

# Ovarian cancer presenting as a metastasis to a trocar tract used for a gasless lift-laparoscopy to resect a benign ovarian cyst: an unusual case report

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## Summary

**Background:** Metastasis to a trocar tract (port-site metastasis, PSM) is an uncommon but serious complication that possibly compromises the prognosis of cancer patients treated laparoscopically. **Case:** A 42-year-old Japanese woman had a 20-cm benign right ovarian cyst resected using gasless lift-laparoscopy. Five years and eight months postoperatively, she noticed a three-cm subcutaneous tumor involving the trocar tract. She was also found to have a pelvic mass and an exploratory laparotomy revealed left ovarian cancer. Based on the histopathological findings, the subcutaneous tumor was diagnosed as a metastasis from the ovarian cancer. **Conclusions:** This case suggested that PSM could occur without direct or indirect wound contamination during laparoscopic surgery.

**Key words:** Laparoscopic surgery; Ovarian cancer; Port-site metastasis.

## Introduction

Laparoscopic surgery offers patients many benefits, including minimal pain after surgery, faster recovery, shorter hospital stay, superior cosmetic results compared to open surgery, and has recently been increasingly applied to malignant diseases. However, the seeding of malignancies at laparoscopic port sites (port-site metastasis, PSM) has become a major concern for surgeons. PSM is an uncommon complication after laparoscopic surgery for cancer patients, with an estimated incidence of one to two percent in the setting of gynecology [1]. Laparoscopic surgeries for malignant conditions are usually applied to early-stage diseases. However, once complicated, PSM may change potentially curable conditions into incurable conditions and may predispose patients to poor prognoses [2].

Herein, the authors report an unusual case of PSM in which a metastasis to the trocar tract of laparoscopic surgery for a benign ovarian cyst led to a diagnosis of ovarian cancer five years and eight months postoperatively.

## Case Report

A 42-year-old, gravida 3, para 3 Japanese woman noticed an increased abdominal girth and was then diagnosed with a right ovarian cyst measuring over 20 cm in size. The cyst was multiloculated but lacked solid components or thickened septations and was interpreted as a benign ovarian cyst. A gasless lift-laparoscopy was performed with a two-cm subumbilical incision, and a ten-mm trocar was placed in the right iliac fossa. The cyst was punctured with the SAND balloon needle to prevent spillage [3], and a total of 3,450 ml of fluid was aspirated when the cyst had totally collapsed. The trocar was removed, and the incision was extended to four cm in length to remove the right ovary from the abdominal cavity. An extra-

corporeal cystectomy was performed and the ovary was reconstituted and returned to the peritoneal cavity. The left ovary appeared normal. No drain was brought out through the port site after surgery. Microscopically, the cyst was diagnosed as a mucinous cystadenoma (Figure 1A) and ascites cytology was negative.

Five years and eight months postoperatively at the age of 48, the patient noticed a subcutaneous tumor involving the trocar tract. She also developed lower abdominal pain and noticed her abdominal girth increasing in size over time. Pelvic examination, ultrasonography (USG), and computed tomography (CT) revealed a left ovarian mass with solid components measuring over ten cm in diameter. A CT scan also demonstrated a well-circumscribed three-cm subcutaneous tumor (Figure 2) and an extrahepatic solitary mass extending into the subdiaphragmatic space. Her serum CA125 and CEA were within normal limits, but CA19-9 was elevated to 374.8 U/ml. These findings led the authors to presume that she had ovarian cancer with disseminated lesions. An exploratory laparotomy was performed, and she was found to have a left ovarian tumor with 100 ml of ascites. She underwent a total abdominal hysterectomy, bilateral salpingo-oophorectomy, and sampling of the pelvic lymph nodes. The subcutaneous tumor and the solitary disseminated mass located at the subdiaphragmatic space were also resected. A histopathological examination of the excised subcutaneous (Figure 1B) and subdiaphragmatic masses revealed mucinous cystadenocarcinoma, which was compatible with the histology of the left ovarian tumor (Figure 1C). Ascites cytology was positive, but no cancer tissue was found in the right ovary that had previously been cystectomized laparoscopically. A histological re-examination of the right ovarian cyst failed to detect any cancerous lesions on the archival slides. These findings suggest that the subcutaneous tumor was a metastasis to the trocar tract of the previous laparoscopic surgery for the benign right ovarian cyst, and she was diagnosed with FIGO Stage IV ovarian cancer. Postoperatively she was given six cycles of chemotherapy, consisting of paclitaxel and carboplatin. The patient tolerated chemotherapy and has survived without evidence of disease for five years after the second surgery.

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Fig. 1A

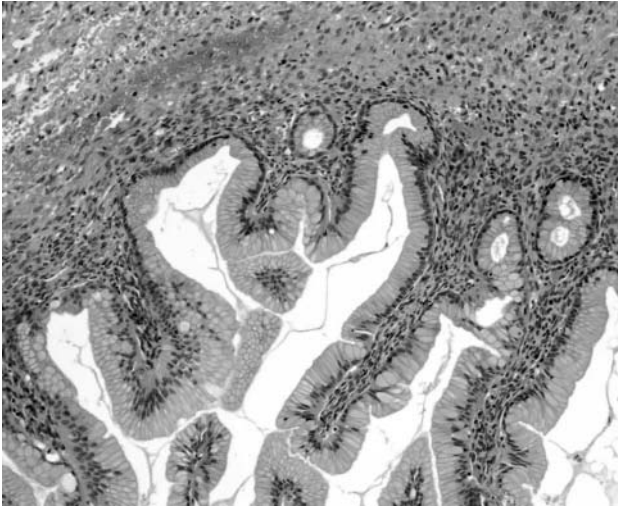


Fig. 1B

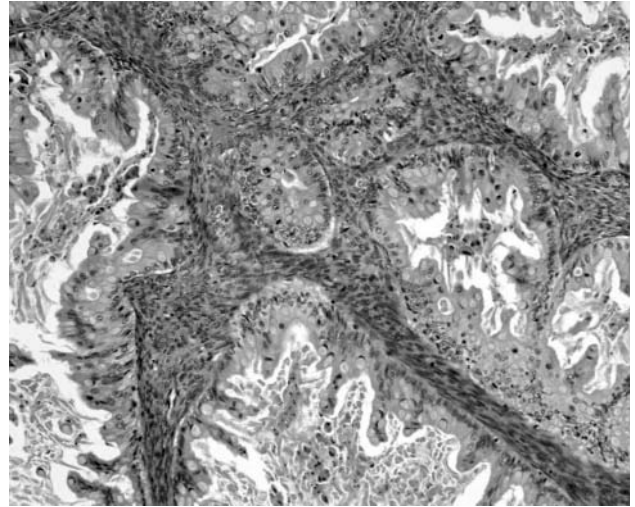


Fig. 1C

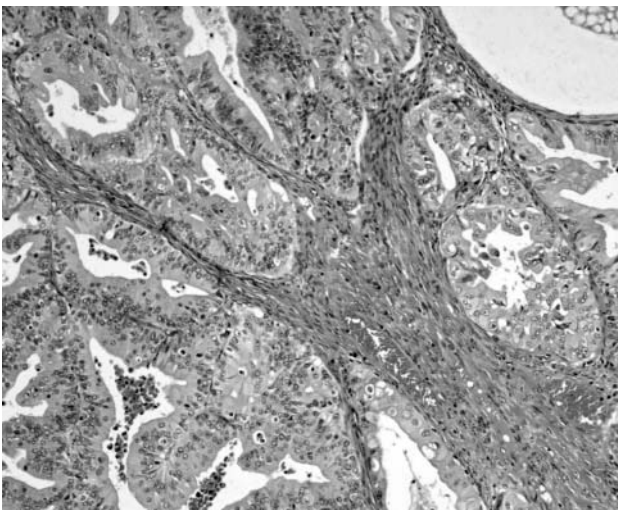


Fig. 2

Figure 1. — A section of the right ovarian cyst showing mucinous cystadenoma (a) (hematoxylin-eosin,  $\times 20$ ). The sections of the left ovarian (b) and the subcutaneous (c) tumors show mucinous cystadenocarcinoma (hematoxylin-eosin,  $\times 20$ ).

Figure 2. — A pelvic CT scan showing a three-cm subcutaneous tumor in the right iliac fossa (\*), suggesting metastasis to the trocar tract.

## Discussion

The definition of PSM is not yet established, but Raymond *et al.* [4] proposed that it should be defined as early tumor recurrences developing locally within the scar tissue of trocar sites or an incision wound after laparoscopy and that these should not be associated with peritoneal carcinomatosis. Although this patient might not fulfill the definition because the metastasis developed over five years post-laparoscopic surgery for the benign ovarian cyst, this unusual case might provide clues for understanding the etiology of PSM.

The pathogenesis of PSM is not fully understood. It is considered to be multifactorial, and three possible factors, including mechanical, metabolic/immunological, and hematogenous, have been proposed [5]. The mechanical factors include direct and indirect wound contamination. Direct contamination is considered to be the most plausible

mechanism, and cancer cells may be seeded during tumor extraction through a small wound or by contact with instruments contaminated with tumor cells. However, it is intriguing that 15 cases, summarized in Table 1, of PSM without tumor manipulation during surgery, have been reported to date [6-19]. Although cancer tissues had not been manipulated in those cases, a malignancy had already been detected at other sites (one uterine cervical squamous; two pancreatic) at the time of surgery in three cases [6, 9, 12] or between surgery and PSM manifestation (one colonic; one uterine; one ovarian) in three cases [10, 15, 17]. Neuhaus *et al.* [5] reported that so-called PSM tends to occur most commonly between three and nine months after malignancy resection. In addition, seven of nine (77.8%) remaining cases manifested a metastasis to the trocar tract within one year of the surgery (Table 1). These patients might have had microscopic or undetected disease at the time of laparoscopy and the metastases might have been caused by

Table 1. — *Pathologic findings.*

Author	Year	Age	Sex	Laparoscopic procedure	Pathological diagnosis in the laparoscopic surgery <sup>1</sup>	Time interval <sup>2</sup>	Tumor that caused port-site metastasis	Prognosis <sup>3</sup>
Patsner and Damien [6]	1992	42	F	Diagnostic laparoscopy	Endometriosis (detected uterine cervical squamous carcinoma)	4 mo	Uterine cervical squamous cell carcinoma Stage 1B	DOD (9 mo)
Siriwardena and Samarji [7]	1993	71	M	Laparoscopic cholecystectomy	Chronic inflammation and fibrosis	4 mo	Pancreatic adenocarcinoma	DOC (1 wk)
Watson [8]	1995	63	F	Laparoscopic gastroenterostomy	N/A	15 wk	Pancreatic adenocarcinoma	AWD (?)
Jorgensen <i>et al.</i> [9]	1995	63	M	Diagnostic laparoscopy	N/A (detected pancreatic adenocarcinoma)	7 wk	Pancreatic adenocarcinoma	DOD (?)
Ugarte [10]	1995	79	F	Laparoscopic cholecystectomy	Unknown (transverse colon carcinoma resected 1 mo after cholecystectomy)	9 mo	Transverse colon carcinoma	DOD (9 mo)
Lane and Pfau [11]	1996	32	F	Diagnostic laparoscopy	N/A	24 mo	Ovarian serous papillary adenocarcinoma	AWD (?)
Naumann and Spencer [12]	1997	41	F	Laparoscopic-assisted Syed needle placement	N/A (detected uterine cervical squamous carcinoma)	5 mo	Uterine cervical squamous cell carcinoma Stage 3B	DOD (3 wk)
Rieger and McIntosh [13]	1998	74	M	Laparoscopic cholecystectomy	Gallstones	6 mo	Cecal adenocarcinoma	DOD (3 mo)
		85	F	Laparoscopic cholecystectomy	Chronic cholecystitis with incidental gallbladder cancer	4 mo	Ovarian moderately differentiated adenocarcinoma	AWD (9 mo)
Lane and Cook [14]	1999	69	F	Laparoscopic cholecystectomy	Chronic inflammation and fibrosis	12 mo	Pancreatic adenocarcinoma	AWD (?)
Carlson <i>et al.</i> [15]	2001	77	F	Laparoscopic cholecystectomy	Gallstones (ovarian serous papillary adenocarcinoma resected 6 mo after cholecystectomy)	27 mo	Ovarian serous papillary adenocarcinoma	NED (?)
Nauhaus S <i>et al.</i> [16]	2001	66	F	Laparoscopic cholecystectomy	Chronic cholelithiasis	3 mo	Colonic adenocarcinoma	AWD (3 mo)
Picone <i>et al.</i> [17]	2003	37	F	Laparoscopic ovarian transposition	N/A (ovarian metastasis resected 6 wk after ovarian transposition)	6.5 mo	Uterine cervical adenocarcinoma Stage 2B	DOD (2 mo)
Yildirim <i>et al.</i> [18]	2006	52	F	Laparoscopic cholecystectomy	Chronic cholecystitis	6 mo	Adenocarcinoma of unknown origin	DOD (18 mo)
Piekarski <i>et al.</i> [19] (13 mo)	2008	57	F	Laparoscopic cholecystectomy	Chronic cholecystitis	22 mo	Unknown origin (cholangioe-	NED
This case		48	F	Laparoscopic ovarian cystectomy	Ovarian mucinous cystadenoma	68 mo	nous tubular adenocarcinoma) Ovarian mucinous cystadenocarcinoma	NED (60 mo)

<sup>1</sup>Comments in the parentheses indicate a malignancy that had been detected at the time of the laparoscopy or detected soon after the laparoscopy.

<sup>2</sup>Time interval between laparoscopy and the diagnosis of port-site metastasis.

<sup>3</sup>Prognosis after the confirmation of port-site metastasis.

N/A: not applicable; DOD: death due to disease; DOC: death due to other causes; AWD: alive with disease; NED: no evidence of disease; mo: month; wk: week.

direct contamination. However, in some patients, indirect contamination, including cancer cell seeding during desufflation of the pneumoperitoneum, or the transfer of aerosolized cancer cells (chimney effect) to the trocar tracts without direct contamination, might play a role in the development of PSM. Stretching of the abdominal wall and CO<sub>2</sub> used for insufflation during a pneumoperitoneal procedure may be associated with an increased release of inflammatory mediators, e.g., transforming growth factor alpha, which may affect wound healing and tumor proliferation. In addition, alterations to pressure and flow rates are also believed to affect local and systemic metabolic and immune responses, which may in turn facilitate tumor survival and implantation [5]. The presented case is uncommon but unique because the left ovarian cancer metastasized to the trocar tract used to manipulate a benign right ovarian cyst with gasless lift-laparoscopy five years and eight months later, suggesting that factors other than mechanical or metabolic/immunological factors might be implicated in the pathogenesis of PSM.

Kruitwagen *et al.* [20] analyzed cases with abdominal wall metastases at trocar or puncture sites following laparoscopy or paracentesis in women with ovarian cancer and reported that all of the metastases occurred in patients with FIGO Stage IIIC - IV including ascites. van Dam [21] also found that patients with PSM had significantly more ascites, and the closure of all layers of the wound significantly reduced the incidence of PSM. Considering the find-

ings that the present patient had peritoneal dissemination and positive ascites cytology, high metastatic potential and the incomplete healing of the abdominal layers as a mechanical barrier might have contributed to the development of metastasis to the trocar tract.

In summary, the authors report an unusual case of ovarian cancer presenting as a metastasis to a trocar tract used for a gasless lift-laparoscopy to resect a benign ovarian cyst. This case suggested that PSM could occur without direct or indirect wound contamination. Further investigation is required to help us better understand the etiology of PSM.

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