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Functional Outcomes Following ACL Reconstruction: A Comparison Between Isolated ACLR and Combined ACLR–LET Procedures

Dr Nitin Ghule[1], Dr Swapnil Sonar[2], Dr Sandesh Gite[3], Dr Rutuja Pundkar[4], Dr Akshay Patil[5]

[1]Associate Professor, [3]Assistant Professor, [5]Senior Resident. Department of Orthopedics, Dr. Balasaheb Vikhe Patil Rural Medical College, Pravara Institute Of Medical Sciences (Du), Loni, Maharashtra, India
[2]Assistant professor, Department of Orthopedics, DY Patil University, School of Medicine, Ambi, Pune
[3]Professor and Head, Department of Community Medicine, DY Patil University, School of Medicine, Ambi, Pune

Corresponding author
Dr Sandesh Gite

ABSTRACT

ACL injuries cause significant knee instability in young, active individuals. While arthroscopic ACL reconstruction is effective, many patients retain rotational instability. Adding lateral extra-articular tenodesis (LET) may improve stability and reduce graft failure, especially in high-risk athletes. This study compares functional outcomes between isolated ACL reconstruction and ACL reconstruction with LET. Aim: To compare the functional outcomes of patients undergoing arthroscopic anterior cruciate ligament (ACL) reconstruction combined with lateral extra-articular tenodesis (LET) versus those undergoing isolated arthroscopic ACL reconstruction in the treatment of ACL injury. Material and methods: A comparative 18-month study on 40 ACL-injury patients assessed clinical and functional outcomes of isolated ACL reconstruction versus combined ACL reconstruction with lateral extra-articular tenodesis. Results: The findings indicate that although operative time was higher in the ACLR + LET group, postoperative complications—including superficial infection, stiffness, and graft failure—were low and similar in both groups. Return-to-sport results clearly favored Group A, with 75% achieving pre-injury performance compared to 50% in Group B. Knee stability was also better in the combined procedure group, especially evident by a significantly higher rate of negative pivot-shift tests, reflecting superior rotational control. Knee Society Scores were consistently higher in Group A at 6, 12, and 18 months, demonstrating enhanced functional recovery. Pain levels decreased in both groups, but Group A reported slightly lower VAS scores at 1 week and 1 month, suggesting improved early postoperative comfort. Overall, the results show that incorporating LET into ACL reconstruction enhances stability, function, and return-to-sport outcomes without increasing complication rates. Conclusion: ACLR combined with LET showed better functional outcomes, improved rotational stability, and higher return-to-sport rates than isolated ACL reconstruction. Both groups recovered well, but the LET group had slightly better range of motion, less pain, and no added complications. LET appears safe and beneficial for patients with high rotational instability.

KEYWORDS: ACL Reconstruction, Lateral Extra-Articular Tenodesis (LET), Functional Outcomes.

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INTRODUCTION

The anterior cruciate ligament (ACL) is a key stabilizer of the knee, essential for controlling anteroposterior and rotational movements. ACL injuries, especially complete tears, are common in young, active individuals involved in pivoting sports and can lead to instability, meniscal damage, and early osteoarthritis.[1] Arthroscopic ACL reconstruction remains the gold standard, restoring anterior stability and enabling return to sport. However, up to 25% of patients continue to experience residual rotational instability, increasing the risk of graft failure and further injury.[2]

To address this, lateral extra-articular tenodesis (LET) has re-emerged as a valuable adjunct procedure. Recent randomized controlled trials and cohort studies suggest that adding LET to ACL reconstruction improves rotational control, decreases graft elongation, and reduces failure rates, particularly in high-risk groups such as young athletes, those with high-grade pivot shift, generalized laxity, or undergoing revision surgery. [3]While findings regarding subjective functional outcomes vary, many studies report improved stability and confidence with combined procedures.[4]

This study aims to compare functional outcomes between isolated ACL reconstruction and ACL reconstruction with LET, helping determine whether the combined approach offers measurable benefits and identifying patient groups most likely to benefit from this evolving surgical strategy.

AIM

To compare the functional outcomes of patients undergoing arthroscopic anterior cruciate ligament (ACL) reconstruction combined with lateral extra-articular tenodesis (LET) versus those undergoing isolated arthroscopic ACL reconstruction in the treatment of ACL injury.

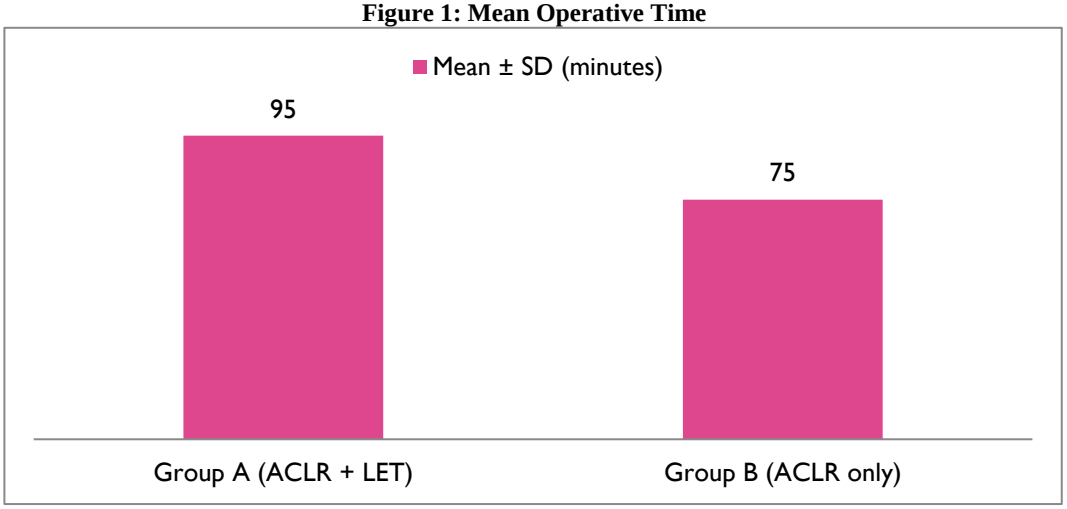
MATERIAL AND METHODS

This comparative longitudinal study was conducted in the Orthopaedics Department of Pravara Rural Hospital over 18 months, including 40 purposively sampled patients with ACL injuries confirmed clinically and radiologically. Eligible adults (>18 years) with positive Lachman/Anterior drawer tests and MRI-proven ACL tears were included, while those with prior ACLR, realignment osteotomy, or multi-ligament injuries were excluded. All patients underwent detailed preoperative evaluation using IKDC, Lysholm, and Tegner scores. Group A received arthroscopic ACL reconstruction with LET (Modified Lemaire), and Group B underwent isolated ACL reconstruction. Standard graft harvesting, tunnel creation, graft fixation, and LET steps were performed following established surgical protocols.

RESULTS

The study findings show that operative time was longer in the ACLR + LET group, though postoperative complications such as superficial infection, stiffness, and graft failure were low and comparable between groups. Return-to-sport outcomes favored Group A, with 75% regaining pre-injury sports levels versus 50% in Group B. Knee stability was superior in the combined procedure group, particularly in pivot-shift negativity, indicating enhanced rotational control. Functional outcomes measured by Knee Society Scores consistently showed significantly higher values in Group A at 6, 12, and 18 months. Pain scores (VAS) decreased in both groups, with Group A experiencing slightly lower pain at 1 week and 1 month, reflecting better early postoperative comfort. Overall, the tables collectively highlight that adding LET to ACL reconstruction provides better stability, functional recovery, and return-to-sport rates without increasing complications.

Figure 1: Mean Operative Time



The mean operative time was longer in Group A (ACLR + LET) at 95 ± 12 minutes compared to 75 ± 10 minutes in Group B (ACLR only).

Table 1: Postoperative Complications

Complications	Group A (n=20)	Group B (n=20)	p-value
Superficial infection	1 (5%)	2 (10%)	0.55
Knee stiffness	2 (10%)	3 (15%)	0.63
Graft failure	1 (5%)	2 (10%)	0.55

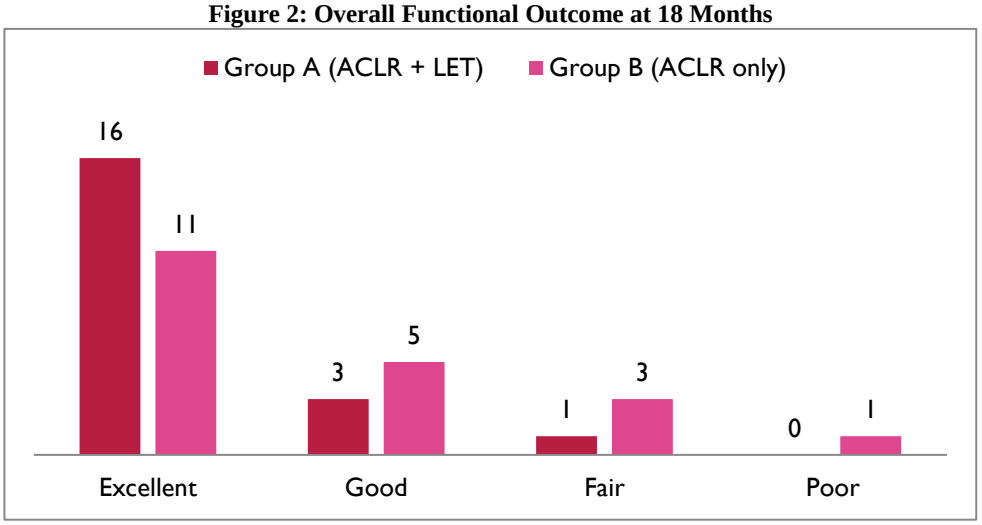
Postoperative complications were infrequent in both groups, with superficial infection occurring in 5% of Group A and 10% of Group B, knee stiffness in 10% and 15%, and graft failure in 5% and 10%, respectively.

Table 2: Return to Sports Level at 12 Months

Level of Return	Group A (n=20)	Group B (n=20)
Pre-injury sports level	15 (75%)	10 (50%)
Lower activity sports level	4 (20%)	7 (35%)
No return	1 (5%)	3 (15%)

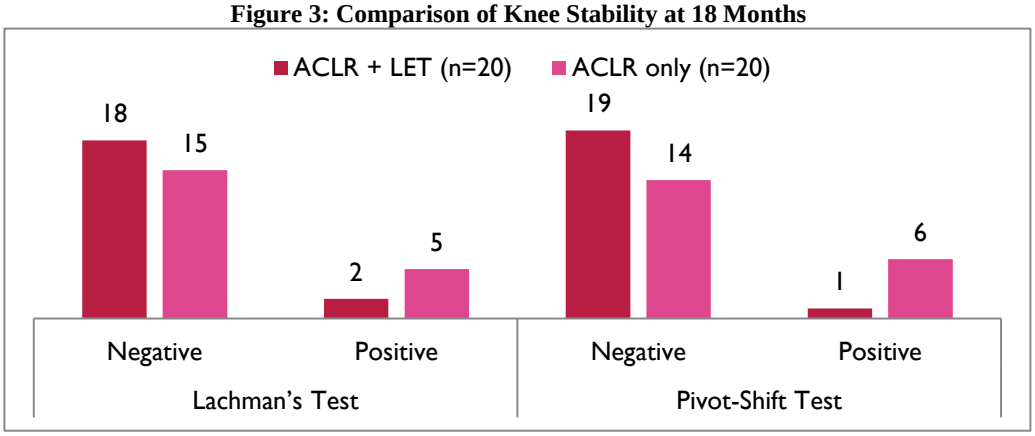
At 12 months postoperatively, 75% of patients in Group A (ACLR + LET) returned to their pre-injury sports level compared to 50% in Group B (ACLR only). A lower activity sports level was reported in 20% of Group A and 35% of Group B, while 5% and 15% of patients, respectively, were unable to return to sports.

Figure 2: Overall Functional Outcome at 18 Months



Good outcomes were observed in 15% of Group A and 25% of Group B, while fair and poor outcomes were less frequent.

Figure 3: Comparison of Knee Stability at 18 Months



At 18 months, Lachman's test showed a higher rate of negative results in Group A (90%) compared to Group B (75%), though the difference was not statistically significant ($p = 0.18$). The pivot-shift test demonstrated significantly better rotational stability in Group A, with 95% negative compared to 70% in Group B ($p = 0.04$).

Table 3: Mean Knee Society Score (KSS) Over Time

Follow-up Duration	Group A (Mean ± SD)	Group B (Mean ± SD)	p-value
3 months	70.2 ± 4.8	68.5 ± 5.0	0.32
6 months	82.4 ± 5.2	78.9 ± 4.6	0.04*
12 months	91.1 ± 3.8	86.3 ± 4.2	0.01*
18 months	94.3 ± 3.2	89.7 ± 3.9	0.002*

The mean Knee Society Score (KSS) improved progressively in both groups over time. While the 3-month scores were comparable ($p = 0.32$), Group A (ACLR + LET) showed significantly higher scores than Group B (ACLR only) at 6, 12, and 18 months follow-up ($p < 0.05$). This indicates better functional outcomes in the combined procedure group over the long term.

Table 4: Postoperative Pain Score (VAS)

Time Interval	Group A (Mean ± SD)	Group B (Mean ± SD)	p-value
24 hours	5.6 ± 1.0	5.8 ± 1.2	0.58
72 hours	4.1 ± 0.9	4.4 ± 1.0	0.36
1 week	2.8 ± 0.7	3.2 ± 0.8	0.04*
1 month	1.2 ± 0.5	1.5 ± 0.6	0.05*

DISCUSSION

ACL injuries are common in active individuals, and while ACL reconstruction restores stability, residual rotational laxity may persist. Adding lateral extra-articular tenodesis (LET) can enhance rotational control. This study compared outcomes of isolated ACLR versus ACLR + LET in 40 adults meeting clinical and MRI criteria, following strict inclusion and exclusion guidelines.

Parameter	Our Study	Thomas L et al. (2025)	Guarino A et al. (2022)	Mishra D et al. (2024)
Sample Size	40 patients	60	200	30
Age Distribution	Majority 26–35 yrs (42.5%), 18–25 yrs (32.5%), 36–45 yrs (25%)	Young adults	Young adults	Young adults with rotational instability
Gender Distribution	72.5% males, 27.5% females	Predominantly males	Not specified	Predominantly males
Side of Injury	Right 55%, Left 45%	Majority right sided	Not specified	Not specified
Mode of Injury	Sports 52.5%, RTA 32.5%, others 15%	Sports-related	Not specified	Sports-related injuries
Preoperative Clinical Tests	Lachman + anterior drawer positive 100%	Not specified, rotational instability assessed	Not specified	Rotational instability and generalized laxity
Investigations	MRI confirmed ACL tear	Clinical assessment, functional tests (agility, hop tests)	MRI, clinical evaluation	MRI, Lysholm, IKDC, VAS scores
Surgical Procedure	ACLR + LET (Group A), ACLR only (Group B)	ACLR + LET	ACLR + LET	ACLR + LET
Operative Time	ACLR + LET: 95 ± 12 min, ACLR only: 75 ± 10 min	Not specified	Not specified	Not specified
Postoperative Complications	Superficial infection 5–10%, stiffness 10–15%, graft failure 5–10%	No adverse effects on muscle strength or PROMs	No graft failures, no ACL-related reoperations	No graft failures reported
Functional Outcomes	KSS significantly higher in ACLR + LET at 6, 12, 18 months; overall excellent outcome 80%	Improved agility and hop test scores at 7 months; PROMs unchanged	Excellent functional results; return-to-sport 88%	Improved Lysholm, IKDC, VAS scores at 6 months and 1 year
Knee Stability (Lachman / Pivot-Shift)	Lachman negative 90% vs 75%, Pivot-shift negative 95% vs 70%	Enhanced rotational stability reported	Improved stability postoperatively	Enhanced rotational and anterior stability
Return to Sports	75% (ACLR + LET) vs 50% (ACLR only)	Comparable between groups; PROMs unaffected	88% returned to pre-injury sports	Favorable RTS rates
Follow-Up Duration	Up to 18 months	7 months	Medium-term follow-up	6 months and 1 year
Range of motion	Group A (ACLR + LET) showed slightly better ROM recovery, with 75% achieving full motion compared to 60% in Group B.	--	ACLR + LET showed slightly better ROM recovery,	ACLR + LET showed slightly better ROM recovery,
Average hospital stay	slightly longer in Group A (5.6 ± 1.2 days) compared to Group B (5.2 ± 1.0 days),	longer in Group A	slightly longer in Group A	slightly longer in Group A
VAS pain scores	decreased progressively in both groups over time	decreased progressively in both groups over time	decreased progressively in both groups over time	decreased progressively in both groups over time

Across studies comparing isolated ACL reconstruction (ACLR) with combined ACLR and lateral extra-articular tenodesis (LET), our study and previous research by Thomas et al. (2025), Guarino et al. (2022), and Mishra et al. (2024) consistently demonstrate improved stability and functional outcomes with the addition of LET. Our cohort of 40 patients—mostly young adult males with sports-related injuries—showed excellent functional recovery, superior rotational stability, higher return-to-sport rates, slightly better range of motion, and lower pain scores in the ACLR + LET group, findings that align with the enhanced agility, hop performance, and improved Lysholm, IKDC, and VAS scores reported in other studies. Although operative time and hospital stay were slightly longer with LET, complication rates remained low across all studies, with no reported graft failures. Overall, evidence consistently supports ACLR + LET as a safe and effective option, particularly in young, active individuals or those with rotational instability.

CONCLUSION

In this study, arthroscopic ACL reconstruction combined with lateral extra-articular tenodesis (ACLR + LET) provided superior functional outcomes, improved knee stability, and higher return-to-sport rates compared to isolated ACL reconstruction. The ACLR + LET group showed better Knee Society Scores, enhanced anterior and rotational stability, and slightly improved range of motion and postoperative comfort, without increased complications. Both groups achieved good recovery, but LET offered

added benefits, particularly for patients with high rotational instability or those involved in demanding sports. Overall, adding LET appears to be a safe, effective strategy that may enhance long-term knee function.

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