Is there a clinical benefit for robotic-assisted total hip arthroplasty compared to conventional total hip arthroplasty?

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INTRODUCTION: Robotic-assisted total hip arthroplasty (RA-THA) continues to grow in popularity. There is a potential advantage for surgical precision and accuracy using robotic assistance but there has been limited translation to clinical outcomes. Using a large national cohort, this study aims to compare clinical outcomes between conventional primary and robotic-assisted total hip arthroplasty.

METHODS: This retrospective cohort study evaluated 354,783 patients who underwent primary THA (CPT 27130) between 2015 and 2023 with data sourced from the Epic Cosmos database. We identified 19,169 RA-THA procedures using CPT codes 0055T and 20985, coupled with preoperative CT imaging CPT code 73700. Primary outcomes were calculated perioperative blood loss, 90-day reoperation, and 12-month reoperation. Univariate analyses and standardized mean differences (SMD) were utilized to investigate patient characteristics, calculated blood loss, and all-cause reoperation. Binary logistic regression was employed to investigate the relationship between RA-THA and outcomes after controlling for patient characteristics.

RESULTS: Utilizing a minimum SMD threshold of 0.20, there were no significant differences in patient baseline demographics or comorbidity burden. There were no significant differences in calculated perioperative blood loss or 90-day reoperation rates between the groups. However, patients in the robotic-assisted cohort experienced lower rates of reoperation at 12 months (10.6% vs. 11.2%, $p = 0.027$). After controlling for demographics, BMI, and comorbidity load, RA-THA was associated with decreased odds of 12-month reoperation [OR: 0.944 (95% CI: 0.896, 0.993), $p = 0.026$]. The odds of reoperation within 90 days did not significantly differ between the groups [OR: 0.992 (95% CI: 0.920, 1.068), $p = 0.826$]. Robotic guidance demonstrated no effect on calculated blood loss [OR: 0.001 (95% CI: -0.002, 0.004), $p = 0.494$].

DISCUSSION AND CONCLUSION: Robotic-assisted THA demonstrated decreased 12-month reoperation rates and lower risk of reoperation within 12 months of the index surgery. There were no significant differences within 90-day complications or calculated perioperative blood loss. RA-THA may have potential benefits beyond 90-day outcomes.