

Long-Term Outcomes and Survivorship of Meniscal Allograft Transplantation: A Systematic Review with Minimum 10-Year Follow-Up

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INTRODUCTION:

Meniscal allograft transplantation (MAT) is an emerging treatment for patients with symptomatic meniscal deficiency. The purpose of this study was to systematically evaluate the long-term clinical outcomes and graft survivorship of MAT with a minimum follow-up of 10 years.

METHODS:

This review was conducted following Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines and registered on Prospero. PubMed, Cochrane Central Register of Controlled Trials (CENTRAL), and Scopus were queried in January 2025. Studies assessing MAT patient-reported or objective outcomes with ≥ 10 years of follow-up were included. Non-English studies, case reports, non-peer-reviewed articles, editorials, commentaries, and reviews were excluded. Lysholm Score, Tegner Activity Scale, Visual Analog Scale (VAS) for pain, Knee Injury and Osteoarthritis Outcome Score (KOOS), and graft survivorship were extracted for analysis. MAT failure was defined by individual studies based on clinical, surgical, and/or radiographic criteria.

RESULTS: Thirteen studies met inclusion criteria, comprising a total of 619 patients and 632 MATs performed from 1984 to 2012. Mean patient age ranged from 24.5 to 43.5 years, with 47-87% males, and a mean follow-up duration of 11.1 to 20.0 years. Fixation techniques included soft tissue (5 studies), bone plug (6), and bone trough (4). Statistically significant improvements were observed in Lysholm (7/9 studies), Tegner (3/4), VAS (3/5), and KOOS (1/1) scores. Two studies reported Patient Acceptable Symptom State (PASS) rates ranging from 70.2-71% for Lysholm and 58.5-82% for KOOS. Two studies also reported Minimal Clinically Important Difference (MCID) rates from 70.4-89.8% for Lysholm and 61-78.2% for KOOS subscales. 10-year MAT survival ranged from 45-100%. Most studies (5/9) demonstrated survivorship $\geq 73\%$ at minimum 10-year follow-up. MAT survival after 15 years or more ranged from 19% to 87%.

DISCUSSION AND CONCLUSION: MAT demonstrated favorable long-term clinical outcomes and variable graft survivorship beyond 10 years. Included studies varied based on graft type, fixation technique, and patient selection. Continued prospective, high-level studies are warranted to standardize surgical approaches, improve the durability of this joint-preserving intervention, and identify modifiable risk factors for inferior long-term outcomes.

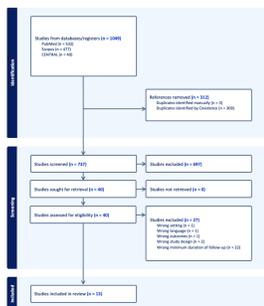


Figure 1. Flowchart according to PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines.

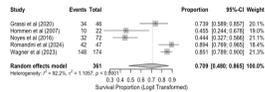


Figure 2. Forest plot of meniscal allograft survival proportions at 10 years postoperatively. Individual study survival estimates and 95% confidence intervals (CI) were calculated using the Wald-type method. The pooled survival proportion was 78.9% (95% CI, 48.0%-84.5%). Between-study heterogeneity was high ($I^2 = 92.2\%$).

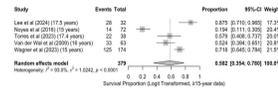


Figure 3. Forest plot of meniscal allograft survival proportions at 15 years postoperatively. Individual study survival estimates and 95% confidence intervals (CI) were calculated using the Wald-type method. The pooled survival proportion was 59.2% (95% CI, 35.4%-78.0%). Between-study heterogeneity was high ($I^2 = 93\%$).

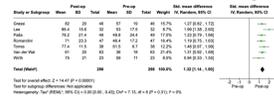


Figure 4. Forest plot of standardized mean differences in pre- and postoperative Lysholm scores. Study estimates were pooled using inverse variance weighting to calculate the overall effect. The pooled standardized mean difference (1.31 (95% CI, 1.14-1.50)) was statistically significant ($p < 0.001$), with no observed between-study heterogeneity ($I^2 = 0\%$).