Functional Outcomes Beyond Ten Years Following Meniscal Repair in ACL Reconstruction: A Systematic Review

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Introduction

Meniscal repair during anterior cruciate ligament reconstruction (ACLR) is increasingly used to preserve knee biomechanics, delay osteoarthritis, and support return to function. Despite its growing use, limited evidence exists on outcomes beyond ten years. As meniscal preservation becomes more common, long-term evidence is essential to guide surgical decision-making.

Methods

A systematic review of PubMed, Embase, Web of Science, and Scopus was conducted through April 2025, following PRISMA guidelines. Studies were included if they reported outcomes of primary ACLR with concomitant arthroscopic meniscal repair and a minimum mean follow-up of 10 years. Nine cohort studies met criteria, with a mean follow-up of 12.1 years. Extracted variables included tear and repair type, failure rates, time to failure, reoperations, ACL graft type, KL-grade progression, return to sport (RTS), and PROs (KOOS, IKDC, Lysholm, WOMAC). Due to heterogeneity, results were qualitatively synthesized.

Results

Across nine studies (n = 23–3,100; mean age 22–30 years), tear patterns included ramp, bucket-handle, longitudinal, red-white zone, complex, and simple configurations. Failure rates ranged from 18% to 28%, with failures typically occurring 3.8 to 5.4 years postoperatively. Secondary meniscectomy was the most common reoperation. Graft types included hamstring (six studies), bone-patellar tendon-bone (four), and quadriceps tendon (three). Patients with successful repairs had KOOS scores averaging 91.9 ± 10.6, compared to 83.8 ± 17.4 in those who underwent meniscectomy. IKDC, Lysholm, and WOMAC scores also supported favorable long-term function. RTS was reported in six studies, with over 80% of patients returning to pre-injury activity within two years and maintaining participation long term. KL-grade progression occurred in 25-40% of patients but was typically asymptomatic.

Discussion

Meniscal repair with ACL reconstruction provides durable pain relief, function, and joint preservation beyond ten years. Failures occurred in roughly 20%, mainly with medial tears or residual laxity, while modern all-inside techniques improved durability. PROs remained high and surpassed meniscectomy, and most patients maintained active lifestyles without higher failure risk. Limited imaging suggested chondroprotection. However, the small number of long-term studies, heterogeneity in repair techniques, and inconsistent outcome reporting limit generalizability. Overall, findings support meniscal repair as a reliable long-term, joint-preserving strategy.

Significance/Clinical Relevance

This review addresses a critical evidence gap by providing the first synthesis of outcomes beyond ten years following meniscal repair during ACL reconstruction, demonstrating durable repair survivorship and long-term function that support meniscal preservation as a reliable clinical strategy.

Study	Failure Rate	Time to Failure	Meniscectomy Rate	Return to Sport
Noyes et al., 2011, USA	38%	NR	6/29 (21%)	15/29 by 4.2 yrs
Rochcongar, 2015, France	17.9%	> 4 years	7/39 (17.9%)	NR
Tagliero et al., 2018, USA	28%	Mean ± SD: 3.8 ± 3.6 yrs	9/13 (69%)	NR
Wright et al., 2023, USA	13%	Mean (medial, lateral): 2.8 yrs, 5.8 yrs	NR	NR
Tanel et al., 2024, France	21.9%	Mean (range): 64.5 (13-126) mos	14/64 (21.9%)	NR
NR = not reported; yrs = years; mos = months				

Long-term outcomes following meniscus repair across cohorts, including failure rates, time to failure, subsequent meniscectomy rates, and RTS data.

Study	PROs
Noyes et al., 2011*	IKDC Objective: 6 normal, 9 nearly normal, 2 abnormal, 2 severely abnormal. IKDC Radiographic: 15 normal, 8 nearly normal, 3 severely abnormal.
Tagliero et al., 2018	IKDC: improved from 47.9 to 87.7, sustained over time ($p < .01$). Tegner improved from 1.9 preoperative to 6.3 postoperatively ($p < .01$); decreased from 8.3 preinjury to 6.3 postoperatively ($p < .01$)
Brophy et al., 2021	Meniscus repair group had significantly worse 10-year KOOS scores in QoL, Symptoms, and ADL compared to the no-tear group ($p < 0.01$). IKDC: Repair vs. no tear Odds Ratio = 0.73, 95% Confidence Interval: 0.59-0.91, $p = 0.004$
Wright et al., 2023	KOOS improved significantly across all subscales over 10 years ($p < 0.001$). IKDC increased from 55 ± 15 to 78 ± 20. No significant difference between successful vs failed repairs at 10 years ($p = 0.31$).
Thalatsis et al., 2023	KOOS was significantly higher in the MR group than in the meniscectomy group across multiple subscales (Pain, ADL, Sport/Rec, QoL) ($p < 0.05$). Lysholm: 95.7 ± 8.3 (repair) vs. 87.2 ± 13.6 (meniscectomy), $p = 0.01$. IKDC: 87.1 ± 12.2 (repair) vs. 74.2 ± 18.8 (meniscectomy), $p = 0.01$. Tegner increased from 1.8 ± 1.2 preoperative to 5.4 ± 1.8 for meniscectomy follow-up; increased from 1.5 ± 1.6 preoperative to 5.5 ± 1.7 for MR at follow-up; decreased from 6.5 ± 2 (meniscectomy) and 6.6 ± 1.6 (MR) at preinjury ($p = 0.97$) to 5.4 ± 1.8 (meniscectomy) and 5.5 ± 1.7 (MR) at follow-up ($p = 0.76$); Overall Tenger for those with meniscus tear is 6.5 ± 1.7 preinjury to 1.6 ± 1.7 preoperative to 5.5 ± 1.7 at follow-up.
Kaarre et al., 2023	KOOS subscale scores comparable between LM repair and LM left in situ groups. QoL trended higher in the control group ($p = 0.064$), but other domains were not statistically different.
Tanel et.al, 2024	IKDC improved from 64.3 ± 13.4 pre-operative to 91.1 ± 10.1 at 10-year follow-up ($p = 0.001$). Tegner decreased from 7.1 ± 1.6 preinjury to 6.3 ± 1.6 at 10-year follow-up ($p = 0.02$).
Sheean et al., 2025	KOOS Pain: Median increased from 75.0 (IQR 61.1-86.1) at baseline to 97.2 (IQR 86.1-100) at 10 years.

IKDC = International Knee Documentation Committee; KOOS = Knee Injury and Osteoarthritis Outcome Score; QoL = Quality of Life; ADL = Activities of Daily Living; OR = Odds Ratio; CI = Confidence Interval; PROs reported as mean ± SD; MR = meniscus repair

* Unlike other included studies, Noyes et al. (2011) reported IKDC Objective and Radiographic grades using the original categorical classification system (Grades A–D) rather than the modern 0-100 IKDC subjective score, which may limit direct numerical comparison with other cohorts.

Summary of patient-reported outcomes (PROs) following meniscus repair, including KOOS, Tegner, QoL, Lysholm, and IKDC scores.