Gynecologic Oncology 137 (2015) 106–111

Contents lists available at ScienceDirect

Gynecologic Oncology

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

Impact of age on 30-day mortality and morbidity in patients undergoing surgery for endometrial cancer☆

Haider Mahdi [a,*], David Lockhart [b], Kathryn A. Maurer [a]

[a] Gynecologic Oncology Division, Ob/Gyn and Women's Health Institute, Cleveland Clinic, Cleveland, OH, USA
[b] Department of Biostatistics, University of Washington, Seattle, WA, USA

HIGHLIGHTS

- Elderly patients did not have increased 30-day morbidity or mortality after surgery for endometrial cancer
- Older patients with endometrial cancer were less likely to have minimally invasive surgery
- Minimally invasive surgery should be considered in elderly patients with endometrial when feasible

ARTICLE INFO

Article history:
Received 15 December 2014
Accepted 22 January 2015
Available online 29 January 2015

Keywords:
Endometrial cancer
Elderly
Surgery
Post-operative morbidity
Post-operative mortality
NSQIP

ABSTRACT

Objectives. To investigate the impact of age on postoperative mortality and morbidity for women undergoing surgery for endometrial cancer.

Methods. Patients with endometrial cancer who had a hysterectomy were identified in the 2005–2011 National Surgical Quality Improvement Program database. Patient characteristics and outcomes were compared between age groups. Multivariable logistic regression models were used.

Results. 4000 patients met inclusion criteria. Octogenarians ($n = 328$) were less likely to undergo laparoscopic surgery ($p < 0.001$) but there was no difference in surgical complexity among age groups ($p = 0.54$). In multivariate analysis, ages 60–69 (OR 0.9, 95% CI 0.3–2.8, $p = 0.82$), 70–79 (OR 1.4, 95% CI 0.4–4.3, $p = 0.60$) and ≥80 years (OR 2.4, 95% CI 0.7–8.1, $p = 0.17$) were not associated with increased mortality compared to age <60 years. Significant predictors of mortality were respiratory or renal disease, dependent functional status, and hypoalbuminemia. Octogenarians were more likely to have non-surgical complications (8% vs. 3–5%, $p = 0.001$) but there was no difference in surgical complications ($p = 0.89$). In multivariate analysis, ages 60–69 (OR 1.2, 95% CI 1.0–1.6, $p = 0.09$), 70–79 (OR 1.3, 95% CI 1.0–1.8, $p = 0.05$) and ≥80 years (OR 1.3, 95% CI 0.9–2.5, $p = 0.14$) were not associated with increased complications compared to age <60 years. Significant predictors of complications were higher ASA class, anemia, and thrombocytosis.

Conclusions. Older patients should not be denied surgery for endometrial cancer based on age alone as they do not have higher rates of 30-day morbidity or mortality after adjusting for other factors. An increased effort should be made to perform minimally invasive surgery in octogenarians.

Introduction

The National Institute on Aging has described the aging of our population as a "silver tsunami approaching for which we are unprepared" [1]. Specifically, from 2000 to 2010, there was a 15% increase in the U.S. population over age 65 [2] and it is estimated that by 2050, 25% of the US population will be over age 65 [3]. By 2030, the number of US octogenerians will have nearly doubled when compared to 2000 [4]. While the overall population ages, the incidence of endometrial cancer in the elderly has also increased by 2.6% per year from 2006 to 2010 [5]. In order to prepare for the increasing prevalence of elderly endometrial cancer patients, we must investigate the appropriate management of these patients.

While surgery is a mainstay in the management of endometrial cancer, octogenarians represent a fragile age group of patients with lower physiologic reserve with the potential for having higher risk of postoperative complications and/or mortality. Small retrospective studies of surgery in elderly patients with endometrial cancer report mortality rates of 0% to 4.27% and complication rates of 5.4% to 42% [6–9]. Although there is significant variation in the reported rates, overall these studies suggest that elderly endometrial cancer patients

☆ Funding: No funding source.
* Corresponding author at: Ob/Gyn and Women's Health Institute, 9500 Euclid Ave, Cleveland, OH 44195, USA. Fax: +1 216 445 6325.
E-mail address: mahdih6281@gmail.com (H. Mahdi).

http://dx.doi.org/10.1016/j.ygyno.2015.01.543
0090-8258/

do well after surgery. Unfortunately recent studies showed that these patients receive less surgery than their younger counterparts with resulting worse survival rates [10,11]. In order to better understand the safety of endometrial cancer surgery in the elderly, further information on the post-operative morbidity and mortality rates is needed in this unique patient population.

Surveys of large nationwide databases offer the opportunity to acquire larger and more generalizable cohorts and do not suffer the biases and power limitations of single institution cohort studies. A survey of a large European national database, for example, reported a low mortality rate (1.7%) in the octogenarian undergoing surgery for endometrial cancer [12]. Surveys of national European databases, however, may not reflect the unique and diverse U.S. population and medical system. For this reason, we surveyed a large U.S. national database for 30-day post-operative outcomes in women undergoing surgery for endometrial cancer. The main objective of the study is to investigate the impact of age on mortality and morbidity after surgery for endometrial cancer using nationwide data from the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) database.

Methods

Data source

ACS NSQIP is a risk-adjusted data collection mechanism that collects and analyzes clinical outcome 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 (including 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 the 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 2005–2011 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 a hysterectomy with or without other surgeries using Current Procedural Terminology (CPT) codes. For study purposes, four age subgroups were abstracted for comparison: ages under 60 years old (<60), 60–69, 70–79 and ≥80 years.

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 hours), septic complications (systematic inflammatory response syndrome, sepsis, septic shock), 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).

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 age 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). Confounders were identified by running regression models with age and one additional preoperative risk factor or demographic variable at a time as predictors and seeing how the results differed from running a logistic model using age alone. A change of >10% between the crude and adjusted odds ratio of the age variable was used as evidence that the covariate was a possible confounder. A final logistic regression model was run using age 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

Demographics and clinical characteristics

4000 patients met the inclusion criteria. Of them, 1559 (39%) aged <60, 1358 (34%) aged 60–69, 755 (19%) aged 70–79 and 328 (8%) aged ≥80 years. Demographics and clinical characteristics of each group are shown in Table 1.

Older patients with endometrial cancer were more likely to have respiratory (<0.001), cardiac ($p < 0.001$) and neurologic ($p < 0.001$) comorbidities as well as hypertension requiring medications ($p < 0.001$), dependent functional status ($p < 0.001$), and higher ASA class ($p < 0.001$). Further, older women were more likely to have higher serum creatinine ≥2 mg/dl ($p < 0.001$), and anemia (hematocrit <35 mg/dl) ($p < 0.001$) (Table 1).

Elderly patients aged ≥80 years were less likely to undergo laparoscopic surgery compared to age <60, 60–69 and 70–79 years respectively (41.5% vs. 49.1% vs. 48.9% vs. 45.8%, $p < 0.001$) (Fig. 1). However, no difference in surgical complexity was noted between the four age groups ($p = 0.54$).