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Trocar site hernia development in patients undergoing robotically assisted or standard laparoscopic staging surgery for endometrial cancer

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Abstract

Objectives—To compare the incidence and potential risk factors of trocar site hernia formation in women undergoing robotically assisted versus standard laparoscopic staging (RBT vs. LSC, respectively) for endometrial cancer.

Methods—We retrospectively identified all patients who underwent MIS staging for endometrial cancer at our institution from 01/09–12/12. Data collection involved the review of all operative notes, postoperative follow-up visit notes, and postoperative imaging reports. Appropriate statistical tests were used.

Results—We identified 760 eligible patients (LSC, 193; RBT, 567). The overall median age was 61 years (range, 33–90). The median BMI was 28.5 kg/m² for LSC (range, 16.6–67.6) and 29.5 kg/m² for RBT (range, 17.9–66) patients ($p=0.8$). A trocar site hernia developed in 16 patients (2.1%)—5 (2.6%) of 193 LSC and 11 (1.9%) of 567 RBT patients ($p=0.6$). Median time to hernia diagnosis was 13 (range, 5–20.5) and 18 months (range, 3–49), respectively ($p=0.5$). All hernias in the LSC cohort developed at the camera trocar site. In the RBT cohort, 10 developed at the camera trocar site and 1 at a lateral trocar site. Only BMI was associated with the development of hernias. A hernia was diagnosed in 7 (6.9%) of 101 patients with a BMI ≥ 40 kg/m² compared with 9 (1.4%) of 659 with a BMI <40 kg/m² ($p=0.001$).

Conclusion—MIS for endometrial cancer is associated with a low rate of trocar site hernia formation, with similar rates associated with RBT and standard LSC. Higher BMI is associated with the development of postoperative trocar site hernias.

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Conflict of Interest Statement

Outside the submitted work, Dr. Jewell reports speaker fees from Covidien. The other authors have no conflicts of interest to disclose.

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Keywords

trocar site; hernia; endometrial cancer; staging; robotic staging; laparoscopic staging

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Introduction

Uterine cancer is the most common malignancy of the female genital tract and the fourth most common malignancy overall in women in the United States, with an estimated 61,380 new cases annually and nearly 11,000 deaths in 2016 [1]. Worldwide, it affects approximately 320,000 women annually [2]. Surgical staging, including a hysterectomy, bilateral salpingo-oophorectomy, and lymphadenectomy (versus sentinel lymph node dissection) remains the standard of care, and is essential for both diagnosis and planning adjuvant treatment [3]. Gynecologic Oncology Group (GOG)-LAP2, a randomized trial comparing laparoscopy to laparotomy, showed no difference in oncologic outcomes among the two approaches, and as a result, minimally invasive approaches with either standard laparoscopy (LSC) or robotically assisted laparoscopy (RBT) have been increasingly adopted [4]. Minimally invasive surgery (MIS) is associated with fewer postoperative complications, decreased perioperative morbidity, and shorter length of hospital stay [5, 6]. The numerous advantages of RBT surgery include lower blood loss, shorter operative time, shorter recovery time, and decreased hospital costs [7].

Despite the numerous advantages of MIS, it is also associated with complications. For example, trocar site hernia formation has been identified as a potential postoperative complication. Early-onset hernias are commonly described as those that develop within 2–12 days of surgery. Patients with these hernias often present with symptoms of a bowel obstruction and often require emergent reoperation. Late-onset hernias are commonly described as those that develop after 2 weeks following surgery; these hernias are often managed conservatively [8]. Several studies have explored trocar site hernia rates in either RBT surgery or LSC surgery, but none have compared the two approaches. We sought to compare the incidence of trocar site hernia formation in women undergoing RBT versus LSC for endometrial cancer. We also sought to identify possible risk factors for trocar site hernia formation in women undergoing MIS for endometrial cancer.

Methods

After Institutional Review Board approval, we retrospectively identified all patients who underwent surgical staging for endometrial cancer at Memorial Sloan Kettering Cancer Center from January 2009 through December 2012, allowing for at least 2 full years of potential follow-up to capture any cases of trocar site herniation that may have occurred during that time. Surgical staging included total hysterectomy, removal of adnexa, and lymph node evaluation via standard lymphadenectomy or sentinel lymph node mapping and biopsy. The surgical approach was categorized as LSC or RBT, depending on the type of surgical approach by which the case was completed. Data collection involved the review of all operative notes, inpatient progress notes, and postoperative follow-up visit notes. All

patients were followed for at least 2 years after surgery. An abdominal examination is part of routine follow-up examinations, but there are no criteria to specifically assess for hernia.

The demographic data collected included patient age, body mass index (BMI), and documented past medical history of hypertension, diabetes mellitus, and history of smoking within the 30 days prior to surgery. The confirmation of trocar site hernias was obtained through documentation of observed herniation on physical exam and/or radiographic evidence of bowel herniation on imaging with computed tomography scans or magnetic resonance imaging. The location of trocar site hernias were noted and classified as either midline or lateral defects. The trocar type and performance of fascial closure also were noted. The surgical repairs of hernias were documented and classified as emergent or non-emergent.

Perioperative details, including time spent operating on the robot console (between docking and undocking) and estimated blood loss (EBL), were noted for each patient. Routine setup for RBT required the use of 5 ports: a 12-mm Hasson camera trocar placed either in the umbilical or supraumbilical region, two 8-mm RBT trocars to the right of the camera trocar, an 8-mm RBT trocar to the left of the camera, and a 10/12-mm assistant trocar in the left upper quadrant. Routine setup for LSC required the use of 3 ports: a 10-mm Hasson camera trocar placed either in the umbilical or supra-umbilical region and two 5-mm trocars in the bilateral lower quadrants. Occasionally, a 10/12-mm assistant trocar was placed suprapubically. General institutional practice includes the primary fascial closure of all 12-mm midline camera ports with absorbable suture directly. An open Hasson technique to enter the abdomen was used in both LSC and RBT cases. Other trocar sites are not routinely closed unless they are extended for specimen extraction.

Association statistical tests between the two groups and other demographic and clinical factors were performed using the chi-square test or Fisher exact test for categorical variables and the Mann–Whitney-U or Kruskal-Wallis test for continuous variables, as appropriate. All statistical analyses were performed on IBM SPSS Statistics version 24.0 (IBM SPSS Statistics for Windows 2013, Armonk, NY).

Results

We identified 760 eligible patients, of whom 567 (75%) underwent RBT and 193 (25%) underwent LSC. Demographic details of each cohort are listed in Table 1. The overall median age was 61 years (range, 33–90 years), with no significant difference between the two cohorts ($p=0.4$). There was no significant difference in median BMI between patients in the RBT and LSC groups (28.5 kg/m^2 and 29.5 kg/m^2 , respectively; $p=0.8$), nor was there a significant difference in the number of smokers ($p=0.2$). There was also no significant difference with regard to pre-existing medical comorbidities, including hypertension ($p=0.5$) and diabetes ($p=0.4$), among the groups.

A trocar site hernia developed in 16 patients (2.1%), none of which developed immediately after surgery (Table 3). A trocar site hernia was diagnosed in 11 (1.9%) of 567 RBT cases and in 5 (2.6%) of 193 LSC cases ($p=0.6$) (Figure 1). Median time to hernia diagnosis was

13 months in the LSC (range, 5–20.5 months) and 18 months in the RBT (range, 3–49 months) groups ($p=0.5$). All hernias in the LSC cohort developed at the camera trocar site. In the RBT group, 10 developed at the camera trocar site and 1 at a lateral trocar site. Surgical hernia repair was performed in 1 (0.5%) LSC case and 4 (0.7%) RBT cases ($p=0.8$). None of the hernias in either group required urgent intervention. Only elevated BMI was associated with the development of a hernia (Table 2; Figure 2). The median BMI for patients who developed a hernia was 36.9 kg/m^2 (range, $23.3\text{--}55.2 \text{ kg/m}^2$), compared with 30.8 kg/m^2 (range, $16.6\text{--}67.6 \text{ kg/m}^2$) for those who did not ($p=0.004$). A hernia was diagnosed in 7 (6.9%) of 101 patients with a BMI $\geq 40 \text{ kg/m}^2$, compared with 9 (1.4%) of 659 patients with a BMI $<40 \text{ kg/m}^2$ ($p=0.001$).

Discussion

Our results show that the overall incidence of trocar site herniation following RBT or LSC for the primary surgical management of endometrial cancer is $<3\%$. Outside of the gynecologic oncology literature, studies have reported trocar site herniation rates of $\sim 0.5\text{--}5\%$ [9, 10]. Furthermore, MIS confers a lower risk for hernia development compared to conventional staging laparotomy, for which the rate has been estimated at $>6\%$ [6].

Several risk factors for the development of trocar site hernia have been described. Our study identified BMI $\geq 40 \text{ kg/m}^2$ as one of those risk factors. Patients with a BMI $\geq 40 \text{ kg/m}^2$ were five times more likely to develop a trocar site hernia, compared with those with a BMI $<40 \text{ kg/m}^2$. The risk of trocar site hernia development may be greater in obese patients due to larger preperitoneal spaces and elevated intra-abdominal pressures [11]. Despite this, we are not aware of methodology that would affect hernia formation based on BMI. Therefore, we close fascia similarly in all cases, with the goal of appropriate fascial approximation.

Another identified risk factor is trocar diameter. In a previous study, 96% of port site hernias developed with the use of trocars 10 mm in diameter or larger [12]. The authors concluded that port sites $>10 \text{ mm}$ should be closed. The use of 5-mm trocars rarely results in hernia formation. Similarly, in our study, all but one hernia (94%) developed at port sites $\geq 10 \text{ mm}$ in diameter or at sites entered via an open Hasson technique. The use of 5-mm trocars for the umbilical trocar site can be used to possibly reduce the rate of hernia formation. We have attempted this at our institution and feel the 5-mm cameras are of lower video resolution quality. We, therefore, typically do not use them.

In the gynecologic literature, two studies have evaluated the incidence of trocar site herniation in women who have undergone robotically assisted surgery. Clark *et al.* described 3 cases of trocar site herniation among 500 patients (0.6%), with a median time to hernia formation of 21 days [8]. An analysis by Boone and colleagues showed no evidence of hernia formation in 842 study patients; however the follow-up time in their analysis was unclear [13].

Some major limitations of our study are inherent to its retrospective study design, which include documentation error and bias in data review. It is possible that the rate of herniae is underestimated in our series due to a lack of documentation and non-standard assessment for

herniae. However, this limitation would affect both surgical approaches, as both groups are assessed similarly in our practice. Although our patients were not randomized between RBT and LSC, this study is homogenous in its patient population (limited to endometrial cancer patients) and does present the largest sample size concerning port site hernia formation.

In our experience, both RBT and LSC have a low incidence of trocar site herniation. The previously described additional benefits and advantages of the MIS approach, combined with the low trocar site herniation rate described in this study, should support the adoption of these technologies for the treatment of women with uterine cancers.

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Research Highlights

- Fascial herniation in women undergoing MIS for endometrial cancer is rare
- Most hernias develop months after surgery and typically at the camera trocar site
- BMI $\geq 40 \text{ kg/m}^2$ is associated with the development of fascial hernia formation

Figure 1.

Summary of trocar site herniation and time to diagnosis

RBT, robotically assisted laparoscopy; LSC, standard laparoscopy; TTD, time to diagnosis

Figure 2.
Summary of trocar site herniation based on body mass index (BMI)

Table 1

Patient demographics

Patient characteristic	RBT (n = 567)	LSC (n = 193)	p
Age, years			
Median	61.0	60.0	0.4
Range	(33–90)	(34–84)	
BMI, kg/m ²			
Median	29.5	28.5	0.8
Range	(17.9–66.0)	(16.6–67.6)	
Comorbidity			
Hypertension	253 (44.6%)	81 (42.0%)	0.5
Diabetes Mellitus	70 (12.3%)	28 (14.5%)	0.4
Smoker within 30 days	30 (5.3%)	15 (7.8%)	0.2

RBT, robotically assisted laparoscopy; LSC, standard laparoscopy; BMI, body mass index

Table 2

Demographics of patients who did and did not develop a hernia

Patient characteristic	Hernia (n = 16)	No hernia (n = 744)	p
Age, years			
Median	63.5	61.2	0.2
Range	(51–80)	(33–90)	
BMI, kg/m ²			
Median	36.9	30.8	0.004
Range	(23.3–55.2)	(16.6–67.6)	
Comorbidity			
Hypertension	10 (62.5%)	324 (43.5%)	0.1
Diabetes Mellitus	3 (18.8%)	95 (12.7%)	0.5
Smoker within 30 days	0 (0.0%)	45 (6.0%)	0.3

Table 3

Rate of hernia formation among patients who underwent robotically assisted versus standard laparoscopy

	RBT (n = 567)	LSC (n = 193)	p
Herniation	11 (1.9%)	5 (2.6%)	0.6
Time to diagnosis, months			
Median	18	13	0.5
Range	3–49	5–20.5	
Surgical Repair	4 (0.7%)	1 (0.5%)	0.8

RBT, robotically assisted laparoscopy; LSC, standard laparoscopy