The Effect of Obesity in Shoulder Arthroplasty Outcomes and Complications

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KEYWORDS

• Total shoulder arthroplasty • Reverse shoulder arthroplasty • Shoulder hemiarthroplasty
• Obesity • Morbid obesity • BMI • Complications • Revision shoulder arthroplasty

KEY POINTS

- The effect of obesity on outcomes and complications in shoulder arthroplasty has been recently reported in the literature with different and conflicting results.
- Obesity should be better stratified in classes according to the World Health Organization to better understand its impact on outcomes and complications in shoulder arthroplasty.
- Morbid obesity (body mass index >40 kg/m^2), more than obesity, is associated with a longer operative time, higher complication rate, reoperation rate, and superficial infection.
- Obesity does not have a detrimental effect on functional outcomes. The magnitude of functional improvement in the obese patients, however, can be inferior to that in nonobese patients.
- Obesity and morbid obesity do not increase hospital charges.

INTRODUCTION

Shoulder arthroplasty is an effective operation providing pain relief and improvement of function in patients with end-stage degenerative shoulder disease that is nonresponsive to nonoperative treatments.[1–4] The successful long-term results of shoulder arthroplasty (anatomic, reverse, and hemiarthroplasty) for various indications have previously been reported in the literature.[5–15] Because patients live longer and remain active into later decades of life, the number of shoulder arthroplasties performed in the United States has been increasing over recent years.[7,16] With the increased number of arthroplasties performed and the expanding indications for shoulder arthroplasty, however, the number of revision shoulder arthroplasties is increasing too.[17–26] To minimize complications and optimize patient outcomes, efforts have been made to identify patient risk factors that are significantly associated with perioperative complications and implant failures.

Obesity has been shown associated with increased rates of complications after orthopedic surgery, such as postoperative infections, intraoperative fractures, and need for revision surgeries.[27–46] According to the World Health Organization (WHO), obesity is defined as a body mass index (BMI) greater than 30 (kg/m^2).[47] The prevalence of obesity is increasing in recent years among adults worldwide, particularly in the United States, where the adult population with a BMI greater than 30 kg/m^2 has been estimated to be 35% and predicted to reach 50% by the year 2030.[48,49]

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The relationship between obesity and outcomes and/or complications in lower extremity arthroplasty has been well studied, whereas there has been a paucity of studies examining the effects of obesity on shoulder arthroplasty. The effect of obesity on outcomes and complications in shoulder arthroplasty has been recently reported in the literature with different and conflicting results.[12,40,50–67] These studies are heterogeneous in their study designs, patient cohort sizes, outcomes measures, and follow-up length.[12,40,50–67] There is a lack of studies, however, that have broadly evaluated the existing literature.

This review analyzes the role of obesity on clinical outcomes and complications. Functional outcomes and costs in shoulder arthroplasty are also assessed.

MATERIALS AND METHODS

A review of the literature was performed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines[68] to identify studies reporting outcomes of shoulder arthroplasty in obese patients.

A search of Pubmed, Medline, Embase, and Google Scholar was conducted using various combinations of the keywords, "shoulder", "arthroplasty", "replacement", "obesity", and "weight". No limit was set with regard to the year of publication.

Two independent researchers (the authors, I. De Martino and L.V. Gulotta) scanned all the articles for titles and abstracts. Disagreements were resolved by arbitration, and consensus was reached after discussion. The last search was performed in October 2017. Only articles in English were included. In addition, reference lists of the included articles were manually checked by the authors for missed studies. Ultimately, the search yielded 20 articles deemed relevant.[12,40,50–67]

Of the 20 included articles, 8 were case series in which patients were stratified according their BMI class[12,50–56]; 2 were case series, including only patients with a BMI greater than 40 kg/m^2 (morbidly obese)[40,57]; 9 were analysis of national databases[58–66]; and 1 was a large health care registry analysis.[67]

Effect of Obesity on Clinical Outcomes and Complications

Linberg and colleagues[40] were the first to evaluate outcomes of shoulder arthroplasty in morbidly obese patients. They evaluated 45 shoulder arthroplasties performed for osteoarthritis in patients with a BMI greater than 40 kg/m^2 with a minimum follow-up of 2 years. They found there was significant improvement in pain and function. A longer operative time was reported, however, due to a more challenging surgical exposure and soft tissue management due to the excessive adiposity. There was a higher perioperative complication rate, with 1 significant complication and 5 revisions that led to a higher rate (29%) of unsatisfied patients.

Statz and colleagues[57] performed a similar analysis using the Mayo Clinic Total Joint Registry. They reviewed all primary reverse total shoulder arthroplasties (TSAs) performed on morbidly obese (BMI >40 kg/m^2) patients at their institution from 2005 to 2012 with at least 2 years of follow-up. Of the 41 patients included in their analysis, 2 of them required revision surgery for infection and humeral loosening. The survivorship was 98% at 2 years and 95% at 5 years. They concluded that reverse TSA was a successful procedure in morbidly obese patients with a reasonable complication rate.

Wagner and colleagues,[50] using the same Mayo Clinic Total Joint Registry, investigated the effect of BMI on implant survival and the rate of complications after shoulder arthroplasty. A total of 4567 consecutive shoulder arthroplasties performed from 1970 to 2013 were included in their analysis. The mean BMI of their cohort was 29.7 kg/m^2 (range 14–66 kg/m^2), with 1622 (36%) having a BMI between 30 kg/m^2 and 40 kg/m^2, and 297 patients having a BMI greater than 40 kg/m^2. The investigators found that increasing BMI was associated with an increased risk of a revision surgical procedure, reoperation, superficial infection, and revision for mechanical failure, and it was negatively associated with risk of periprosthetic fracture. Compared with nonobese patients, the risk of reoperation in morbidly obese patients was increased of 46%. This association remained similar when stratified by implant type (hemiarthroplasty, anatomic, or reverse), surgical indication, and glenoid type (metal-backed or all-polyethylene). They found a stronger association between BMI and superficial wound infection, with an increased risk of 82% of any infection in morbidly obese patients relative to nonobese patients. It is clear from this study that increasing BMI is strongly associated with increased rates of postoperative complications and revision surgical procedures.

Similar results were reported by Gupta and colleagues.[56] They analyzed the effect of BMI in 119 patients who had a reverse TSA at their institution with a minimum of 90 days'