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Mid-Term Outcomes And Safety Of Medial Meniscus Allograft Transplantation Using A Bone-Bridge Technique: A Single-Center Experience

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Faculty Disclosure Information

- **Conflicts of Interest:**
  - *None declared by any of the authors*

Objectives

Meniscal allograft transplantation (MAT) comprises an alternative surgical technique for patients with symptomatic meniscal deficiency. The aim of this study was to assess the mid-term clinical outcomes and safety profile of arthroscopic medial meniscus allograft transplantation (MMAT) using the bone-bridge technique. Additionally, a comprehensive overview of this technique is presented.

To date, only sparse evidence exists concerning medial meniscal allograft transplantation (MMAT) using a bone-bridge technique. In contrast to the widely used MMAT techniques using bone-plug and soft-tissue attachment, MMAT with bone-bridge is technically more demanding, as the bone-bridge is significantly longer compared to the graft used in lateral MAT. Yet, the bone-bridge technique displays distinct advantages over other techniques, including:

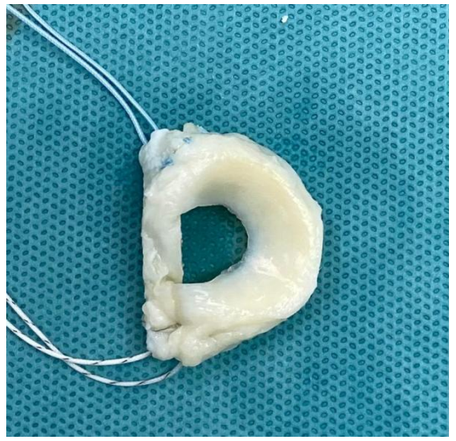
(i) an anatomically larger, bone-to-bone contact surface, which facilitates improved engraftment;

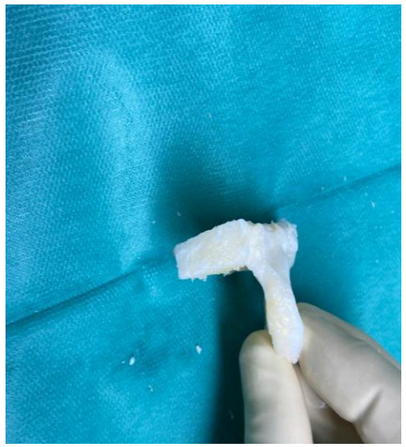
(ii) strong fixation of the meniscal roots with preservation of the natural meniscus-bone interface, which may reduce the risk of medial meniscus protrusion;

(iii) and trans-osseous fixation at the meniscal horns, which may more closely restore knee-joint contact mechanics while providing superior load distribution.

Methods

A prospective, single-center longitudinal study was performed including consecutive patients undergoing MMAT. Between 2014 and 2022, 17 patients (11 females) underwent MMAT with bone-bridge technique. The meniscal transplant was performed using a minimally-invasive arthroscopic technique. Clinical outcomes were evaluated using internationally standardized and validated questionnaires, including the International Knee Documentation Committee (IKDC) score, Knee injury and Osteoarthritis Outcome Score (KOOS), Lysholm score, and Tegner activity scale. Patient satisfaction was measured using the Visual Analog Scale (VAS). Complication rates, including graft failure, the necessity for revision MMAT, or conversion to arthroplasty, were documented.





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Results

Mean (±standard deviation [SD]) follow-up time was 4.2 (± 0.5) years. Mean (±SD) patient age was 32.7 (±11.5) years and mean BMI (±SD) was 24.2 (±4.1) kg/m2. MMAT of the right knee was performed in 9 (53%) patients. All patients had undergone at least 1 prior ipsilateral knee surgery. Concomitant surgical procedures were performed in 8 patients (47%). Graft failure was recorded in 1 patient (6%), who underwent unicompartmental knee-replacement. At follow-up, significant post-operative improvements were observed in KOOS, IKDC, Lysholm, VAS for satisfaction and Tegner scores. There were no statistically significant differences in clinical outcomes between isolated MMAT and MMAT combined with other surgical procedures.

Prior Surgical Procedure(s)	Patients (n=17)
Partial or total medial meniscectomy, n (%)	17(100)
ACL reconstruction, n (%)	2(11.7)
Revision ACL reconstruction, n (%)	3 (17.6)
Previous MMAT	2 (11.7)
Meniscal repair, n (%)	2 (11.7)
ACI trochlea, n (%)	1 (5.9)
Proximal tibial osteotomy, n (%)	1 (5.9)
Previous CMI, n (%)	2 (11.7)

Concomitant procedures	All (n=8)
ACI n (%)	4 (23.5)
AMIC lateral tibial plateau n (%)	1 (5.9)
AMIC medial tibial plateau n (%)	2 (11.7)
Microfracture lateral FC n (%)	1 (5.9)

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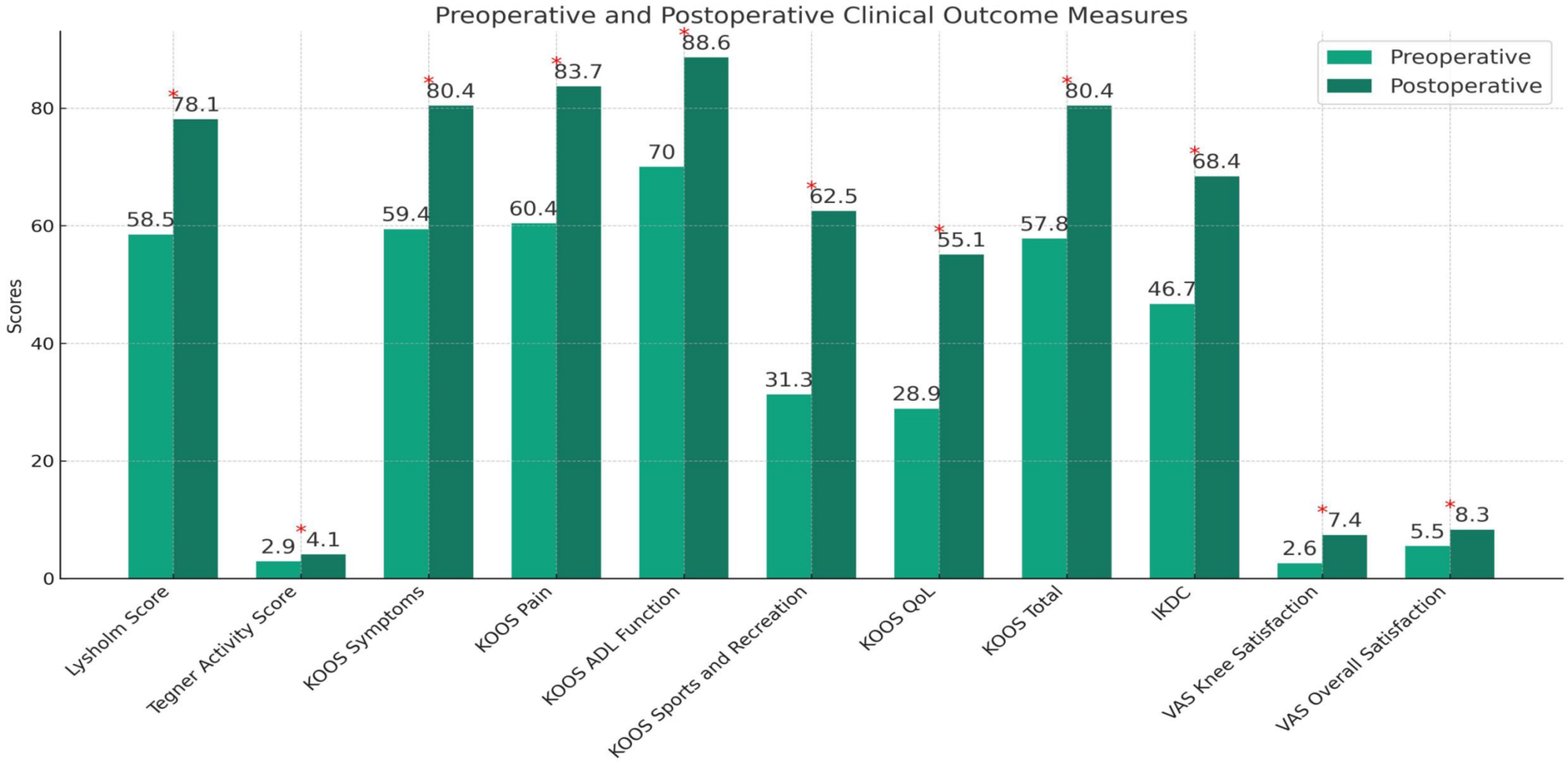
Results


Preoperative and Postoperative Clinical Outcome Measures
Preoperative
Postoperative
Scores
0
20
40
60
80
58.5
78.1
2.9
4.1
59.4
80.4
60.4
83.7
70
88.6
31.3
62.5
28.9
55.1
57.8
80.4
46.7
68.4
2.6
7.4
5.5
8.3
Lysholm Score
Tegner Activity Score
KOOS Symptoms
KOOS Pain
KOOS ADL Function
KOOS Sports and Recreation
KOOS QoL
KOOS Total
IKDC
VAS Knee Satisfaction
VAS Overall Satisfaction

Conclusions

MMAT with bone-bridge fixation is a safe and effective intervention for treating meniscal deficiency and salvaging knees post-meniscectomy. The technique's mid-term success rates and high levels of patient satisfaction, along with its favorable safety profile, support its broader clinical application.

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