Effect of Robotic Assistance on Early Revisions and Aseptic Loosening in Cementless Total Knee Arthroplasty: An Analysis of the American Joint Replacement Registry

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INTRODUCTION:
Total knee arthroplasty (TKA) with cementless fixation is associated with higher risk of early aseptic loosening and reoperation within two years after primary TKA. We hypothesized that cementless TKA with robotic-assistance results in significantly lower all-cause revision and aseptic loosening compared to conventional cementless TKA.
METHODS:
Using the American Joint Replacement Registry (AJRR), a retrospective cohort of 9,220 cases in patients with osteoarthritis, ages 65+, who underwent primary TKA from January 2017 through March 2020 with cementless femur and tibial components, was identified. Linkage with Medicare claims data provided 2-year follow up. Hybrid fixation cases were excluded. Robotic assistance was used in 44.8% (4,130) of cases. Analysis compared conventional TKA to robotic-assisted TKA on all-cause linked revision as well as reasons for revision. Independent variables were generally similar between groups. A mixed-effects model was used to analyze the odds ratios for all-cause linked revision on robotics use and was adjusted for age, gender, comorbidities, surgeon, and institution. Sub-analyses were performed on reasons for revision. A power analysis demonstrated the ability to measure moderate effect sizes based on Cohen's d.
RESULTS:
All-cause 2-year revision was similar between robotic and conventional TKA (1.16 vs. 1.30%; p=0.6), and the mixed-effects logistic regression model found no statistical difference (p=0.4) between techniques in all-cause revision risk. On univariate analysis, robotic-assistance was significantly associated with higher risk for infection and mechanical loosening as significant reasons for revision with p-values of 0.026 and 0.030 respectively. However, once included in an adjusted analysis controlling for, age, sex, and Charlson comorbidity index, there was no statistical difference identified for the association between robotic use and revision for infection (p=0.18) or mechanical loosening (p=0.08).
DISCUSSION AND CONCLUSION:
In rejection of the hypothesis, robotic-assistance did not reduce the risk of 2-year all-cause revision or aseptic loosening in cementless TKA.