Comparative Analysis of Robotic-Assisted and Manual Total Knee Arthroplasty: A Two-Year Outcome Study Using the PearlDiver Database

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INTRODUCTION:
Increasing utilization of robotic-assisted total knee arthroplasty (RA-TKA) has sparked debate regarding its clinical outcomes and implications. This study aimed to compare two year outcome data of RA-TKA versus manual TKA at a population level. We hypothesize that the RA-TKA cohort will exhibit fewer mechanical complications compared to the manual TKA cohort.
METHODS:
A retrospective matched cohort study was conducted utilizing the PearlDiver database. Subsequently, RA-TKA patients (n =5,709) were matched 1:4 with manual TKA patients (n =22,742) across age, sex, Elixhauser Comorbidity Index, and comorbidities. Two-year prosthesis-related complications and opioid utilization, measured by morphine milligram equivalents (MME), were compared using multivariable logistic regression.
RESULTS:
At two years postoperatively, the manual TKA cohort exhibited significantly higher rates of aseptic revision (0.98% vs. 1.51%; OR 0.64), aseptic loosening (0.09% vs. 0.30%; OR 0.06), manipulation under anesthesia (MUA) or lysis of adhesions (LoA) (3.73% vs. 4.38%; OR 0.84), other mechanical complications (0.95% vs. 2.26%; OR 0.41), and all cause reoperation (4.84% vs. 6.16%; OR 0.77).
DISCUSSION AND CONCLUSION:
Compared to manual TKA, RA-TKA was associated with lower rates of aseptic revision, aseptic loosening, and all cause reoperation at two years. Additionally, RA-TKA resulted in lower MME in the acute postoperative period. Future study should investigate specific robotic technologies, including the influence of image-based versus imageless systems and active versus passive robotics.