

Clinical and Radiographic Outcomes Following Posterior Meniscal Root Repair With a Retensionable Knotless All-Suture Anchor

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INTRODUCTION: Posterior meniscal root repair (PMMR) has become a widely accepted intervention for restoring meniscal biomechanics and reducing the progression of osteoarthritis in patients with root tears. However, failure rates remain substantial, ranging from 3% to 22%, with retear often necessitating further surgical intervention or even conversion to arthroplasty. A hypothesized contributor to repair failure is the “bungee effect,” caused by distal fixation several centimeters away from the meniscal root. Recent advances in suture design have resulted in a knotless, retensionable construct for direct fixation of meniscal root tear. This aims to overcome the bungee effect by securing the meniscus directly to its bony bed, potentially improving structural integrity and healing rates. Despite its promising biomechanical design, clinical outcomes associated with this novel device have not been well characterized. This study aims to address this gap by evaluating clinical and radiographic outcomes following PMMR with a novel retensionable knotless all-suture anchor at minimum 1-year follow-up.

METHODS: This was a single-center, retrospective study evaluating patients who underwent PMMR with a knotless all-suture anchor with minimum 1-year follow-up. Patients were excluded if they underwent previous surgery on the ipsilateral knee or concomitant procedures at the time of index surgery beyond partial lateral meniscectomy or limited chondroplasty. Demographic data were collected from patient charts. Patient-reported outcome measures (Lysholm, IKDC, KOOS-12, Tegner), satisfaction, and return to sport were collected at 1-year post-operatively. Failure was defined as retear on MRI, return to OR, or hardware-related complications. Radiographic outcomes were assessed on 1-year postoperative MRI, including evaluation of root healing, meniscal extrusion, tear gap distance, and cartilage degeneration using ICRS criteria.

RESULTS: Of 18 patients (mean age 49.4 ± 12.6; 74% female; mean BMI 29.3), 10 patients (56%) demonstrated complete root healing and 8 patients (44%) showed partial healing. No cases of complete non-healing or clinical failure were observed. Mean pre-op tear gap was 3.23 ± 1.18 mm. Meniscal extrusion increased significantly from pre- to postoperatively (3.43 ± 1.34 mm to 4.33 ± 1.62 mm; $p = 0.028$). Cartilage degeneration worsened in both the medial femoral condyle (ICRS 2.06 to 2.67, $p = 0.008$) and medial tibial plateau (ICRS 1.44 to 2.00, $p = 0.008$). VAS pain scores improved significantly at rest and with activity ($p < 0.001$), and functional scores demonstrated moderate to good outcomes (KOOS-12: 72.3 ± 22.5; Lysholm: 70.9 ± 22.5; IKDC: 66.3 ± 21.1). Overall, 83.3% of patients reported improvement in physical function, with 66.7% (12/18) stating they felt “much better” and 16.7% (3/18) “slightly better”; 5.6% (1/18) reported no change, and 11.1% (2/18) felt “slightly worse”. Patient satisfaction was high, with 94% indicating they would choose to undergo surgery again. Tegner activity improved from post-injury but remained below pre-injury baseline. Return to sport was reported in 79% of previously active patients, and 21% returned to their prior level or higher.

DISCUSSION AND CONCLUSION: PMMR using the novel knotless all suture anchor demonstrated favorable short-term outcomes with high rates of healing and patient satisfaction. Despite increases in meniscal extrusion and progression of cartilage degeneration, clinical improvement and return to activity suggest that subchondral fixation may be a viable advancement in meniscal root repair techniques. Further comparative studies are warranted to validate long-term benefits of this fixation strategy.

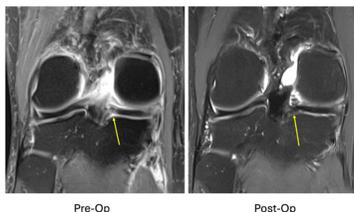


Figure 1. Pre-op and post-op coronal MRI images demonstrating a completely healed meniscus. The signal intensity of the repair is black, similar in signal to the normal meniscus

Variable	Mean	SD	p value
KOOS-12	72.3	22.5	
Lysholm	70.9	22.5	
IKDC	66.3	21.1	
Pre-op extrusion	3.43	1.34	0.028
Post-op extrusion	4.33	1.62	
Gap Distance	3.23	1.18	

Table 1. Continuous variables including clinical outcome scores, extrusion, and gap distance

Variable	1	2	3	4	p value
Pre-op cartilage score medial femoral condyle	5	7	6	0	0.008
Post-op cartilage score medial femoral condyle	2	5	8	3	
Pre-op cartilage score medial tibial plateau	10	8	0	0	0.008
Post-op cartilage score medial tibial plateau	5	9	3	1	
Pre-op meniscal tear characterization	0	4	14		
Post-op meniscal root healing	10	8			

Table 2. Categorical variables including cartilage degeneration and tear characterization. For cartilage scores 1-4 correspond to ICRS grade. For pre-op meniscal tear characterization, 1 no tear, 2 partial tear, 3 complete tear. For post-op meniscal root healing, 1 Fully healed, 2 partially healed, 3 completely not healed