New Joints, Same Old Weight: Weight Changes After Total Hip and Knee Arthroplasty

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Abstract Obesity is a well-known risk factor for postoperative complications following total joint arthroplasty. However, because the operation is often successful, orthopedic surgeons continue to operate on obese individuals, and many surgeons do so under the assumption that patients will lose weight after they are able to walk and exercise without pain. In this article, we review a recent study by Ast et al., who performed a retrospective review, using a single-center institutional registry, to determine (1) whether patients do actually lose weight after total hip and/or total knee arthroplasty, (2) whether there are predictors of postoperative weight change, and (3) whether postoperative weight changes affect patient-reported clinical outcomes. The principle conclusion was that most patients maintained their body mass index (BMI) after total hip and total knee arthroplasty (73 and 69%, respectively). However, patients undergoing total knee arthroplasty, patients who had a higher preoperative BMI, and female patients were more likely to lose weight postoperatively. When examined in the context of the current literature, this study provides valuable information for the preoperative counseling of total joint arthroplasty candidates, especially in the setting of obesity.

Keywords total joint arthroplasty · weight changes · obesity

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Introduction

As the rate of obesity in the United States continues to rise, surgeons must increasingly understand the role and impact of obesity on total joint arthroplasty. In addition to being a risk factor for osteoarthritis, obesity has been associated with the occurrence of complications following total joint arthroplasty including periprosthetic infection, venous thromboembolism, dislocation, and a need for revision surgery [10]. For these reasons, surgeons often recommend that patients lose weight prior to total joint arthroplasty in order to minimize the risk of perioperative complications.

The potential for total joint arthroplasty to positively impact weight loss is often discussed. However, the actual effect of total joint arthroplasty on postoperative weight and how potential postoperative weight changes affect clinical outcomes following arthroplasty remain unclear. Knowing this information would provide important facts for both patients and surgeons regarding preoperative expectations. A 2013 systematic review by Inacio et al. [3] revealed that studies investigating these research questions frequently had conflicting results, limited sample sizes, and significant methodological limitations (e.g., failure to control for confounding variables and/or selection bias).

A new study authored by Ast and colleagues was published in 2015 and provides additional insight regarding this clinical dilemma. The purpose of this review is to interpret the data and conclusions published by Ast et al. in the setting of current published literature on postoperative weight changes following total joint arthroplasty.

The Article

Weight Changes After Total Hip or Knee Arthroplasty: Prevalence, Predictors, and Effects on Outcomes. Ast MP,

Abdel MP, Lee YY, Lyman S, Ruel AV, Westrich GH. *J Bone Joint Surg Am*. 2015 June;97(11):911–9.

The aims of this study were to determine whether patients will lose weight after total hip and/or total knee arthroplasty, whether there are predictors of postoperative weight change, and whether postoperative weight changes will affect patient-reported clinical outcomes. The investigators examined two-year follow-up data from a single-center institutional registry on 3893 total hip and 3036 total knee arthroplasty patients from May 2007 to November 2010.

All patients included in the study underwent elective, unilateral, primary arthroplasty for osteoarthritis. Demographic information including age, sex, race, highest education level, and insurance status were collected and body mass index (BMI) and the Charlson–Deyo comorbidity index were calculated at baseline. Self-reported BMI was the main dependent variable studied and a 5% change in BMI was considered clinically meaningful. Thus, weight changes fell into one of three categories: weight gain (BMI gain greater than 5%), weight loss (BMI loss greater than 5%), or no change (BMI within 5% of preoperative value). The patient-reported outcome measures used were the lower-extremity activity scale (LEAS), SF-36 physical and mental component summary scores, hip disability and osteoarthritis outcome score, and knee injury and osteoarthritis outcome score.

No postoperative change in BMI was observed in 73% of total hip and 69% of total knee arthroplasty patients. Statistically significant predictors of weight loss were total knee arthroplasty (versus total hip arthroplasty), larger preoperative BMI, and female sex. Patients who underwent total knee arthroplasty and lost weight had significantly improved clinical outcome scores. In contrast, weight gain was significantly correlated with worse clinical outcome scores. The authors concluded that most patients maintained their BMI after total hip or total knee arthroplasty. However, patients that received total knee arthroplasty that had a higher preoperative BMI and/or were female were more likely to lose weight postoperatively.

Commentary

This study provides important information for patients and surgeons regarding postoperative weight change in the setting of total joint arthroplasty and concludes that the majority of patients undergoing total hip and knee arthroplasty will maintain their weight.

This study has a number of important strengths. Its principle research questions were well-defined and valuable to both surgeons and patients who frequently question whether total joint arthroplasty would have a beneficial impact on weight postoperatively. With 3893 total hip arthroplasty patients and 3036 total knee arthroplasty patients, this study is one of the largest to investigate postoperative weight changes. Access to a well-organized institutional registry provided adequate follow-up (i.e. 2 years). The selected clinical outcome measures are appropriately validated, and the statistical methods appropriately

stratified the patient population in order to meaningfully analyze and compare outcomes across demographic and weight change categories. The authors' conclusion that the majority of patients maintain their BMI after total hip arthroplasty and total knee arthroplasty was clear and well-supported. Furthermore, this study provides an important addition to our current understanding of total joint arthroplasty patients' postoperative course.

This study also has several important limitations. First, the patient population was overwhelmingly white (93.2% and 89.2% among total hip and total knee arthroplasty patients, respectively), well-educated (39.9% and 33.0%, respectively, held advanced degrees), and well-insured (1.0% and 1.7%, respectively, were Medicaid patients), thus creating some population bias. Given reported associations between these factors with BMI, access to care, and other important clinical outcome measures, the ability to generalize the authors' conclusions may be questioned by some readers [1, 5]. In spite of this, the present study has a powerful “take home” message. Even patients known to have excellent access to health care and weight loss resources typically do not lose weight after total joint arthroplasty.

Additionally, the study relied on patients' self-reported BMI at a two-year follow-up in order to assess weight changes postoperatively. A recent study reported that patients with osteoarthritis were more likely to underreport their BMI than healthy patients, and that a larger BMI correlated with a more inaccurate self-reporting [7]. In addition, a 2007 systematic review demonstrated a trend of underestimating weight and overestimating height across multiple patient populations [2]. Taken together, these prior studies raise concerns regarding the self-reporting of weight. While the authors acknowledge this weakness, the 5% change in BMI chosen as a benchmark for meaningful difference leaves little leeway for inaccuracy. That being said, if patients had lost weight, one would expect them to be more accurate in reporting their two-year postoperative weight; if anything, self-reporting weight loss may underestimate the number of patients who actually *gained* weight, but may not affect the reporting of patients who *lost* weight; thus, we believe the conclusions made by Ast et al. remain valid.

Finally, the authors' conclusions regarding the associations between postoperative weight changes and clinical outcome measures, while statistically significant, are of uncertain clinical significance. To our knowledge, no study has been performed to evaluate the minimal clinically important difference of the LEAS, although the paper originally describing the LEAS does note that an approximate one point difference (from 7.5 to 8.5) indicated the responsiveness of the scale to clinical improvement [8].

Despite a small number of methodological limitations, the authors should be applauded for a large, well-designed study examining important research questions regarding postoperative weight changes in total joint arthroplasty patients. This study had important benefits over prior studies attempting to answer this question, including a larger sample size, length of follow-up, comprehensive data collection, and thorough statistical analysis which controlled for

potential confounding variables. Teichtahl et al. [9] showed that most total knee and total hip arthroplasty patients lose weight postoperatively in a prospective study, but they only followed 86 patients for 6 months. Mackie et al. [6] performed a similar study by reviewing the records of 1545 total knee arthroplasty patients over a three-year period using an institutional registry. They also showed a significant negative effect of postoperative weight gain on outcome scores, but did not present their postoperative BMI data.

Inacio et al. [4] performed the largest study in 2014, using the registry and electronic health records of 35 Kaiser Permanente hospitals to track the weight of 30,362 total hip and total knee arthroplasty patients for 1 year before and after surgery. They found that 64.0% of total hip arthroplasty and 68.5% of total knee arthroplasty patients maintained their weight postoperatively. These percentages are slightly lower than those reported by Ast et al., who, unlike Inacio et al., found that total hip arthroplasty patients maintained their weight more often than total knee arthroplasty patients. The two studies similarly found that female sex was a predictor of weight loss, and that preoperative obesity status correlated with weight loss after total hip arthroplasty. Interestingly, Inacio et al. found no specific association of preoperative obesity status with weight loss after total knee arthroplasty. While Ast et al. found no significant postoperative BMI trends related to age or race, Inacio et al. found that older patients were less likely to gain weight after either total hip or total knee arthroplasty, black patients were more likely to gain weight versus white patients after total hip arthroplasty and Asian and Hispanic patients were less likely to lose or gain weight versus white patients after total knee arthroplasty.

While Inacio et al.'s study population was much larger and more diverse than that of Ast et al., they assessed weight data from an electronic health record system, presumably measured by a healthcare provider, but the measurement method was not specified. In addition, if more than one weight was reported in a given time interval (for example, 181 days to 365 days postoperatively), the median weight was used, which may have introduced inconsistencies and inaccuracies in postoperative weight trends between patients. Finally, their follow-up was limited to one year, with significant loss to follow-up (12.6% of total hip arthroplasty patients had incomplete follow-up).

In conclusion, the study by Ast et al. is well-designed and provides important information for patients and surgeons in the setting of total joint arthroplasty. Consistent with Inacio et al.'s findings, most total hip and total knee arthroplasty patients maintained their BMI postoperatively. Ast et al. found that female sex, a higher preoperative BMI, and total knee arthroplasty were significant predictors of weight loss postoperatively, providing the orthopedic surgeon important data when counseling patients. While the conclusions regarding clinical outcome score improvements may be of uncertain clinical significance in the setting of postoperative weight loss, a decreased postoperative BMI is certainly beneficial for a patient's overall health and

minimizing other potential obesity-related complications. Finally, while the study's conclusions are unlikely to alter clinical practice, they provide vital information for the preoperative counseling of total joint arthroplasty candidates, especially in the setting of obesity. Future prospective, multi-center studies of total joint arthroplasty patients should consider BMI monitoring to enhance our understanding of postoperative weight changes and their potential impact on clinical outcomes.

Compliance with Ethical Standards

Conflict of Interest: Daniel J. Hurwit, MD and Samir K. Trehan, MD have declared that they have no conflict of interest. Michael B. Cross, MD reports personal fees from Exactech, Link, Smith and Nephew and Intellijoint, outside the work.

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Informed Consent: N/A

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References

1. Browne JA, Novicoff WM, D'Apuzzo MR. Medicaid payer status is associated with in-hospital morbidity and resource utilization following primary total joint arthroplasty. *J Bone Joint Surg Am.* 2014; 96(21): e180.
2. Connor Gorber S, Tremblay M, Moher D, et al. A comparison of direct vs. self-report measures for assessing height, weight and body mass index: a systematic review. *Obes Rev.* 2007; 8(4): 307–326.
3. Inacio MC, Kritz-Silverstein D, Paxton EW, et al. Do patients lose weight after joint arthroplasty surgery? A systematic review. *Clin Orthop Relat Res.* 2013; 471(1): 291–298.
4. Inacio MC, Silverstein DK, Raman R, et al. Winter weight patterns before and after total joint arthroplasty and characteristics associated with weight change. *Perm J.* 2014; 18(1): 25–31.
5. Inneh IA. The combined influence of sociodemographic, preoperative comorbid and intraoperative factors on longer length of stay after elective primary total knee arthroplasty. *J Arthroplasty.* 2015 May;S0883-5403(15)[Epub ahead of print].
6. Mackie A, Muthumayandi K, Shirley M, et al. Association between body mass index change and outcome in the first year after total knee arthroplasty. *J Arthroplasty.* 2015; 30(2): 206–209.
7. Magnusson K, Haugen IK, Osteras N, et al. The validity of self-reported body mass index in a population-based osteoarthritis study. *BMC Musculoskeletal Disord.* 2014; 15: 442.
8. Saleh KJ, Mulhall KJ, Bershadsky B, et al. Development and validation of a lower-extremity activity scale. Use for patients treated with revision total knee arthroplasty. *J Bone Joint Surg Am.* 2005; 87(9): 1985–1994.
9. Teichtahl AJ, Quirk E, Harding P, et al. Weight change following knee and hip joint arthroplasty—a six-month prospective study of adults with osteoarthritis. *BMC Musculoskeletal Disord.* 2015; 16: 137.
10. Workgroup of the American Association of Hip and Knee Surgeons Evidence Based Committee. Obesity and total joint arthroplasty, a literature based review. *J Arthroplasty.* 2013; 28(5): 714–721.