniscal repair: quality of life, sports return, and meniscal failure rate-2- to 12-year follow-up. J Orthop Surg Res. 2020 Aug 27;15(1):361.

[19] Pathak S, Bharadwaj A, Patil P, Raut S, Rv S. Functional Outcomes of Arthroscopic Combined Anterior Cruciate Ligament Reconstruction and Meniscal Repair: A Retrospective Analysis. Arthrosc Sports Med Rehabil. 2020; 2(2): e71–e76.

[20] Bhardwaj SH, Aware S, Pangavane S, Apte A, Maniar A, Fuse A. The Functional Outcome of Simultaneous Anterior Cruciate Ligament Reconstruction with Meniscus Repair. MVP J Med Sci. 2021:99–104.

[21] Melton JT, Murray JR, Karim A, Pandit H, Wandless F, Thomas NP. Meniscal repair in anterior cruciate ligament reconstruction: a long-term outcome study. Knee Surg Sports Traumatol Arthrosc. 2011; 19: 1729–1734.

[22] Phillips M, Rönnblad E, Lopez-Rengstig L, Svantesson E, Stålman A, Eriksson K, Ayeni OR, Samuelsson K. Meniscus repair with simultaneous ACL reconstruction demonstrated similar clinical outcomes as isolated ACL repair. Knee Surg Sports Traumatol Arthrosc. 2018;26(8):2270–2277.

[23] Yang YP, Ma X, An H, Liu XP, An N, Ao YF. Meniscus repair with simultaneous anterior cruciate ligament reconstruction: clinical outcomes, failure rates and subsequent processing. Chin J Traumatol. 2022;25(1):37–44.

[24] DePhillipo NN, Dornan GJ, Dekker TJ, Aman ZS, Engebretsen L, LaPrade RF. Clinical Characteristics and Outcomes After Primary ACL Reconstruction and Meniscus Ramp Repair. Orthop J Sports Med. 2020;8(4):2325967120912427.

[25] Westermann RW, Wright RW, Spindler KP, Huston LJ, MOON Knee Group, Wolf BR. Meniscal repair with concurrent anterior cruciate ligament reconstruction: operative success and patient outcomes at 6-year follow-up. Am J Sports Med. 2014;42(9):2184–2192.

[26] Rodriguez AN, LaPrade RF, Geeslin AG. Combined Meniscus Repair and Anterior Cruciate Ligament Reconstruction. Arthroscopy. 2022;38(3):670–672.

[27] Sarraj M, Coughlin RP, Solow M, Ekhtiari S, Simunovic N, Krych AJ, MacDonald P, Ayeni OR. ACL reconstruction with concomitant meniscal surgery: a systematic review and meta-analysis. Knee Surg Sports Traumatol Arthrosc. 2019;27(11):3441–3452.

[28] Seo SS, Kim CW, Lee CR, Park DH, Kwon YU, Kim OG, Kim CK. Second-look arthroscopic findings and clinical outcomes of meniscal repair with concomitant ACL reconstruction. Arch Orthop Trauma Surg. 2020; 140: 365–372.