28-Year Experience with 610 Osteochondral Allograft Transplantations: Factors Associated with Treatment Failure and Suboptimal Improvement in Clinical Outcomes

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INTRODUCTION: Prior research has shown that graft survivorship and clinical outcomes after osteochondral allograft (OCA) transplantation are influenced by patient- and graft-specific factors, but studies are limited by small samples, short follow-up, and univariate analyses. This study used a multivariable model to identify predictors of OCA treatment failure and suboptimal improvement in clinical outcomes in a large cohort of patients.

METHODS: 610 knees undergoing OCA transplantation from 1997 to 2023 were included. Treatment failure was defined as conversion to arthroplasty or graft removal. Clinical outcome was measured by International Knee Documentation Committee (IKDC) total scores. Suboptimal outcome was defined as <10-point improvement from preoperatively to latest follow-up, reflecting the minimal clinically important difference (MCID). Multivariable logistic regression identified predictors of treatment failure and suboptimal improvement in outcomes after controlling for the influence of multiple factors or confounding variables.

RESULTS: Treatment failure occurred in 93 knees (15.2%) at a median of 3.5 years postoperatively (66 arthroplasties, 26 revision allografts, 1 patellectomy). Patient age, body mass index, diagnosis, and graft size independently predicted a higher risk of treatment failure after controlling for other variables (Table 1). The median follow-up was 7.5 years (range 2-26 years) for the 517 knees with grafts in situ. Patient sex and diagnosis independently predicted a higher risk of suboptimal improvement in clinical outcomes after controlling for other variables (Table 2).

DISCUSSION AND CONCLUSION: Older age, obesity, degenerative diagnoses, and larger graft areas increased treatment failure risk. Female sex and degenerative or trauma-related diagnoses predicted suboptimal improvement in clinical outcomes. Young patients and those with osteochondritis dissecans had the best results. After adjustment, no graft-specific factors were associated with treatment failure or clinical outcomes. These findings may help surgeons make candidate selection decisions for OCA transplantation, as well as communicate prognostic expectations to patients.

Table 1. Logistic regression results for variables predicting treatment failure, after controlling for all other variables in the model.

Predictor	Odds ratio in comparison to reference group	p-value	95% confidence interval
Age			
≤ 30*			
> 30	2.04	0.017	1.14, 3.66
Body mass index			
≤ 30*			
> 30	1.99	0.029	1.07, 3.70
Diagnosis			
Osteochondritis dissecans*			
Traumatic chondral injury	1.06	0.915	0.35, 3.22
Degenerative chondral lesion	2.25	0.033	1.07, 4.73
Avascular necrosis	4.49	0.002	1.76, 11.45
Fracture	1.95	0.222	0.67, 5.67
Osteoarthritis	3.44	0.009	1.36, 8.70
Total graft size			
≤ 8 cm^2*			
> 8 cm^2	1.81	0.038	1.03, 3.17

*Reference group

Table 2. Logistic regression results for factors predicting suboptimal improvement in clinical outcomes, after controlling for all other variables in the model.

Predictor	Odds ratio in comparison to reference group	p-value	95% confidence interval
Sex			
Male*			
Female	2.55	0.002	1.42, 4.57
Diagnosis			
Osteochondritis dissecans*			
Traumatic chondral injury	2.68	0.027	1.12, 6.41
Degenerative chondral lesion	2.22	0.039	1.04, 4.75
Avascular necrosis	1.85	0.334	0.53, 6.43
Fracture	8.85	<0.001	2.97, 26.39
Osteoarthritis	3.41	0.022	1.20, 9.69
Preoperative IKDC score	1.05	<0.001	1.03, 1.07

*Reference group