Effects of a Behavioral Health Program on Graft Survival Rates after Osteochondral Allograft Transplantation in the Knee

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INTRODUCTION: Joint preservation surgeries accomplished through osteochondral allograft (OCA) transplantation require extensive pre-operative preparation and education, as well as prolonged post-operative adherence to restriction, recovery, and rehabilitation protocols, in order to maximize patient outcomes in terms of functional graft survival rates. Emerging evidence suggests that patients' behavioral health plays important roles in influencing success after OCA transplantation. In our ongoing effort to optimize outcomes for OCA transplantation surgeries, a comprehensive behavioral health program (BHP) including pre-operative assessment and education and post-operative counseling and support, led by a health behavior psychologist, was implemented for patients considering OCA transplantation at our center. In evaluating the impact of our BHP, this study was designed to test the hypothesis that patients enrolled in this program would realize a significantly higher functional graft survival rate when compared to patients not enrolled in the program.

METHODS: With IRB approval and documented informed consent, patients seeking OCA transplantation to treat symptomatic articular cartilage defects in the knee were presented with the opportunity to participate. Enrollment in the BHP was determined based on an evidence-based shift in practice and/or patient choice. Patients undergoing OCA transplantation in the knee were enrolled in a lifelong outcome registry prior to surgical intervention. The Kaplan-Meier method using log-rank tests was used to compare 2-year cumulative survival rates between BHP and no-BHP cohorts. Functional graft survival time was defined as the time between surgical intervention and OCA treatment failure or the most recent follow-up with documented absence of failure. OCA treatment failure was defined as any need for a revision OCA surgery or conversion to any form of knee arthroplasty. Tobacco use and non-adherence to postoperative protocols were compared between cohorts using Fishers exact tests. Age and BMI were compared using two-sided t-Tests. Multivariable Cox regression analyses adjusted for age, body mass index (BMI), non-adherence, and tobacco use were used to evaluate the influences of BHP on graft survival. Significance was set at $p < 0.05$.

RESULTS: In total, 303 patients were included in the analyses: 81 were enrolled in the BHP and 222 were not enrolled in the program. At 2-year follow-up, a significantly lower cumulative graft survival rate was observed for patients not enrolled in the BHP (68.5% vs 91.3%; p = .0038). Age, BMI, tobacco use, and non-adherence to post-operative protocols were not significantly different between groups. When adjusting for Age, BMI, tobacco use, and non-adherence, patients not enrolled in the BHP demonstrated a 3-times greater likelihood to fail by 2 years compared with BHP patients (95% CI, 1.38-6.57; p = 0.01).

DISCUSSION: Our findings indicate that enrollment in a comprehensive behavioral health program had positive effects on functional graft survival for patients undergoing OCA transplantation in the knee. In agreement with previous studies, non-adherence was found to be negatively associated with functional OCA survival. To mitigate treatment failure, OCA transplantation requires extensive pre-operative preparation and education and prolonged and challenging adherence to post-operative restriction, recovery, and rehabilitation protocols. As such, patients and their informal caregivers need effective education, counseling and support throughout the process in order to promote adherence and optimize outcomes. At our center, an integrated behavioral health program led by a health behavior psychologist and implemented through a multidisciplinary team approach has proven effective in addressing these goals and significantly reducing OCA transplantation failure rates. This analysis has limitations. Factors that could affect survival rates that have not yet been analyzed include number of knee surfaces being transplanted, graft source, previous operation numbers and types , concomitant surgeries, and additional changes to our joint preservation center's treatment protocol beyond the inception of the BHP. Future steps for this analysis will focus on evaluating the impact of these factors in relation to the BHP impacts.

SIGNIFICANCE/CLINICAL RELEVANCE: Taken together, these data suggest that the addition of a comprehensive behavioral health program including pre-operative assessment and education and post-operative counseling and support, led by a health behavior psychologist, is a cost-effective method for significantly improving outcomes after OCA transplantation, and has become a requirement for patients to pursue this joint preservation surgery at our center.

IMAGES AND TABLES:

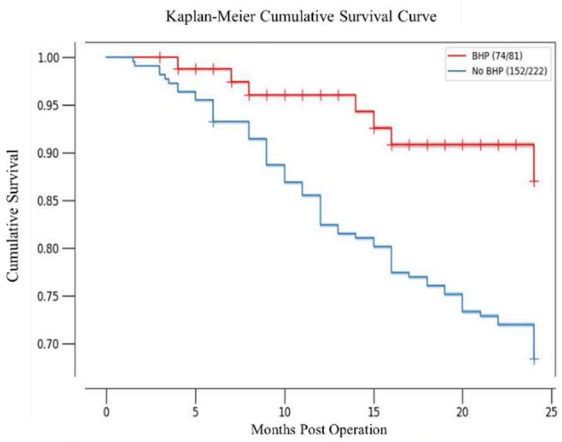

Figure 1) Kaplan-Meier curve of 2-year cumulative survival by enrollment in BHP. Lower cumulative survival was found in patients not enrolled in BHP as compared to those enrolled in BHP.

OCA Transplantation Patients Enrolled or Not in Behavioral Health Program

	Behavioral Health Program Enrollment				
	Total	No BHP	BHP	95% CI	p-value
Patients	303	222	81		
Age (years)	36.8 ± 12.5 (12-69)	37.2 ± 12.4 (13-69)	34.7 ± 12.4 (15-62)	-0.68 to 5.69	0.1226
Body Mass Index	28.5 ± 5.1 (16-46)	28.7 ± 5.1 (16-46)	26.9 ± 4.8 (17-37)	-1.41 to 1.56	0.9179
Non Adherent	61 (22.1%)	51 (22.9%)	10 (12.3%)		0.0514
Tobacco	22 (7.26%)	20 (9%)	2 (2.47%)		0.0769
Graft Failure	77 (25.4%)	70 (31.5%)	7 (8.64%)		**0.0038**

Table 1) Values shown by mean ± std (range) or No. (%). Tobacco use and non-adherence were compared between groups using Fishers exact. Age and body mass index were compared between groups using independent-sample t-tests. Significance for all tests was set at $p < 0.05$, significant findings are emboldened.

Multivariate Cox Regression Analysis of the Influence of Behavioral Health Program Enrollment on Graft Failure in OCA Transplantation

	Coefficient	p-value	Hazard Ratio	95% CI
Age (years)	0.01	0.08	1.01	1.00 to 1.03
Body Mass Index	0.02	0.25	1.02	0.98 to 1.07
Non Adherent	0.63	**0.01**	1.87	1.18 to 2.96
Tobacco	-0.76	0.3	0.44	0.20 to 1.20
No BHP	1.1	**0.01**	3.01	1.38 to 6.57

Table 2) Cox regression analysis using Age, Body Mass Index, Non-adherence, and Tobacco use as covariates. Significance set at $p < 0.05$, significant findings are emboldened. Non-adherence and no enrollment in the BHP were found to significantly influence graft failure.