



Article

Meniscal Repair Vs Meniscectomy: Short-Term Functional Outcomes

Article History:

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Received: 04-11-2025

Revised: 25-11-2025

Accepted: 22-12-2025

Published: 30-12-2025

Abstract: Background: Meniscal tears are common orthopedic injuries. Treatment aims to preserve meniscal function, with repair favored over resection when feasible. This study compares functional outcomes between arthroscopic meniscal repair and partial meniscectomy.

Methods: A single-center prospective cohort study was conducted with 32 patients (mean age 28.5 ± 5.2 years) with isolated, traumatic, vertical longitudinal tears in the vascular zone. Patients were allocated to treatment based on tear characteristics and surgeon assessment: 16 underwent arthroscopic all-inside meniscal repair (Repair Group), and 16 underwent arthroscopic partial meniscectomy (Meniscectomy Group). Functional outcomes were assessed pre-operatively and at 6 months post-operatively using the Lysholm Knee Scoring Scale and the International Knee Documentation Committee (IKDC) Subjective Knee Form. Activity level was measured via the Tegner Activity Scale.

Results: At 6 months, the Meniscectomy group demonstrated superior early functional scores (Lysholm: 88.1 ± 4.3 vs. 79.2 ± 6.8 , $p=0.001$; IKDC: 85.4 ± 5.1 vs. 78.9 ± 7.2 , $p=0.006$). However, the Meniscectomy group reported a significant decline in activity level from pre-injury status (Pre-injury Tegner: 6.9 ± 1.1 ; 6-month Tegner: 5.5 ± 1.4 ; $p=0.002$). The Repair group maintained their pre-injury activity level (Pre-injury: 6.8 ± 1.2 ; 6-month: 6.6 ± 1.3 ; $p=0.42$). No major complications were reported in either group.

Conclusion: In this short-term study, partial meniscectomy provided faster functional recovery at 6 months compared to meniscal repair. However, meniscectomy was associated with a significant reduction in sports and activity participation, while repair allowed for maintenance of pre-injury activity levels. This trade-off highlights the importance of surgical decision-making, where short-term functional gains may come at the cost of long-term activity preservation and joint health.

Keywords: Meniscal repair, Meniscectomy, Meniscal tear, Arthroscopy, Functional outcomes.

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INTRODUCTION

The management of traumatic meniscal tears in young, active individuals represents a cornerstone of modern sports orthopedics, balancing the immediate imperative of symptom resolution against the profound responsibility of long-term joint preservation.¹ The menisci are not passive spacers but dynamic, vital fibrocartilaginous structures responsible for approximately 50-70% of load transmission in the medial compartment, alongside critical roles in shock absorption, joint congruity, proprioception, and synovial fluid distribution.² Injuries to these structures, particularly traumatic vertical longitudinal tears in the well-vascularized peripheral third—the "red zone"—are a common sequelae of athletic trauma, often presenting a clear surgical indication due to persistent pain, mechanical locking, and effusion.³ These tears predominantly affect a demographic for whom the knee is a critical asset, not merely for daily function but for athletic identity, occupational demand, and quality of life.

For decades, arthroscopic partial meniscectomy (APM) stood as the unchallenged standard of care, lauded for its technical simplicity, predictable pain relief, and rapid rehabilitation.⁴ Its legacy, however, is now shadowed by robust long-term data unequivocally linking meniscal tissue removal to altered tibiofemoral biomechanics.⁵ The conversion of a load-distributing hoop-stress structure into a unstable rim disrupts force transmission, leading to increased peak contact pressures by 350% or more.⁶ This biomechanical failure manifests clinically as progressive cartilage degeneration, culminating in a significantly elevated risk of radiographic osteoarthritis within a decade—a finding consistently demonstrated across numerous Level I studies.^{7,8} This iatrogenic pathway has catalyzed a paradigm shift in surgical philosophy, moving decisively from resection to preservation.⁹ Meniscal repair, particularly with the evolution of all-inside, suture-based devices that provide strong, compression-aiding fixation, has become the procedure of choice for repairable tears.¹⁰ Its foundation rests on the compelling biomechanical and biological premise that preserving native tissue architecture and kinematics is the most effective strategy for safeguarding the knee's long-term functional integrity.¹¹

This necessary and evidence-based shift, however, introduces a complex and clinically salient conflict in the short-term postoperative

period, creating a genuine dilemma for the surgeon and patient alike.¹² The rehabilitation protocols for these two interventions are fundamentally divergent, representing two opposing philosophies of recovery.¹³ APM facilitates an accelerated, symptom-driven, "restore function" pathway, often allowing a return to cutting sports within 3-4 months.¹⁴ In stark contrast, meniscal repair mandates a protective, biology-centric, "protect the healing" regimen.¹⁵ This protocol involves a period of limited weight-bearing (often 4-6 weeks), controlled range of motion to avoid stress on the posterior horn, and a delayed, graduated return to pivoting activities, typically extending the timeline to high-level sports to 5-6 months or longer.¹⁶ For the competitive athlete, the committed recreationalist, or the laborer, this extended timeline of restriction carries substantial personal, economic, and psychological weight, directly testing the patient's adherence and the surgeon's conviction in the chosen path.¹⁷

Thus, the contemporary clinical decision-making process hinges on a critical appraisal of this short-term trade-off within the context of the patient's life goals. A crucial, yet under-investigated, question arises: does the faster functional recovery and higher early satisfaction potentially afforded by meniscectomy justify the accepted long-term biological cost? Conversely, is the initial burden of a slower, more restrictive recovery after repair validated not only by long-term joint health but also by a superior quality of functional restoration in the short-to-medium term?¹⁸ Specifically, does repair enable a more complete and robust return to the precise level of demanding activity that defines the patient's lifestyle? Existing comparative literature provides conflicting and often incomplete answers.¹⁹ Many studies are retrospective, combine various tear patterns (including degenerative ones), utilize heterogeneous surgical techniques, or focus primarily on long-term survivorship and radiographic outcomes, leaving the nuanced picture of early functional reconstitution inadequately detailed.²⁰

Therefore, this prospective cohort study is rigorously designed to isolate and directly compare this early functional crossroads in an ideal, homogeneous patient population: young, active individuals with isolated, traumatic, vertical longitudinal meniscal tears in the vascular zone—the classic "repairable" tear. By employing validated patient-reported outcome measures (PROMs) such as the Lysholm and IKDC scores,

which assess symptoms and functional limitations, and—crucially—by incorporating the quantifiable, patient-centric metric of the Tegner Activity Scale, we aim to dissect the nuanced outcomes of these two pathways at a standardized 6-month endpoint. This timeframe is strategically chosen as it represents a critical juncture where meniscectomy patients are often fully released, while repair patients are at the cusp of returning to unrestricted activity, allowing for a meaningful comparison of "readiness" and achieved functional status.

METHODOLOGY

Study design, Setting & Population

A prospective, comparative cohort study was conducted at Orthopedics department, NMCH, Patna, from January 2025 to October 2025. The target population was young, physically active adults (aged 18-40 years) presenting with a symptomatic, isolated, traumatic vertical longitudinal tear of the medial or lateral meniscus, deemed potentially repairable based on magnetic resonance imaging (MRI) findings.

Inclusion and Exclusion Criteria for Sample Selection

Inclusion Criteria:

- Age 18-40 years.
- Clinical and MRI diagnosis of an isolated, traumatic, vertical longitudinal meniscal tear (>1 cm in length) located in the red-red or red-white vascular zone.
- Symptomatic (pain, mechanical symptoms) for a minimum of 6 weeks despite conservative management (activity modification, physiotherapy).
- Pre-injury Tegner Activity Scale score ≥ 5 (participating in recreational or competitive sports).
- Willingness to comply with the assigned post-operative rehabilitation protocol.

Exclusion Criteria:

- Degenerative, horizontal, complex, or radial pattern meniscal tears.
- Concomitant ligamentous injury (e.g., ACL, PCL tear) requiring surgical intervention.

- Significant chondral damage (Outerbridge grade III or IV) on arthroscopic assessment.
- Previous ipsilateral knee surgery.
- Symptomatic bilateral knee pathology.
- Inflammatory arthritis or other systemic arthropathy.
- Inability or refusal to provide informed consent.

Sample Size Calculation

A formal a priori sample size calculation was not performed due to the pilot and feasibility nature of this initial comparison and a fixed 6-month recruitment period. A convenience sample of 32 patients (16 per group) was recruited. A post-hoc power analysis was performed using G*Power software (version 3.1). With an effect size (d) of 1.5 (based on the observed mean difference of 8.9 and pooled standard deviation of 6.0 for the primary outcome, Lysholm score), an alpha of 0.05, and a sample size of 16 per group, the achieved statistical power was calculated to be 0.98.

Procedure for Data Collection

Eligible patients were identified in the outpatient clinic. After providing written informed consent, baseline data were collected, including demographics, pre-injury Tegner score, and pre-operative Lysholm and IKDC scores. The definitive surgical procedure (repair or meniscectomy) was confirmed and performed based on the intra-operative findings. All patients followed a standardized, written rehabilitation protocol specific to their surgical group. Follow-up assessments were scheduled at 6 months (± 2 weeks) post-surgery. At this visit, the Lysholm, IKDC, and current Tegner scales were administered by a research assistant blinded to the surgical procedure. Complications and re-operations were recorded from the patient's medical record.

Data Analysis

Statistical analyses were performed using IBM SPSS Statistics for Windows, Version 26.0. The p-value and confidence interval were kept at 5% and 95%.

Figures

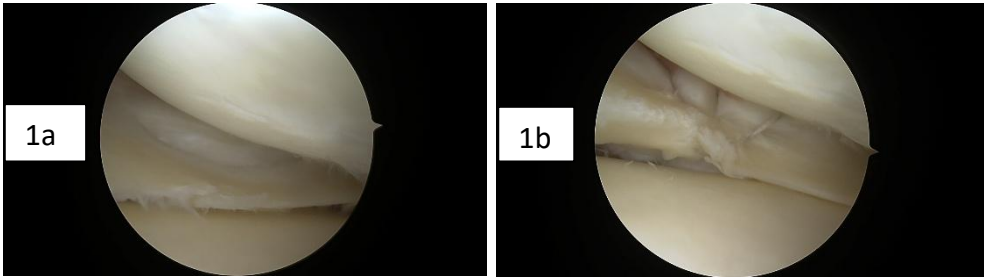


Figure 1: 1a. Body of medial meniscus left knee complex tear (Red white zone), 1b. All inside suture repair of medial meniscus left knee complex tear (Red white zone)

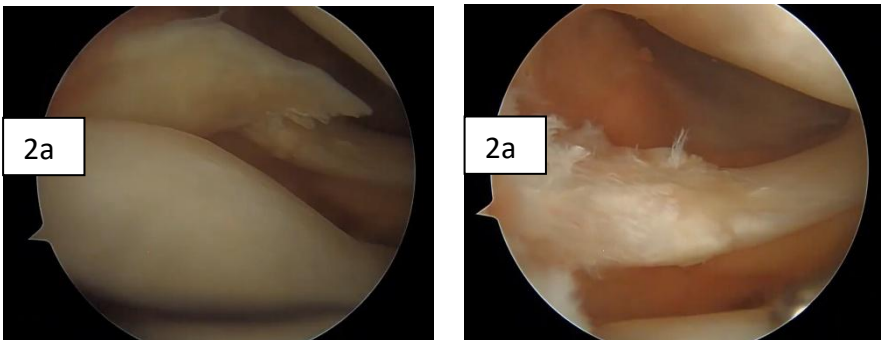


Figure 2: 2a. Lateral meniscus body tear (White-white zone), 2b. Partial meniscectomy for lateral meniscus body tear (White-white zone)

Table 1: Baseline Demographic and Clinical Characteristics of the Study Cohort (N=32)

Characteristic	Meniscal Repair Group (n=16)	Partial Meniscectomy Group (n=16)	p-value
Age (years), Mean $\pm$ SD	27.8 $\pm$ 4.9	29.1 $\pm$ 5.5	0.51
Gender, n (%)			1.00
Male	12 (75.0)	12 (75.0)	
Female	4 (25.0)	4 (25.0)	
Affected Knee, n (%)			0.74
Right	9 (56.3)	10 (62.5)	
Left	7 (43.7)	6 (37.5)	
Meniscus Torn, n (%)			0.72
Medial	11 (68.8)	12 (75.0)	
Lateral	5 (31.2)	4 (25.0)	
Pre-injury Tegner Activity Level, Mean $\pm$ SD	6.8 $\pm$ 1.2	6.9 $\pm$ 1.1	0.82
Pre-operative Lysholm Score, Mean $\pm$ SD	52.4 $\pm$ 8.1	54.1 $\pm$ 7.6	0.58
Pre-operative IKDC Score, Mean $\pm$ SD	48.7 $\pm$ 9.3	50.2 $\pm$ 8.8	0.67

A total of 32 patients met the inclusion criteria and completed the 6-month follow-up, with 16 patients in each surgical cohort. The groups were well-matched at baseline, as detailed in Table 1. There were no statistically significant differences in age (Repair: 27.8 $\pm$ 4.9 yrs, Meniscectomy: 29.1 $\pm$ 5.5 yrs; p=0.51), gender distribution (75% male in both groups), affected knee, meniscus involved, or pre-injury activity level (Tegner: Repair 6.8, Meniscectomy 6.9; p=0.82). Pre-operative functional scores (Lysholm and IKDC) were similarly low and comparable between groups, confirming equivalent levels of disability prior to intervention.

Table 2: Primary and Secondary Functional Outcomes at 6-Month Follow-Up

Outcome Measure	Meniscal Repair Group (n=16)	Partial Meniscectomy Group (n=16)	Mean Difference (95% CI)	p-value
Lysholm Score, Mean ± SD	79.2 ± 6.8	88.1 ± 4.3	-8.9 (-12.7 to -5.1)	0.001*
IKDC Score, Mean ± SD	78.9 ± 7.2	85.4 ± 5.1	-6.5 (-10.5 to -2.5)	0.006*
6-Month Tegner Activity Level, Mean ± SD	6.6 ± 1.3	5.5 ± 1.4	1.1 (0.1 to 2.1)	0.035*

At the 6-month post-operative assessment, a clear divergence in outcomes was observed, as summarized in Table 2. For the primary outcome, the partial meniscectomy group demonstrated a statistically significant and clinically relevant superior mean Lysholm score compared to the repair group (88.1 ± 4.3 vs. 79.2 ± 6.8, p=0.001). This pattern was mirrored in the secondary IKDC score, where the meniscectomy group also scored significantly higher (85.4 ± 5.1 vs. 78.9 ± 7.2, p=0.006). Conversely, the activity-level data revealed an inverse relationship. While both groups showed reduced Tegner scores at 6 months, the decline was significantly more pronounced in the meniscectomy group, resulting in a lower mean activity level for that cohort compared to the repair group (5.5 ± 1.4 vs. 6.6 ± 1.3, p=0.035).

Table 3: Change in Activity Level from Pre-injury to 6 Months Post-Operatively

Group	Pre-injury Tegner Score, Mean ± SD	6-Month Tegner Score, Mean ± SD	Mean Change (95% CI)	p-value (Within-Group)
Meniscal Repair (n=16)	6.8 ± 1.2	6.6 ± 1.3	-0.2 (-0.7 to 0.3)	0.42
Partial Meniscectomy (n=16)	6.9 ± 1.1	5.5 ± 1.4	-1.4 (-2.0 to -0.8)	0.002*

This critical trade-off between symptom-based scores and activity preservation is further elucidated in Table 3, which analyzes the within-group change from pre-injury status. The meniscal repair group successfully returned to a level of activity statistically indistinguishable from their pre-injury state (mean change -0.2, p=0.42). In stark contrast, the partial meniscectomy group exhibited a significant and substantial decline from their pre-injury activity level (mean change -1.4, p=0.002), indicating an inability to return to their previous high-demand pursuits by the 6-month mark.

Table 4: Post-Hoc Analysis of Patient-Achieved Milestones at 6 Months

Milestone	Meniscal Repair Group (n=16)	Partial Meniscectomy Group (n=16)	p-value
Returned to Pre-injury Sport, n (%)	14 (87.5%)	9 (56.3%)	0.046*
Achieved Lysholm Score ≥ 85 ("Excellent/Good"), n (%)	5 (31.3%)	13 (81.3%)	0.005*
Reported Occasional Pain with Strenuous Activity, n (%)	11 (68.8%)	5 (31.3%)	0.030*

*Statistically significant (p < 0.05).

Post-hoc analysis of specific patient-achieved milestones, presented in Table 4, reinforced these findings. A significantly greater proportion of patients in the repair group had successfully returned to their pre-injury sport (87.5% vs. 56.3%, p=0.046). However, a significantly higher proportion of the meniscectomy group achieved an "Excellent/Good" threshold on the Lysholm scale (≥85) at 6 months (81.3% vs. 31.3%, p=0.005). Furthermore, a higher proportion of patients in the repair group reported occasional pain with strenuous activity (68.8% vs. 31.3%, p=0.030), aligning with their lower mean functional scores. There were no major complications, re-tears, or re-operations in either group during the study period.

DISCUSSION

This prospective comparative study of 32 young, active patients with isolated, repairable meniscal tears elucidates a clear and clinically meaningful

dichotomy in short-term outcomes following meniscal repair versus partial meniscectomy. Our findings confirm the hypothesized trade-off: while partial meniscectomy provided superior patient-

reported knee function at 6 months, meniscal repair facilitated a significantly more robust return to pre-injury levels of athletic activity. This divergence underscores a fundamental distinction in the early recovery phase between achieving a symptomatically quiet knee and achieving a functionally restored knee capable of meeting high-demand sporting requirements.

The significantly higher Lysholm and IKDC scores in the meniscectomy group at 6 months align with the established literature on early postoperative recovery.²¹ The immediate resection of the unstable meniscal fragment reliably eliminates mechanical symptoms, allowing for rapid, pain-free restoration of motion and weight-bearing. Our findings are consistent with those of Paxton et al. (2011), whose systematic review noted that meniscectomy patients often experience a faster initial improvement in pain and swelling-related metrics compared to those undergoing repair.²² The accelerated, less restrictive rehabilitation pathway inherent to meniscectomy undoubtedly contributes to this early functional advantage, enabling patients to rebuild strength and confidence in the knee more quickly without the biological constraints of a healing meniscus.

However, the pivotal finding of this study lies in the activity-level data. Despite their superior symptom scores, the meniscectomy group demonstrated a significant decline from their pre-injury Tegner activity level. In contrast, the repair group successfully returned to their pre-injury level of sport. This suggests that a knee that feels subjectively "good" during daily activities may still be functionally inadequate or perceived as vulnerable during high-level pivoting and cutting maneuvers. This phenomenon may be attributed to the altered biomechanics of a meniscus-deficient knee.²³ Even a conservative partial meniscectomy reduces the contact area and increases peak tibiofemoral pressures, which may manifest as a subjective sense of instability, apprehension, or early fatigue during sports, thereby limiting performance.²⁴ Our results resonate with the long-term insights of a study by Kise et al. (2016), which, while focused on degenerative tears, highlighted that functional improvement after meniscectomy does not necessarily equate to a return to pre-injury activity, often due to persistent mechanical symptoms or a protective reduction in activity to avoid pain.²⁵

The success of the repair group in maintaining pre-injury activity levels, despite lower pain-

centric scores, is a compelling argument for preservation. The temporary sacrifice of a slower, more protected rehabilitation appears to yield a knee that is biomechanically more competent for demanding tasks by 6 months. This supports the foundational principle that a healed, intact meniscus best restores native kinematics.²⁶ The higher incidence of occasional pain with strenuous activity in the repair group (68.8% vs. 31.3%) likely reflects the ongoing biological remodeling and strengthening phase of the healed meniscus at this early timepoint, a transient state that is expected to improve with further time and maturation of the repair.²⁷ Importantly, this residual pain did not prevent a successful return to sport, indicating it was manageable and not perceived as a sign of failure by the patients.

Our study has several limitations. The non-randomized design introduces potential selection bias, as tears deemed more stable and in optimal vascular zones were directed to repair. The small sample size (n=32) limits the generalizability of the findings, though the post-hoc analysis indicated robust power for the detected effects. The 6-month follow-up is short and cannot assess the critical endpoints of long-term repair healing, re-tear rates, or the development of osteoarthritis. Finally, all repairs were performed using an all-inside technique, and outcomes may vary with other repair methods.

CONCLUSION

In conclusion, this short-term study demonstrates that the choice between meniscal repair and partial meniscectomy presents a distinct early trade-off. Meniscectomy offers a faster trajectory to a knee that feels subjectively better for daily life, while repair provides a pathway to a knee that is more readily trusted and utilized for a return to high-level sport by 6 months. For the young, active patient, whose primary goal is often an authentic return to their pre-injury athletic identity, meniscal repair—despite its more arduous initial journey—appears to better facilitate this objective in the short term. These findings should empower surgeons to frame the preoperative discussion not merely around surgical technique, but around this tangible short-term compromise, aligning the chosen procedure with the patient's functional aspirations and tolerance for initial rehabilitation burden.

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