Reverse Total Shoulder Arthroplasty in Obese Patients

John D. Beck, MD, Kaan S. Irgit, MD, Cassondra M. Andreychik, BA, Patrick J. Maloney, MD, Xiaoqin Tang, PhD, G. Dean Harter, MD

Purpose To determine function and complications after reverse total shoulder arthroplasty (RTSA) in obese patients compared with a control group of nonobese patients.

Methods Between 2005 and 2011, we performed 76 RTSAs in 17 obese, 36 overweight, and 23 normal weight patients, based on World Health Organization body mass index classification. We reviewed the charts for age, sex, body mass index, date of surgery, type of implant, type of incision, length of stay, comorbidities, surgical time, blood loss, American Society of Anesthesiologists score, shoulder motion, scapular notching, and postoperative complications. Complications and outcomes were analyzed and compared between groups.

Results Reverse total shoulder arthroplasty in obese patients was associated with significant improvement in range of motion. Complication rate was significantly greater in the obese group (35%), compared with 4% in the normal weight group. We found no significant differences between scapular notching, surgical time, length of hospitalization, humeral component loosening, postoperative abduction, forward flexion, internal and external rotation, pain relief, or instability between groups.

Conclusions Our results show that obese patients have significant improvement in motion after RTSA but are at an increased risk for complication. Obesity is not a contraindication to RTSA, but obese patients need to understand fully the increased risk of complication with RTSA. *(J Hand Surg 2013;38A:965–970. Copyright © 2013 by the American Society for Surgery of the Hand. All rights reserved.)*

Type of study/level of evidence Therapeutic III.

Key words Shoulder arthroplasty, reverse, morbidly obese, complications, infection.

The prevalence of obesity has been on the rise in the United States and the remainder of the well-developed world is expected to follow.[1,2] Operations on obese patients constitute a large portion of elective and nonelective orthopedic procedures.[3] However, longer surgical times, increased perioperative complications such as wound healing and infection, limited postoperative range of motion, and increased revision rates are a concern in this population, as demonstrated in the adult joint reconstruction literature.[4–7] These perioperative complications can potentially be attributed to technical difficulties in surgical exposure, longer operation times, and increased blood loss.[8] Impaired immune response and poorly vascularized fatty tissues may explain high wound complication rates in obese patients.[9,10] Morbidly obese patients have been shown to have a greater incidence of unsatisfactory results after anatomic total shoulder arthroplasty (TSA), and this may also translate to other forms of shoulder arthroplasty.[5]

Reverse total shoulder arthroplasty (RTSA) was developed in the late 1980s for elderly patients with rotator cuff arthropathy, to increase motion and reduce pain.[11] Since the approval of the device by the Food and

From Geisinger Orthopaedics, Danville, PA.

Received for publication September 13, 2012; accepted in revised form February 15, 2013.

The authors acknowledge Kent Strohecker, MS, for assistance with institutional review board preparation. They also thank Larry P. Gerhard, MHC, for help in patient evaluation.

G.D.H. has a consultancy agreement with DJO, which makes one of the reverse shoulder implants used in this study.

No benefits in any form have been received or will be received related directly or indirectly to the subject of this article.

Corresponding author: John D. Beck, MD, Department of Orthopaedics, UCI Medical Center, 611 Turtle Crest Drive, Irvine, CA 92603; e-mail: jdbeck1@gmail.com.

0363-5023/13/38A05-0018$36.00/0
http://dx.doi.org/10.1016/j.jhsa.2013.02.025

Drug Administration in 1993, its use in the United States has grown to include a variety of indications such as failed anatomic TSA, inflammatory arthropathy with a massive rotator cuff tear, painful and irreparable rotator cuff tears, proximal humeral fractures, nonunion or malunion, tumor, and chronic pseudoparalysis without arthritis.[12–14] With an increasing number of RTSAs performed each year and the growing concern regarding expenditures by health care systems, interest in appropriate patient selection is increasing. Although clinical outcomes are promising, the numbers of complications reported for RTSA range from 19% to 68%.[15,16] A study of morbidly obese patients after anatomic TSA demonstrated improvement in pain and function. However, they had an increased rate of unsatisfactory outcomes compared with nonobese patients.[5] The purpose of this study was to evaluate the results and complications of RTSA for rotator cuff arthropathy in obese patients compared with a nonobese control group.

MATERIALS AND METHODS

We obtained institutional review board approval for this study. We conducted a retrospective review of all patients undergoing RTSA for rotator cuff arthropathy by a single surgeon from January 1, 2005, to March 1, 2010. Inclusion criteria for analysis included patient age greater than 18 years, primary diagnosis of rotator cuff arthropathy, minimum 2-year follow-up, and subsequent RTSA by the senior author (G.D.H.). We excluded from the study patients with history of infection. Patients were divided into 3 groups using the World Health Organization classification. Normal weight patients have a body mass index (BMI) of 18.5 to 24.9, overweight patients have a BMI of 25.0 to 29.9, and obese patients have a BMI of 30.0 or greater.[17] Two surgical approaches were used over the study period: a deltoid-splitting approach and a deltopectoral approach. The primary surgeon used the deltoid splitting approach during the first years of the study and switched to the deltopectoral for the last years. The approach was not varied by patient weight.

We evaluated patients at 2 weeks, 6 weeks, 3 months, 1 year, and then every 2 years after surgical intervention. The charts were reviewed for: age, sex, BMI, date of surgery, type of implant, type of incision, length of hospitalization, comorbidities (diabetes, hypertension, rheumatoid arthritis, and renal or cardiac failure), surgical time, blood loss, American Society of Anesthesiologists classification, and postoperative complications (wound problems, superficial and deep infection, necessity for revision, dislocation, intraoperative fracture, nerve palsy, stroke, and myocardial infarction). In addition, postoperative objective outcomes of shoulder active forward flexion, abduction, and external rotation were obtained using goniometric measurement.

The primary outcome of interest was complication rate after surgery between the obese group and the 2 control groups, normal weight and overweight, after RTSA. Secondary outcomes included rate of infection, instability, intraoperative fracture, postoperative pain, loosening, surgery time, blood loss, postoperative motion, and scapular notching. We graded pain with a score of 0 to 10 on a visual analog scale.

We reviewed radiographs to determine the presence of notching and periprosthetic radiolucency. Notching was classified according to the Nerot–Sirveaux[18] classification. A grade 1 notch is contained within the inferior pillar of the scapular neck. A grade 2 has erosion to the level of the inferior screw. A grade 3 notch extends superior to the inferior screw, and a grade 4 extends to the undersurface of the baseplate.

Data are presented as mean and standard deviation for continuous variables and as frequency for categorical variables. We made baseline comparisons between groups using the 2-sample *t*-test and the Pearson chi-square or Fisher exact test, as appropriate. Significance was defined as $P < .05$. We used logistic regression analysis, corrected for medical comorbidities, to examine the association between obesity and the likelihood of having complications.

RESULTS

A total of 76 patients met inclusion criteria, 23 of whom were in the normal weight group, 36 were in the overweight group, and 17 were in the obese group. Patients age ranged from 51 to 88 years, with a mean of 75 years. Patients undergoing RTSA had no significant difference in sex, hypertension, rheumatoid arthritis, cardiac failure, renal failure, or American Society of Anesthesiologists score between groups (Table 1). Patients in the obese group had a significantly greater rate of diabetes mellitus then the normal weight and overweight groups. Follow-up ranged from 24 to 61 months in the obese group, 24 to 61 months in the overweight group, and 24 to 61 months in the normal weight group. Months of mean follow-up were 42 ± 1.3, 35 ± 1.2, and 35 ± 1.9, respectively.

Average blood loss was significantly greater in the obese group than the overweight group. Surgical time and average length of stay were not significantly different between groups (Table 2). Postoperative active abduction, forward flexion, and external rotation were not different between