SCIENTIFIC PAPER

Port-Site Metastases After Robotic Surgery for Gynecologic Malignancy

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ABSTRACT

Background and Objectives: Robotic-assisted laparoscopic surgery is increasingly used for the management of patients with gynecologic malignancies. The rate of port-site metastases in patients undergoing these procedures is unknown.

Methods: We conducted a retrospective cohort analysis of a prospective database. A total of 220 women underwent robotic-assisted surgery from 2007 through 2011. Malignancy was detected in 145 cases, and 142 met the inclusion criteria with histologically proven cancer and robotically completed surgery. All women who underwent surgical treatment for their malignancies were followed up at the study site for oncology treatments.

Results: There were 710 potential port sites for metastasis. We found that 2 of 142 patients each had a single port-site metastasis, for an overall rate of 1.41%, or 0.28% per trocar site. Recurrent disease was not isolated in the two patients found to have port-site metastases because both had concurrent sites of pelvic recurrence.

Conclusion: The rate of port-site metastases in patients undergoing robotic-assisted laparoscopic surgery for gynecologic malignancies is similar to the published rate in the literature for traditional laparoscopic oncology.

Key Words: Port-site metastases, Robotics, Gynecologic oncology.

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INTRODUCTION

Minimally invasive surgery, whether laparoscopic or robotic, has clearly shown patient benefits. These include faster recovery time, shorter hospitalization, and less blood loss.[1] Robotic surgery offers certain advantages to gynecologic oncologists such as binocular vision, tremor reduction, and wristed instrumentation.[1] Robotic surgery is playing an increasing role in gynecologic oncology, but only one study has evaluated the rate of port-site metastases in robotic cases.[2]

Laparoscopic port-site metastasis was first described by Döbrönte et al[3] in a case report in 1978. Since that time, there have been multiple reports on the rate of port-site metastases in cervical, ovarian, and endometrial cancers in patients undergoing laparoscopic surgery.[4,5] The published rate varies but generally ranges between 1% and 2%.[5,6] Ndofor et al[2] published the first study of the rate of port-site metastases in patients undergoing robotic surgery for gynecologic malignancy, reporting a rate of 1.1% in their sample. The aim of this study is to investigate the rate of port-site metastases during robotic-assisted laparoscopic surgery for gynecologic malignancies.

METHODS

Institutional review board approval was obtained. A prospective robotic gynecologic surgery database and patient medical records were reviewed. During the study period from January 2007 through December 2011, a total of 220 robotic-assisted surgeries were performed. The inclusion criteria for this study were the presence of a histologically confirmed gynecologic malignancy, follow-up at the study site, and the completion of the case robotically. The exclusion criteria were benign disease, conversion to an open procedure, or incomplete medical records. A total of 142 patients who met the inclusion criteria were included in the analysis. The follow-up duration was from the time of their initial surgery through April 2012.

All surgery was performed with the da Vinci Surgical System (Intuitive Surgical, Sunnyvale, California, USA). These surgeries were performed with the use of 3 robotic 8-mm trocars, one robotic 12-mm trocar for the camera port, and one 12-millimeter assist port. The camera port

was located above the umbilicus. There were 3 robotic ports with 2 on the patient's right and 1 on the patient's left. One additional assistant port was placed in the patient's left upper quadrant. The fascial layer of the camera port and assistant port were closed with No. 0 Vicryl suture (Ethicon, Somerville, New Jersey, USA). Insufflation of the peritoneum was performed with carbon dioxide with a maximum intra-abdominal pressure of 15 mm Hg. The skin was closed with Monocryl suture (Ethicon). Port-site metastasis was defined as recurrence of tumor within or near the trocar site. None of the published techniques to attempt to reduce the rate of port-site metastases were used in this study. Staging was assigned with the revised International Federation of Gynecology and Obstetrics (FIGO) staging system.

A literature review was performed by conducting a PubMed search of the English-language literature using several search terms—"robotic gynecology port-site metastases," "robotic port-site metastases," and "port-site metastases"—and by reviewing the citations of articles for any further likely sources of information. References from the initial literature search were evaluated for additional case reports.[7–10]

RESULTS

Gynecologic cases were performed on 220 patients with robotic assistance from 2007 through 2011. The inclusion criteria were met for 142 cases. The mean age was 58.8 years, with a range from 26 to 82 years. The mean body mass index was 32.2 kg/m^2 (range, 20–59.4 kg/m^2), with a median of 31 kg/m^2 (**Table 1**). The mean follow-up period was 25.9 months (range, 1–60 months; median, 24 months). Most of the patients underwent a hysterectomy and bilateral salpingo-oophorectomy (n = 67, 47%) or a hysterectomy, bilateral salpingo-oophorectomy, and pelvic lymph node sampling (n = 62, 44%). Intraoperative frozen sections were obtained, and when the patient had grade 1 or 2 endometrioid uterine cancer with a tumor size <2 cm with <49% endometrial invasion, we did not proceed with lymph node sampling.[11] The remaining patients had radical hysterectomies (n = 6, 4%); hysterectomy with unilateral salpingo-oophorectomy (n = 1, 0.7%); hysterectomy, unilateral salpingo-oophorectomy, and pelvic lymph node sampling (n = 2, 1.4%); bilateral salpingo-oophorectomy and lymph node sampling (n = 1, 0.7%); lymph node sampling only (n = 2, 1.4%); or unilateral salpingo-oophorectomy (fertility sparing) (n = 1, 0.7%) (**Table 2**).

Most malignancies were uterine in origin (n = 128, 90%), with a predominance of endometrioid type (n = 114, 89%). Excluding the records of 4 patients who had no pelvic washings collected, we have a rate of positive washings of 7 of 124, or 5.6%, in endometrial cancer cases. Patients with positive washings had the following stages: 2 had stage IA disease, 4 had stage IIIA, and 1 had stage IIIC. Six individuals had evidence of premalignancy on endometrial sampling preoperatively but had no residual malignancy on the final uterine histologic analysis, with complex atypical hyperplasia noted (n = 6, 4.8%). There were 9 patients with cervical cancer (6.3%), and the remaining 5 patients had ovarian malignancies. **Table 1** outlines the primary tumor site and the final histologic diagnosis. Staging was performed with the FIGO staging system, and staging based on primary tumor site is listed in **Table 3**.

Port-site metastases were detected in 2 (1.41%) of the 142 patients, with a per port rate of metastasis of 0.28%.

Table 1.
Demographic Characteristics (N = 142) and Primary Tumor Site

Characteristic	Data
Age (y)	
Mean	58.8
Range	26–82
Body mass index (kg/m^2)	
Mean	32.3
Range	20–59.4
Primary tumor site	N=142
Uterine	128 (90%)
Endometrioid	114 (89%)
Mixed endometrioid and sarcoma	1 (0.7%)
Serous	5 (3.9%)
Embryonal rhabdomyosarcoma	1 (0.7%)
Carcinosarcoma	2 (1.6%)
Complex atypical hyperplasia	6 (4.8%)
Cervical	9 (6.3%)
Squamous	5 (56%)
Adenocarcinoma	4 (44%)
Ovarian	5 (3.9%)
Endometrioid	1 (20%)
Clear cell	1 (20%)
Borderline	1 (20%)
Papillary serous	1 (20%)
Mucinous	1 (20%)

Table 2.
Robotic-Assisted Procedures Performed

Procedure	No. of Patients
Hysterectomy, BSO[a]	67
Hysterectomy, BSO, staging	62
Radical hysterectomy	6
Hysterectomy, USO[a], staging	2
Hysterectomy, USO	1
BSO, staging	1
Staging	2
USO	1

[a]BSO = bilateral salpingo-oophorectomy; USO = unilateral salpingo-oophorectomy.

Table 3.
FIGO Staging of Patients Who Underwent Robotic-Assisted Laparoscopic Surgery

FIGO Stage	No. of Patients
Uterine	
IA	75
IB	35
IIA	3
IIB	2
IIIA	6
IIIC1	1
Cervical	
IA1	3
IB1	6
Ovarian	
IA	2
IB	2
IC	1

Surgeon protocol did not include irrigation with povidone-iodine solution. None of the patients undergoing robotic-assisted surgery for ovarian or cervical malignancy had port-site metastases.

Patient 1 was a 49-year-old gravida 0 woman who presented with menometrorrhagia. An endometrial biopsy showed grade 2 endometrial carcinoma with atypical hyperplasia. She underwent a robotic-assisted total laparoscopic hysterectomy and bilateral salpingo-oophorectomy. Surgical pathology showed endometrioid adenocarcinoma, stage 1A, grade 2 with 10% myometrial invasion; no lymph node dissection was performed. Her peritoneal washings were negative. The patient self identified a new mass at the left lower port site 25 months after her original surgery. She underwent a second surgery with removal of a 3.5 × 2.5 × 2.5—cm suprafascial mass involving the subcutaneous tissues. The mass was clinically palpable above the level of the fascia. One-centimeter margins were dissected on all sides of the mass. The remaining port sites were palpated intraoperatively, and no masses were identified. Despite a normal pap test, examination under anesthesia showed a vaginal apex nodule that, on biopsy, documented pelvic recurrence. She received further treatment with carboplatin and paclitaxel as well as radiation therapy. The patient was alive and well with a repeat positron emission tomography scan showing resolution of all metastases 31 months after her original surgery.

Patient 2 was an 82-year-old woman with postmenopausal vaginal bleeding who was found to have atypical papillary endometrium suspicious for endometrioid carcinoma on endometrial biopsy. She underwent a robotic-assisted total laparoscopic hysterectomy and bilateral salpingo-oophorectomy. The pathology from her surgery showed endometrioid adenocarcinoma with sarcomatous components, stage IIA, grade 3. The tumor size was 3.5 cm in its greatest dimension; no pelvic lymph node dissection was performed. Peritoneal washings were negative. The patient self identified an abdominal mass in her right lower quadrant 14 months after surgery. Excision of a 4.5 × 3 × 1—cm suprafascial mass was performed that showed adenocarcinoma. This mass did not extend to the level of the fascia. It was dissected with 1-cm margins around all aspects of the mass. The other port sites were palpated intraoperatively, and no masses were identified. A positron emission tomography scan after excision showed further sites of metastatic disease in the pelvis that were treated with radiation. Neither of these cases had an isolated recurrence of metastatic disease.

Our literature review showed 5 published cases of port-site metastases that occurred in the setting of robotic gynecologic cancer surgery (**Table 4**). Two cases were found at routine visits and 3 during evaluation of pain or urinary symptoms. The port-site metastases ranged from 1.7 to 10 cm (mean, 5 cm) and involved operative as well as camera port sites. The assistant port was not a documented site of port-site metastasis. Only one case was an isolated site of recurrent cancer.[7–10]

Table 4.
Published Cases of Port-Site Metastases Related to Robotic-Assisted Surgery for Gynecologic Malignancies

Year, Author	No. of Cases	Primary Cancer	Stage	Surgery	Symptoms	Time to Metastasis Identification	Use of Iodine Lavage	Involved Port	Port-Site Metastasis in Largest Dimension	Concurrent Disease
2010, Sert[9]	1	Cervical adenocarcinoma	IB1	RA[a] radical hysterectomy/BSO[a] PLND[a]	Urinary symptoms	18 mo	Not reported	Left robotic	Not reported	Bowel and bladder
2011, Ndofor et al.[2]	2	(1) Gallbladder	(1) IVB	(1) RA TLH[a]/BSO	(1) Discovered at postoperative visit	(1) 3 wk	(1) Yes	(1) Right robotic	(1) 1.7 cm	(1) Liver
		(2) Endometrial	(2) IIIC	(2) RA TLH/LSO	(2) Pain	(2) 11 mo	(2) Yes	(2) Umbilical	(2) 4 cm	(2) Carcinomatosis
2012, Bolles and Borowsky[8]	1	Cervical squamous cell	IB2	RA radical hysterectomy/bilateral salpingectomy PLND	Pain	5 mo	Not reported	Umbilical	10.5 cm	Lymph nodes
2012, Rauff and Ng[10]	1	Cervical adenocarcinoma	IIIB	RA radical hysterectomy/BSO PLND/omentectomy	Discovered at routine visit	5 mo	Not reported	Right and left robotic	6 cm	None
2013, current study	2	(1) Endometrial	(1) IA	(1) RA TLH/BSO	(1) Discovered by patient	(1) 25 mo	(1) No	(1) Left robotic	(1) 3.5 cm	(1) Vaginal and pelvic
		(2) Endometrial, sarcomatous components	(2) IIA	(2) RA TLH/BSO	(2) Discovered by patient	(2) 14 mo	(2) No	(2) Right robotic	(2) 4.5 cm	(2) Diffuse pelvic

[a]BSO = bilateral salpingo-oophorectomy; PLND = pelvic lymph node dissection; RA = robotic assisted; TLH = total laparoscopic hysterectomy.

DISCUSSION

Port-site metastasis, described as the presence of tumor in the subcutaneous tissue at or near the insertion site of a laparoscopic trocar, has been a concern for oncologists performing laparoscopic surgery for cancer since Döbrönte et al[3] first described it in a case report in 1978. The rate in the early gynecologic literature was very high, leading some surgeons to question the utility of laparoscopic surgery given the potential risks. In 1996, Kruitwagen et al[12] compared the rate of port-site metastases and overall survival in 43 patients who underwent diagnostic laparoscopy followed by a primary debulking. They showed port-site metastases in 7 patients (16%) and a non-statistically significant trend toward an increased mortality rate in patients with port-site metastases.

The patients in early studies shared a number of characteristics. They generally had advanced disease (FIGO stage IIIC or IV), high grade (II or III), and the presence of ascites.[12,13] The high rate of port-site metastases in these studies occurred principally because surgeons were using laparoscopy for diagnostic purposes in patients already suspected to have advanced-stage disease. As surgical trends changed and the field of laparoscopy expanded, more surgery for lower-stage disease was performed. The LAP2 study, published in 2009, compared laparoscopy with open surgery for treatment of endometrial cancer. In their article Walker et al[7] found only 4 cases of port-site metastasis in 1696 patients, for an overall rate of 0.24%. Zivanovic et al[5] reported on 20 cases (1.8%) of port-site metastases in 1694 laparoscopic procedures performed for malignancy. They found a median survival of 12 months in patients with port-site metastases diagnosed within 7 months of laparoscopic procedures but survival of 37 months if diagnosed >7 months after these procedures. They argued, "The presence of port-site implantation is a surrogate for advanced disease and should not be used as an argument against laparoscopic surgery in gynecologic malignancies."

A single cohort study evaluating the rate of port-site metastases in robotic-assisted gynecologic laparoscopic surgery has been published; the authors showed an overall rate in their series of 1.1%, with one case being related to a gynecologic malignancy and the other to metastatic ovarian adenocarcinoma from primary malignancy of the gallbladder.[2]

The rate of port-site metastasis in this study was 1.41%, which is comparable with the published rate for both laparoscopic and robotic surgery. It should be noted that

the operative protocol at our institution does not include application of iodine to the port sites or excision of the port-site tissue at the end of the case. Despite the rare occurrence of port-site metastases, routine examination of the laparoscopic sites should be performed in the postoperative care of cancer patients. If port-site metastases are found, a metastatic workup should be completed.

The strengths of this study include a prospective database, mean follow-up period of 24 months, and a single surgeon responsible for all cases. The study is hindered by the retrospective nature of the chart review, small sample size, heterogeneous primary cancer sites, and early stage of disease in most patients.

This study shows an overall low rate of port-site metastases in patients who undergo robotic-assisted laparoscopic surgery for gynecologic malignancy, consistent with previously published reports from traditional laparoscopy. Unfortunately, the data from case reports and case series make it difficult to assess possible risk factors and whether the risk factors differ by type of primary cancer, stage, or surgical procedure. Whether robotic instrumentation modifies the risk of port-site metastasis cannot be assessed without a randomized prospective clinical trial with adequate sample size. More research is needed to identify modifiable risk factors and methods for prevention and optimal management of port-site metastases.

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