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Utility of peritoneal washing cytology in staging and prognosis of ovarian and fallopian tube neoplasms: a 10-year retrospective analysis

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ABSTRACT

The prognostic significance of peritoneal washing cytology in gynecologic neoplasms is controversial. The presence of neoplastic cells in peritoneal washings is currently part of the Federation of Gynecology and Obstetrics and American Joint Committee on Cancer TNM staging systems in cases of ovarian and fallopian tube neoplasms without metastasis beyond the pelvis. In this study, we retrospectively reviewed all cases of ovarian and fallopian tube neoplasms in which cytologic studies were performed. The utility of cytology in tumor staging and the relationship between cytology results and patient outcome are studied. All cases of ovarian and fallopian tube neoplasms in our institution between July 2002 and July 2012 were reviewed. Primary tumor characteristics including type and pelvic extension were collected, categorized, and correlated with peritoneal washing cytology. Final tumor staging was reviewed and the impact of positive cytology was evaluated. A total of 120 cases of ovarian and fallopian tube neoplasms without extrapelvic metastasis were identified within the study period. Peritoneal washing cytology was positive in 24% (29/120) of neoplasms and upstaged the tumor 83% (24/29) of the time when positive. Overall, 20% (24/120) of reviewed cases were upstaged based on positive cytology results. Peritoneal washing cytology remains a useful staging tool for ovarian and fallopian tube neoplasms limited to the pelvic cavity. Positive cytology results in upstaging in a significant proportion of the cases regardless of the tumor type. A larger study is needed to analyze follow-up data to determine if upstaging based on positive cytology adversely affects outcome.

1. Background

Peritoneal washing cytology is routinely performed during surgery for gynecological neoplasms to detect occult intraperitoneal metastases; it has high sensitivity with minimal risk [1–2]. The presence of neoplastic cells in peritoneal washings was incorporated in the staging system of the International Federation of Gynecology and Obstetrics (FIGO) in 1975 for ovarian carcinomas [3]. Today it remains to be a component of the FIGO staging and the TNM system by the American Joint Committee on Cancer in cases of ovarian and fallopian tube neoplasms limited to the pelvis [4,5]. In cases when cancer has spread beyond the pelvic cavity or to local lymph nodes, cytology no longer impacts staging. A positive peritoneal washing upstages a T1a/T1b tumor to T1c and a T2a/T2b tumor to T2c for both ovarian and fallopian tubal neoplasms.

In contrast to its role in staging ovarian/fallopian tube neoplasms, peritoneal washing cytology is no longer a component in the staging system for endometrial carcinoma because it has been shown that upstaging based solely on positive peritoneal washing does not affect outcome in endometrial cancer [5–7]. Peritoneal washing cytology is also not included in the staging system for cervical carcinomas [5,8]. Therefore, the role of peritoneal washing cytology in the staging and outcome of ovarian/fallopian tube neoplasms has been recently reinvestigated [9,10]. This question is particularly important in the current era of laparoscopic surgeries if peritoneal washing can be omitted. In this study, we retrospectively reviewed all cases of ovarian and fallopian tube neoplasms in which peritoneal washing cytologic studies were performed. The cytology result, its utility in tumor staging, and the relationship between cytology results and patient outcomes are investigated.

2. Materials and methods

The study was approved by our institution's Human Subjects Committee.

All cases of ovarian and fallopian tube neoplasms in our institution between July 2002 and July 2012 were retrieved from CoPath and reviewed. Primary tumor characteristics including type, grade, and pelvic extension were collected, categorized, and correlated with peritoneal washing cytology. Tumors with a stage of T3 or T4 (extension

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Table
Ovarian/fallopian tube neoplasms with corresponding peritoneal washing cytology and staging results

Tumor type	Total (n)	Cytology results		Upstaged by P+[a]	
		P+[a]	P−[a]	Yes	No
Ovarian neoplasms					
Borderline mucinous	33	3	30	2	1
Serous carcinoma	21	6	15	6	0
Borderline serous	23	6	17	5	1
Endometrioid carcinoma	10	3	7	1	2
Mucinous carcinoma	9	2	7	1	1
Clear cell carcinoma	7	2	5	2	0
Mixed epithelial carcinoma	6	0	6	0	0
Neuroendocrine carcinoma	2	2	0	2	0
Granulosa cell	1	0	1	0	0
Total	112	24	88	19	5
Fallopian tube neoplasms					
Serous carcinoma	7	5	2	5	0
MMMT	1	0	1	0	0
Total	8	5	3	5	0

Abbreviation: MMMT, malignant mixed müllerian tumor.
[a] P = peritoneal washing.

beyond pelvis) were excluded from the study because pelvic cytology is not part of the staging system for ovarian/fallopian tube neoplasms in advanced stages. The pathologic reports of qualifying cases were reviewed to determine what impact positive cytology results had on final tumor staging.

At the time of receiving, peritoneal washing specimens were centrifuged in the laboratory (in 200 mL aliquot). After centrifugation, the supernatant was removed. The cell pellet was used to make a direct smear slide stained with Diff-Quik stain and a ThinPrep (Hologic, Bedford, MA) slide stained with Papanicolaou stain. These 2 slides were prepared and reviewed for all peritoneal washing specimens. A cellblock was also prepared when necessary, and so were immunohistochemical stains. Because peritoneal cytology is part of the staging procedure, the diagnostic categories included "negative for neoplastic cells" and "positive for neoplastic cells." If a rare "atypical" diagnosis was encountered, the slides were reviewed and reclassified as either negative or positive for the study.

3. Results

A total of 120 cases of ovarian (112) and fallopian tube (8) neoplasms without extrapelvic metastasis were identified within the study period. Patients' ages ranged from 27 to 81 years (median, 53 years). The ovarian tumors included 56 borderline tumors (33 borderline mucinous and 23 borderline serous), 55 carcinomas (21 serous, 10 endometrioid, 9 mucinous, 7 clear cell, 6 mixed, and 2 neuroendocrine carcinomas), and 1 granulosa cell tumor. The fallopian tube tumors included 7 serous carcinomas and 1 malignant mixed müllerian tumor. Peritoneal washing cytology was positive in 24% (29/120) of all neoplasms and upstaged 20% of all neoplasms (24/120) (Table). When positive, cytology upstaged the tumor 83% (24/29) of the time. In the remaining 17% of cytology positive cases, there was ovarian surface tumor involvement or ovarian capsule rupture which automatically upstaged the tumor. T1 neoplasms had positive cytology in 19% (19/102) of cases and were upstaged in 13% of cases. T2 tumors had positive cytology in 55% (10/18) of cases and were upstaged in all 55% of cases. T1 neoplasms were upstaged by cytology in 68% (13/19) cases when positive (from T1a/T1b to T1c); T2 neoplasms were upstaged in all positive cytology cases (10/10; from T2a/T2b to T2c).

In this study, borderline neoplasms had positive washings in 16% (9/56) of cases and were upstaged by positive cytology in 13% (7/56) of cases. Carcinomas demonstrated positive cytology in 27% (15/56) of cases and were upstaged by positive cytology in 21% (12/56) of cases. The upstaging occurred with all tumor subtypes. When peritoneal cytology was positive, it upstaged 78% (7/9) of borderline tumors and 80% (12/15) of carcinomas that had positive peritoneal cytology (Figs. 1, 2, and 3). Ovarian neoplasms had positive peritoneal cytology in 21% of cases (24/112) and were upstaged by positive cytology in 17% of cases (19/112). Fallopian tube tumors had positive peritoneal cytology in 63% of cases (5/8) and were upstaged by positive cytology in all positive cases (5/8).

In the follow-up study (median follow-up, 53 months), among 19 patients with ovarian tumors upstaged by cytology, 5 lost to follow-up, 4 developed recurrences (21%), and 10 were free of diseases (53%). Among 76 patients with ovarian tumors not upstaged by cytology, 19 lost to follow-up, 9 developed recurrences (12%), and 48 were free of diseases (63%). However, the number is too small to reach a statistical significance. Among 5 patients with fallopian tube malignancies upstaged by peritoneal cytology, 1 lost to follow-up, 1 developed

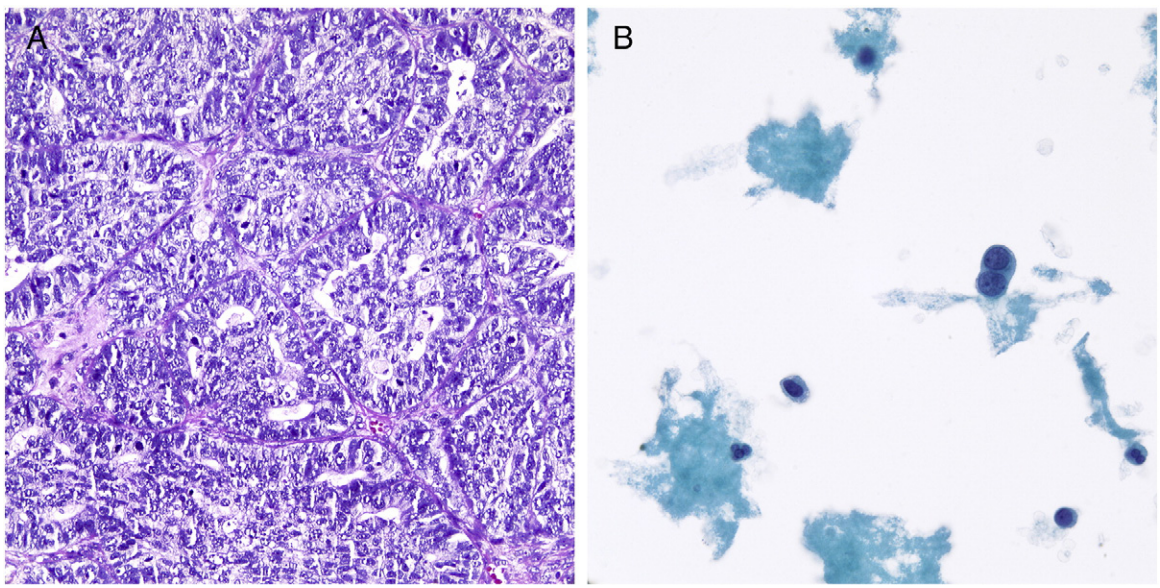

Fig. 1. Example of a case when peritoneal washing cytology was negative and did not affect the ovarian tumor staging. (A) Ovarian high-grade serous carcinoma (hematoxylin and eosin [H&E] stain, original magnification ×200). (B) Negative peritoneal washing cytology (Papanicolaou stain, ×200).