

Dislocation Risk after Total Hip Arthroplasty is Lower with Robotic Assistance or Fluoroscopy Guidance

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INTRODUCTION:

Technology may reduce total hip arthroplasty (THA) dislocations by improving accuracy and precision of component positioning. We investigated dislocation rates with fluoroscopy, computer navigation, and robotic-assistance, controlled for surgical approach, bearing diameter, and bearing type.

METHODS:

We reviewed 13,268 THAs performed between January 2016 - December 2022, including 7,213 without technology, 4,653 with computer navigation, and 1,402 with robotics. Fluoroscopy was used in 3,900, often with other technologies (51.8%) and primarily with the anterior approach (94.2%). Approach was posterior in 7,665 (57.8%), anterior in 4,861 (36.6%), and direct lateral in 742 (5.6%). Fixed bearing diameters \geq 36-millimeters were used in 57.0%. Dual mobility was used in 3.9%. Multivariable analysis yielded dislocation odds ratios (OR) for each variable.

RESULTS:

Raw dislocation rates were: posterior approach 1.6%, anterior approach 1.0%, lateral approach 0.8%, manual unguided 1.9%, manual with fluoroscopy 0.7%, manual with computer navigation 1.2%, manual with fluoroscopy and computer navigation 0.7%, robotic without fluoroscopy 0.4%, and robotic with fluoroscopy 0%.

Upon multivariable analysis, robotics associated with significantly reduced dislocation risk compared to manual surgery (OR 0.25, 95% CI 0.11-0.56), as did fluoroscopy (OR 0.53, 95% CI 0.18-0.88). Computer navigation did not independently associate with reduced risk with the numbers available (OR 0.76, 95% CI 0.54-1.06).

For the posterior approach, the dislocation risk was lower with robotics (0.3%) than with conventional (1.7%) or computer-navigated (1.6%, $p=0.001$) surgery. For anterior surgery, fluoroscopy alone and robotics alone each associated with a decreased dislocation risk compared to unguided surgery (0.5 vs. 2.4%, $p<0.001$ and 0.4 vs. 2.4%, $p<0.001$, respectively). Adding navigation or robotics to fluoroscopy did not demonstrate a significant further reduction in risk with the numbers available.

DISCUSSION AND CONCLUSION:

Surgeons seeking to reduce dislocations may consider adopting robotics or fluoroscopy. The role of imageless computer navigation alone requires further study.