Robotics and Computer Navigation Do Not Offer Significant Benefits Compared to Manual Techniques for Total Knee Arthroplasty

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INTRODUCTION: Computer navigation and robotics have been introduced to total knee arthroplasty (TKA) as a way to improve precision in component positioning and soft-tissue balancing. Increasing interest in kinematic alignment has increased interest in these technologies to help surgeons achieve individualized targets. Both technologies have been heavily marketed to both surgeon and patients alike.

METHODS:

This pragmatic, retrospective single center study compared outcomes for patients who underwent a primary unilateral TKA for osteoarthritis between January 2020 and December 2023. Surgical technique and implant selection were left to surgeon choice, though all TKAs were performed using a medial parapatellar approach, with the majority being cemented. Overall, 4,273 patients met eligibility criteria. Patient reported outcomes (PROMs) were collected using an electronic patient engagement platform pre-operatively, at 12 weeks, 6 months, and 1 year. Linear and logistic regression modeling were used to assess potential confounders in the dataset.

RESULTS:

The use of computer navigation increased over the time frame assessed, while the use of robotics decreased. The vast majority (87%) of patients underwent a TKA using manual techniques. Cementless fixation predominated in computer navigation and robotics and as such, demographics reflected a younger, healthier, male patient population. There was no difference in patient reported outcomes among techniques, nor was there a difference in complications. Cost differed significantly, with the robotic group being an average of $2,000 more expensive, even when controlling for confounders.

DISCUSSION AND CONCLUSION: Robotics, but not computer navigation, increased overall costs of TKA surgery without any differences noted in complication rates or patient reported outcomes for any group compared to conventional instrumentation. This study is significant in that it is pragmatic, and no surgeon involved had industry ties. The best technique for modern TKA remains the one an individual surgeon is most comfortable with.