Impact of Obesity on Outcomes in Breast Reconstruction: Analysis of 15,937 Patients from the ACS-NSQIP Datasets

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BACKGROUND: Obesity is a growing epidemic in the United States (US) affecting more than 33% of adults. We aimed to use the World Health Organization (WHO) obesity stratification scheme to assess the overall risk of obese patients undergoing breast reconstruction using the ACS-NSQIP database from 2005 to 2010.

STUDY DESIGN: We reviewed the 2005 to 2010 ACS-NSQIP databases identifying encounters for Current Procedural Terminology (CPT) codes including either implant-based reconstruction (immediate, delayed, and tissue expander) or autologous reconstruction (pedicled transverse rectus abdominis myocutaneous [pTRAM], free TRAM, and latissimus dorsi flap with or without implant). Patients were classified and compared based on WHO obesity criteria: nonobese (body mass index [BMI] = 20 to 29.9 kg/m^2), class I (BMI = 30 to 34.9 kg/m^2), class II (BMI = 35 to 39.9 kg/m^2), and class III (BMI > 40 kg/m^2).

RESULTS: During the study period 15,937 breast reconstructions were performed. The majority of reconstructions were immediate reconstructions (85.0%) and implant-based (79.1%). The incidence of obesity was 27.1%, with 16.3% defined as class I obese, 6.9% defined as class II obese, and 4.0% defined as class III obese. The WHO-classified obese patients tended to have a progressively higher incidence of comorbid conditions, higher American Society of Anesthesiologists (ASA) physical status ($p < 0.001$), longer operative times ($p = 0.0001$), and greater lengths of hospital stay ($p = 0.0001$). Progressively higher BMIs were associated with higher rates of complications, including wound ($p < 0.001$), medical ($p < 0.001$), infections ($p < 0.001$), major surgical ($p < 0.001$), graft and prosthesis loss ($p < 0.001$), and return to the operating room ($p < 0.001$).

CONCLUSIONS: This study characterized the effect of progressive obesity on the incidence of surgical and medical complications after breast reconstruction using a large, prospective multicenter dataset. Increasing obesity is associated with increased perioperative morbidity. Data derived from this cohort study can be used to risk-stratify patients, enhance risk counseling, and advocate for institutional reimbursement in obese patients undergoing breast reconstruction. (J Am Coll Surg 2013;217:656–664. © 2013 by the American College of Surgeons)

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Obesity is a significant public health concern and represents an epidemic in the United States, with an incidence exceeding 30% of all adults.[1,2] Morbidity and complications linked to obesity are associated with a cost of at least $11 billion a year, underscoring the tremendous fiscal burden this disease imparts on our health care system.[1] Obesity is well-defined as a predictor of perioperative complications in a variety of surgical procedures, including breast reconstruction.[3-8]

The majority of studies assessing complications and risk in obese patients have been single-institution studies to date. And few studies have attempted to qualify the impact of obesity using the World Health Organization

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Abbreviations and Acronyms

ACS-NSQIP = American College of Surgeons National Surgical Quality Improvement Program
BMI = body mass index
CPT = Current Procedural Terminology
OR = odds ratio
TRAM = transverse rectus abdominis myocutaneous
WHO = World Health Organization

(WHO) obesity stratification scheme, which subcategorizes obese patients based on body mass index (BMI). We previously reported that progressive obesity is associated with significant rates of perioperative morbidity and added cost in patients undergoing free autologous breast reconstruction at a single institution.[3] However, there is a significant need for larger, generalizable studies assessing the impact of obesity on overall outcomes in breast reconstruction, both implant and autologous.

In an effort to optimize patient education and risk stratification, we aimed to provide a comprehensive outcome analysis of all WHO-classified obese patients undergoing breast reconstruction using the 2005 to 2010 American College of Surgeons National Surgery Quality Improvement Program (ACS-NSQIP) datasets.

METHODS

We reviewed the 2005 to 2010 ACS-NSQIP databases identifying encounters for breast reconstruction.[9] Patients were placed into cohorts as defined by the WHO obesity classification system: class I obesity (BMI = 30 to 34.9 kg/m^2), class II obesity (BMI = 34.9 to 39.9 kg/m^2), and class III obesity (BMI > 40 kg/m^2).[10] The following 2010 Current Procedural Terminology (CPT) codes were used to define our patient cohorts: implant-based reconstructions included immediate implant (19340), delayed implant (19342), and tissue expander placement (19357). Autologous reconstructions included the latissimus dorsi (LD) flap (19361) with and without placement of implant, the free transverse rectus abdominis myocutaneous (TRAM) (19364), and the pedicled TRAM (including microsurgical super-charging) (19367, 19368, 19369). Immediate reconstructions were considered in patients who underwent concurrent mastectomy during the initial hospitalization. The CPT codes for mastectomy included partial mastectomy with (19102) and without (19101) axillary lymphadenectomy, simple mastectomy (19103), subcutaneous mastectomy (19104), radical mastectomy (19105 and 19106), and modified radical mastectomy (19107). Delayed reconstructions were defined as reconstructions done without a concurrent mastectomy.

Patient encounters with a CPT code for reconstruction alone or with one for mastectomy and reconstruction were included. For the purposes of this study, patients undergoing latissimus muscle flap with or without implant were included within the autologous cohort because the specific use of a pedicled muscle flap represented the more significant component of the reconstruction. Other patients with multiple different reconstructive modality CPT codes were excluded from the study. Any patient less than 18 years of age was also excluded.

The ACS-NSQIP data were collected by trained research nurses at each institution using a systematic sampling of general and vascular operations performed in each participating institution. Results from audits completed to date reveal a disagreement rate of 1.8% for program variables. Each dataset contains 240 Health Insurance Portability and Accountability Act (HIPAA) compliant variables for each case encounter, including patient demographics, preoperative risk factors, baseline comorbidities, intraoperative variables, and 30-day postoperative morbidity and mortality. The list and definitions of variables collected in the database can be found at the ACS-NSQIP Website (http://www.acsnsqip.org/). Patients are contacted by letter or telephone survey after discharge to ensure a full 30-day follow-up period. Data were accessed on December 1, 2012.

Several endpoint outcomes variables were defined by combining defined ACS-NSQIP variables. We characterized a major surgical complication as a deep wound infection, graft or prosthetic loss, or an unplanned return to the operating room within 30 days. Medical complications included any defined ACS-NSQIP endpoints, such as pneumonia, pulmonary embolism, postoperative renal insufficiency (creatinine > 2 mg/dL), urinary tract infection, stroke, myocardial infarction, symptomatic deep venous thrombosis, or sepsis. Wound complications were defined as superficial surgical site infections, deep wound infection, organ space infection, or wound dehiscence. In addition to the predefined ACS-NSQIP variables, which can be viewed for each year of data (http://site.acsnsqip.org/), we also characterized hypoalbuminemia as any albumin value <3.5 g/dL.[11]

All data were entered into an Excel workbook (Microsoft Corp). Statistical analyses included chi-square and Fisher's exact tests for categorical variables and the Wilcoxon rank sum test and Kruskal-Wallis test for continuous variables. All tests were 2-tailed, and statistical significance was defined as $p < 0.05$. Any variable found to be statistically different across obesity cohorts was included in a post-hoc analysis using the Bonferroni correction to determine the specific groups within which differences might be present. A multivariate logistic regression analysis was used to assess the independent risk of obesity (BMI > 30 kg/m^2) on complications. Analyses were performed using STATA IC 10.0 (StataCorp).