# Perioperative Outcomes for Laparotomy Compared to Robotic Surgical Staging of Endometrial Cancer in the Elderly

## *A Retrospective Cohort*

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**Objective:** This study aimed to compare outcomes of endometrial cancer (EMCA) staging in elderly patients performed either robotically or via laparotomy.

**Methods:** A retrospective, multi-institutional chart review was conducted of all robotic and laparotomy staging surgeries for EMCA between 2003 and 2009. Charts were reviewed for intraoperative and postoperative complications and morbidities.

**Results:** Seven hundred forty-six women were identified who had undergone EMCA staging either robotically or via laparotomy; 89 and 93 patients 70 years or older underwent staging for EMCA via robotic and laparotomy, respectively. Both groups had similar age and body mass index. Among elderly patients being staged robotically, a higher incidence of pelvic lymphadenectomy, and decreased blood loss, incidence of blood transfusion, and overall complications were seen compared to laparotomy. Postoperatively, elderly patients staged robotically had a shorter median hospital stay (1 vs 4 days, $P < 0.001$), with no increase in readmission or return to the operating theater. No vessel, bowel, or genitourinary injuries occurred. Vaginal cuff dehiscence after robotic surgery was not significantly different, but wound and fascial complications were significantly increased in patients undergoing laparotomy. Thromboembolism rates were similar between both groups.

**Conclusions:** Elderly patients can safely undergo robotic EMCA staging with improved outcomes compared to laparotomy. The benefits of robotic staging include higher incidence of completion of lymphadenectomy, decreased hospital stay (without an increase in readmissions or reoperations), decreased transfusions, and decreased wound and fascial complications.

**Key Words:** Endometrial cancer, Surgery, Robotic surgery

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Endometrial cancer (EMCA) is the most common gynecologic malignancy with a 2.6% lifetime risk for women in the United States. The median age at diagnosis is 61 years,[1] which represents the fastest growing segment of the US population.[2] Persons older than 65 years are expected to account for 20% of Americans by the year 2030. Also, persons older than 75 years are expected to triple and those older than 85 years are expected to double in this same period.[3] Increasing age is directly associated with increasing rates of cancer and as Americans continue to live longer, so too will the burden of cancer shift to older and older individuals.

Elderly patients pose a unique challenge to cancer care, both medically and surgically. Endometrial cancer is surgically staged, and as such, a total extrafascial hysterectomy (TH), bilateral salpingo-oophorectomy (BSO) with pelvic and para-aortic lymph node dissection is the standard in the management of this disease and is often curative in early-stage disease.[4] Applying these complex procedures to elderly patients can be particularly challenging because these women have more medical comorbidities, and a greater potential for postoperative complications.

Laparoscopic and, more recently, robotic-assisted surgical staging has become increasingly more common and has rapidly gained acceptance as a standard approach to surgical staging in EMCA. Minimally invasive surgery has been demonstrated to have an improved postoperative recovery with shorter hospital stays, less blood loss, and decreased incidence of thromboembolic events and serious complications compared to laparotomy.[5] These improved outcomes would be ideal in the treatment of elderly patients.

The objective of our study was to compare short- and long-term complications and morbidities of elderly women between the traditional laparotomy approach and robotic-assisted surgical staging.

## MATERIALS AND METHODS

A retrospective, multi-institutional chart review was conducted of all patients undergoing robotic staging surgeries for EMCA between 2006 and 2009 at the Ohio State University and Florida Hospital, Orlando. To account for the trend toward robotic surgery, laparotomies for EMCA staging were obtained between 2003 and 2005 before the start of our robotics program. Institutional review board approval was obtained for all institutions involved in the study. Charts were reviewed for intraoperative and postoperative complications, morbidity, and mortality. Patient demographics, pathologic results, and hospital length of stay (LOS) were analyzed.

Endometrial cancer staging was defined as TH and BSO. Incidence of pelvic and para-aortic lymph node dissection was recorded but was not part of the inclusion criteria. The experimental group consisted of patients 70 years or older and staged robotically with the da Vinci Surgical System (Intuitive Surgical, Inc, Sunnydale, CA). The control group consisted of patients 70 years or older and staged via laparotomy.

Categorical variables were compared with $\chi^2$ tests to compare proportions using JMP 9 software (SAS Institute, Inc, Cary, NC). All tests were 2-sided and a $P$ value less than 0.05 were considered statistically significant. Continuous variables were compared with 2-sample independent $t$ test. Descriptive statistics were reported as median and range, unless otherwise specified. Data were analyzed by intent to treat.

## RESULTS

A total of 778 women were identified who had undergone a TH, BSO, and lymphadenectomy for EMCA staging either robotically or via laparotomy (Fig. 1). Thirty-two patients were excluded due to intraoperative conversion to laparotomy (24 patients < 70 and 8 ≥ 70; odds ratio [OR], 0.62; 95% confidence interval [CI], 0.3–1.5) in the per protocol analysis. Robotic EMCA staging was performed in 471 women; of which, 89 were 70 years or older with a median age of 75 years (range, 70–92 years). Laparotomy was performed for 275 women; of which 93 were 70 years or older with a median age of 75 years (range, 70–86 years). Body mass index (BMI) was lower for patient younger than 70 years (median, 34 kg/m$^2$) compared to elderly (BMI, 29 kg/m$^2$) ($P < 0.001$).

Ninety-eight percent of elderly patients (n = 79) underwent a robotic pelvic lymphadenectomy versus 87% (n = 81) via laparotomy (OR, 5.8; 95% CI, 1.4–39). Para-aortic lymphadenectomy was not significantly different between the groups (Table 1). The estimated blood loss was higher for laparotomy than robotic and patients undergoing

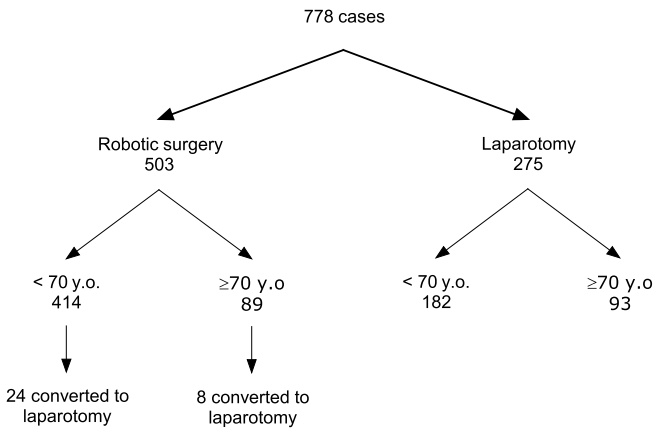


**FIGURE 1.** Patient flow chart.

**TABLE 1.** Patient characteristics of all patients older than 70 years

| | Laparotomy (n = 93) | Robotics* (n = 89) | *P* |
|---|---|---|---|
| Stage, n (%) | | | 0.078 |
| I/II | 71 (76) | 77 (87) | |
| III/IV | 22 (24) | 12 (13) | |
| BMI, kg/m$^2$ | 30 (17–49) | 28 (19–50) | <0.001 |
| Age, y | 75 (70–86) | 75 (70–92) | 0.53 |
| LOS, median (range), d | 4 (2–28) | 1 (0–13) | <0.001 |
| Median EBL (range), mL | 300 (75–1500) | 75 (10–600) | <0.001 |
| Intraoperative transfusion, n (%) | 16 (17) | 2 (2) | 0.0008 |
| Postoperative transfusion, n (%) | 11 (12) | 2 (2) | 0.018 |
| PLND, n (%) | 81 (87) | 87 (98) | 0.007 |
| Median number of pelvic LN (range) | 18 (1–39) | 15 (1–46) | 0.007 |
| PALND, n (%) | 72 (77) | 61 (67) | 0.18 |
| Median number of aortic LN (range) | 9 (1–25) | 7 (2–17) | 0.14 |

*Eight patients in the robotic surgery group underwent intraoperative conversion to laparotomy.

EBL, Estimated blood loss; LN, lymph node; PALND, para-aortic lymph dissection; PLND, pelvic lymph node dissection.

laparotomy received blood transfusions more frequently than those undergoing robotic staging (OR, 0.08; 95% CI, 0.01–0.3). The median LOS for elderly was longer for laparotomy than for robotic surgery (4 vs 1 day, $P < 0.001$). Median LOS was 1 day for patients 70 years or older and younger than 70 years undergoing robotic surgery; whereas after laparotomy, LOS was longer (median LOS, 4 days) for patients 70 years or older compared to 3 days for those younger than 70 years ($P < 0.001$). Intraoperative complications were rare; in the elderly robotic group, no vessel, bowel, or genitourinary injuries occurred. Elderly patients were more likely to develop wound dehiscence or infection after laparotomy compared to robotic staging (Table 2). Elderly patients undergoing laparotomy trended to have increased rates of ileus (OR, 3.1; 95% CI, 0.83–14.4) compared to robotic staging. Readmissions and reoperations in elderly cases were similar for laparotomy and robotics, with readmission rates of 15.1% and 12.4% (OR, 1.3; 95% CI, 0.53–3.01) and reoperation rates of 6.5% and 2.3% (OR, 3.0; 95% CI, 0.31–22), respectively. There were 2 postoperative deaths after laparotomy and 1 after robotic staging; all 3 patients were 75 years old. Fascial dehiscence occurred more frequently among those undergoing laparotomy (3.2% vs 0%, $P = 0.13$). Thromboembolism rates were not significantly different between robotic and laparotomy groups. There was a nonsignificant absolute increase of cardiac events in elderly after laparotomy than after robotic surgery (Fig. 2).

## DISCUSSION

As the average life expectancy continues to increase, more elderly will go on to develop cancer. Age is a known risk factor for EMCA and increasing age is also a poor prognostic factor. Laparoscopic surgery has rapidly been accepted as the preferred modality for the management of early EMCA. Overtime, this has begun to give way to robotic-assisted laparoscopy and has demonstrated even further improvement in perioperative outcomes.[6] Our study confirmed the

**TABLE 2.** Surgical and perioperative variables among elderly patients by surgical approach

| | Laparotomy >70 y, n = 93 (%) | Robotic >70 y, n = 89 (%) | OR (95% CI) |
|---|---|---|---|
| Ileus | 9 (9.7) | 3 (3.4) | 3.1 (0.83–14.4) |
| SBO | 3 (3.2) | 0 | $P = 0.13$ |
| Thromboembolic events | 3 (3.2) | 1 (1.1) | 2.9 (0.31–78.1) |
| Cardiac event | 4 (4.3) | 1 (1.1) | 3.9 (0.48–98.9) |
| Postoperative bleeding | 1 (1.1) | 1 (1.5) | 0.96 (0.02–37.7) |
| Abdominal abscess | 3 (3.2) | 3 (3.4) | 0.95 (0.16–5.7) |
| Hernia | 3 (3.2) | 0 | $P = 0.13$ |
| Wound infection | 8 (8.6) | 2 (2.3) | 4.1 (0.91–28.7) |
| Wound dehiscence | 14 (15.1) | 2 (2.3) | 7.6 (1.9–51) |
| Nerve injury | 1 (1.1) | 0 | $P = 0.51$ |
| Readmission | 14 (15.1) | 11 (12.4) | 1.3 (0.53–3.01) |
| Reoperation | 6 (6.5) | 2 (2.3) | 3.0 (0.61–22) |
| Death | 2 (2.15) | 1 (1.1) | 1.9 (0.14–57.7) |
| Fascial evisceration | 3 (3.2) | 0 | $P = 0.13$ |
| Total complication events | 94 | 24 | |

SBO, Small bowel obstruction.

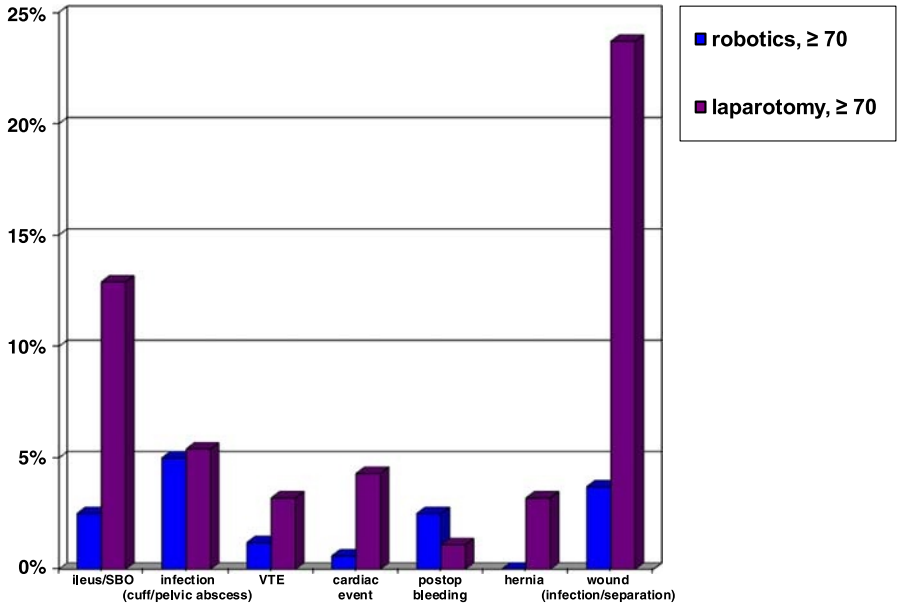


**FIGURE 2.** Complications of robotic and laparotomy groups for those 70 years or older. Values are given in percentages.

safety of robotic surgery in the elderly with similar rates of comprehensive staging, blood loss, LOS, and readmission rate as compared to the younger cohort. Furthermore, blood loss, LOS, and other complications compared favorably to the elderly undergoing laparotomy.

Although treatment principles are not different for elderly patients with EMCA, the surgical approach is important to consider in this more fragile population. Surgery may unmask or exacerbate underlying comorbidities such as renal, cardiac, memory, and functional issues. Wright et al[7] demonstrated increased perioperative and medical complications, increased need for blood transfusion, and longer hospital stays, whereas there was no increased intraoperative injury in older patients undergoing surgical treatment for EMCA. Furthermore, perioperative death increased with age, to nearly 4-fold in those older than 85 years (1.6%).[7] Elderly patients undergoing laparotomy in LAP2 were more likely to experience congestive heart failure, arrhythmia, venous thromboembolism, pneumonia, and urinary fistula. This difference was not seen in those undergoing laparoscopy.[8]

Robotic surgery provides the opportunity to limit some of the predisposing factors, such as large fluids shifts, ileus, and hypothermia, as the abdomen remains closed. Furthermore, patients often experience less discomfort and are ambulatory earlier than after laparotomy. The swifter recovery after robotic surgery results in decreased narcotic and antiemetic use, and potentially decreased risk of delirium, postoperative confusion, and disorientation in this high-risk population.[9,10] In addition, postoperative bowel dysfunction (ileus and/or small bowel obstruction) is a common reason for prolonged hospitalization and readmission and the elderly patients seem to be particularly prone to this complication.[11] This too may be decreased by limiting narcotic and antiemetic therapy. Our cohort demonstrated a greater than 3-fold risk of bowel dysfunction in the elderly after laparotomy, but had a similar incidence after robotic surgery to their younger (<70 years) counterparts undergoing robotics or laparotomy. This represents an important improvement in health risk and other complications associated with prolonged bowel rest, poor nutritional intake, and impaired mobility.

Our study demonstrated a 9% conversion rate to laparotomy and a 1-day median LOS in women older than 70 years. This compares very favorably to data from the LAP2 trial, where conversion to laparotomy for those older than 70 years was 28.6%,[8] increasing by 30% for each advancing decade of age from an overall conversion rate of 25.8%. Also, LAP2 reported a median LOS of 3 days for laparoscopy.[5] Similar low conversion rates and median LOS (3.7% and 1 day, respectively) were found in a subset analysis of very elderly patients (80–95 years) who underwent robotic surgery for EMCA.[12] In terms of adequacy of staging, elderly patients undergoing robotic surgery were more likely to undergo lymph node dissection with no difference in nodal counts (OR, 5.8; 95% CI, 1.4–39). Similarly, Frey et al[13] compared women older than or younger than 65 years who had robotic surgery and found no difference in estimated blood loss, lymph node count, surgical time, complication rate, and LOS between the 2 age groups.

Accepted aspects of robotic surgery include the steep Trendelenburg necessary for visualization and prolonged operative time compared to standard laparoscopy and laparotomy. This can increase the risk of ischemic optic neuropathy, particularly in patients with hypertension, diabetes, cardiovascular disease, and narrow-angle glaucoma; all of which have increased incidence in the elderly population.[14] Although our study was not powered to evaluate this outcome, it is important to note that no visual loss was encountered. Nor was the positioning or operative time of robotic surgery associated with any increased medical morbidity or mortality. Lavoue et al[15] found similar outcomes in their study of elderly patients.

This study is limited by its retrospective nature, which can result in the underreporting of complications. The absence of randomization and the inclusion of robotic cases during its initial implementation may also limit the interpretation. Patient selection may lead to bias in interpreting the results and patients during the initial inception of robotic surgery may be affected by the learning curves of surgeons and supportive staff. Furthermore, without a true prospective protocol in place for staging surgery, there may be variability in the extent of surgery performed among the patients due to surgeon bias or preference. We tried to limit this by using only laparotomy cases from the period before introduction of the robotic program.

The low perioperative complication rate and short hospital stay in this elderly cohort emphasizes the safety and applicability of robotic surgery for staging of EMCA in elderly patients without affecting adequacy of staging compared to traditional laparotomy. We therefore conclude that age should not determine surgical approach (minimally invasive vs laparotomy). Congruent to the younger population, performance status and other comorbidities should be considered when planning best treatment options for any patient with EMCA. Advantages of robotic surgical staging may especially manifest itself in the elderly population at increased risk of perioperative complications.

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