No Minimal Clinically Important Difference in Patient-Reported Outcomes in Obese Patients Undergoing Robotic and Manual Primary Total Hip Arthroplasty: A Propensity Matched Analysis

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INTRODUCTION: It is estimated that approximately 55% of primary total hip arthroplasties (THA) in the United States will be performed in obese patients by 2029. Obesity is associated with higher risks of postoperative complications, including component malpositioning, infection, and loosening. Therefore, various technologies and adjustments to perioperative management have been explored to mitigate these risks. The 2024 American Joint Replacement Registry reported that the use of robotics in THA (RA-THA) has tripled since 2017, with a reported prevalence of 6.6%. Specifically, among patients with obesity, previous studies have shown greater accuracy in acetabular component positioning and better leg length restoration with RA-THA than with manual THA (M-THA). However, the potential impact of RA-THA on patient-reported outcomes (PROMs) in obese patients has not yet been explored. Therefore, this study aims to compare PROM survey scores among obese patients who underwent either robotic or manual THA.

METHODS: IRB approval was obtained prior to this study. A total of 8,085 patients who underwent primary THA at a tertiary academic institution were reviewed. The following inclusion criteria was applied: 1) a body mass index (BMI) > 30 kg/m^2 and 2) a completed preoperative and postoperative PROM surveys. After exclusion, propensity score-matched analysis was performed in a 1:3 (RA-THA to manual THA) ratio based on age, gender, diabetes history, Charlson Comorbidity Index (CCI), and American Society of Anesthesiologists (ASA) score. Ninety-day, one-year, and two-year complication rates were recorded for both groups. The mean preoperative and postoperative scores of the Physical Function Short Form of the Hip Disability and Osteoarthritis Outcome Score (HOOS-PS), Patient Reported Outcome Measurement Information System (PROMIS) Global Physical and Mental, and the Physical Function Short Form (SF-10a) surveys were calculated. The delta of the two scores was then used to determine thresholds for minimal clinically important difference in improvement (MCID-I) or worsening (MCID-W) after surgery. The number of patients in each cohort who met either threshold was recorded.

RESULTS SECTION: Following propensity-matching, 54 RA-THA and 162 M-THA patients remained for analysis. There were no differences in demographics between the two groups (p>0.05). Complication rates were similar at 90 days, and one and two years postoperatively (p>0.05). Absolute preoperative and postoperative PROM scores had no difference between groups (p>0.05). Delta scores were equal between RA-THA and M-THA patients (p>0.05). Similar proportions of clinically significant improvement, no change, and worsening were seen between groups across all PROMs (p>0.05).

DISCUSSION: Given the rising prevalence of obesity and RA-THA, it is increasingly important to evaluate whether these technological advancements lead to improved clinical outcomes in this patient population. This is one of the first studies to compare patient-perceived improvements in obese patients undergoing robotic or conventional THA with propensity score matching. Our results demonstrate that both surgical techniques yield comparable improvements in all four PROMs after primary THA. In addition, postoperative complication rates were similar in both cohorts. This may suggest that despite the technological advances and potential benefits associated with RA THA, this may not translate into superior patient reported outcomes in patients with obesity.

SIGNIFICANCE/CLINICAL RELEVANCE: Despite the potential benefits associated with Robotic-Assisted THA, this may not translate into superior patient reported outcomes in patients with obesity.

Variable	Robotic-Assisted (N = 54)	Manual (N = 162)	P-value
Age (years)	64.2 ± 11.1	65.0 ± 10.4	0.689
Body mass index (kg/m^2)	34.7 ± 3.5	34.5 ± 3.4	0.699
Female	35 (64.8%)	102 (63.0%)	0.935
Diabetes	7 (13.0%)	21 (13.0%)	1.000
CCI distribution			0.999
ASA score distribution			0.409

Table 1. Demographics of robotic-assisted and manual total hip arthroplasty patients following propensity-matching.

Patient-Reported Outcome Measure	Robotic-Assisted	Manual	P-value
SF-10a	**N = 50**	**N = 146**	
Preoperative score	32.90 ± 4.96	34.05 ± 5.74	0.2655
Postoperative score	40.18 ± 7.96	41.38 ± 8.88	0.403
Delta score	7.28 ± 6.59	7.32 ± 8.29	0.8307
Improved	38 (76%)	99 (68%)	0.3621
PROMIS Mental	**N = 50**	**N = 154**	
Preoperative score	45.49 ± 8.98	47.90 ± 9.00	0.171
Postoperative score	49.33 ± 8.42	50.44 ± 9.28	0.3702
Delta score	3.85 ± 7.14	2.54 ± 7.25	0.223
Improved	28 (56%)	72 (47%)	0.3303
PROMIS Physical	**N = 50**	**N = 154**	
Preoperative score	36.68 ± 6.63	38.06 ± 6.89	0.3814
Postoperative score	44.20 ± 7.17	44.45 ± 9.06	0.768
Delta score	7.52 ± 7.01	6.39 ± 8.45	0.2554
Improved	36 (72%)	102 (66%)	0.5597
HOOS-PS	**N = 26**	**N = 114**	
Preoperative score	45.01 ± 15.82	53.21 ± 17.19	0.0288
Postoperative score	73.67 ± 19.27	78.25 ± 17.14	0.2582
Delta score	28.66 ± 21.52	25.04 ± 20.17	0.503
Improved	19 (73%)	94 (82%)	0.4131

Table 2. Patient-Reported Outcome Measures for robotic-assisted and manual total hip arthroplasty.