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Incidence and Effect on Survival of Abdominal Wall Metastases at Trocar or Puncture Sites Following Laparoscopy or Paracentesis in Women with Ovarian Cancer

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The aim of this retrospective study was to examine the incidence and prognostic significance of abdominal wall metastases in patients with ovarian cancer present at the primary debulking at the entry sites of previous laparoscopy or paracentesis. The clinical records of 219 patients were studied. In 7 of 43 patients (16%) who had undergone laparoscopy and 3 of 30 patients (10%) who had undergone paracentesis previous to the primary debulking, an abdominal wall metastasis had developed at the entry sites. All metastases occurred in patients with FIGO stage IIIC–IV including ascites. Survival analysis using the Cox proportional hazards model showed that after adjustment for age, FIGO stage, histology, grade, ascites, and residual disease after primary debulking, the presence of abdominal wall metastases in the entry sites of previous laparoscopy or paracentesis was negatively, although not statistical significantly, correlated with survival ($P = 0.14$).

INTRODUCTION

Both laparoscopy and paracentesis are known procedures in the diagnosis of abdominal malignancy including ovarian cancer. Numerous case reports have described the development of tumor implants occurring at the abdominal trocar entry sites after laparoscopy in patients with ovarian cancer [1–5]. Nevertheless, some of these reports have stated that the development of such tumor implants after laparoscopy in patients with ovarian carcinoma is rare [1, 2]. So far, to our knowledge, no systematic study has been performed regarding its incidence and possible prognostic significance.

This retrospective study was performed to determine the incidence of abdominal wall metastases at trocar or puncture entry sites after laparoscopy or paracentesis, and whether it influences survival.

MATERIALS AND METHODS

The case records of 419 patients with ovarian cancer diagnosed between 1979 and 1991 in the University Hospital Nijmegen and the Bosch Medical Center at 's-Hertogenbosch were scrutinized. The year 1979 was chosen because from that year onward cisplatin was common as part of the adjuvant chemotherapy. Only those patients with epithelial ovarian cancer and no previous therapy were included in the study ($n = 219$). They were staged according to the revised FIGO classification of 1987 [6]. Patient's age and tumor characteristics are summarized in Table 1. Abdominal wall metastases at the laparoscopic trocar or paracentesis sites had to comply with the following criteria: (1) presence at the primary debulking, (2) subcutaneous, and (3) histologically confirmed. All abdominal wall metastases were removed during the primary debulking. The survival time was calculated from the date of the primary debulking.

All laparoscopies were performed using the double-puncture technique. After making a (sub)umbilical incision (1 cm), a Verres needle was inserted and a pneumoperitoneum was established by insufflating carbon dioxide to an intraabdominal pressure of 10 mm Hg. After removing the Verres needle a 10-mm trocar was placed through the (sub)umbilical incision. The laparoscope was introduced through this trocar and used to transilluminate the site of the second port. This second 5-mm trocar was introduced at either the midline or lower right quadrant of the abdomen. Paracenteses were not routinely performed with ultrasonic guidance.

Cox's proportional hazards' model was used to quantify the effect of the presence of the abdominal wall metastases at the entry sites of previous laparoscopy or paracentesis on survival, taking account of known prognostic factors (age, FIGO stage, histology, grade, residual disease after primary debulking, and the presence or absence of ascites). The performance status could not be introduced as a variable with possible effect on survival because the performance status

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TABLE 1
Age and Tumor Characteristics of the 219 Patients

	Number of patients (%)
Age (years)	
≤44	35 (16.0)
45–54	47 (21.5)
55–64	60 (27.4)
65–74	63 (28.7)
≥75	14 (6.4)
FIGO stage	
I	52 (23.7)
II	35 (16.0)
III	103 (47.0)
IV	29 (13.3)
Grade	
I	22 (12.2)
II	64 (35.4)
III	90 (49.7)
Undifferentiated	5 (2.7)
Unknown	38
Histology	
Serous	84 (38.4)
Mucinous	43 (19.6)
Endometrioid	31 (14.2)
Cystadenocarcinoma	39 (17.8)
Clear cell	7 (3.2)
Malignant Brenner	4 (1.8)
Mixed	6 (2.7)
Undifferentiated	5 (2.3)
Ascites	
No	105 (48.4)
Yes	112 (51.6)
Unknown	2
Residual disease after primary debulking	
None (macroscopic)	74 (40.6)
≤2 cm	46 (25.3)
>2 cm	62 (34.1)
Unknown	37
Abdominal wall metastases	
No previous laparoscopy or paracentesis	
No	144 (96.0)
Yes	6 (4.0)
Previous laparoscopy or paracentesis	
No	57 (82.6)
Yes, at trocar or puncture entry site	10 (14.5)
Yes, not at trocar or puncture entry sites	2 (2.9)

was not systematically registered in the case records. First, the likelihood-ratio test (LR test) was applied to investigate the influence of each of the above-mentioned factors on survival. Second, the effect on survival of abdominal wall metastases was evaluated after adjustment for all other factors. The variable age was divided into five subgroups of patients (≤44, 45–54, 55–64, 65–74, and ≥75 years). The variable histology was reduced to two subgroups (serous/mucinous/endometrioid/not classified cystadenocarcinoma and clear cell/malignant Brenner/mixed/undifferentiated). The variable residual disease after primary debulking was divided into three types (no macroscopic residual disease, residual disease ≤2 cm, and residual disease >2 cm). The variable abdominal wall metastases was divided into three types (no abdominal wall metastases, abdominal wall metastases not related to entry sites of previous laparoscopy or paracentesis, and abdominal wall metastases at entry sites of previous laparoscopy or paracentesis). The amount of fluid that constitutes ascites was defined as 100 ml or more.

RESULTS

In 7 of 43 patients (16%) in whom a diagnostic laparoscopy was performed preceding the primary debulking, one or more abdominal wall metastases developed at the entry sites (five patients had a metastasis at one, two patients had metastases at two entry sites). In 3 of 30 patients (10%) in whom one ($n = 25$) or more ($n = 5$) paracenteses were performed preceding the primary debulking, an abdominal wall metastasis developed at the entry site. In these three patients only one paracentesis was performed. In none of the laparoscopic procedures and paracenteses were difficulties and/or complications reported. All 10 patients with abdominal wall metastases at the entry sites of the laparoscopic trocars or paracentesis had the following features in common: FIGO stage IIIC or IV; grade II, III, or "unknown"; and ascites present at the primary debulking. None of the women without ascites ($n = 21$) and/or stage I–II disease ($n = 14$) developed abdominal wall metastases following laparoscopy or paracentesis. The median time interval between the laparoscopy or paracentesis and primary debulking was 15 days in the 10 patients who had developed abdominal wall metastases at the trocar entry sites (range, 9–35 days) and 13 days in the 63 patients who had not developed abdominal wall metastases after previous laparoscopy or paracentesis (range, 1–187 days); the difference was not statistically significant.

Eight patients had abdominal wall metastases present at the primary debulking not related to a previous laparoscopy or paracentesis (Table 1).

The survival time was significantly related to age, FIGO stage, tumor grade, residual disease after primary debulking, ascites, and abdominal wall metastases at the entry sites of previous laparoscopy or paracentesis (Table 2). No significant correlation was found with tumor histology. In the Cox proportional hazards' model, patients with abdominal wall metastases at the entry sites adjusted for age, FIGO stage, grade, histology, ascites, and residual disease after primary debulking had a shorter survival time, although the difference was not statistically significant (Table 3). For example, patients with abdominal wall metastases at the entry sites of previous laparoscopy or paracentesis together with the combination of age of 65–74 years, grade III cystadenocarci-

TABLE 2
Relation between Factors and Survival among 219 Ovarian Cancer Patients, Diagnosed between 1979 and 1991

Factor	Number of patients	Number of deaths in 3 years (%)[a]	Relative hazard with respect to baseline	95% confidence interval for relative hazard	*P* value
Age group					
≤44	35	6 (17)	1.00	Baseline	<0.001
45–54	47	18 (38)	2.02	0.96– 4.26	
55–64	60	29 (48)	2.56	1.26– 5.19	
65–74	63	35 (56)	3.56	1.79– 7.10	
≥75	14	11 (79)	9.70	4.07–23.13	
FIGO stage					
I	52	5 (10)	1.00	Baseline	<0.001
II	35	5 (14)	1.68	0.67– 4.26	
III	103	65 (63)	9.19	4.55–18.57	
IV	29	24 (83)	23.63	10.64–52.48	
Grade					
I	22	3 (14)	1.00	Baseline	<0.001
II	64	24 (38)	3.12	1.22– 7.98	
III + undifferentiated	95	55 (58)	5.27	2.11–13.17	
Histology					
Cystadenocarcinoma	197	86 (44)	1.00	Baseline	0.70
Others	22	13 (59)	1.12	0.63– 1.99	
Ascites					
No	105	25 (24)	1.00	Baseline	<0.001
Yes	112	74 (66)	4.31	2.88– 6.46	
Residual disease after debulking					
None (macroscopic)	74	10 (14)	1.00	Baseline	<0.001
≤2 cm	46	29 (63)	5.72	3.17–10.30	
>2 cm	62	45 (73)	8.23	4.70–14.41	
Abdominal wall metastases					
No	201	85 (42)	1.00	Baseline	<0.001
Yes, not at entry sites	8	5 (63)	2.39	1.05– 5.48	
Yes, at entry site	10	9 (90)	5.12	2.65– 9.89	

[a] All of the deaths were due to cancer progression.

noma FIGO stage III, residual disease >2 cm, and ascites present had a much worse survival than patients with the same combination but without abdominal wall metastases in the entry sites (Table 4).

DISCUSSION

Laparoscopy is a common procedure in the diagnostic workup of possibly gynecological related complaints. Also

TABLE 3
Relation between Abdominal Wall Metastases and Survival after Adjustment for the Known Risk Factors: Age, FIGO Stage, Tumor Grade, Histology, Ascites, and Residual Disease

	Number of patients	Number of deaths in 3 years (%)[a]	Risk Ratio	95% confidence interval	*P* value
Abdominal wall metastases					
No	137	63 (46)	1.00	Baseline	0.14
Yes, not at entry sites	6	4 (67)	1.10	0.38–3.22	
Yes, at entry site	7	6 (86)	2.70	1.08–6.75	
Unknown for at least one factor	69				

[a] All of the deaths were due to cancer progression.

TABLE 4

Survival (Calculated within the Cox's Proportional Hazards' Model. All Patients 65–74 Years of Age, FIGO III, Cystadenocarcinoma, Tumor Grade III, Residual Disease >2 cm, and Ascites Present)

Survival period in months	No abdominal wall metastases (%)	Abdominal wall metastases outside trocar or puncture entry sites (%)	Abdominal wall metastases at trocar or puncture entry site (%)
3	92	91	79
6	85	84	65
12	64	61	30
18	46	42	12
24	31	28	4

in cases in which an ovarian malignancy is suspected, a laparoscopy can be performed to confirm the diagnosis. In the presence of ascites a paracentesis with cytological examination of the fluid obtained can attribute to the diagnosis. Numerous case reports have mentioned the development of tumor metastases at entry sites after a diagnostic laparoscopy in patients with ovarian cancer. In reports on patients with advanced disease [1, 2], and also in patients with ovarian tumors of low malignant potential [3, 5], metastases in the abdominal wall after a diagnostic laparoscopy have been described. Childers *et al.* [7] recently reviewed 88 diagnostic laparoscopic procedures in which an intraperitoneal malignancy was documented, of which 88% (77/88) had gross disease and 80% (70/88) had ovarian cancer. In only one case, in which microscopical ovarian cancer disease was present, a tumor metastasis developed at the abdominal wall puncture site. It was stated therefore that such tumor implantation after laparoscopy is an infrequent occurrence.

In the present study, in 43 of 219 patients (19.7%) a diagnostic laparoscopy preceded the primary debulking of an ovarian carcinoma. Furthermore, in 30 patients (13.7%) a paracentesis was performed preceding the primary debulking. In 10 of these 73 patients (13.7%) abdominal wall tumor implantation occurred at these trocar or puncture sites. This is a much higher percentage than that reported by Childers *et al.* [7]. The reason(s) for this discrepancy is not known. The occurrence of abdominal wall metastases after laparoscopy or paracentesis was reportedly only in patients with FIGO stage IIIC–IV including the presence of ascites. None of the women without ascites and/or stage I–II disease abdominal wall metastases developed in the interval between laparoscopy or paracentesis and laparotomy. Nduka *et al.* [8], in a review, mentions numerous aspects specifically related to laparoscopy which may lead to an increased likelihood of wound metastases. The present data support the concept that the presence and possibly leakage of ascites through the small skin incision is one of the mechanisms resulting in an increased contamination of these skin incisions with malignant cells.

A negative correlation was found between the development of these metastases and duration of survival independent of known prognostic factors such as age, FIGO stage, grade, histology, residual disease after primary debulking, and the presence or absence of ascites. This negative correlation was not statistically significant, possibly due to the small samples. It is plausible that in cases of stage III–IV ovarian carcinoma, the development of abdominal wall metastases at the entry sites after laparoscopy or paracenteses itself does not affect survival, but rather it is the expression of the biological aggressiveness of the tumor which in turn explains the shorter survival.

In addition to diagnostic laparoscopic procedures, laparoscopic surgery is becoming more widely used in the treatment of adnexal masses considered as being benign. Maiman *et al.* [9] found that 31% of laparoscopically removed ovarian tumors considered to be benign were subsequently found to be malignant. Recently, the development of an abdominal wall metastasis after laparoscopic removal of a borderline ovarian tumor has been described [10]. Therefore, it is important that also in cases in which an ovarian tumor is considered to be benign and is laparoscopically removed, one should try to minimize the exposure of the small incisions to exfoliated cells [8]. This can be accomplished by leaving the ovarian tumor intact until it is resected and placed in a pouch in which it can be aspirated if necessary and finally removed through the skin incision.

In conclusion, in cases of pelvic masses in which an ovarian malignancy is supected, one should be reserved in performing a laparoscopy or paracentesis. The development of abdominal wall metastases in these cases at the entry sites of previous laparoscopy or paracentesis is a grave prognostic sign. During laparoscopic surgery one should always try to minimize the exposure of the small skin incisions to exfoliated cells.

REFERENCES

1. Döbrönte, Z., Wittmann, T., and Karácsony, G. Rapid development of malignant metastases in the abdominal wall after laparoscopy, *Endoscopy* **10**, 127–30 (1978).

2. Stockdale, A. D., and Pocock, T. J. Abdominal wall metastasis following laparoscopy: A case report, *Eur. J. Surg. Oncol.* **11,** 373–375 (1985).
3. Hsiu, J. G., Given, F. T., and Kemp, G. M. Tumor implantation after diagnostic laparoscopic biopsy of serous ovarian tumors of low malignant potential, *Obstet. Gynecol.* **68S,** 90–93 (1986).
4. Miralles, R. M., Petit, J., Giné, L., and Balagueró, L. Metastatic cancer spread at the laparoscopic puncture site: Report of a case in a patient with carcinoma of the ovary, *Eur. J. Gynaecol. Oncol.* **10,** 442–444 (1989).
5. Gleeson, N. C., Nicosia, S. V., Mark, J. E., Hoffman, M. S., and Cavanagh, D. Abdominal wall metastases from ovarian cancer after laparoscopy, *Am. J. Obstet. Gynecol.* **169,** 522–523 (1993).
6. International Federation of Gynecology and Obstetrics. Changes in definitions of clinical staging for carcinoma of the cervix and ovary, *Am. J. Obstet. Gynecol.* **156,** 263–264 (1987).
7. Childers, J. M., Aqua, K. A., Surwit, E. A., Hallum, A. V., and Hatch, K. D. Abdominal-wall tumor implantation following laparoscopy for malignant conditions, in *Abstracts Western Association of Gynaecological Oncologists,* Vol. 18, p. 108 (1994).
8. Nduka, C. C., Monson, J. R. T., Menzies-Gow, N., and Darzi, A. Abdominal wall metastases following laparoscopy, *Br. J. Surg.* **81,** 648–652 (1994).
9. Maimann, M., Seltzer, V., and Boyce, J. Laparoscopic excision of ovarian neoplasms subsequently found to be malignant, *Obstet. Gynaecol.* **77,** 563–565 (1991).
10. Shepherd, J. H., and Carter, P. G. Wound recurrence by implantation of a borderline ovarian tumour following laparoscopic removal, *Br. J. Obstet. Gynaecol.* **101,** 265–266 (1994).