

Outcomes of Medial Meniscus Root Repair with Centralization for the Extruded Meniscus: A Mean 3-Year Follow-Up

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INTRODUCTION: Meniscal root tears alter tibiofemoral mechanics and accelerate the development of osteoarthritis (OA). While repair has shown improved outcomes, meniscus extrusion (≥ 3 mm beyond the tibial plateau) may persist after repair and is an independent risk factor for OA. Limited data exists on patient outcomes following meniscus root repair with concomitant centralization. This study reports clinical and radiographic outcomes for patients undergoing medial meniscus posterior root repair with meniscus centralization at minimum 2-year follow-up.

METHODS:

Patients undergoing medial meniscus posterior root repair with meniscus centralization from January 2020 to October 2022 at a single institution were reviewed. The surgical technique involved anatomic restoration of the meniscus root footprint, previously described in-detail by Leafblad and colleagues. Preoperative radiographs and magnetic resonance imaging (MRI) were reviewed for Kellgren-Lawrence (K-L) grade, hip-knee angle, and degree of meniscus extrusion. Follow-up assessments at minimum 1-year and 2-year intervals included surgery satisfaction (10-point scale), Tegner Activity Score, Visual Analog Scale (VAS) for pain at rest and with use, International Knee Documentation Committee (IKDC) score, and Knee Injury and Osteoarthritis Outcome Score for Joint Replacement (KOOS Jr).

RESULTS:

Thirty patients (24 females, 6 males; mean age: 50.2 years; mean BMI: 32.4 kg/m^2) were included, with 28 patients (93%) experiencing an acute injury. Preoperative radiographs demonstrated K-L grade 1 osteoarthritis in 19 patients (83%) and grade 2 in 11 patients (37%). Varus alignment was present in 29 patients (97%) on hip-knee radiographs, with a mean varus angle of 2.9° . The average preoperative medial meniscus extrusion measured 3.0 mm. The mean duration from symptom onset to surgery was 4.2 months. Eight patients (27%) underwent concomitant ACL reconstruction.

Mean postoperative follow-up was 3.2 years. Patients demonstrated significant improvements in VAS pain at rest (1.2), VAS pain with use (2.9), IKDC (62.3), and KOOS Jr (85.1) compared to their preoperative baseline ($p \leq 0.03$) (**Table 1**). Twenty-three patients (77%) reported a Likert 5-point scale score of “much better than before surgery” ($p < 0.001$). The mean IKDC, KOOS Jr, and VAS scores all achieved patient acceptable symptom state (PASS) for their respective thresholds (**Figure 1**). At final follow-up, no significant radiographic OA progression was observed, and no patients required total knee arthroplasty or revision surgery.

DISCUSSION AND CONCLUSION: Medial meniscus root repair with centralization demonstrates promising results, with patients achieving significant clinical improvements and maintaining joint integrity at mean 3-year follow-up. This procedure may be considered for select patients with medial meniscus root tears, particularly those with minimal osteoarthritis and preserved joint function.

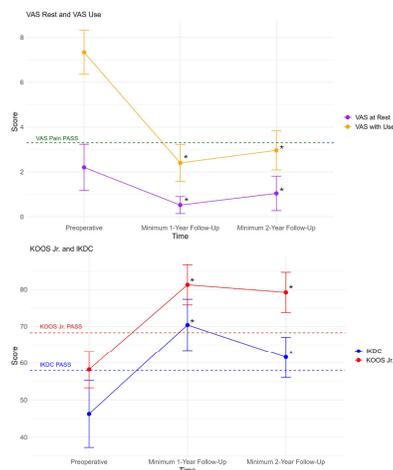


Figure 1. Comparison of preoperative, minimum 1-year, and minimum 2-year follow-up patient-reported outcome scores. Dashed line indicates the Patient Acceptable Symptom State (PASS) threshold. *Indicates significant difference ($p < 0.05$) versus preoperative baseline.

	Value	p-value
Mean Follow-Up (years)	3.2 ± 0.7	
VAS Pain at Rest		
Pre-op	2.2 ± 2.5	0.03
Post-op	1.2 ± 1.9	
VAS Pain with Use		
Pre-op	7.3 ± 2.3	<0.01
Post-op	2.9 ± 2.1	
IKDC		
Pre-op	46.3 ± 10.8	0.01
Post-op	62.3 ± 13.3	
KOOS Jr.		
Pre-op	59.0 ± 9.1	<0.01
Post-op	85.1 ± 12.7	
Tegner Activity Score		
Pre-op	3.5 ± 2.0	0.84
Post-op	3.3 ± 1.7	
Likert Five-Point Scale		<0.01
Much Better Than Before Surgery	23 (77%)	
Slightly Better Than Before Surgery	6 (20%)	
No change	1 (3%)	
Slightly Worse Than Before Surgery	0	
Much Worse Than Before Surgery	0	
Surgery Satisfaction (0-10 scale)	9 ± 1.2	

IKDC: International Knee Documentation Committee Score
 KOOS Jr.: Knee Injury and Osteoarthritis Outcome Score, Joint Replacement