Unipolar and Bipolar Osteochondral Allograft Transplantation to the Patellofemoral Joint Results in Similar Short- to Mid-term Outcomes: A Comparative Retrospective Study at Minimum 2-year Follow-up

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INTRODUCTION:

While osteochondral allograft (OCA) transplantation for tibiofemoral chondral lesions has been extensively studied, there is limited literature on outcomes following patellofemoral (PF) OCA transplantation, especially for the treatment of bipolar PF chondral lesions. This study aimed to compare graft failure rates, reoperation, and patient-reported outcomes (PROs) between patients undergoing unipolar and bipolar PF OCA transplantation with a minimum follow-up of two years.

METHODS:

A retrospective review of PF OCA transplantations between 2015-2022 at a single institution was performed. Those with concomitant tibiofemoral OCA transplantation or < 2-year follow-up were excluded. Graft failure (conversion to total or PF knee arthroplasty or revision OCA), reoperation (second-look arthroscopy with graft or surrounding cartilage debridement), and pre- and post-operative International Knee Documentation Committee (IKDC) and Knee injury and Osteoarthritis Outcome Score (KOOS) subscale PRO scores were compared between unipolar and bipolar PF OCA patients. Categorical variable comparisons between groups were performed using Fisher's exact tests. PRO score comparisons between groups were performed using Wilcoxon rank-sum tests or unpaired t-tests, depending on the normality of data as determined by the Shapiro-Wilk test. Kaplan-Meier survivorship analysis was performed for failure and reoperation, with comparisons between groups conducted using the log-rank test. All testing was two-sided, and significance was established as $p < 0.05$.

RESULTS:

Thirty-six knees (24 unipolar, 12 bipolar) from 35/41 (85.4%) eligible patients (68.6% female; age 33.59 ± 8.10 years; BMI 29.24 ± 5.28 kg/m^2) were included at a mean follow-up of 3.58 ± 1.39 years (3.87 ± 1.45 years unipolar vs 3.00 ± 1.10 bipolar, $p = 0.05$). There were no significant differences in baseline PROs, defect size ($p = 0.98$), prior surgeries ($p = 0.53$), previous cartilage repair ($p = 0.66$), and concomitant ($p = 0.19$) or prior tubercle osteotomy ($p = 0.48$). Graft failure was similar (N = 1 (4.17%) unipolar vs N = 1 (8.3%) bipolar, $p > 0.99$), with no difference in survivorship over time ($p = 0.16$) (100% unipolar and 91.7% bipolar grafts survived at 2-4 years postoperatively)(**Figure 1**). Reoperation-free survivorship for unipolar OCA was 92% at 2, 3, and 4.7 years, while for bipolar OCAs it was 92% at 2 years, 76% at 3 years, and 57% at 4.7 years ($p = 0.15$). IKDC and KOOS scores improved similarly from baseline to final follow-up (**Figure 2**). No significant differences in MCID achievement for IKDC ($p = 0.74$), KOOS Pain ($p = 0.64$), and KOOS Sports ($p = 0.33$) were observed (**Figure 3**).

DISCUSSION AND CONCLUSION: Bipolar and unipolar PF OCA transplantation both yielded excellent and comparable graft survivorship and clinically significant functional improvement at short- to mid-term follow-up.

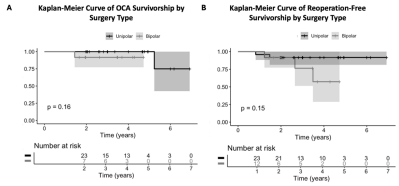

Figure 1. Kaplan-Meier Survival Analysis Curve of Failure and Graft Reoperation by Surgery Type. A) Graft survivorship without failure. In the unipolar group (dark curve), the probability of graft survivorship at 4 and 6 years after surgery was 100.0% and 75.0%, respectively. In the bipolar group (light curve), survival probabilities were 90.0% at both 4 and 4.7 years after surgery. (B) Graft survivorship without reoperation by surgery type. In the unipolar group (dark curve), the probability of graft survivorship without reoperation was 92.0% 2. to 5 years after surgery. In the bipolar group (light curve), the probability of graft survivorship without reoperation was 92.0%, 76.4%, and 56.2% at 2, 3, and 4.7 years postoperatively, respectively.

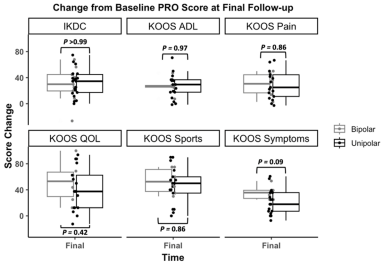

Figure 2. Final PRO Score Change from Baseline At Final Follow-up. No significant difference in the change from the baseline score at the final follow-up between the unipolar (dark) and bipolar (gray) groups for IKDC and all KOOS subscores.

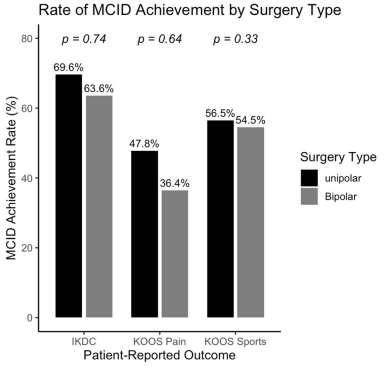

Figure 3. MCID Achievement Rate by Surgery Type At Final Follow-up. No significant difference in MCID achievement rate at the final follow-up between the unipolar (dark) and bipolar (gray) groups for IKDC, KOOS Pain, and KOOS Sports. Minimal Clinically Important Difference (MCID) achievement was determined using previously established thresholds for IKDC (MCID: 17.0), KOOS Pain (MCID: 16.7), and KOOS Sport (MCID: 25).[1-3]