Total Knee Arthroplasty In A Transplant Population Achieves Similar Outcomes To A Matched Non-transplanted Population: A Retrospective Cohort Study

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Introduction: Solid organ transplants (SOT) of the heart, kidney, lung, and liver are becoming increasingly commonplace, and survival has improved with modern surgical technique; as a result, more patients with a history of SOT are interested in total knee arthroplasty (TKA). The purpose of this study is to compare rate of perioperative complications and readmission (primary outcomes) as well as mortality, function, and re-operation rate (secondary outcomes) following elective primary TKA in patients with a history of SOT versus a matched cohort of non-transplanted patients.

Methods: A single-institution, multi-hospital retrospective case-control investigation of primary TKAs was performed. Patients selected for study inclusion had undergone SOT between March 2017 and April 2025 with mean final post-TKA follow up of 46 months (0.4 - 103.5 months range). Index arthroplasty surgery was performed 32 different orthopedic surgeons. Inclusion criteria were elective primary TKA and at least one post-operative follow-up visit. A cohort of non-transplanted control patients was generated using an exact matching algorithm with the variables age, BMI, and gender being included in the matching algorithm. Of the matches generated, two matches were selected for each patient (2:1 ratio) in the transplant group, with preference given to the match pairs with the most statistically similar Elixhauser Comorbidity Index (ECI) scores. Both primary and secondary outcomes were analyzed in an a priori fashion. Due to significant differences in ECI between the two cohorts, multivariable regression with ECI as a covariate was utilized to analyze both primary and secondary outcomes. For continuous variables, a linear multivariable regression analysis was used whereas for binary and time-to-event outcomes, multivariable logistic and multivariable Cox regression models were utilized respectively. All statistical variables (odds ratio [OR], P values) are reported as the adjusted values after accounting for ECI differences between the groups.

Results: A total of sixty-nine transplant patients met criteria for inclusion in the study and one hundred thirty-five matched controls were generated (3 matches were unable to be generated based on study matching criteria, 3/138, 2.2%). Cohorts were well matched for age (65.7 ± 8.0 years transplant group vs 66.0 ± 7.7 years, $P = 0.818$), BMI (28.8 ± 8.3 vs 30.5 ± 5.1, $P = 0.112$), and sex (43.5% female transplant group vs 44.4% female control group, $P = 0.895$). Groups differed significantly with respect to ECI score (SOT 12.0 vs 7.9 control, $P < 0.001$). In the SOT group, 6 (8.7%) patients received multiple organ transplantations, 12 (17.4%) received an isolated heart transplant, 27 (39.1%) received a kidney transplant, 6 (8.7%) received a lung transplant, and 30 (43.5%) received a liver transplant. In terms of primary outcomes, overall rate of 90-day readmission due to complications related to TKA was similar between cohorts (8.7% vs 1.5%, odds ratio 2.53, 95% CI 0.95 - 6.75, $P = 0.105$). Of the 6 readmissions in the SOT cohort, 3 were for uncontrolled pain, 2 for post-surgical acute kidney injury, and 1 for a surgical site hematoma. Rate of periprosthetic joint infection (SOT 4.3% vs 3.0% control cohort, OR 0.83, 95% CI 0.15 - 4.46, $P = 0.830$), periprosthetic fracture (0% vs 0.7%, $P = 1.00$), and delayed wound healing (2.9% vs 0.7%, OR 1.69, 95% CI 0.08 - 34.5, $P = 0.733$) were similar between the SOT and control cohorts

respectively. For secondary outcomes, reoperation rates for manipulation under anesthesia (MUA) (SOT 2.9% vs control 11.1%, OR 0.37, 95% CI 0.08 - 1.72, *P* = 0.204), arthroscopic lysis of adhesions (LOA) (1.4% vs 3.7%, OR 1.03, 95% CI 0.10 - 10.41, *P* = 0.979), and revision arthroplasty with component exchange for arthrofibrosis (0% vs 0.7%, *P* = 1.00) were similar between cohorts. Overall mortality rate was similar between the transplant and control cohorts (7.2% vs 7.7%, OR 0.327, 95% CI 0.16 - 1.86, *P* = 0.327) with mean time to loss of follow-up due to mortality also being similar between the groups (SOT 2.4 ± 2.8 years vs 1.8 ± 0.9 years control, *P* = 0.681). Both SOT and control cohorts demonstrated similar rates of achieving post-operative flexion ≥ 120 degrees at <31 days (4.9% vs 6.3%, OR 0.68, 95% CI 0.69 - 1.10, *P* = 0.997), 31-180 days (47.8% vs 55.0%, OR 1.08, 95% CI 0.28 - 4.20, *P* = 0.911), and >180 days (67.7% vs 64.5%, OR 0.49, 95% CI 0.18 - 1.32, *P* = 0.159) respectively. The transplant cohort had a statistically significantly higher rate of early post-operative (<31 days) flexion contracture ≥ 5 (60.7% vs 32.5%, OR 2.86, 95% CI 1.26 - 6.58, *P* = 0.012), though similar rates of flexion contracture ≥ 5 degrees were noted at 31-180 day follow-up (30.4% vs 20.0%, odds ratio 1.30, 95% CI 0.26 - 6.37, *P* = 0.752) and >180 day follow-up (8.8% vs 8.1%, OR 1.06, 95% CI 0.10 - 11.90, *P* = 0.957).

Discussion: Recipients of SOT undergoing elective TKA demonstrated similar outcomes with respect to the primary outcome of the study, complication rates and readmission rates, when compared to a matched control group. Transplanted patients were also similar to the control cohort with respect to the secondary outcomes studied, with a notable exception being that transplant patients were more likely to have early post-operative flexion contracture. This increased rate of early flexion contracture seen in the transplant cohort ultimately improved at later follow-up intervals.

Significance/Clinical Relevance: The results of this study suggest that TKA can offer similar outcomes in patients with a history of SOT as those seen in a non-transplanted population.