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# Does Prior Bariatric Surgery Affect Implant Survivorship and Complications Following Primary Total Hip Arthroplasty/Total Knee Arthroplasty?

Gwo-Chin Lee, MD [a,*], Kevin Ong, PhD [b], Doruk Baykal, PhD [b], Edmund Lau, MS [b], Arthur L. Malkani, MD [c]

[a] Department of Orthopaedic Surgery, University of Pennsylvania, Philadelphia, PA
[b] Exponent Inc, Philadelphia, PA
[c] Department of Orthopaedic Surgery, University of Louisville, Louisville, KY

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ABSTRACT

*Background:* The purpose of this study is to evaluate the impact of prior bariatric surgery on survivorship, outcome, and complications following primary total hip arthroplasty (THA)/total knee arthroplasty (TKA).

*Methods:* Using the Medicare 5% part B data from 1999 to 2012, we analyzed patients who underwent primary THA (n = 47,895) and primary TKA (n = 86,609). Patients with prior bariatric surgery before arthroplasty were compared to patients with other common metabolic conditions. Kaplan-Meier risk of revision THA/TKA for those with and without bariatric surgery and each of the metabolic bone conditions was calculated. The risk for infection was also evaluated. Regression analysis was used to determine the relative risk of revision at various time intervals for those with and without each of the metabolic conditions. Analysis was also adjusted for the metabolic conditions, age, gender, socioeconomic status, and Charlson comorbidity index.

*Results:* The prevalence of patients with prior bariatric surgery within 24 months of primary THA/TKA was 0.1%. Benchmarked against other common chronic metabolic conditions, bariatric surgery prior to THA was not associated with an increased risk for revision surgery at all measured intervals but positively correlated with increased risk for developing infections. Conversely, patients undergoing primary TKA following bariatric surgery were at increased risk for revision compared to controls but not at increased risk for infection.

*Conclusion:* The impact of bariatric surgery prior to elective THA/TKA remains unclear. These patients remain at increased risk for infections following THA and revisions following TKA.



The prevalence of morbid obesity in patients considering hip and knee replacement surgery is on the rise [1]. Although there is mounting evidence the risk of complications is significantly increased in patients with body mass index (BMI) greater than 40 kg/m$^2$ and beyond; the best strategy to modify and manage this risk factor remains unclear [2,3]. Lui et al [4] performed a review of the available evidence on nonpharmacologic and nonsurgical weight loss interventions in the year leading up to joint arthroplasty and the authors concluded that there was limited evidence to support the effectiveness of nonpharmacologic and nonsurgical weight loss prior to arthroplasty on reducing complications.

Bariatric surgery is a weight reduction strategy often suggested to morbidly obese patients prior to surgery to minimize complications. Despite an increasing number of obesity patients, the incidence of bariatric surgery in the United States has plateaued at approximately 113,000 cases per year [5]. Studies have shown that these procedures can positively affect chronic diseases such as diabetes and hypertension [6]. However, bariatric surgery is not without complications and its optimal timing and indications in

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* Reprint requests: Gwo-Chin Lee, MD, Department of Orthopaedic Surgery, University of Pennsylvania, 3737 Market Street, 6th Floor, Philadelphia, PA 19104.

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orthopedic surgery remain unknown [7]. Studies on the effect of bariatric surgery prior to total hip arthroplasty (THA)/total knee arthroplasty (TKA) have failed to show significant improvements in quality outcomes. Inacio et al [8] could not demonstrate that bariatric surgery greater than 2 years prior to arthroplasty positively affected complications, readmissions, and revisions. Similarly, Martin et al [9] evaluated a group of 91 TKAs in patients who had undergone bariatric surgery preoperatively. Although the intervention was effective in reducing BMI, these patients remained at higher risk of reoperation and revision surgery. Therefore, the purpose of this study is to use the Medicare data to evaluate the impact of prior bariatric surgery on (1) implant survivorship and (2) risk of infection, and compare these patients to patients with other common comorbidities undergoing THA/TKA.

## Materials and Methods

This study utilized a retrospective, observational study design based on the 5% sample of part B Medicare data (carrier/physician claims) from 1999 to 2012. The 5% sample is compiled by the Centers for Medicare and Medicaid Services based on selecting beneficiary records with selected digits in their Health Insurance Claim number. Patients who underwent primary THA or primary TKA were identified from the Medicare data based on the presence of Current Procedural Terminology procedure codes 27130 and 27447, respectively. Because our study included evaluating comorbidities within the 24 months prior to primary THA or primary TKA, patients who did not have at least 24 months of enrollment in Medicare prior to their surgery were excluded. Patients were also excluded if they were aged less than 65 years because they would be enrolled in Medicare for their physical disabilities, end-stage renal disease, or Lou Gehrig's disease. Health Maintenance Organization enrollees and those not enrolled in both parts A and B of Medicare were also excluded from this study, due to their incomplete claim history.

Patients with a history of bariatric surgery prior to arthroplasty and patients with a diagnosis of several metabolic conditions within 24 months of surgery were identified using codes listed in Appendix A. The Kaplan-Meier risk of revision THA or revision TKA within 0.5, 1, 2, and 5 years was evaluated for those with and without each of the metabolic bone conditions. The risk of revision for periprosthetic joint infection was also evaluated. Multivariate Cox regression was used to determine the relative risk of revision within 0.5, 1, 2, and 5 years for those with and without each of the metabolic bone conditions. To isolate the impact of prior bariatric surgery on THA/TKA survivorship and complications, the statistical analysis adjusted for all the metabolic bone conditions in Table 1, as well as age, gender, socioeconomic status (Medicare buy-in status as a proxy; indicates patients who received state subsidy for their Medicare premium), Charlson comorbidity score, race, Census region, and year. Each patient's general comorbid history was evaluated by calculating the Charlson score using all of the diagnosed comorbidities within 12 months prior to their surgery. The Charlson score predicts the 10-year mortality for a patient who may have a range of comorbid conditions. Each condition is assigned a score of 1, 2, 3, or 6, depending on the risk of dying associated with the condition. Scores are summed to provide a total score to predict mortality. Patients were categorized into one of the 4 comorbidity score categories: 0 (none), 1-2 (low), 3-4 (moderate), and 5+ (high). The previous diagnoses of selected metabolic bone conditions were evaluated in the 24 months prior to primary total joint arthroplasty as comorbidities for the analysis (Table 1). The diagnosis of human immunodeficiency virus in the 2 years prior to surgery was also considered as a covariate.

**Table 1**
Chronic Conditions Benchmarked Against Bariatric Surgery Status.

| Condition | ICD-9-CM Code |
|---|---|
| Diabetes | 250.x |
| Hypothyroidism | 243-244.9 |
| Impaired renal function | 285.21, 584.x, 585.x, 586.x, 587.x, 588.x, 593.9 |
| Vitamin D deficiency | 268.0-268.9 |
| Hypoparathyroidism | 252.1 |
| Hyperparathyroidism | 252.0, 252.0x, 588.81 |
| Calcium metabolism disorder/renal osteodystrophy | 275.4, 275.4x, 588.0 |
| Hypocalcemia | 275.41 |
| Hypercalcemia | 275.42 |
| Arthropathy associated with endocrine/metabolic bone disorder | 713.0 |
| Paget's disease | 731.0 |
| Osteomalacia/rickets/phosphorus disorders | 268.2, 275.3 |
| Osteodystrophy | 756.5, 756.5x |
| Cushing's syndrome | 255.0 |

ICD-9-CM, The International Classification of Diseases, Ninth Revision- Clinical Modification.

## Results

A total of 47,895 primary THA and 86,609 primary TKA patients were identified. The prevalence of patients with prior bariatric surgery within 24 months of primary THA/TKA was 0.1%. Compared against other common chronic metabolic conditions, bariatric surgery prior to THA was not associated with an increased risk for revision surgery at all measured intervals (Table 2), even though there was a general trend toward increased revision risk.

In contrast, bariatric surgery prior to THA was positively correlated with increased risk for postoperative infections (Table 3). Bariatric surgery patients were associated with 12.8 ($P = .009$), 10.1 ($P = .017$), and 7.7 ($P = .038$) times greater risk of periprosthetic joint infection at 0.5, 1, and 2 years, respectively, than the nonbariatric surgery patients. There was also a trend toward greater revision risk for PJI at 5 years for bariatric surgery patients.

Conversely, patients undergoing primary TKA following bariatric surgery were at increased risk for revision (Table 4) compared to controls but not at increased risk for infections (Table 5). At 1, 2, and 5 years of follow-up, primary TKA patients who previously underwent bariatric surgery had a 4.3 ($P = .003$), 3.6 ($P = .004$), and 3.4 ($P = .003$) times greater risk of revision for any reason.

## Discussion

The prevalence of patients with obesity undergoing THA and TKA is increasing [1]. Bariatric surgery is often suggested to morbidly obese patients as a method for weight loss and reducing risk prior to joint arthroplasty. However, the influence of prior bariatric surgery on THA and TKA is unknown. Therefore the purpose of this study is to use the Medicare data to evaluate the impact of prior bariatric surgery on (1) implant survivorship and (2) risk of infection benchmarked against a group of common comorbidities found in patients undergoing THA/TKA.

This study has several limitations. First, the data used for this analysis represent only a 5% sample of Medicare part B enrollees who received either a primary THA or TKA. Although the number of procedures is relatively large, there is a potential for bias as the comorbidities may not be uniformly distributed across all patient groups. Second, because the study question attempted to evaluate the effect of bariatric surgery on THA/TKA outcomes, we limited patients with only a 24-month history of Medicare enrollment. This can further bias the analysis. However, the benchmarking of bariatric surgery against other common chronic conditions found in