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Port-site metastasis after diagnostic laparoscopy for presumably benign ruptured ovarian cyst: disseminated intraperitoneal metastasis of a Krukenberg tumor

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Abstract The occurrence of port-site metastasis (PSM) has been reported largely after surgical laparoscopy for gastrointestinal and gynecological carcinomas, mainly ovarian and cervical neoplasia. We present an uncommon case of a port-site metastasis after diagnostic laparoscopy for presumably benign ruptured ovarian cyst, which turned out to be a disseminated intraperitoneal metastasis of a Krukenberg tumor. Although such tumors are rare, every surgeon should be aware of their incidence, especially in relation to the clinical presentation, the younger patient age and peritoneal metastasis of an unknown primary tumor. Since the risk related to PSM after laparoscopic surgery for malignancy still has to be determined, preventive measures should be encouraged when laparoscopy is carried out and intraoperatively ascites or peritoneal carcinosis is being diagnosed.

Keywords Gastric cancer · Metastasis · Peritoneum · Port-site metastasis · Krukenberg tumor

Introduction

Laparoscopic surgery has become a very popular and widespread operating technique in gynecological surgery, representing one of the most important surgical innovations in the past 20 years. Minimally invasive surgery has many advantages compared to conventional laparotomy, including better cosmetic wound, reduced postoperative pain, shorter hospitalization and rapid recovery [1]. Nowadays, the use of laparoscopy has even been advocated for oncological operations since patients have a lower morbidity and shorter hospital stays [2, 3, 4]. However, with

the widespread popularity of this technique, a new possible complication has become evident: the port-site metastasis (PSM). Occurrence of PSM has largely been reported after surgical laparoscopy for colonic or ovarian carcinomas [3, 4]. The incidence of PSM following laparoscopic surgery is estimated between 0 and 21% [5]. Wexner and Cohen [6] estimated the incidence of PSM to be approximately 4%, with a range between 1.5 to 21%. These results raised concern, since they were higher compared to the incidence of wound metastases after conventional surgery (approximately 0.7%) of operated cases [7]. However, an incidence of trocar metastases occurring in 0.7–1.1% of the cases was recently reported, with a correspondence to the known incidence of 0.8–1.6% incision metastases in conventional tumor surgery [8]. Furthermore, in a recent review, an overall incidence of 0.71% for PSM occurrence has been suggested [4]. The overall incidence of PSM in gynecologic cancers was estimated at 2.3%, with the highest risk being in patients with recurrence of ovarian or primary peritoneal malignancies undergoing procedures in the presence of ascites [9].

We report an extremely rare case of intraperitoneal carcinoma with abdominal wall invasion on the trocar site following diagnostic laparoscopic surgery for presumably ruptured ovarian cyst. Subsequent staging procedures revealed a Krukenberg tumor. This is, to our knowledge, the first report of a PSM of a peritoneal metastatic Krukenberg carcinoma.

Case report

A 30-year-old woman presented to a gynecological emergency department with acute lower abdominal pain. The medical history was unremarkable. The patient did not complain of nausea, vomiting, changing bowel function or weight loss. Ultrasound was significant for intra-abdominal fluid without any abdominal or pelvic mass. A diagnostic laparoscopy was performed for a presumably ruptured benign ovarian cyst. During the operation, yellowish ascites were noted, which presented throughout the peritoneum. Additionally, metastatic foci of a primarily unknown cancer at the diaphragm were noted, consistent with a peritoneal carci-

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noma. Both ovaries appeared to be slightly enlarged in size and shape, but no biopsy could be performed. The patient was then admitted to the reporting institution for further evaluation and therapy. She presented to our department with an approximately 5×4×4-cm, hard, non-tender, mobile mass at the left lower abdominal region of the trocar incision, suggesting a port-site metastasis of a malignant tumor. A gynecological ultrasound revealed abdominal ascites with slightly enlarged ovaries. The cytological examination of the punctured abdominal ascites revealed highly suspicious neoplastic cancer cells, without any information about the primary tumor site. A subsequent CT scan revealed peritoneal carcinosis with ascites, enlarged paravascular lymph nodes and ovaries, right pleura effusion and a tumor on the ventral part at the greater curve of the stomach between the corpus and antrum. These results were consistent with a metastatic gastric cancer (Krukenberg tumor). A subsequent gastroscopy showed an approximately 10-cm, hard gastric tumor with no stenosis. Multiple biopsies revealed only a reflux esophagitis and a gastric *Helicobacter pylori* infection. Due to the highly suspicious tumor, a second gastroscopy was performed and multiple biopsies were taken. These biopsies showed a poorly differentiated tumor of unknown origin. Further immunohistochemical analysis revealed a negative steroid receptor status, suggesting a primary gastric cancer metastatic to the ovaries. After adequate mobilization, the patient was dismissed and referred for further palliative chemotherapeutic treatment.

Discussion

We presented for the first time a case of port-site metastasis after diagnostic laparoscopy for a presumably benign ruptured ovarian cyst. Intraoperatively, disseminated intraperitoneal metastasis of an unknown primary tumor was diagnosed, revealing a Krukenberg tumor after staging procedures. The patient presented with lower abdominal pain without nausea or vomiting. Although ultrasound scan demonstrated free fluid within the abdomen, the laparoscopy was performed with the presumable diagnosis of a ruptured ovarian cyst. Intraoperatively, the ovaries seemed to be slightly enlarged, but with no obvious clinical signs of an ovarian tumor. The rapid appearance of PSM within a couple of days since primary laparoscopy was suspicious of an aggressive tumor type. However, the disseminated intraperitoneal metastasis was suggestive of an unknown primary tumor rather than metastatic ovarian cancer.

PSM in gynecologic oncological surgery was first reported in 1978 [10], occurring after laparoscopic surgery for endometrial, fallopian tube, ovarian and cervical cancer [3, 4, 11]. Meanwhile, PSM have been described after laparoscopic surgery for several gastrointestinal carcinomas, including the gall bladder [12], colon [4] and stomach [13, 14]. Metastatic neoplasms are by far the most common tumors encountered in the female peritoneum [15]. Most are associated with known primary tu-

Table 1 Possible risk factors contributing to port-site metastasis

Mechanisms
Hematogenous spread and direct wound implantation
Instrument contamination
“Chimney effect”
Aerosolization of tumor cells
Surgical technique and experience
Excessive tumor manipulation
Pressure and CO ₂ of the pneumoperitoneum
Impairment of local immune response

mor sites, such as the ovary, gastrointestinal tract or breast. In a large survey of over 118,000 laparoscopic procedures, mainly cholecystectomies, just 4 cases of PSM after diagnosing gastric cancer with peritoneal metastasis were described [14]. Gastric carcinomas have the disposition to metastasize to the ovaries, mainly through lymphatic vessels. The first documented case by Krukenberg [16] consists of a report of neoplastic metastases to the ovaries of well-defined histology from the gastrointestinal tract. Meanwhile, it is recognized that Krukenberg tumors are rare events, occurring predominantly in premenopausal women [17], with 93% of the cases originating from the stomach [18]. Unfortunately, the prognosis for such tumors is unfavorable, with an average 5-year survival of 12% [19].

Several mechanisms have been suggested to explain the genesis etiology of PSM (Table 1). The two mechanisms that have been studied most intensively are the aerosolization of tumor cells into exhaust gas during laparoscopy and the direct spread of free intraperitoneal tumor cells due to contact with the instruments and/or trocars [20]. Other potential mechanisms for the development of PSM include hematogenous spread, direct wound implantation, surgical technique, tumor manipulation, pneumoperitoneum, pressure, CO₂ insufflation and an impairment of the immune response of the patient (for review, see [3, 4, 11]). However, the precise etiological mechanisms of PSM still are not fully elucidated. Understanding the mechanisms of tumor implantation at the port site might lead to the creation of preventive strategies. However, the etiology of tumor implantation at the port site is not yet fully understood. Since the risk related to PSM after laparoscopic surgery for malignancy still has to be determined, preventive measures should be encouraged when laparoscopy is carried out.

Different measures have been proposed by several authors, including sufficient technical preparation (adequate equipment and technique), avoidance of gas leakage and tumor manipulation, use of retrieval bags for speci-

Table 2 Possible prevention measurements of port-site metastases

Measurements	
Sufficient technical preparation	Adequate equipment and technique, experienced surgeon
Intraperitoneal agents	Heparin, taurolidine, iodine, 5-fluorouracil, doxorubicin
Alternative insufflating strategies	Helium, gasless laparoscopy
Peritoneal wound closure	
Retrieval bags for specimens	

mens as well as povidone-iodine irrigation of the laparoscopic instruments, the trocars and the port-site wounds (Table 2; for review see [3, 4, 11, 21]).

In conclusion, we presented an uncommon case of a port-site metastasis after diagnostic laparoscopy for presumably benign ruptured ovarian cyst, which turned out to be a disseminated intraperitoneal metastasis of a Krukenberg tumor. Although such tumors are rare, every surgeon should be aware of their incidence, especially of its relation to the clinical presentation, the younger patient age and peritoneal metastasis of an unknown primary tumor. Additionally, one should consider Krukenberg tumors as a differential diagnosis if a peritoneal metastasis is present without obvious signs of ovarian cancer. Since the risk related to port-site metastases after laparoscopic surgery for malignancy has still to be determined, preventive measures should be encouraged when laparoscopy is carried out and ascites or peritoneal carcinosis is being diagnosed intraoperatively. However, the feasibility, medical consequences and cost-effectiveness of such preventive measures are still unclear.

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