Does Use of Cruciate-Retaining Implants Change with Adoption of Robotic Assistance in Total Knee Arthroplasty?

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INTRODUCTION: Robotic-arm assisted total knee arthroplasty (TKA) can facilitate ligament balancing and protect the posterior cruciate ligament (PCL) during bone preparation, which may preferentially improve implantation of cruciate-retaining (CR) implants. Historical evidence suggests equivalent manual TKA outcomes between CR and posterior-stabilized (PS) implants. This study aims to analyze how CR implant usage changes as robotic technology is increasingly implemented in TKAs.

METHODS: This was a retrospective review of 3,759 primary TKA cases from January 2017 to December 2023, focusing on surgeons that used both conventional and robotic techniques. Patients were either implanted with a CR or PS femoral implant. Robotic technology included in the study were the Mako, ROSA, and CORI systems. Implant and surgical data were obtained from electronic medical records. The correlation between use of robotic-assistance and CR implants was computed using chi-square tests, linear regression, and Pearson's correlation. Sub-analysis was further performed to investigate the individual robotic systems surgeons used.

RESULTS: We found 79.4% of robotic surgeries in the period studied used CR implants compared to 45.9% of conventional surgeries (P<0.001). Overall, correlation and regression analysis indicated that as surgeons increase their use of robotic technology, there is a significant, though weak to moderate, increase in percent usage of CR implants (r=0.293, B=0.277, P<0.001; Figure 2). As one surgeon grew their robotic percentage from 52.68% in 2021 to 97.84% in 2023, their CR percentage increased from 50.10% to 82.73% respectively (Figure 2). On further sub-analysis, surgeons using primarily Mako robots were more aligned with increases in CR use than those using other systems (Figure 3).

DISCUSSION AND CONCLUSION: The adoption of robotics has yielded a high utilization of CR implants. The analyzed data reveals a correlation between the percentage of robotic cases and CR implants used. Future work should investigate how increased use of implants with robotic assistance affects clinical outcomes.

Figure 1. A. % Cruciate-Retaining Implant Use B. % Robotic Use over Time, stratified by surgeon
*Colors represent different surgeons

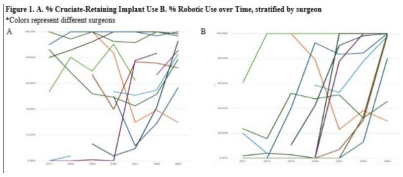

Figure 2. Overall Use of Cruciate-Retaining Implants and Robotic-Assistance over Time

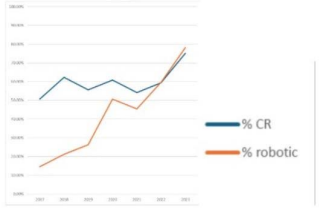

Figure 3. Use of Cruciate-Retaining Implants and Robotic-Assistance over Time A. Primarily Mako Users B. Multiple Systems Users C. Primarily Non-Mako Users