

Revision Risk After Allograft Anterior Cruciate Ligament Reconstruction: Association with Graft Processing Techniques, Patient Characteristics and Graft Type

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Summary:

Graft irradiation over 1.8 Mrad, BioCleanse processing, younger patients, male patients and BPTB allograft were associated with higher risk of revision surgery after primary allograft anterior cruciate ligament reconstruction (ACLR). Surgeons should be aware that vendor-specific graft processing methods, graft type, patient age and gender have implications on revision risk after allograft ACLR.

Abstract:

INTRODUCTION

Allograft tissue is a common graft choice for anterior cruciate ligament reconstruction (ACLR). Allograft sterilization methods vary widely across numerous commercially available tissue vendors, without an established gold standard. Multiple studies, despite being limited in sample size, have suggested a higher rate of clinical failure associated with the use of allograft tissue in ACLR when compared to autograft. It remains unclear whether this higher allograft failure rate is related to graft properties, patient attributes or a combination of both. The purpose of this study was to examine the association of graft processing techniques, patient characteristics and graft type with risk of revision surgery after allograft ACLR.

METHODS

A retrospective cohort study was conducted using an integrated U.S. healthcare system's ACLR Registry to identify primary unilateral cases in which allografts were used. Aseptic revision was the end point of the study. Allograft type, processing methods (irradiation dose, AlloWash, AlloTrue, BioCleanse) and graft donor age were assessed as potential risk factors for revision, while adjusting for patient age, gender and body mass index (BMI) using logistic regression analysis models. Hazard ratios (HR) and 95% confidence intervals (CI) were calculated.

RESULTS

5,968 primary ACLR cases with allograft were included in the study, of which 3,688 (61.8%) were male. The median age of the cohort at the time of surgery was 34.1 years-old (inter-quartile range 24.1-42.9). The mean time to follow-up was 2.1 years (SD=1.5). There were 3,751 (62.9%) allograft ACLRs utilizing soft-tissue, 1,188 (19.9%) with Achilles tendon and 1,029 (17.2%) with bone-patellar tendon-bone (BPTB). There were 156 (2.6%) aseptic revisions. After adjusting for patient age, gender and BMI, the use of BioCleanse (HR=2.45, 95%CI 1.36-4.40) and irradiation over 1.8 Mrad (HR=1.64, 95%CI 1.08-2.49) were associated with a higher risk of revision when compared to all other methods of processing. BPTB allografts were at higher risk of revision (HR=1.79, 95%CI 1.20-2.66) when compared to soft tissue allografts. Conversely, with every 5 year increase in age, the odds of revision were 0.67 (95%CI 0.61-0.73) times lower. Males were found to be at higher risk of revision when compared to females (HR=1.47, 95%CI 1.04-2.07). The use of AlloWash or AlloTrue processing, patient BMI and graft donor age did not affect revision rate significantly.

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CONCLUSION

In the largest known study of its kind examining outcome after primary allograft ACLR, graft irradiation over 1.8 Mrad, BioCleanse graft processing, younger patients, male patients and BPTB allograft were all associated with a higher risk of clinical failure and subsequent revision surgery. Surgeons selecting allograft for primary ACLR should be aware that vendor-specific graft processing methods, graft type, patient age and patient gender have implications on higher postoperative revision risk.