Gynecologic Oncology xxx (2014) xxx–xxx

Contents lists available at ScienceDirect

Gynecologic Oncology

journal homepage: www.elsevier.com/locate/ygyno

Racial disparity in the 30-day morbidity and mortality after surgery for endometrial cancer

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HIGHLIGHTS

- African American patients with endometrial cancer have more preoperative morbidities and less likely to undergo minimally invasive surgery.
- African American patients with endometrial cancer are more likely to have postoperative complications including surgical and non-surgical in univariate analysis.
- African American race was not an independent predictor of poor 30-day outcomes in multivariable analysis after controlling for other confounders.

ARTICLE INFO

Article history:
Received 25 March 2014
Accepted 24 May 2014
Available online xxxx

Keywords:
Race
Surgery
Endometrial cancer
Morbidity
Mortality
African American
White

ABSTRACT

Objectives. To examine postoperative 30-day morbidity and mortality in African American (AA) compared to white patients (W) with endometrial cancer (EC).

Methods. Patients with EC were identified from the American College of Surgeons National Surgical Quality Improvement Program from 2005 to 2011. AA and W subgroups were studied. Multivariable logistic regression models were performed.

Results. Of 3248 patients, 2899 (89%) W and 349 (11%) AA were identified. AA were more likely to have diabetes, hypertension, ascites, neurologic morbidities, weight loss, non-independent functional status, higher ASA class, higher serum creatinine ≥2 mg/dl, hypoalbuminemia and anemia. Laparoscopic surgery was performed less frequently in AA than W (41.4% vs. 50.3%, $p < 0.001$). AA had a significantly higher risk of postoperative complications than W (21% vs. 12%, $p < 0.001$) including surgical (17% vs. 10%, $p < 0.001$) and non-surgical complications (7% vs. 4%, $p = 0.022$). Mean length of hospital stay and operative time were longer in AA than W but there was no difference in surgical re-exploration. In multivariable model after adjustment for confounders including surgical complexity and associated morbidities, AA race was not an independent predictor of "any postoperative complications" for both laparotomy group (OR 1.1, 95% CI 0.73–1.61, $p = 0.65$) and laparoscopic group (OR 1.43, 95% CI 0.80–2.45, $p = 0.21$). No difference in 30-day mortality was found between AA and W (1% vs. 1%, $p = 0.11$).

Conclusions. AA patients with EC have more preoperative morbidities, postoperative complications and were less likely to undergo minimally invasive surgery. However, AA race was not an independent predictor of poor 30-day outcomes after controlling for other confounders.

Introduction

Endometrial cancer is the most common gynecologic malignancy in the United States causing 52,630 incident cases and 8590 deaths in 2014 [1]. Despite the advance in management and significant improvement in survival, disparities in uterine cancer incidence, treatment and outcome between African American and white patients have been increasingly identified over the recent years. African American patients are more likely to present with advanced stage, poorly differentiated and aggressive non-endometrioid cancers compared to white patients [2–5]. Further, African American patients with endometrial cancer are less likely to undergo surgical treatment and have worse survival [4,6–9]. Nonetheless, after controlling for multiple variables including stage, histology, and treatment, African American women with endometrial cancer still have a worse survival than white women [7,3,4]. On the other hand, single institutional data showed no difference in outcome when correcting for other prognostic factors [10]. In the systematic review of the published literature on racial disparities in uterine cancer, Long et al. showed that the increased mortality in African Americans is multifactorial. However, the most consistent contributor

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http://dx.doi.org/10.1016/j.ygyno.2014.05.024
0090-8258/

to incidence and mortality disparities were histology and socioeconomics [11].

Pattern of care studies has shown that African American patients are less likely to undergo surgical treatment when diagnosed with cancer compared to white patients [10,12,13]. African American patients who receive treatment for endometrial cancer are more likely to undergo primary radiotherapy than surgery compared to white women. Furthermore, African American patients who undergo surgery for endometrial cancer are less likely to receive definite surgery than white women [9,4].

Across all tumor types, AA patients who undergo surgery have variable surgical outcomes. African American patients are nine times more likely to experience postoperative mortality following acoustic neuroma resection than white patients [16]. Furthermore, African Americans with breast cancer are 35% more likely to develop postoperative complications and 87% more likely to experience in-hospital mortality than white women [13]. On the other hand, in an analysis of patients undergoing surgical treatment of a variety of thoracic, abdominal and pelvic malignancies, no difference was found in 30-day postoperative complications between white and African American patients [17]. We questioned whether differences in the rates of postoperative morbidity and mortality drive the racial disparity in survival between African American and white patients with endometrial cancer. The information on the differences in short-term postoperative outcomes between these two racial groups are limited. Therefore, the objective of this study is to analyze the difference in the 30-day morbidity and mortality between white and African American women following surgery for endometrial cancer using nationwide data from the American College of Surgeons (ACS) National Surgical Quality Improvement Program (NSQIP) database.

Methods

Data source

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 demographics, comorbidities, laboratory values), intraoperative variables, and 30-day postoperative mortality and morbidity 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 throughout their hospital course and after discharge from hospital for up to 30 days postoperatively. A site's Surgical Clinical Reviewer (SCR) captures these data using a variety of methods including medical chart extraction, doctor's office records, 30-day telephone interview with the patients and other methods.

Patients who were diagnosed with endometrial cancer were identified from the 2005 to 2011 ACS-NSQIP participant use files, which include data collected from 258 academic and community hospitals throughout the United States using ICD-9 codes. Patients with endometrial cancer were included if they had at least hysterectomy with or without other surgeries using Current Procedural Terminology (CPT) codes.

For study purposes, 2 subgroups were abstracted for comparison: White (W) and African American (AA) patients.

Risk factors and outcome

All risk factors available in the ACS NSQIP database were compared between the two groups. The primary end points of the study were analysis of 30-day mortality, postoperative morbidity, procedure-related complications, surgical re-exploration (return to the operating room within 30 days) and length of hospital stay. The secondary end point was to perform subset analysis looking at laparotomy and laparoscopic approaches. Composite end points were created to categorize postoperative complication into few related groups: surgical complications (all surgical site infections, wound disruption, bleeding requiring transfusion and peripheral nerve injury), renal complications (progressive renal failure, acute renal failure), pulmonary complications (pneumonia, unplanned intubation, respiratory insufficiency requiring ventilation for 48 h), infectious complications (systematic inflammatory response syndrome, sepsis, septic shock, surgical site infection and pneumonia), cardiovascular complications (pulmonary embolism, stroke/cerebrovascular event, cardiac arrest, myocardial infarction, deep vein thrombosis requiring therapy) and any nonsurgical complication (any complication except surgical complications). Patients with pre-operative sepsis were excluded from the study. Patients who are ventilator dependent, with renal failure or on dialysis before surgery were excluded from their respective complication category.

Statistical analysis

Associations between categorical covariates were assessed using Chi-squared test. Group differences in means of continuous measures were assessed using student's *t*-test or Wilcoxon rank-sum test. The preoperative laboratory values were used both as continuous and categorical variables: serum albumin (>3 versus ≤ 3 mg/dl); hematocrit (<35 versus ≥ 35); serum creatinine (≥2 versus < 2 mg/dl); platelets (<350,000 versus ≥ 350,000 cell/cubic ml); and WBC (<11 versus ≥ 11 cells/cubic ml). The cutoffs for laboratory values were decided based on the percentile (90th or 10th percentile when appropriate) combined with clinically valuable cutoff based on prior literature.

To adjust for surgical complexity, patients who underwent additional surgical procedures beside hysterectomy were given a specific score for each procedure. Then, based on the number of procedures performed, the sum of these scores was calculated creating a modified surgical complexity scoring system. A score of 1 was given to any of the following procedures: hysterectomy with or without salpingo-oophorectomy, lymphadenectomy or omentectomy. A score of 2 was given to any of the following procedures: small or large bowel resection, gastrectomy, hepatectomy, splenectomy and pancreatectomy.

Multivariable logistic regression models were used to assess the association between race and 30-day postoperative complications while controlling for all other confounders. For the creation of the models, we considered all preoperative variables available in the ACS NSQIP database, including demographics (age and race), preoperative health status and comorbidities, preoperative laboratory values (serum albumin, creatinine, white cell count, platelet count and hematocrit), and operative factors (operative time, ASA class, surgical complexity). The preoperative morbidities, operative risk factors or demographic variables that were significantly associated with postoperative complications in the univariate logistic regression model with a p value < 0.05 were included in the multivariate regression model. A final logistic regression model was run using the two racial groups and all confounders found in this way. All tests of significance were at the $p < 0.05$ level, and p values were two-tailed. STATA 10.0 program (College Station, TX) was used for the analysis of the data.

Results

3248 patients met the inclusion criteria. Of them, 2899 (89%) were W and 349 (11%) were AA. Demographics and clinical characteristics of each group are shown in Table 1. African American patients with endometrial cancer were more likely to have morbid obesity ($p = 0.01$), diabetes ($p < 0.001$), hypertension requiring medications ($p < 0.001$), ascites ($p < 0.001$), neurologic morbidities ($p = 0.002$), weight loss within 6 months prior to surgery ($p = 0.01$), dependent functional status ($p = 0.016$), and higher ASA class ($p < 0.001$). Further, AA were

Please cite this article as: Mahdi H, et al, Racial disparity in the 30-day morbidity and mortality after surgery for endometrial cancer, Gynecol Oncol (2014), http://dx.doi.org/10.1016/j.ygyno.2014.05.024