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Rate of port-site metastasis is uncommon in patients undergoing robotic surgery for gynecologic malignancies

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Abstract

Objective—To describe the rate of port-site metastasis in patients who underwent robotic surgery for suspected gynecologic malignancy.

Methods—Using a prospective database, we identified all patients who underwent robotic surgery performed by the Gynecologic Oncology service at 1 institution between December 2006 and March 2010. Records of patients with confirmed malignancy were reviewed for clinicopathologic data and information about port-site metastasis.

Results—One hundred eighty-one patients met the inclusion criteria. The median age was 55.4 years (range, 19–82), and the median body mass index was 29.6 kg/m^2 (range, 17.9–70.7). Port-site metastases were detected in two patients (1.1%) at 3 weeks (patient 1) and 11 months (patient 2) after surgery. Patient 1 underwent surgery for an adnexal mass and pathologic examination revealed gallbladder adenocarcinoma metastatic to the ovary. She had a recurrence in the right lateral-abdominal-wall robotic-trocar site with concurrent metastases in the gallbladder fossa and liver. Patient 2 was diagnosed with adenocarcinoma of unclear (cervical vs. endometrial) origin. Imaging showed metastases in pelvic and paraaortic lymph nodes. She underwent laparoscopy and was found intraoperatively to have gross disease on the right ovary. The patient underwent right salpingo-oophorectomy and chemoradiation. She had residual disease in the cervix and subsequently underwent robotic hysterectomy and left salpingo-oophorectomy. Pathologic examination revealed endometrial cancer. She had a recurrence at the transumbilical trocar site concurrent with retroperitoneal lymphadenopathy and carcinomatosis. There were no cases of isolated port-site metastasis.

Conclusions—The rate of port-site metastasis after robotic surgery in women with gynecologic cancer is low and similar to the rate for laparoscopic procedures.

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Conflict of Interest Statement

Pamela T. Soliman serves as speaker and proctor for Intuitive Surgery.

Pedro T. Ramirez serves as speaker for Intuitive Surgery.

All other authors have no conflict of interest

Keywords

Robotic; laparoscopy; port-site metastasis/recurrence; ovarian cancer; cervical cancer; uterine cancer

Introduction

Robotic surgery is becoming increasingly popular in gynecologic oncology as evidenced by a growing number of publications supporting the safety and feasibility of this approach in the management of gynecologic malignancies [1–5]. The advantages of the robotic system over standard laparoscopy include high-definition three-dimensional vision, wristed instrumentation that allows more surgical precision and dexterity, improved ergonomics for the surgeon, and improved teaching capabilities for trainees. A review of the literature shows similar results between robotic and laparoscopic surgery for estimated blood loss, operative time, length of hospital stay, and surgical outcomes [1–5].

Port-site metastasis is an uncommon complication, occurring in 1–2% of all oncology-related laparoscopic surgeries [6–11]. The first report of a port-site metastasis was published in 1978 and described a port-site metastasis in a patient who underwent diagnostic laparoscopy for ovarian cancer [7]. The exact incidence of port-site metastasis is not known. There are very limited data in the literature on the risk of port-site metastasis in patients undergoing robotic surgery for gynecologic malignancies. The goal of our study was to determine the rate of roboticport-site metastasis in patients with gynecologic malignancies.

Methods

This study was conducted with approval from the Institutional Review Board of The University of Texas MD Anderson Cancer Center. We maintain a prospective database of all patients undergoing robotic procedures performed by the Gynecologic Oncology service, and we reviewed all cases performed between December 2006 and March 2010. All patients with a gynecologic malignancy who underwent robotic surgery were included. Patients with benign disease, those who had less than 1 month of follow-up, and those whose procedure was converted to laparotomy were excluded. Data abstracted included patient age at diagnosis, race, body mass index, primary tumor type, histologic subtype, stage, type of procedure performed, intraoperative findings, presence of ascites, information regarding lavage of trocar sites, adjuvant treatment after initial surgery, detection of port-site metastasis, time to development of port-site metastasis, findings at the time of diagnosis of port-site metastasis, and overall survival for patients who developed port-site metastasis. Stage was assigned as delineated in the revised International Federation of Gynecology and Obstetrics (FIGO) staging system [12]. The medical records reviewed included operative reports, diagnostic imaging reports, and pathology reports, as well as progress notes from services involved in patient care, including gynecologic oncology, radiation oncology, and medical oncology.

In all cases, the da Vinci Surgical System (Intuitive Surgical, Inc., Sunnyvale, CA) was used. On average, five trocars were placed during the procedure, and incision size ranged

from 8 to 12 mm. One trocar, usually supraumbilical, served as the camera port, and the three robotic trocars were placed 8 cm relative to each other. An additional assistant port was also used. Placement of these trocars was procedure and surgeon dependent. Entry into the abdominopelvic cavity was achieved under direct visualization. The nonrobotic trocar used in all cases was the Xcel trocar system (Ethicon Endosurgery, Cincinnati, OH). The 10- to 12-mm trocar sites were closed in two layers at the fascia and the skin. Routinely, the abdomen was deflated with the trocars in place; then the trocars were removed. A lavage of the port sites with povidone-iodine solution was performed at the discretion of the surgeon. Port-site metastasis was defined as tumor recurrence in the abdominal wall, near or within the scar tissue of the previous robotic-trocar site.

Standard statistical analyses were utilized and performed using SPSS software, version 17.0. Descriptive statistics and proportions were used to report relevant demographic characteristics.

Results

Two hundred forty-eight robotic surgery procedures were performed during the study period. We identified 181 patients who met the inclusion criteria. The characteristics of the patients in the study are outlined in Table 1. The median age of the patients in the study was 55.4 years (range, 19–82). The median body mass index was 29.6 kg/m^2 (range, 17.9–70.7). Eighty-three percent of the patients were white. Ninety percent of the patients had no intraoperative evidence of disease outside of the target diseased organ. No patient had an intraoperative finding of ascites, and pelvic washings were obtained in 113 patients. Of these, 105 (93%) patients had negative pelvic washings. The primary tumor types and histologic subtypes for all of the patients in the study are summarized in Table 2. The most common tumor type was uterine cancer. The FIGO stages by primary tumor type are listed in Table 3. The robotic procedures performed are listed in Table 4.

The median follow-up time for all of the patients was 8 months (range, 1–33). Port-site metastases were detected in 2 of the 181 patients (1.1%). The interval between robotic surgery and detection of port-site metastasis was 3 weeks in patient 1 and 11 months in patient 2.

Patient 1 was a 47-year-old woman with a history of gallbladder carcinoma treated with cholecystectomy and partial right hepatic lobectomy and subsequently trastuzumab. She underwent a computed tomography scan of the abdomen and pelvis 1 year after her diagnosis, which showed an ill-defined soft tissue density in the liver and a solid left adnexal mass. She underwent a robotic-assisted hysterectomy and bilateral salpingo-oophorectomy; the final pathology examination revealed gallbladder adenocarcinoma metastatic to the ovary. Intraoperatively, a 10- to 12-cm mass was detected in the left ovary; there was no evidence of disease in the pelvis or upper abdomen or ascites. The mass was placed in a large ENDO CATCH bag (Covidien, Mansfield, MA). A large-bore needle was placed inside the bag as the bag was extruded through the vaginal canal, and the needle was used to aspirate fluid from the mass. The mass was then removed through the vagina using the ENDO CATCH bag. All trocar sites were irrigated with 5% povidone-iodine solution. The

12-mm trocar sites were closed in two layers. When the patient presented for her postoperative visit 3 weeks later, she was noted to have a port-site metastasis measuring 1.7×1.1 cm in the right lateral abdominal wall robotic port site. She was also noted to have metastases in the gallbladder fossa and liver. She was treated with eight cycles of gemcitabine and cisplatin and then FOLFIRI (leucovorin calcium, fluorouracil, and irinotecan hydrochloride) plus bevacizumab. At this writing, the patient is alive 17 months after recurrence and is receiving palliative radiation therapy because of progression of her disease.

Patient 2 was a 50-year-old woman who presented with a 5-cm cervical mass. A biopsy revealed adenocarcinoma, but it was unclear whether the tumor was an endocervical or endometrial primary tumor. Imaging studies showed metastases in the pelvic and paraaortic lymph nodes. The patient underwent laparoscopy and was found intraoperatively to have gross disease on the right ovary; she underwent right salpingo-oophorectomy. Postoperatively, she received 60 Gy to the pelvis and paraaortic area with concurrent single-agent carboplatin. Then she underwent combination therapy with six cycles of paclitaxel and carboplatin. Upon completion of chemotherapy, she underwent positron emission tomography-computed tomography, which showed a small focus of fluorodeoxyglucose-avid disease in the region of the cervix. She then underwent robotic hysterectomy and left salpingo-oophorectomy. Intraoperatively, no gross disease was detected outside the uterus and ovary. At the completion of the procedure, all trocar sites were irrigated with 5% povidone-iodine solution. Findings on the final pathology examination were consistent with endometrial endometrioid adenocarcinoma FIGO grade 1 involving the uterus, left ovary, and paratubal spaces. The patient was then treated with megestrol acetate. A recurrence was detected 11 months after robotic surgery, when a computed tomography scan of the abdomen and pelvis obtained for evaluation of abdominal pain revealed a 4-cm transumbilical implant as well as retroperitoneal lymphadenopathy and peritoneal carcinomatosis. The patient underwent fine-needle aspiration of a paraaortic lymph node, which was positive for metastatic adenocarcinoma compatible with the uterine primary tumor. She then received nine cycles of paclitaxel and carboplatin followed by eight cycles of liposomal doxorubicin. At this writing, she is alive 14 months after recurrence and is currently participating in a phase I trial of the combination of bevacizumab and temsirolimus; she has had a mixed response.

None of the patients undergoing primary surgery for cervical, ovarian, or fallopian tube cancer developed a port-site metastasis. None of the patients in our series experienced a port-site hernia.

Discussion

Our study showed that the incidence of port-site metastasis in patients undergoing robotic surgery for the management of gynecologic malignancies is 1.1%. To our knowledge, this is the first study evaluating the incidence of port-site metastasis from robotic procedures performed for suspected gynecologic malignancies. The 1.1% incidence in our study is similar to the reported incidence of port-site metastasis following laparoscopic surgery [11].

The etiology of port-site metastasis remains unclear. Proposed mechanisms for the development of port-site metastasis include hematogenous spread; direct wound implantation due to tumor contamination of instruments; aerosolization of tumor cells, also known as “the chimney effect”; and local and systemic effects of CO_2 pneumoperitoneum on immune response [13–15]. The likelihood of port-site metastasis may be minimized by avoidance of minimally invasive procedures in patients with advanced disease. A higher rate of port-site metastasis has been observed in patients with ovarian cancer who have large-volume ascites and omental cake [16, 17]. Additional techniques for preventing port-site metastasis include modifying surgical technique by trocar fixation, avoiding repeated removal and reintroduction of trocars during the procedure, preventing gas leaks, removing the intact specimen in an endoscopic bag, using layered closure of the trocar site, and performing lavage of the peritoneal cavity and trocar sites with agents such as heparin, povidine-iodine, methotrexate, and normal saline [13, 18, 19].

Review of the gynecologic oncology literature reveals one previously reported case of port-site metastasis after robotic surgery for gynecologic malignancy. Sert reported a 60-year-old woman with stage IB1 adenocarcinoma of the cervix who underwent a robotic-assisted radical hysterectomy, bilateral-salpingo-oophorectomy, and bilateral pelvic lymph node dissection. Eighteen months after her surgery, she developed an 8-mm robotic-port-site metastasis as well as recurrence in the bladder and bowel [20]. In our study, none of the patients who underwent primary surgery for cervical cancer developed a port-site metastasis.

Our study is limited by a short follow-up period as well as potential selection bias associated with a large tertiary referral center. Furthermore, the incidence of port-site metastasis was very low, precluding multivariable analyses to determine risk factors associated with increased incidence of port-site metastasis. Preventive measures to reduce the risk of port-site metastasis were not routinely documented, limiting our ability to assess the effectiveness of prevention methods. However, our study is the first study addressing robotic-port-site metastasis in a large cohort of patients to date. Additional strengths of our study include the use of a prospective database, clearly defined criteria for port-site metastasis, and consistent surgical technique among surgeons throughout the study period.

In summary, we found that the rate of port-site metastasis in patients undergoing surgery for gynecologic malignancies does not exceed the rate of port-site metastasis previously reported in the literature for laparoscopy. Port-site metastasis should not be considered a contraindication to the use of robotic surgery in management of gynecologic malignancies.

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References

1. Cho JE, Nezhat FR. Robotics and gynecologic oncology: review of the literature. J Minim Invasive Gynecol. 2009; 16:669–81. [PubMed: 19896593]
2. Magrina JF, Kho RM, Weaver AL, et al. Robotic radical hysterectomy: comparison with laparoscopy and laparotomy. Gynecol Oncol. 2008; 109:86–91. [PubMed: 18279944]

3. Nezhat FR, Datta MS, Liu C, Chuang L, Zakashansky K. Robotic radical hysterectomy versus total laparoscopic radical hysterectomy with pelvic lymphadenectomy for treatment of early cervical cancer. JSLS. 2008; 12:227–37. [PubMed: 18765043]
4. Boggess J, Gehrig P, Cantrell L, et al. A comparative study of 3 surgical methods for hysterectomy with staging for endometrial cancer: robotic assistance, laparoscopy, laparotomy. Am J Obstet Gynecol. 2008; 19:360–2. [PubMed: 18928974]
5. Diaz-Arrastia C, Jurnalov C, Gomez G, Townsend C Jr. Laparoscopic hysterectomy using a computer–enhanced surgical robot. Surg Endosc. 2002; 16:1271–3. [PubMed: 12085153]
6. Zivanovic O, Sonoda Y, Diaz JP, et al. The rate of port-site metastases after 2251 laparoscopic procedures in women with underlying malignant disease. Gynecol Oncol. 2008; 111:431–7. Epub 2008 Oct 16. [PubMed: 18929404]
7. Dobronte Z, Wittmann T, Karascony G. Rapid development of malignant metastases in the abdominal wall after laparoscopy. Endoscopy. 1978; 10:127–30. [PubMed: 149005]
8. Ramirez PT, Frumovitz M, Wolf JK, Levenback C. Laparoscopic port-site metastases in patients with gynecological malignancies. Int J Gynecol Cancer. 2004; 14:1070–7. [PubMed: 15571612]
9. Childers JM, Aqua KA, Surwit EA, Hallum AV, Hatch KD. Abdominal-wall tumor implantation after laparoscopy for malignant conditions. Obstet Gynecol. 1994; 84:765–9. [PubMed: 7936509]
10. Kruitwagen RF, Swinkels VM, Keyser KG, Doesburg WH, Schijf CP. Incidence and effect on survival of abdominal wall metastases at trocar or puncture sites following laparoscopy or paracentesis in women with ovarian cancer. Gynecol Oncol. 1996; 60:233–7. [PubMed: 8631544]
11. Abu-Rustum NR, et al. Subcutaneous tumor implantation after laparoscopic procedures in women with malignant disease. Obstet Gynecol. 2004; 103:480–7. [PubMed: 14990410]
12. Pecorelli S. Revised FIGO staging for carcinoma of the vulva, cervix and endometrium. Int J Gynaecol Obstet. 2009; 105:103–4. [PubMed: 19367689]
13. Ramirez PT, Wolf JK, Levenback C. Laparoscopic port-site metastasis: etiology and prevention. Gynecol Oncol. 2003; 91:179–89. [PubMed: 14529679]
14. Smidt VJ, Singh DM, Hurteau JA, Hurd WW. Effect of carbon dioxide on human ovarian carcinoma cell growth. Am J Obstet Gynecol. 2001; 185:1314–7. [PubMed: 11744902]
15. Targarona EM, Martinez J, Nadal A, et al. Cancer dissemination during laparoscopic surgery: tubes, gas, and cells. World J Surg. 1998; 22:55–61. [PubMed: 9465762]
16. Van Dam PA, DeCloedt J, Tjalma WA, Buytaert P, Becquart D, Vegote IB. Trocar implantation metastases after laparoscopy in patients with advanced ovarian cancer: can the risk be reduced? Am J Obstet Gynecol. 1999; 181:536–41. [PubMed: 10486460]
17. Vergote I, Marquette S, Amant F, Berteloot P, Neven P. Port-site metastases after open laparoscopy: a study in 173 patients with advanced ovarian carcinoma. Int J Gynecol Cancer. 2005; 15:776–9. [PubMed: 16174223]
18. Nehaus SJ, Watson DI, Ellis T, Rofe AM, Jamieson GG. Influence of cytotoxic agents on intraperitoneal tumor implantation after laparoscopy. Dis Colon Rectum. 1999; 42:10–5. [PubMed: 10211514]
19. Van Dam P, DeCloedt J, Tjalma W, Buytaert P, Becquart D, Vergote IB. Trocar implantation metastasis after laparoscopy in patients with advanced ovarian cancer: can the risk be reduced? Am J Obstet Gynecol. 1999; 181:536–41. [PubMed: 10486460]
20. Sert B. Robotic port-site and pelvic recurrences after robot-assisted laparoscopic radical hysterectomy for a stage IB1 adenocarcinoma of the cervix with negative lymph nodes. Int J Med Robot. 2010; 6:132–5. [PubMed: 20049750]

Research Highlights

1. The rate of port-site metastasis in patients undergoing robotic surgery was 1.1%.
2. This rate is similar to that previously reported for laparoscopic surgery.
3. There were no cases of isolated port-site metastasis after robotic surgery.

Table 1

Demographic and clinicopathologic characteristics

Characteristic	No. of patients (N=181)
Age, years	
Median	55.4
Range	19–82
Body mass index, kg/m^2	
Median	29.6
Range	17.9–70.7
Race	
White	150 (83%)
Other	17 (9%)
Asian	8 (4%)
Black	6 (3%)
Primary tumor type	
Uterine cancer	116 (64%)
Cervical cancer	50 (28%)
Ovarian cancer	11 (6%)
Unknown primary tumor	2 (1%)
Fallopian tube cancer	1 (0.5%)
Gallbladder carcinoma	1 (0.5%)
Intraoperative gross disease	
No	164 (91%)
Yes	17 (9%)
Pelvic ascites	
No	181 (100%)
Yes	0
Pelvic-washing findings	
Negative	105 (58%)
Positive	8 (4%)
Not performed or documented	68 (38%)
Lavage of port site	
Yes	107 (59%)
Not documented	74 (41%)
Adjuvant treatment	
None	111 (61%)
Chemoradiation	21 (12%)
Radiation, vaginal cuff only	18 (10%)

Characteristic	No. of patients (N=181)
Chemotherapy only	13 (7%)
Radiation, pelvic	10 (6%)
Unknown	6 (3%)
Radiation, other	1 (0.5%)
Hormonal treatment	1 (0.5%)

Table 2

Primary tumor type and histologic subtype

Tumor type and histology	No. of patients	%
Uterine cancer	116	64.1
Endometrioid	87	75.0
Mixed	8	6.9
Serous	7	6.0
Other[a]	4	3.4
Clear cell	3	2.6
ESS[b]	3	2.6
Carcinosarcoma	2	1.7
Leiomyosarcoma	2	1.7
Cervical cancer	50	27.6
Squamous	24	48.0
Adenocarcinoma	18	36.0
Clear cell	4	8.0
Adenosquamous	2	4.0
Small cell	1	2.0
Neuroendocrine	1	2.0
Ovarian cancer	11	6.1
Low malignant potential	5	45.4
Mixed	2	18.2
Sex cord stromal	2	18.2
Endometrioid	1	9.1
Mucinous	1	9.1
Unknown primary	2	1.1
Fallopian tube cancer	1	0.6
Serous	1	100
Other[c]	1	0.6

[a] Other: uterine sarcoma, endometrioid adenosarcoma, undifferentiated adenocarcinoma of endometrium.

[b] Endometrial stromal sarcoma

[c] Gallbladder carcinoma metastasized to the ovary.

Table 3

FIGO stage by primary tumor type

FIGO stage	No. of patients
Uterine cancer	
IA	82
IB	18
IIIA	1
IIIC1	5
IIIC2	5
IVB	2
Unstaged	3
Cervical cancer	
IA1	9
IA2	12
IB1	28
1B2	1
Ovarian cancer	
Low malignant potential	5
IA	3
IB	1
IC	1
IIIB	1
Fallopian tube cancer	
IA	1

Table 4

Robotic procedures performed

Procedure	No. of patients	%
Hysterectomy ± BSO	74	40.8
Hysterectomy, BSO, and staging	35	19.3
Radical hysterectomy	31	17.1
Hybrid staging[a]	9	5.0
Radical parametrectomy	9	5.0
Other[b]	8	4.4
USO and BSO	7	3.9
Radical trachelectomy	5	2.8
BSO and staging	2	1.1
Staging	1	0.6

BSO, bilateral salpingo-oophorectomy. USO, unilateral salpingo-oophorectomy.

[a] Hysterectomy, BSO, bilateral pelvic lymph node dissection, and laparoscopic retroperitoneal paraaortic lymph node dissection.

[b] Simple trachelectomy, resection of anterior-abdominal-wall nodule, paraaortic lymph node debulking, resection of pelvic tumor, or pelvic and paraaortic lymph node dissection.