

# Fewer Dislocations after Total Hip Arthroplasty with Robotic Assistance or Fluoroscopic Guidance

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## BACKGROUND

- Accurate and precise component positioning may reduce total hip arthroplasty (THA) dislocations
- Computer navigation and robotic-assistance may help guide implant placement
- The impact of these technologies on dislocation risk is subject to debate

## OBJECTIVE

- We investigated dislocation rates for THAs using conventional techniques, robotic-assistance, and computer navigation, and controlled for surgical approach, dual mobility (DM) use, and fluoroscopic guidance

## METHODS

- 11,754 THAs performed between January 2016 - December 2022
- 5,878 conventional
- 1,295 with robotics
- 4,581 with computer navigation
- Demographic and clinical outcomes were collected
- Potential confounding variables assessed: intraoperative fluoroscopy, surgical approach (posterior vs. anterior vs. lateral), implant type (fixed bearing vs. dual mobility)
- Dislocations were identified using an EMR query based on ICD and CPT codes and validated with chart review
- Multivariable analysis yielded odds ratios (OR) for dislocation and revision for dislocation/instability
- Additional regressions performed for approach and DM
- Statistical analysis utilized SPSS

**Table 1.** Baseline characteristics, Stratified by Intraoperative Technology

	Conventional (n=5878)	Robotic (n=1295)	Navigation (n=4581)	P-Value
Age*	65.7 (15 - 97)	63.9 (18 - 91)	63.4 (17 - 97)	<0.001
Female^	3340 (56.8)	723 (55.8)	2644 (57.7)	0.503
BMI*	29.4 (14.3 - 53)	29.3 (16.2 - 52.1)	29.3 (14.9 - 58.4)	0.959
Days to Last Follow-up*	786 (8 - 2704)	626 (8 - 2674)	649 (6 - 2224)	<0.001
<b>Surgical Approach^</b>				<b>&lt;0.001</b>
Anterior	1946 (33.1)	478 (36.9)	1920 (41.9)	
Posterior	3658 (62.2)	817 (63.1)	2117 (46.2)	
Lateral	274 (4.7)	0 (0.0)	544 (11.9)	
<b>Dual-Mobility Implant^</b>	583 (9.9)	122 (9.4)	516 (11.3)	<b>0.039</b>
<b>Fixed-Bearing Head, mm*</b>	34.8 (22 - 40)	35.5 (28 - 40)	35.2 (22 - 44)	<b>&lt;0.001</b>
<b>Fluoroscopy Used^</b>	1458 (24.8)	277 (21.4)	1920 (41.9)	<b>&lt;0.001</b>
<b>Revisions^</b>	164 (2.8)	22 (1.7)	140 (3.1)	<b>0.032</b>
Dislocation/Instability	35 (21.3)	1 (4.5)	21 (15.0)	0.089
<b>Dislocation^</b>	72 (1.2)	5 (0.4)	42 (1.0)	<b>0.021</b>

\*Mean (minimum – maximum)  
^Number (%)

**Table 2.** Multivariable Analysis for Anterior and Posterior Approach THA Dislocation Odds Ratio

	Dislocation Risk Anterior Approach		Dislocation Risk Posterior Approach	
	OR (95% CI)	P-Value	OR (95% CI)	P-Value
<b>Intraoperative Technology<sup>1</sup></b>				
Conventional	-	-	-	-
Robotic	0.5 (0.1 - 1.6)	0.213	0.2 (0.0 - 0.7)	<b>0.014</b>
Navigation	1.6 (0.5 - 4.7)	0.401	1.0 (0.6 - 1.6)	0.994
<b>Dual-Mobility Implant</b>	1.6 (0.4 - 6.8)	0.548	0.6 (0.3 - 1.3)	0.178
<b>Fluoroscopy</b>	0.1 (0.0 - 0.3)	<b>&lt;0.001</b>	-	-

OR, odds ratio  
<sup>1</sup> Conventional used as reference group.

## RESULTS

- Factors associated with reduced dislocation risk in multivariable analysis
  - Robotics compared to conventional (OR: 0.3, 95% CI 0.1-0.8; P=0.011)
  - Anterior compared to posterior approach (OR: 0.5, 95% CI 0.4-0.8; P=0.005)
  - Lateral compared to posterior approach (OR: 0.4, 95% CI 0.1-1.0; P=0.046)
- Navigation did not independently reduce risk as compared to conventional (P=0.370)
- Dislocation rates were: Anterior with fluoroscopy (0.4%), anterior without fluoroscopy (2.3%), posterior (1.3%), lateral (0.5%)
- For anterior approach, fluoroscopy use significantly reduced odds of dislocation (OR: 0.1, 95% CI 0.0-0.3; P<0.001)
- For posterior approach, robotics was associated with reduced dislocation risk compared to conventional (OR: 0.2, 95% CI 0.0-0.7; P=0.014)
- The use of DM components only significantly decreased dislocation risk in the conventional cohort (OR: 0.2, 95% CI 0.5-0.9, P=0.037), of which 90.2% were posterior approach

## CONCLUSIONS

- Robotics was associated with improved dislocation outcomes compared to conventional overall
- When examined separately, fluoroscopy in anterior approach and robotics in posterior approach were effective in reducing dislocation risk
- The role of imageless computer navigation and DM implants requires further study