

# Robotic-Assistance is Associated with Better Outcomes Compared to Conventional Techniques in Total Hip Arthroplasty: A Propensity-Matched Large Database Study of 7,896 Patients

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**Introduction:** The outcomes of total hip arthroplasty (THA) are highly dependent upon the restoration of native hip biomechanics and optimal component positioning. The introduction of robotic technologies for THA has rapidly improved the accuracy of component positioning and maintaining the planned center of rotation. Furthermore, robotic-assisted THA (RA-THA) has been shown to reduce the rate of revision due to dislocation and decrease postoperative costs by thousands of dollars. While RA-THA has primarily been employed in surgically intricate cases, its potential benefits in scenarios of diminished surgical complexity remain less explored. Therefore, the purpose of this study was to assess the odds of developing systemic and joint complications up to a 5-year postoperative period in patients undergoing RA-THA in routine THA cases.

**Methods:** A retrospective cohort study was conducted using a national database to identify patients who underwent primary THA (Current Procedural Terminology code 27130) from 2005 to 2022. Patients undergoing RA-THA were identified by ICD-10-PCS code 8E0Y0CZ and Healthcare Common Procedure Coding System code S2900. One-to-one propensity score matching was conducted to generate 2 cohorts: 1) RA-THA and 2) conventional THA (C-THA). Systemic and joint complications were assessed at the 30-day, 90-day, 1-year, and 5-year postoperative periods. A 1:1 propensity score matching was conducted using a greedy nearest neighbor matching algorithm. Patients were matched on the demographics and comorbidities. Patient characteristics were considered well-matched if the p-value was less than 0.05. Dichotomous outcomes were assessed using an odds ratio (OR) with a 95% confidence interval (CI). A p-value less than 0.05 was considered significant.

**Results:** After propensity-matching, patients undergoing RA-THA had a lower risk of need a revision THA at 90 days (OR: 0.3, 95% CI: 0.1 to 0.6, p = <0.001), 1 year (OR: 0.3, 95% CI: 0.2 to 0.5, p = <0.001), and 5 years (OR: 0.4, 95% CI: 0.2 to 0.8, p = 0.001). The risk of prosthetic dislocation was lower in the RA-THA cohort at 90 days (OR: 0.3, 95% CI: 0.1 to 0.7, p = 0.002) and 1 year (OR: 0.2, 95% CI: 0.1 to 0.5, p = <0.001). The RA-THA cohort had a lower risk of developing a femur fracture or hip dislocation at 30 days (OR: 0.5, 95% CI: 0.3 to 0.6, p = <0.001), 90 days (OR: 0.5, 95% CI: 0.4 to 0.7, p = <0.001), 1 year (OR: 0.5, 95% CI: 0.4 to 0.7, p = <0.001), and 5 years (OR: 0.6, 95% CI: 0.4 to 0.9, p = 0.002). The odds of developing prosthetic pain were lower in the RA-THA cohort at 1 year (OR: 0.4, 95% CI: 0.2 to 0.8; p <0.001) and 5 years (OR: 0.4, 95% CI: 0.2 to 0.8, p = <0.001).

**Discussion:** The analysis found comparable medical complication risks at all time points between RA-THA and C-THA. Additionally, RA-THA showed reduced risks of revision, prosthetic joint infection, prosthetic dislocation, hip dislocation or femur fracture, and prosthetic pain. The results of this analysis encourage future utilization of RA-THA compared to C-THA for routine hip arthroplasty cases due to the significant reduction in complication rates. The study utilized a database reliant on data retrieved from electronic health records across various systems, leading to potential coding discrepancies and underreporting complications.

**Clinical Relevance:** These findings suggest that RA-THA has decreased orthopaedic complication risks at 30-day to 5-year timepoints compared to C-THA. Future studies with large sample sizes and long-term follow-up are needed to understand the patient-reported outcomes and functional outcomes of RA-THA for cases with reduced surgical complexity.