Editorial Commentary: Knee Meniscal Transplant Positive Outcomes at 2 Years May Be Maintained at 10 Years; However, Loss to Follow-up Is High, and Concomitant Procedures May Play a Role

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Abstract: Meniscal allograft transplants provide effective pain relief for patients with a nonfunctional meniscus, treatable or minimal ipsilateral compartment osteoarthritis, proper or correctable alignment, and a stable or stabilizable knee. In a significant number of cases (50%-70%), cartilage resurfacing, realignment osteotomy, and/or ligament reconstruction (stabilization) is performed. Because concomitant injuries and procedures are very common in meniscal transplant recipients, and loss to long-term follow-up may be high, it remains unknown whether the positive outcome relates to the allograft, the concomitant procedure, or both.

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An increase in patient-reported outcomes (PROs) between preoperative and postoperative follow-up in patients treated with meniscal allograft transplantation (MAT) of both the medial and lateral meniscus is well established in the literature. A recent review by Wu et al.[1] found 21 studies reporting PROs after MAT with minimum 2-year follow-up and observed that all showed significant improvements in postoperative PROs. Additionally, PROs at 10 or more years and high MAT survivorship at 10 years are well established, with a systematic review from Novaretti et al.[2] in 2019 reporting 5 studies with minimum 10-year follow-up of PROs and an average survivorship rate of 73.5% at 10 years. Furthermore, as techniques have advanced, the reported MAT survivorship rates have been increasing in the recent literature, with some studies reporting close to 90% survivorship rates at 10 to 15 years.[3,4]

The recently published work by Bi, Mufti, Sachs, Franzia, Lemme, and Cole[5] titled "Two-Year Patient-Reported Outcomes Are Predictive of Mid- and Long-Term Outcomes Following Meniscal Allograft Transplantation" reports on PROs at short-term (2 years), mid-term (5-10 years), and long-term (≥10 years) follow-up of 16 patients who underwent isolated medial or lateral MAT and 38 patients who underwent MAT with a concomitant cartilage-resurfacing procedure and/or realignment osteotomy. Additionally, the authors correlated short- and long-term PROs and reported on failures and complications associated with their cohort of patients undergoing MAT. Bi et al.[5] should be commended for their ability to obtain long-term outcomes (≥10 years) and their interest in attempting to establish a connection between short- and long-term outcomes. They present important clinical findings suggesting that early success and outcomes with MAT are suggestive of continued success over the course of a decade and potentially longer.

The study by Bi et al.[5] reports on the outcomes of 54 patients (of 537 total patients who underwent MAT in the study time frame, as indicated in Fig 2 in the article) who underwent a medial or lateral meniscal transplant in the senior author's practice between 2001 and 2019 with a mean follow-up period of 10.4 years. However, only 16 patients underwent isolated MAT. The key points of this study were as follows: (1) Patients reported significant improvements in preoperative to postoperative PROs in all postoperative time frames (≥2 years, 5-10 years, and ≥10 years) with a consistent upward trend. (2) The 2-year PROs were predictive of the PROs at 10-year or longer follow-up, with the Knee

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Injury and Osteoarthritis Outcome Score pain subscore reporting the highest correlation. (3) Concomitant procedures were performed in 70.4% of patients, with the majority being cartilage procedures (osteochondral allograft transplantation/osteochondral allograft transfer and matrix-induced autologous chondrocyte implantation comprised 84%). (4) Of the 54 patients with more than 5-year follow-up, 33% required a reoperation and 9.2% went on to undergo a total knee arthroplasty.

However, are these improved PROs due to the meniscal transplant or the concomitant procedures? With most patients undergoing additional procedures (70%), could these findings be more indicative of the concomitant procedures rather than the MAT? In our practice, we have found similar results of MAT being effective for long-term pain relief, and over half of our patients undergo concomitant procedures, mainly osteotomies, anterior cruciate ligament reconstructions, and cartilage procedures, in addition to MAT.[6] However, we have also found that young patients treated with a realignment osteotomy alone often have even more durable and predictable outcomes than those who initially did not undergo MAT because of bipolar cartilage surface changes after a partial meniscectomy. Thus, it is difficult to clarify the effect of the concomitant procedures with MAT on the improvements in PROs. Although the present study by Bi et al.[5] did not directly compare the concomitant procedure group with the isolated MAT group, it may have been a useful comparison even with significant heterogeneity among the concomitant procedures. As was noted in this study by Bi et al. and various other studies, concomitant injuries and procedures are very common and many of these patients have already undergone at least 1 previous knee operation or multiple previous knee operations. One of the most common concomitant injuries associated with meniscectomy is poor cartilage, and one of the most common concomitant procedures at the time of MAT is cartilage related (osteochondral allograft transplantation, osteochondral allograft transfer, matrix-induced autologous chondrocyte implantation, and so on). Many other studies have reported that concomitant cartilage lesions (if left untreated) could be the reason some patients still have poor outcomes after MAT. For example, a study by Husen et al.[7] reported on subjective success rates of MAT procedures based on Lysholm scores and reported that high-grade International Cartilage Repair Society scores (poor cartilage quality) were predictive of subjective failure (Lysholm score $\leq$ 65), along with age older than 25 years and body mass index greater than 30. In another study, Kempshall et al.[8] reported greater improvements in PROs and lower failure rates in an MAT group with minimal cartilage wear compared with patients with advanced cartilage wear. A study by Lee et al.[9] reported lower rates of meniscal extrusion when a varus-correcting high tibial osteotomy was performed in conjunction with an MAT. These studies suggest that treatment of concomitant injuries (usually cartilage based) could be behind the positive trend in PROs seen in the study by Bi et al.,[5] rather than the MAT itself.

An overall limitation of the study by Bi et al.[5] is the fact that only 10% of the total meniscal transplants (54 of 537) had minimum 5-year follow-up—and only 5.2% had 10-year or longer follow-up (28 of 537). For example, the same group published a study in 2023 with 174 patients who underwent primary MAT with minimum 10-year follow-up[10] (whereas the present study included only 28 patients with $\geq$10-year follow-up). Furthermore, in the 2023 study, they reported a 23% failure rate (revision MAT, total knee arthroplasty, or unicompartmental knee arthroplasty) at an average of 7.3 years, and in the present study, they only reported a 9.2% failure rate at an average of 8.9 years. Finally, the current study mentions that only 13% of the patients (7 of 54) had PROs from all 4 time points (preoperatively and postoperatively at 2 years, 5-10 years, and $\geq$10 years), which is concerning in terms of reporting on the correlation of PROs over time. Despite these limitations, this work is the first we know of that provides data supporting the idea that if a patient is doing well at 2 years postoperatively after MAT, then there is a high likelihood that this patient will also be doing well at 10 years postoperatively, especially regarding pain relief, as evidenced by the significantly improved Knee Injury and Osteoarthritis Outcome Score pain subscores. Additionally, this study reinforces the strong PROs and survivorship at 10 or more years after MAT reported in the literature.

Overall, this study provides a clinically important addition to the literature for surgeons who perform MAT and clinicians who work with these patients. This positive trend in PROs, especially for patients treated with concomitant procedures, is encouraging for surgeons and patients alike. However, there is still a significant gap in the literature looking at long-term follow-up related to the initial preoperative cartilage status and concomitant cartilage procedures at the time of MAT. Future studies should explore specific differences between medial and lateral MAT, report any associations between concomitant procedures, especially cartilage-based procedures or injuries, and long-term outcomes.

Disclosures

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: C.M.L. receives speaking and lecture fees from Foundation Medical and Evolution Surgical; has a family member who reports a consulting or advisory relationship with Ossur

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