The Role of Bariatric Surgery in the Obese Total Joint Arthroplasty Patient

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KEYWORDS

• Bariatric surgery • Arthroplasty • Risk modification • Outcomes • Complications • Readmissions

KEY POINTS

- Morbid obesity (BMI > 40 kg/m^2) greatly increases the risk profile associated with total joint arthroplasty, and bariatric surgery is proven means of weight loss and comorbidity reduction in this high-risk patient population.
- Obesity changes the mechanical axis and loading patterns in the lower extremity, which may affect implant loading, and therefore wear profiles, in this patient population.
- Weight loss after bariatric surgery may reduce pain and disability associated with osteoarthritis, and the radiographic appearance of disease.
- Current data on efficacy of bariatric surgery in reducing risks associated with TJA in the morbidly obese patient population are mixed and are based exclusively on retrospective studies.
- Bariatric surgery may lead to substantial cost savings in the arthroplasty population, both related to health care resource utilization and to reduced incidence of adverse events after TJA.

INTRODUCTION

Obesity, defined as a body mass index (BMI) greater than 30 kg/m^2, contributes to many chronic medical conditions, such as obstructive sleep apnea, hypertension, hyperlipidemia, diabetes mellitus, and cardiovascular disease,[1] and its prevalence in American adults is steadily increasing.[2,3] Obese adults are more likely to be malnourished and have other metabolic derangements than their nonobese peers, which contribute to a state of poor overall health.[1,4–11] Obesity has been identified as an independent risk factor for the development of osteoarthritis; excess body weight increases loads at the hips and knees, accelerating cartilage degeneration.[12,13] The excess adipose tissue in obese patients acts like an endocrine organ, generating and releasing proinflammatory mediators that may further contribute to articular cartilage damage.[14–16] Obese patients are often younger when they are considered for total joint

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arthroplasty (TJA), and are at increased risk for perioperative complications and readmissions.[17–22] To help reduce the risk of complications, bariatric surgery is often recommended for morbidly obese patients being considered for TJA.

Bariatric surgery has proven to be a more effective means of weight loss than nonsurgical interventions in the morbidly obese patient population (BMI > 40 kg/m^2), and can help induce partial or complete remission of obesity-related comorbidities, such as type 2 diabetes mellitus, hypertension, and dyslipidemia.[5] This article reviews the effects of obesity on arthroplasty surgery outcomes, metabolic changes associated with bariatric surgery, the role of bariatric surgery as a risk-modification tool, specific considerations for perioperative care of the bariatric surgery patient undergoing TJA, and the impact of these interventions on perioperative outcomes.

EFFECTS OF OBESITY ON ARTHROPLASTY OUTCOMES

Because of increased body weight and associated changes in body habitus, obese patients often modify their gait to decrease lower extremity joint loading. The knee is consistently subjected to greater loads than the hip.[23] A recent meta-analysis found that obese patients have a lower walking velocity, an increased toe-out angle, and a greater absolute adduction moment compared with normal-weight individuals.[24] Obese individuals compensate for the increased abduction moment at the hip by widening their stance and abducting the hips, especially during high-demand tasks, such as sit-to-stand.[25] At the knee, it is hypothesized that elevated body weight and an increased adduction moment loads the articular cartilage in the medial compartment beyond its yield point, causing irreversible changes. After an obese patient undergoes total knee arthroplasty (TKA), the bearing surfaces bear the excess load, and the adduction moment persists.[26] Obese patients are at increased risk of accelerated bearing surface wear, implant loosening, and early prosthesis failure compared with normal-weight patients who undergo TKA and total hip arthroplasty (THA).[13,18–20,27]

In addition to mechanical issues related to implant loading, TJA is more technically difficult in obese patients. Multiple studies have demonstrated a higher number of technical errors occurring in obese patients.[28–30] The 2013 American Association of Hip and Knee Surgeons expert workgroup on obesity in arthroplasty patients concluded that obese patients are at increased risk of surgical site infections, periprosthetic joint infections, respiratory complications, thromboembolic events, need for revision surgery, component malposition, and prosthetic loosening.[21] Obese patients are also more likely to have an increased length of stay and elevated total cost associated with their TJA procedure.[21] The overall rate of complications after TJA increases from 5% to 22%, and the rate of periprosthetic joint infection increases from 0.37% to 4.66% in morbidly obese patients.[22,31] Perioperative risk has also been shown to increase with higher BMIs; Schwarzkopf and colleagues[18] demonstrated that each incremental 5-unit increase in BMI higher than 45 kg/m^2 was associated with a statistically significant increased risk of in-hospital complications (odds ratio [OR], 1.69), postoperative outpatient complications (OR, 2.71), and readmissions (OR, 2). The official recommendation of the American Association of Hip and Knee Surgeons workgroup was for weight loss before proceeding with TJA in the morbidly obese population.

Given the increasing prevalence of obesity in the TJA patient population, bariatric surgery is often offered to morbidly obese patients with end-stage arthropathy as a legitimate means for weight loss, overall health improvement, and reducing perioperative arthroplasty risks.

BARIATRIC SURGICAL OPTIONS

In the general population, bariatric surgery is offered to patients with BMI greater than 40 or to patients with BMI greater than 35 and the presence of obesity-related comorbidities, because higher grades of obesity are associated with excess mortality from cardiovascular disease and diabetes.[3,32] Although evidence has shown that bariatric surgery effectively reduces weight and decreases the burden of obesity-related comorbidities, there is insufficient evidence to support offering bariatric surgery to nonobese patients specifically for glycemic control or cardiac disease risk reduction.[32] Because of the well-demonstrated risk increase associated with BMI greater than 40 in patients undergoing TJA, orthopedic surgeons often refer obese patients indicated for TJA for consultation with bariatric surgeons.

Bariatric surgical procedures are defined as restrictive (laparoscopic adjustable gastric