A Reduction in Body Mass Index from ≥ 40 to < 40 Lowers Emergency Department Visits, but May Increase All-cause Readmissions after Primary Total Hip Arthroplasty: Conflicting 90-Day Outcomes at a Single Institution

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INTRODUCTION:

Obesity is a risk factor for hip arthritis, and obesity may contribute to patients seeking total hip arthroplasty (THA) at a younger age. However, patients who have obesity have a higher rate of perioperative complications after surgery. This has led several groups and systems to implement the 2013 American Academy of Hip and Knee Surgeons (AAHKS) guidelines that recommend delay of elective surgery for patients who have a BMI > 40, incentivizing weight loss as an optimization strategy.

It has been demonstrated that access to total hip arthroplasty provides obese patients with equal or greater gains in functional outcomes and quality of life metrics than non-obese patients. It is likely that BMI thresholds lead to an access restriction at certain institutions, as most patients who have obesity seeking THA or total knee arthroplasty (TKA) do not lose weight and do not move forward with surgery. However, it is not clear that the patients who are able to lose weight and meet that threshold actually benefit from improved outcomes.

We examined our institution's experience with implementation of the AAHKS BMI recommendations. Starting in 2014, our institution began encouraging arthroplasty surgeons to delay indication for THA in patients who had a BMI > 40. In this study we asked what our patient's perioperative morbidity rates were before and after 2014, focusing on patients who had to clear that BMI threshold in the year leading up to surgery.

METHODS:

We queried our institutional database to select all primary THA from January 2010 to May 2020. There were 1,383 THA that were pre-2014, and 3,273 THA that were post-2014. The 90-day emergency-department (ED) visits, readmissions, and returns-to-operating room (OR) were identified. Patients were propensity-score weight-matched according to comorbidities, age, initial surgical consultation (consult), BMI, and sex. We conducted three comparisons: A) pre-2014 patients who had a consult and surgical BMI ≥ 40 against post-2014 patients who had a consult BMI ≥ 40 and surgical BMI < 40; B) pre-2014 patients against post-2014 patients who had a consult and surgical BMI < 40; and C) post-2014 patients who had a consult BMI ≥ 40 and surgical BMI < 40 against post-2014 patients who had a consult BMI ≥ 40 and surgical BMI ≥ 40.

RESULTS:

The following data reported are the raw data; the weighted percentages and *chi*-squares upon which these *P*-values are based are available in Tables 2 to 4, as well as relative risk and 95% confidence intervals. In Analysis A, patients who reduced their weight from their surgical consultation visit BMI of ≥ 40 to a surgical BMI < 40 post-2014 had significantly less ED visits (7.6 vs. 14.1%, P=0.0007), but similar readmissions (11.9 vs. 6.3%, P<0.22) and similar returns to the OR (5.4 vs. 1.6%, P=0.09) compared to propensity score weight-matched patients who had a surgical consultation BMI ≥ 40 pre-2014 (Table 1). In Analysis B, patients who had a BMI < 40 after 2014 had significantly less readmissions (5.9 vs. 9.3%, P<0.0001), similar all-cause returns to the OR (1.6 vs. 1.2%, P=0.32), and similar ED visits (5.9 vs. 6.5%, P=0.83) than patients pre-2014 (Table 2). In Analysis C, after 2014, patients who had a consult BMI ≥ 40 and surgical BMI ≥ 40 had lower readmissions (12.5 vs. 12.8%, P=0.05), similar ED visits (12.5 vs. 7.3%, P=0.71), and similar returns to the OR (3.1 vs. 5.5%, P=0.37) than patients who had a consult BMI ≥ 40 and surgical BMI < 40 (Table 3).

DISCUSSION AND CONCLUSION:

In this single center retrospective study, we showed a paradoxical adverse effect of instituting a BMI threshold of 40 on our elective primary THA patients. We identified 185 patients who lost weight preoperatively across the BMI 40 threshold post-2014. Although this weight loss cohort was less likely to visit the ED compared to a cohort of patients who did not lose weight pre-2014, they trended toward being readmitted more postoperatively (11.9%) compared to a cohort of matched patients who did not lose weight pre- (9.3%) or post-2014 (5.9%), although this did not reach statistical significance. They also trended toward an increase in all-cause returns to the OR compared to a pre-2014 matched group who did not lose weight, although this also did not reach statistical significance (5.4 versus 1.6%, P=0.09).

Based on these results, it appears that the BMI 40 threshold affects THA and TKA patients differently. The threshold seemingly benefits both patient populations for unexpected returns to the ED, as we found in a similar study by our group analyzing the BMI threshold and TKA. However, this retrospective study raises the concern that the same threshold for hips may raise the rate of readmissions and even result in a higher rate of returns to the OR for THA.

Although obesity is a risk factor for perioperative complications post THA and TKA, it is possible that, at least in the case of THA, it is not necessarily a modifiable risk. We believe that an ethical balance between known pathology, expected

improvement after surgery and overall risk of complications for each patient should be included in patient-surgeon decision making.

Table 1. Propensity Score Weighted Analysis of Reducing Body Mass Index (BMI) for Elective Primary Total Hip Arthroplasty, Categorized By Pre-2014 Cohort with Surgical Consultation BMI and Surgical BMI ≥ 40 and Post-2014 Cohort with Surgical Consultation BMI ≥ 40 and Surgical BMI < 40. OR = opening room; BMI = kg/m^2; CI = confidence interval; RR = relative risk; * = significant

Analysis A N=249	Pre-2014 N=64 (%)	Pre-2014 Weighted Figures (%) [95% CI]	Post-2014 N=185 (%) [95% CI]	Weighted Chi-Square *P*-value	Weighted Chi-Square RR [95% CI]
Ninety-Day All-cause Adverse Events					
Emergency Department Visits	9 (14.06)	14.96 (23.38) [13.01%, 33.75%]	14 (7.57) [3.76%, 11.38]	0.0007*	3.09 [1.58, 6.04]
Readmissions	4 (6.25)	4.15 (6.49) [0.45%, 12.53%]	22 (11.89) [7.25%, 16.55%]	0.2241	0.55 [0.20, 1.50]
All-cause Returns to Operating Room	1 (1.56)	0.35 (0.54) [-1.26%, 2.34%]	10 (5.41) [2.15%, 8.67%]	0.0928	0.10 [0.00, 2.93]

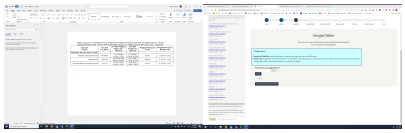

Table 3. Propensity Score Weighted Analysis of Reducing Body Mass Index (BMI) for Elective Primary Total Hip Arthroplasty, Categorized by Post-2014 Cohort with Surgical Consultation BMI and Surgical BMI ≥ 40 and Post-2014 Cohort with Surgical Consultation BMI < 40 and Surgical BMI < 40. Surg = surgical; BMI = kg/m^2; CI = confidence interval; RR = relative risk; * = significant

Analysis C N=260	Surg BMI < 40 N=164 (%)	Surg BMI < 40 Weighted Figures (%) [95% CI]	Surg BMI ≥ 40 N=96 (%) [95% CI]	Weighted Chi-Square *P*-value	Weighted Chi-Square RR [95% CI]
Ninety-Day All-cause Adverse Events					
Emergency Department Visits	12 (7.32)	10.01 (10.98) [4.20%, 15.76%]	17 (17.50%) [3.88%, 19.12%]	0.7120	0.88 [0.44, 1.74]
Readmissions	21 (12.80)	36.42 (22.21) [13.85%, 28.57%]	17 (17.50%) [3.88%, 19.12%]	0.0523	1.78 (0.97, 3.24)
All-cause Returns to Operating Room	9 (5.49)	9.13 (5.57) [2.06%, 9.08%]	3 (3.13%) [-0.33%, 6.61%]	0.3675	1.78 (0.50, 6.41)