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Original Article

The Impact of Obesity on the 30-Day Morbidity and Mortality After Surgery for Endometrial Cancer

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ABSTRACT **Study Objectives:** To examine the effect of body mass index (BMI) on postoperative 30-day morbidity and mortality after surgery to treat endometrial cancer.

Design: Retrospective cohort study (Canadian Task Force classification II-2).

Setting: National Surgical Quality Improvement Program.

Patients: Patients with endometrial cancer who underwent surgery from 2005 to 2011.

Interventions: Women were grouped according to weight, as follows: normal weight (BMI 18 to <30), obese (BMI 30 to <40), and morbidly obese (BMI ≥40). Univariate and multivariable logistic regression models were analyzed.

Measurements and Main Results: Of 3947 patients, 38% were of normal weight, 38% were obese, and 24% were morbidly obese. Of these, 48% underwent laparoscopy and 52% underwent laparotomy. Overall 30-day morbidity and mortality were 13% and 0.7%, respectively. Obesity and morbid obesity were associated with a higher American Society of Anesthesiologists class, diabetes, and hypertension. Preoperatively, elevated serum creatinine concentration, hypoalbuminemia, and leukocytosis were more common in morbidly obese women than those of normal weight. Laparoscopic surgery was performed less frequently in morbidly obese women than in those of normal weight (42.5% vs 50%; $p = .001$). Morbidly obese patients were more likely to develop postoperative complications (morbidly obese 16% vs normal weight 13% vs obese 11%; $p = .001$), in particular surgical (morbidly obese 14% vs normal weight 11% vs obese 9%; $p < .001$) and infectious complications (morbidly obese 10% vs normal weight 5% vs obese 5%; $p = .01$). After laparotomy, morbidly obese women demonstrated a higher rate of any complication (normal weight 21%, obese 18%, morbidly obese 25%; $p = .002$), surgical complications (normal weight 18%, obese 14%, morbidly obese 22%; $p = .002$) and infectious complications (normal weight 6%, obese 10%, morbidly obese 16%; $p < .001$). After laparoscopy there was no difference in complication rates according to BMI group. The 30-day mortality was not significantly different according to BMI. After adjusting for confounders, obesity and morbid obesity did not independently predict 30-day morbidity or mortality.

Conclusions: Morbidly obese patients with endometrial cancer have more preoperative morbidities and postoperative complications, in particular surgical and infectious complications, and are less likely to undergo minimally invasive surgery. However, obesity was not an independent predictor of perioperative outcomes after controlling for other confounders. Journal of Minimally Invasive Gynecology (2015) 22, 94–102 © 2015 AAGL. All rights reserved.

Keywords: Endometrial cancer; Morbid obesity; Morbidity; Mortality; Obesity; Surgery

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Obesity is one of the most common causes of morbidity and death in the United States [1]. More than a decade ago it was estimated that morbidity and complications associated with obesity cost $11 billion every year [2]. This cost has likely increased as our population has grown more obese. Experts predict that by 2030 about half of the general population will be obese, with 11% qualifying as severely obese [3]. As gynecologic oncologists, the magnitude and prevalence of this issue is amplified; more than two-thirds of women with endometrial cancer, the most common cancer we treat, are obese [4,5].

The high cost of obesity is due, at least in part, to postoperative complications associated with excess body weight. These complications demand further interventions and longer hospital stay. Higher rates of wound and surgical site infections (SSIs), hospital stay, and readmission have been associated with obesity in a variety of surgical fields [6–10]. Understanding the postoperative complications that are associated with obesity helps us to counsel patients appropriately and to search for ways to optimize their recovery and minimize complications they might experience. In addition, in the era of modern healthcare reform, understanding which complications are more likely in the obese or morbidly obese patient are of interest, given plans to modify payment for services on the basis of hospital-acquired complications [11].

With the increase in minimally invasive surgery and advances in medical and surgical management of patients, perioperative complications and death are increasingly rare. However, when complications do occur, they can delay adjuvant therapy, create substantial anxiety, and generate additional costs. Most previous studies that explored the postoperative complications associated with obesity were small and were performed at a single institution [12–16]. Larger and more generalizable studies are needed to describe the true risk of these complications in obese women compared with those of normal weight. The objectives of the present study were to analyze the association of body mass index (BMI) with 30-day morbidity and mortality after surgery to treat endometrial cancer using nationwide data from the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) database.

Materials and Methods

Data Source

The ACS NSQIP is a risk-adjusted data collection mechanism that collects and analyzes clinical outcomes data. Participating hospitals use their collected data to develop quality initiatives that improve surgical care and to identify elements in provided health care that can be improved when compared with other institutions. The ACS NSQIP collects data on 135 variables including preoperative risk factors (patient demographic data, comorbidities, and laboratory values), intraoperative variables, and 30-day postoperative morbidity and mortality outcomes for a systematic and prospective sample of patients undergoing major surgical procedures. Data are collected in a standardized fashion according to strict definitions by dedicated surgical clinical nurse reviewers. Patients are followed up throughout their hospital course and after discharge from the hospital for up to 30 days postoperatively. A site Surgical Clinical Reviewer captures these data from medical records, physician office records, 30-day follow-up telephone interview with patients, and other methods.

The present study received exempt status from the institutional review board. Patients with a diagnosis of endometrial cancer were identified from the 2005–2011 ACS NSQIP participant use files, which include data collected from 258 academic and community hospitals throughout the United States using ICD-9 (*International Classification of Diseases, Ninth Revision*) codes. Patients with endometrial cancer were included if they had undergone hysterectomy with or without other surgeries, according to CPT (Current Procedural Terminology) codes.

For the purposes of the present study, 3 clinically relevant subgroups were generated for comparison. The normal weight group comprised patients with BMI >18 but <30, the obese group included patients with BMI 30 to <40, and the morbidly obese group included patients with BMI ≥ 40. A separate analysis was conducted stratifying morbidly obese patients into 3 categories: morbidly obese 1 (MO1), BMI 40 to 49; morbidly obese 2 (MO2), BMI 50 to 59; and morbidly obese 3 (MO3), BMI ≥ 60.

Risk Factors and Outcome

All risk factors available in the ACS NSQIP database were compared between the 3 BMI groups (normal weight, obese, and morbidly obese). The primary end points of the study were analysis of 30-day mortality, postoperative morbidity, procedure-related complications, surgical reexploration (return to the operating room within 30 days), and length of hospital stay. The secondary end point was to perform subset analysis of open laparotomy and laparoscopy groups separately. Composite end points were created to categorize postoperative complications into a few related groups: surgical complications (all SSIs, wound disruption, bleeding requiring transfusion, and peripheral nerve injury), renal complications (progressive renal failure and acute renal failure), pulmonary complications (pneumonia, unplanned intubation, and respiratory insufficiency requiring ventilation for 48 hours), infectious complications (systematic inflammatory response syndrome, sepsis, septic shock, SSI, and pneumonia), cardiovascular complications (pulmonary embolism, stroke/cerebrovascular event, cardiac arrest, myocardial infarction, and deep vein thrombosis requiring therapy), and any nonsurgical complications (any complication except surgical complications). Patients with preoperative sepsis were excluded from the study. Patients who were