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Surgical outcomes of robotic-assisted surgical staging for endometrial cancer are equivalent to traditional laparoscopic staging at a minimally invasive surgical center

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Abstract

Objective—To compare peri- and post-operative complications and outcomes of robotic-assisted surgical staging with traditional laparoscopic surgical staging for women with endometrial cancer.

Methods—A retrospective chart review of cases of women undergoing minimally invasive total hysterectomy and pelvic and para-aortic lymphadenectomy by a robotic-assisted approach or traditional laparoscopic approach was conducted. Major intraoperative complications, including vascular injury, enterotomy, cystotomy, or conversion to laparotomy, were measured. Secondary outcomes including operative time, blood loss, transfusion rate, number of lymph nodes retrieved, and the length of hospitalization were also measured.

Results—275 cases were identified—102 patients with robotic-assisted staging and 173 patients with traditional laparoscopic staging. There was no significant difference in the rate of major complications between groups ($p=0.13$). The mean operative time was longer in cases of robotic-assisted staging (237 min vs. 178 min, $p<0.0001$); however, blood loss was significantly lower (109 ml vs. 187 ml, $p<0.0001$). The mean number of lymph nodes retrieved were similar between groups ($p=0.32$). There were no significant differences in the time to discharge, re-admission, or re-operation rates between the two groups.

Conclusion—Robotic-assisted surgery is an acceptable alternative to laparoscopy for minimally invasive staging of endometrial cancer. In addition to the improved ease of operation, visualization, and range of motion of the robotic instruments, robotic surgery results in a lower mean blood loss, although longer operative time. More data are needed to determine if the rates of urinary tract injuries and other surgical complications can be reduced with the use of robotic surgery.

Keywords

Robotics; Laparoscopy; Uterine cancer; Surgical staging

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Conflicts of interest statement

The authors declare that there are no conflicts of interest, except Thomas Randall, MD, speaker for Intuitive Surgical.

Introduction

Endometrial cancer is the most common gynecologic malignancy, with an incidence of 42,160 cases and 7780 deaths in 2009 [1]. Surgical staging for endometrial cancer was introduced in 1988 for both diagnosis and neoadjuvant treatment planning. Over the last decade and a half, minimally invasive approaches to cancer therapy, including laparoscopic-assisted vaginal hysterectomy and lymphadenectomy, have been increasingly adopted by gynecologic oncologists for the treatment of endometrial cancer. A large randomized trial comparing laparoscopy to laparotomy in patients with endometrial cancer (GOG LAP-2) showed no difference in oncologic outcomes with the laparoscopic approach, promoting further refinement of minimally invasive techniques for cancer surgery [2]. However uniform adoption of laparoscopy has been limited by a steep learning curve due to the non-traditional surgical skills required and high reliance on adept surgical assistants, patients who are morbidly obese, large uteri, or significant intra-abdominal adhesions.

A number of the technical challenges of traditional laparoscopy have been eliminated with the development of robotic-assisted surgery, which allows for three-dimensional imaging, wrist-like instrument rotation, tremor ablation, and motion scaling [3]. FDA approval in 2005 allowed application of robotic-assisted surgical approaches in gynecologic surgery, this technology was applied to complex gynecologic procedures, including surgical staging for endometrial cancer [3–5]. Several groups have described robotic-assisted total hysterectomy and bilateral pelvic and aortic lymphadenectomy, with small series comparing robotic surgery to traditional laparoscopy having suggested advantages to the robotic approach including reduced estimated blood loss, and shorter operative time [6–11]. These advantages may allow for a shorter recovery.

Here we report our experience with robotically assisted surgical staging for endometrial cancer over a 2-year period at an academic medical center dedicated to minimally invasive oncologic surgery. We compare the intraoperative complication rates, perioperative morbidity, staging, and pathological outcomes between two cohorts of patients, one approached with robotic-assisted surgery and one approached with traditional laparoscopy at the same institution.

Methods

A retrospective review was conducted to identify all cases of minimally invasive endometrial cancer staging procedures performed by a single board certified gynecologist oncologist at Pennsylvania Hospital between December 2007 to July 2009 using a robotic-assisted approach and between January 2003 and December 2007 using a traditional laparoscopic approach. Institutional review board approval was obtained. Age, body mass index (BMI), and co-morbid medical conditions for each patient were recorded. Intraoperative complications identified included vascular injuries, enterotomy, bladder or urologic injuries, and conversion to open laparotomy. Peri and postoperative data collected included operative time (defined as veres needle insertion/skin incision to skin closure), estimated blood loss, pre- and post-operative hemoglobin values, need for transfusion, length of hospital stay, and re-operation or re-admission. Pathologic data collected were the total number of lymph nodes retrieved, uterine weight, FIGO stage of tumor; and the histology and grade of the tumor. Incomplete charts were excluded from the study.

Data analysis was conducted using SPSS Version 13.0 (SPSS Inc., Chicago, IL). Continuous data were analyzed with two-sample *t* test, and categorical data were conservatively evaluated with Fisher's exact test. Relative risks and 95% confidence interval were constructed where appropriate, and an α was set at 0.05 for statistical significance.

Surgical procedure

The surgical techniques for both procedures included pelvic washings, hysterectomy, bilateral salpingo-oophorectomy, and bilateral pelvic and peri-aortic lymphadenectomy at least to the level of the inferior mesenteric artery, with routine post-operative cystoscopy, as previously described, although our robotic-assisted approach included slight modifications [12,13]. While we do place the robotic camera port approximately 25 cm above the pubic symphysis, with the three accessory robotic ports placed laterally at 8–10 cm intervals, we prefer to place the fifth port for the bedside assistant on the right flank, in line with the other ports rather than in the left upper quadrant. Additionally, it is our personal approach to begin the procedure with the para-aortic lymphadenectomy and to place the lymph nodes in an endoscopic bag that is then stapled and stored in the pelvic gutter until it is removed through the colpotomy incision following hysterectomy. Following the para-aortic node dissection, we isolate and transect the infundibulopelvic ligaments and then proceed with the pelvic lymphadenectomy prior to starting the hysterectomy. The pelvic lymph nodes are collected in a second endoscopic bag that is tagged and later removed through the colpotomy after the hysterectomy. The remainder of the procedure follows the previously published descriptions [12]. For the laparoscopic approach, a 5-mm trocar is placed in the umbilicus or in the left upper quadrant in some patients with previous midline incision to the umbilicus. Two 12-mm trocars are placed through the flanks and a 5-mm trocar is placed supra-umbilically in the midline or in the supra-pubic area. The patient is placed in Trendelenburg position. The ureters are identified along the bilateral pelvic side walls and, with the ureters under direct vision the ovarian vessels are isolated, ligated, and transected. The medial leaves of the posterior broad ligaments are incised sharply. The bladder is dissected free from the anterior surface of the uterine cervix and upper vagina. The cardinal ligaments are ligated and transected. A circumferential incision is made around the cervical portio. Anterior and posterior cul-de-sacs are entered sharply. The uterosacral and remainder of the cardinal ligaments are then clamped, transected, and ligated, and the cervix and uterus are delivered through the vaginal incision. The vaginal incision is then closed with a running locking absorbable suture, including the uterosacral ligaments for vaginal suspension. The bilateral perivesical and perirectal space are opened with gentle blunt dissection, and nodal dissection are performed along the external and internal iliac vessels as well as along the obturator spaces, common iliac vessels and lower 3 cm of the right and left aspects of the aorta. The lymph node are placed in a disposable bag and removed via one of the flank ports.

All patients received preoperative antibiotics to reduce the rate of wound infections, and lower extremity sequential compression devices and subcutaneous heparin for deep venous thrombosis prophylaxis. A clear diet was offered to patients on the day of surgery and advanced to regular diet on postoperative day one. Pain control was provided with both a PCA narcotic and an oral narcotic and/or non-steroidal anti-inflammatory drug. Intravenous fluids were maintained until the patient tolerated oral fluids. Hemoglobin levels and hematocrit was checked on the first postoperative day. Patients were discharged home after demonstration of their ability to ambulate independently, tolerate regular diet, and adequately control pain with oral agents.

Results

From January 2003 to July 2009 the total number of patients having surgical staging for endometrial cancer was 388 [100%] which is distributed as open 92 [23.71%], laparoscopic 186 [47.94%], and robotic approach 110 [28.35%]. In the laparoscopic cohort 13 cases were excluded for incomplete data and in the robotic group 7 cases were excluded due to did not meet our criteria [additional surgery was performed for example umbilical hernia repair, cholecystectomy, rectal/enterocele repair] and/or incomplete data.

173 cases of laparoscopic surgical staging and 102 cases of robotically assisted surgical staging for a total of 275 cases were identified for inclusion in the study. There were no statistically significant differences in age, BMI, history of abdominal surgery, or pre-existing co-morbid conditions between the two groups (Table 1).

Among patients undergoing robotic-assisted surgical staging there were significantly more cases of pathologically high-grade disease ($p=0.030$). No statistically significant difference was found across distribution of surgical stage and tumor type between the two groups ($p=0.37$ and $p=0.085$, respectively) (Table 2). Excised uterine weight was similar between the two groups in cases where the data were available (148 ± 111 g vs. 139 ± 89.8 g; $p=0.51$), and the number of collected lymph nodes was similar with both surgical approaches (22 vs. 23, $p=0.32$) (Table 2).

The mean operative time was significantly longer in robotic-assisted surgery cases (237 ± 57 vs. 178 ± 58.9 , $p<0.0001$), although variability in operative time was less. Relative risk of conversion to laparotomy between robotic-assisted cases and traditional laparoscopic cases was 5.30, but not significant at 95% confidence (1% vs. 5.2%, $p=0.096$) (Table 3). The reason for conversion in the one robotic case was poor exposure, and in the nine traditional laparoscopic cases were adhesions (three cases), bleeding, laceration of hypogastric vein and cystotomy, pulmonary insufficiency, ureteral injury, large uterine size, and poor surgical exposure. Estimated blood loss was significantly lower in cases using a robotic-assisted approach relative to the traditional laparoscopic approach (109 ± 83.3 ml vs. 187 ± 187 ml, $p<0.0001$) (Table 3). The 95% CI for EBL in the robotic group was 78.53–139, whereas the 95% CI for the laparoscopic group was 163.9–210.8. Notably, the maximum blood loss among patients undergoing robotic procedures was 400 ml, compared to a maximum of 1250 ml among the laparoscopic cases. However, the transfusion rate was low in both groups and there was no significant increased risk of transfusion between groups (2.9% vs. 1.7%, $p=0.67$).

The length of the hospital stay after operation was similar in both groups (1.88 vs. 2.31 days, $p=0.091$). In total, eight patients were readmitted, five in the robotic-assisted surgery group and three in the traditional laparoscopy group, which did not represent a significant relative risk (4.9% vs. 1.7%, $p=0.151$) (Table 4). Reasons for readmission in the robotic group were pelvic abscess (two cases), refractory nausea/vomiting, vaginal cuff dehiscence, and pulmonary embolus. Reasons for re-admission in the laparoscopic group were pneumonia, vaginal cuff cellulitis, and incisional hernia. The re-operation rate was similar for both groups (1.96% vs. 1.16%, $p=0.629$) (Table 4). In the robotic-assisted surgery group, one patient required surgical intervention on post-operative day 3 due to small bowel perforation, and another patient required repair of a vaginal cuff dehiscence. Among the traditional laparoscopic group, one patient underwent exploratory laparotomy for high-grade small bowel obstruction secondary to herniation of the ileum to one of the laparoscopic ports, and another patient underwent a laparoscopic reduction of incarcerated small bowel at the trocar site.

The overall rate of intraoperative injury was low in both cohorts (2.0% vs. 3.5%, $p=0.714$) (Table 5). Among patients undergoing robotic-assisted staging, one developed symptomatic lymphocyst, one had an incisional hernia, two were treated for urinary tract infection, one had refractory vomiting that required re-admission, one had vaginal cuff dehiscence, two developed pelvic abscess, and one presented to pulmonary embolism on post-operative day 10. Among patients undergoing traditional laparoscopic staging, three patients developed symptomatic lymphocyst, two were treated for vaginal cuff cellulitis, one developed a urinary tract infection, two developed pneumonia, two developed wound seromas, one developed a hematoma, one developed an abscess at the port site, and one was readmitted on post-operative day 3 with intestinal obstruction due to small bowel herniation at the laparoscopic trocar site (Table 6).

There were two major post-operative complications among patients who underwent robotic-assisted surgery—a woman with a history of colectomy and extensive lysis of adhesion developed small bowel perforation and required re-operation, and her hospital course was complicated by an enterocutaneous fistula, deep venous thrombosis, and acute renal failure. There was one case of thrombo-embolism on post-operative day 10. There were no major postoperative complications among patients undergoing laparoscopic staging. All complications including intra-operative, intra-hospital, and post-discharge had insignificant relative risks between the two groups.

Discussion

Minimally invasive surgery offers a means to decrease the morbidity associated with endometrial cancer therapy [2]. Our study, which consists of cases performed by a single surgeon at a single academic center dedicated to advancing minimally invasive approaches for the surgical treatment of women with gynecologic cancers, aimed to compare the outcomes of robotic-assisted surgery to move the traditional laparoscopic approach. We found that the robotic-assisted approach to surgical staging for endometrial cancer is an acceptable alternative to traditional laparoscopy, and that both approaches result in a low rate of intra-operative and early postoperative complications.

There was no significant difference in the patients selected for minimally invasive surgical staging in these two groups, as reflected in their comparable age, body mass index and medical and surgical histories, as well as the similar uterine weights in both groups. There was also no significant difference found between the stage or tumor type, further suggesting the internal validity of comparison between our cohorts.

Consistent with previous reports, we found both a lower mean blood loss and fewer cases of severe bleeding in patients staged robotically [8–11,14].

The literature has conflicting evidence for which of the two surgical approaches has a faster intra-operative time [8,9]. While in our study the operative time for robotic-assisted cases was longer than traditional laparoscopic cases, this may have been precipitated by the fact that our mean operative time for traditional laparoscopic staging was shorter than that reported elsewhere [8]. A reduction in operative times after the learning curve without compromise in comprehensive staging was reported by previous publication [15–17]. According to Lowe and Seamon the learning curve for robotic-assisted surgical staging for endometrial cancer lies between 9 and 20 cases. In our experience, no major change for robotic-assisted staging over time was recorded; consistent with other reports, the operative time of our first 51 and last 51 robotic-assisted cases was not significantly different (229 ± 53.5 min, range 130–417 min, vs. 246 ± 60.2 min, range 147–437 min, $p=0.14$), this absence of decreased in the operative time may be explained by the fact that all cases were performed by a single attending surgeon with the assistance of one fellow-in-training and one resident. As proficiency was gained the fellows started to participate as console operator, performing specific tasks on a stepwise progression. Currently, the residents spend an average of 20–30 min in the console. Individual console times were not recorded. Similar findings and reasons were reported by Veljovich, when they introduced a new attending and fellows as assistance [18].

Our conversion rate for the robotically assisted cohort (1.0%) falls well below the range of previous studies (2.9%–12.4%), whereas our 5.2% rate of conversion rate for laparoscopic cases is similar to other series (4.9% to 21.8%) [8,9,14,15]. As was done elsewhere at academic institutions, both residents and fellows participated in these cases as part of their surgical training, and the robotic-enhanced technique requires a significant shortened learning curve relative to the traditional laparoscopic approach [6,9,20].

Our number of lymph nodes retrieved is consistent with other studies and range between 17 to 32 for the robotic cohort and 16 to 23 for the laparoscopic cohort [7–9,21]. Our approach is to perform lymph node dissection regardless of the pre-operative grade as long as it is feasible. Ninety-nine percent patients in the robotic cohort and 97% in the laparoscopic cohort underwent LND. The number of lymph node retrieved was consistent over time 21.8 and 21.7 for the first and last 51 cases, respectively ($p=0.95$), for the robotic cohort and 23.1 and 23.3 for the first 50% and last 50% of cases in the laparoscopic cohort, respectively ($p=0.89$).

In our experience, robotic staging facilitates the para-aortic lymphadenectomy both because the camera placement above the umbilicus does not require rotation to visualize the aortic bifurcation and renal vessels, and because the stability and articulation of the robotic instruments allows better exposure and lessens the technical challenges of this surgical procedure [22].

The advantages inherent to minimally invasive surgery were evident in both groups, with a short hospital stay and low rates of both intra-operative injury and post-operative complications, consistent with the experience of other groups [8–10,19,20,23,24]. There was a decrease in the length of stay over the study time period for the robotic cohort, unfortunately that difference did not reach the statistic significance. It is notable that injuries among patients treated by the robotic-assisted approach occurred in the intestinal tract, while patients treated with the traditional laparoscopic approach had injuries affecting the ureters and bladder. We feel that the better visualization afforded by the three-dimensional imaging of the robotic system allows easier identification and manipulation of the ureters, resulting in a lower rate of ureteral complications. The intestinal injuries primarily occurred during extensive lysis of adhesions. Of note, dense intestinal adhesions were not seen as an indication for conversion of a robotic staging to a laparotomy.

Our study had a number of potential weaknesses. It was retrospective, lacked randomization, and susceptible to some degree of selection bias. The traditional laparoscopic and robotic-assisted cases were performed in consecutive time periods. Furthermore, while it remains one of the largest studies of its sort early in the characterization of robotic-assisted surgery in gynecologic oncology, the study size was somewhat limited in its ability to precisely capture significant relative risks. Finally, the surgical team performing all the procedures is experienced in both robot-assisted and traditional laparoscopic approaches to staging of endometrial cancer, which may represent an underestimation of complications, time, and adverse event rates relative to the general gynecologic oncology community. However, strengths of this study include the number of cases on both cohort evaluating minimally invasive surgeries, and that it has significant internal consistency with all cases representing a single surgeon's experience with both traditional laparoscopic and robotically assisted staging for endometrial cancer in a teaching hospital.

In our experience with this study, we have found robotic-assisted surgery to be a safe, feasible approach to the staging and treatment of women with endometrial cancer. This study contributes to the growing body of literature supporting the adoption of this surgical technology for the treatment of women with gynecologic cancers. Additionally, the decreased blood loss and ergonomic advantages that the design and operation of the robotic system permits may allow more women to be eligible for minimally invasive surgery. Although suggested here, further data through a well-designed, large randomized controlled trial are needed to determine more precisely whether the rate of urinary tract injury or the occurrence of other operative complications can be reduced with the use of robotic-assisted surgery. Moreover, broader scale statistical modeling or large, long-term trials incorporating costs, quality of life outcomes, and long-term clinical outcomes are needed to accurately evaluate the potential posed by robotic-assisted surgery for treatment of gynecologic cancers.

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Table 1

Patient demographics and comorbid conditions for robotic vs. laparoscopic hysterectomy and bilateral pelvic and aortic lymphadenectomy endometrial cancer.

Characteristics	Robotic staging, n=102	Laparoscopic staging, n=173	p value ^a
Age [y]			
Mean (SD)	62 (8.7)	59.6 (9.75)	0.070 ^b
Median	61	59	
Range	40 to 84	27 to 80	
BMI [kg/m ²]			
Mean (SD)	32.32 (8.13)	32.7 (9.5)	0.73 ^b
Median	31.35	30	
Range	17 to 55	17 to 58	
Prior abdominal surgery (%)	43 (42.2)	80 (40.6)	0.5323
Medical history (%)			
Hypertension	56 (54.9)	89 (51.4)	0.6180
Coronary artery disease	5 (4.9)	7 (4)	0.7659
Dyslipidemia	30 (29.4)	46 (26.6)	0.6758
Diabetes	18 (17.6)	25 (14.5)	0.4956
COPD	0 (0)	5 (2.9)	0.1612
Obstructive sleep apnea	2 (2.0)	5 (2.9)	1.0000
Asthma	5 (4.9)	18 (10.4)	0.1214

^a p value from Fischer's exact test.

^b p value from two sample *t* test.

Table 2

Staging, pathologic findings, and tumor type for robotic vs. laparoscopic hysterectomy and bilateral pelvic and aortic lymphadenectomy for endometrial cancer.

	Robotic staging, n=102	Laparoscopic staging, n=173	p value ^a
FIGO stage (%)			0.37 ^b
I A	31 (30.4)	65 (37.6)	
I B	37 (36.3)	63 (36.4)	
I C	14 (13.7)	24 (13.9)	
II A	1 (1.0)	3 (1.7)	
II B	2 (2.0)	6 (3.5)	
III A	8 (7.8)	6 (3.5)	
III C	8 (7.8)	5 (2.9)	
IV A	1 (1.0)	1 (0.6)	
Grade (%)			0.030 ^b
Grade 1	51 (50)	106 (61.3)	
Grade 2	24 (23.5)	43 (24.9)	
Grade 3	27 (26.5)	24 (13.9)	
Tumor type (%)			0.085 ^b
Endometrioid	85 (83.4)	157 (90.8)	
Papillary serous	7 (6.9)	8 (4.6)	
MMMT	4 (3.9)	7 (4)	
Clear cell	1 (1.0)	0 (0)	
Mixed	5 (5.0)	1 (0.6)	
Lymph nodes			
Total lymph nodes			0.32
Mean (SD)	22 (10.3)	23 (12.2)	
Median	20	21	
Range	0 to 53	0 to 60	
Para-aortic lymph nodes			0.068
Mean (SD)	9 (6.1)	7.18 (6.01)	
Median	9	6	
Range	0 to 27	0 to 30	
Pelvic lymph nodes			0.005
Mean (SD)	13 (6.8)	16.1 (8.88)	
Median	13	15	
Range	0–50	0–52	
Uterine weight (g)	n=82	n=148	0.51
Mean (SD)	148 (111)	139 (89.8)	
Median	112	106	
Range	35 to 550	33 to 521	

^a p value from two sample *t* test.

^b
p value from Fischer's exact test.

Table 3

Operative time, conversion to laparotomy and blood loss characteristics for robotic vs. laparoscopic hysterectomy and bilateral pelvic and aortic lymphadenectomy for endometrial cancer.

	Robotic staging, n=102	Laparoscopic staging, n=173	Relative risk (95% CI) ^a	p value ^b
Operative time [min]				
Mean (SD)	237 (57)	178 (58.9)	n/a	<0.0001 ^c
Median	222	170		
Range	130 to 437	85 to 558		
Conversion to laparotomy	1 (1.0)	9 (5.2)	5.30 (0.68 to 41.28)	0.0969
Blood transfusion (%)	3 (2.9)	3 (1.7)	0.58 (0.12 to 2.87)	0.6735
Estimated blood loss [ml]				
Mean (SD)	109 (83.3)	187 (187)	n/a	<0.0001 ^c
Median	100	100		
Range	25 to 400	20 to 1250		

^a Modified maximum likelihood estimate used where necessary.

^b p value from Fischer's exact test.

^c p value from two sample *t* test.

Table 4

Length of hospital stay, re-admission and re-operation rates for robotic vs. laparoscopic hysterectomy and bilateral pelvic and aortic lymphadenectomy for endometrial cancer.

	Robotic staging, n=102	Laparoscopic staging, n=173	Relative risk (95% CI)	p value ^a
Hospital stay [d]				0.091 ^b
Mean (SD)	1.88 (1.67)	2.31 (2.21)	n/a	
Median	1	2		
Range	1 to 14	1 to 20		
Readmission (%)	5 (4.9)	3 (1.7)	0.35 (0.086 to 1.45)	0.1516
Re-operation (%)	2 (1.96)	2 (1.16)	0.59 (0.084 to 4.12)	0.6290

^a p value from Fischer's exact test.

^b p value from two sample *t* test.

Table 5

Summary of complications for robotic vs. laparoscopic hysterectomy and bilateral pelvic and aortic lymphadenectomy for endometrial cancer.

	Robotic staging, n=102	Laparoscopic staging, n=173	Relative risk (95% CI)	p value ^a
Intra-operative (%)	2 (2.0)	6 (3.5)	1.76 (0.36 to 8.60)	0.7143
Urinary tract	0 (0)	6 (3.5)	7.70 (0.44 to 135.2)	0.0877
Intestinal tract	2 (2.0)	0 (0)	0.12 (0.006 to 2.44)	0.1367
Intra-hospital (%)	15 (14.7)	33 (19.1)	1.28 (0.74 to 2.27)	0.4128
Post-discharge (%)	9 (8.8)	13 (7.5)	0.85 (0.38 to 1.92)	0.8185
Lymphocele (%)	1 (0.98)	3 (1.7)	1.76 (0.19 to 16.78)	1.00

^a p value from Fischer's exact test.

Table 6

Comparison of late complications for robotic vs. laparoscopic approach for endometrial cancer.

Complication	Robotic staging, n=102 (%)	Laparoscopic staging, n=173 (%)	p value ^a
Major			
Pulmonary embolism	1	0	
Enterocutaneous fistula	1	0	
Total	2 (2%)	0 (0%)	0.1367
Minor			
Lymphocele	1	3	
Urinary tract infection	2	1	
Pneumonia	0	2	
Wound seroma	0	2	
Vaginal cuff cellulitis	0	2	
Vaginal cuff dehiscence	1	0	
Pelvic abscess	2	0	
Incisional hernia	1	0	
Nausea/vomiting	1	0	
Small bowel obstruction	0	1	
Hematoma	0	1	
Port site abscess	0	1	
Total	8 (7.8%)	13 (7.5%)	1.00

^a p value from Fischer's exact test.