Pathologic sampling of the omentum for neoplasms that involve the female genital tract

A retrospective analysis of 1055 cases

*Neil Allen Maglalang, MD; Oluwole Fadare, MD**

Department of Pathology, University of California San Diego, San Diego, CA, United States

Abstract

Objective: We sought to assess the number of blocks that should routinely be submitted for microscopic examination of omentectomy specimens associated with neoplasms that involve the female genital tract.

Methods: Clinicopathologic data were retrospectively reviewed in 1055 cases wherein the omentum was resected for possible gynecologic cancer staging. We investigated any associations between the microscopic positivity rate (MPR) and the number of blocks submitted, block groups (categorized as 1-2 blocks, 3-4 blocks, 5-6 blocks, and >6 blocks), and block to size ratio (the number of blocks submitted to the widest specimen dimension, classified as approximate deciles).

Results: Of the 1055 cases we studied, 536 (50.8%) were grossly normal, and 519 (49.2%) were abnormal. Within the grossly normal group, there were no statistically significant differences in MPR between the block groups and between cases with 1, 2, 3, 4, 5, or 6 blocks submitted ($P > .50$ for all pairwise comparisons). Cochran-Armitage tests for trend did not show any linear trend between increasing block groups ($P = .88$) or increasing block to size ratios ($P = .39$) and MPR; a binomial logistic regression analysis confirmed that neither block groups (odds ratio, 1.144 [95% CI, 0.794-1.648]; $P = .47$) nor block to size ratio (odds ratio, 1.022 [95% CI, 0.770-1.358]; $P = .88$) showed a statistically significant linear relation to MPR. For diffusely or multifocally abnormal cases, the highest MPR (95.5%) was reached at the 1 to 2 blocks group level, and MPR did not statistically significantly increase with higher levels of sampling.

Conclusions: Submitting 1 to 2 block sections of the omentum in the studied setting results in an MPR that is not statistically significantly lower than the MPR associated with higher levels of sampling.

KEY POINTS

- This retrospective study analyzed the MPR of various levels of sampling of omentectomy specimens associated with neoplasms that involve the female genital tract.
- For a grossly normal omentum and for multifocally/diffusely abnormal omentum, our findings suggest that 1-2 blocks does not result in a significant decrease in the MPR compared with higher levels of sampling.
- Additional studies are required to address omentum sampling in specific clinical scenarios, including following neoadjuvant therapy.

Key words

grossing; omentum sampling; ovarian cancer; endometrial cancer

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*Corresponding author: Oluwole O. Fadare (oluwole.fadare@gmail.com)

INTRODUCTION

Omentum involvement in endometrial and tubo-ovarian malignancies denotes advanced-stage disease.[1-3] Given that treatment and prognosis are highly dependent on staging, the accurate determination of omentum involvement by a gynecologic tract neoplasm is paramount. Omentectomy (or partial omental sampling) has long been a mainstay of staging procedures for patients with ovarian cancer.[4] Omentectomy not only facilitates achieving

the "optimal cytoreduction" standard that is thought to have tremendous prognostic value in patients with advanced-stage ovarian cancer[5] but is also invaluable in recognizing the 2.3% to 3% of patients with apparently early-stage ovarian cancer whose disease is upstaged solely due to microscopic disease.[6,7] For patients with endometrial cancers, only 0.4% to 1.9% of clinically early-stage disease are found to have microscopic involvement of the omentum.[8,9] Up to one-third of patients with nonendometrioid or "aggressive" histotypes show omentum involvement, however; accordingly, omentectomy is commonly performed in this setting.[10,11]

The omentum specimen submitted to the pathology laboratory is often large, and it is neither practical nor cost-effective to microscopically evaluate a large portion of the specimen, especially given the widespread limitations in resources that the discipline faces.[12,13] In contrast, inadequate sampling of the omentum by the pathologist may lead to a failure to recognize microscopic disease, understaging, and (potentially) adverse patient outcomes. Only a few prior studies have attempted to determine the optimal number of blocks that should be submitted in this setting. Doig and Monaghan[14] reviewed 332 cases that were limited to malignant and borderline ovarian tumors. They concluded that submitting 1 block from a grossly involved omentum is sufficient. Usubutun et al[15] evaluated 258 endometrial and ovarian malignancies, inclusive of retrospective and prospective cohorts, and concluded that 1 block is sufficient when the omentum is grossly involved. In another analysis, 44 ovarian and endometrial cases with grossly normal omentum and microscopic disease were assessed; using a simulated model, the authors found that 5, 10, and 14 blocks of omentum in such cases will yield a sensitivity of 82%, 95%, and 99%, respectively.[16] There are some shared conclusions between these studies, but overall, the optimal number of blocks that should routinely be submitted for microscopic examination of staging omentectomy specimens, especially when grossly unremarkable, is not entirely clear. In the current study, the authors sought to provide a comprehensive reexamination of the issue, with an emphasis on grossly normal omentum, using the largest cohort reported to date and encompassing tumors of various types at different sites in the female genital tract.

METHODS

The authors searched the pathology database at an academic medical center for consecutive cases in which the omentum had been excised as part of possible gynecologic cancer staging (ie, as a component of formal surgical staging for a previously diagnosed gynecologic neoplasm or as part of intraabdominal exploration for a gynecologic tract mass or lesion) between January 2002 and August 2024**.** Only cases in which a borderline or malignant neoplasm involved the ovary, fallopian tube, or uterus were included. The neoplasms included epithelial neoplasms (borderline and malignant), sarcomas, sex cord stromal tumors, and non-gynecologic primaries with mass-forming involvement of the gynecologic tract. Cases were excluded if they failed to meet these inclusion criteria. Surgical pathology reports were reviewed in detail, and the following items were collected: primary tumor site, histologic subtype, gross appearance, microscopic status, number of blocks submitted, and largest omental dimension. Cases for which key study parameters were incomplete were excluded. For most of the study period, the gross manual at our institution called for omentum specimens to be sectioned at 5-mm intervals, with 1 to 3 sections to be submitted for grossly abnormal omentum and 6 sections to be submitted grossly normal omentum. Given the wide spectrum of descriptions for the omentum across the pathology reports we reviewed, the gross appearances were classified into 4 categories for analytic purposes using preset guidelines:

- **Normal.** These cases were specifically described as normal; grossly unremarkable; or showing no distinct or discernable lesions, nodules, or masses. They were frequently described as displaying yellow, tan, or reddish lobulated cut surfaces.
- **Focally abnormal.** These omental specimens had a distinct lesion, encompassing fibrosis, thickening, induration, nodules, or masses limited to a single discrete abnormality in an otherwise unremarkable specimen. Other descriptors for focal abnormality included cystic change, "mucinous" change, or chalky change. Based on specified measurements, a singular lesion that was described as equal to or less than 10% of the specimen's greatest dimension was classified in this category. The category also includes cases where a separate specimen was labeled as an omental nodule or implant, even if the separately submitted larger specimen was described as being grossly unremarkable.
- **Multifocally abnormal.** These omental specimens had the same identifiable gross discrete lesions described in the focal category but showed more than 1 focus of abnormality in a single specimen or had at least 1 abnormality in multiple specimens if separately submitted. Abnormalities for the specimens in this category were frequently described as multiple, multifocal, several, numerous, or a definite number when the lesions were countable. Specimens with more than focal areas described by nonspecific terminologies (eg, fibrous, thickened, studded, intermixed, interspersed with indistinct lesions) were also included in this category.
- **Diffusely abnormal.** For these specimens, there was a predominance of the lesional component over the fatty or fibrofatty areas. They were frequently described as diffuse, replaced, entirely involved, confluent, grossly positive, or caked. Cut surfaces were typically described as solid and the omentum as firm or rubbery.

Microscopic positivity (microscopic abnormality) for tumor was the primary outcome measure or end point used in this study. A case was classified as microscopically positive when viable tumor cells were reported as being definitively present in a section from the omentum. Samples that showed only acellular mucin, psammoma bodies, "atypical cells," and reactive changes were classified as negative if tumor cells were not concurrently present. The number of blocks submitted was correlated with the microscopic positivity rate (MPR). In some analyses, the number of blocks submitted was categorized arbitrarily into 4 subgroups to facilitate subset analyses: 1 to 2 blocks,

Table 1 MPRs for Each Number of Submitted Blocks and Block Groups

	Grossly normal cases			Grossly abnormal cases		
Submitted blocks, No.	Total, No.	Microscopically positive, No.	MPR, %	Total, No.	Microscopically positive, No.	MPR, %
1	149	10	6.7	97	97	79.4
2	72	5	6.9	154	154	93.5
3	52	5	9.6	100	100	85.0
4	15	1	6.7	55	55	90.9
5	34	4	11.8	31	31	83.9
6	190	15	7.9	38	38	78.9
7	9	1	11.1	12	12	58.3
8	4	1	25.0	14	14	78.6
9	2	0	0.0	4	4	75.0
10	3	1	33.3	7	7	57.1
>10	6	0	0.0	7	7	71.4
Block groups						
1-2	221	15	6.8	251	221	88.0
3-4	67	6	9.0	155	135	87.1
5-6	224	19	8.5	69	56	81.2
> 6	24	3	12.5	44	30	68.2
Overall	536	43	8.0	519	442	85.2

Abbreviation: MPR, microscopic positivity rate.

3 to 4 blocks, 5 to 6 blocks, and more than 6 blocks. The ratio of the number of blocks submitted to the longest dimension of the specimen was designated the *block to size ratio* and was used as an alternative surrogate indicator for the percentage of the omentum sampled. Subset analyses were performed for cases in which 1% to less than 10%, 10% to less than 20%, 20% to less than 30%, 30% to less than 40%, and 40% or more of the sample had been sampled. Fisher exact and χ^2 tests were used to assess MPR as a function of the number of blocks submitted, block groups, and the percentage of omentum sampled, with statistical significance set at $\alpha = .05$. For further analysis within the grossly normal group, *2* statistical methods were also performed: a Cochran-Armitage test of trend and binomial logistic regression. The Cochran-Armitage test of trend was performed to assess the effects of blocks submitted, block groups, and block to size ratio on MPR as well as whether statistically significant trends in MPR as a function of sampling could be identified. Given the dichotomous nature of our outcome variable (positive or negative for microscopic disease), binomial logistic regression was also employed using the same variables. These tests were used adjunctively to substantiate whether a trend exists, complementing the pairwise comparisons using Fisher exact tests. These sets of analyses provided a more comprehensive assessment of any potential trends. Statistical analyses were performed using Microsoft Excel (part of Microsoft 365, version 2410) and IBM SPSS Statistics, version 29, software.

RESULTS

General microscopic positivity rates

A total of 1629 possible cases were initially found, 1055 of which remained in the final study set after exclusion criteria were applied; 536 (50.8%) of the 1055 cases had been classified as having grossly normal omenta, and 519 (49.2%) of the 1055 cases had been classified as having grossly abnormal omenta. The focally abnormal, multifocally abnormal, and diffusely abnormal groups comprised 13.2%, 30.0%, and 6.0% of the entire cohort, respectively. As expected, the MPR for the grossly normal group (43/536 [8.0%]) was much lower than the MPR for the grossly abnormal group (442/519 [85.2%]), $P < .0001$. Similarly, within the grossly abnormal group, the MPR for the focally abnormal subgroup (66.4%) was substantially lower than the rates for the multifocally abnormal (91.1%), diffuse abnormal (96.8%), and the multifocally + diffusely abnormal (92.1%) subgroups ($P < .001$ for all).

MPRs and number of blocks submitted in the grossly normal group

Table 1 shows the MPRs associated with each level of sampling in cases classified as grossly normal. Of these 536 cases, 512 (95.5%) had 6 blocks or fewer submitted, with variable representation for each level of sampling. The overall MPR was 8.0%, and subgroup analysis of cases with 6 or fewer blocks submitted showed MPRs that ranged from 6.7% to 11.8%. Notably, there were no statistically significant differences in the MPR for cases with 1, 2, 3, 4, 5, or 6 blocks submitted ($P > .50$ for all pairwise comparisons). A separate analysis classified the cases into subgroups of 1 to 2 blocks, 3 to 4 blocks, 5 to 6 blocks, and more than 6 blocks to account for the variability in number of cases (Table 1). The MPRs for these 4 subgroups were 6.8%, 9.0%, 8.5%, and 12.5%, respectively; again, pairwise comparisons showed no statistically significant differences in MPRs between any 2 subgroups. The MPRs for cases with 1 block submitted (10/149 [6.7%]) were not statistically significantly

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different from the MPRs for cases with 2 to 6 blocks submitted (30/363 [8.3%]; $P = .59$).

At the other end of the spectrum, MPRs for cases with 6 blocks submitted (15/190 [7.9%]) were not statistically significantly different from the MPRs for cases with 5 or fewer blocks submitted (25/322 [7.8%]; $P > .99$). Various other iterations, including fewer than 5 blocks vs 5 to 6 blocks vs more than 6 blocks, similarly showed no statistically significant difference in MPR. These findings were confirmed by a Cochran-Armitage test of trend, which did not show any linear trend between increasing block groups and MPR ($P = .88$), as well as Fisher exact tests for the group as a whole, showing no statistically significant association between block groups and MPR ($P = .66$). The block to size ratio was analyzed as approximate deciles (1% to <10%, 10% to <20%, 20% to <30%, 30% to <40%, and ≥40%) (Table 2). The MPR was comparable at all levels of sampling for each category ($P = .72$), and there was no statistically significant linear trend in MPR as a function of block groups ($P = .882$) or block to size ratio. (Cases with 0% to <10% [$n = 15$], 10% to <20% [$n = 12$], 20% to <30% [$n = 8$], 30% to <40% [$n = 2$], and ≥40% [$n = 6$] sampling showed MPRs of 8.2%, 6.3%, 10.3%, 6.9%, and 10.5%, respectively; $P = .39$).

Finally, a binomial logistic regression analysis confirmed that neither block groups (odds ratio, 1.144 [95% CI, 0.794-1.648]; $P = .47$) nor block to size ratio (odds ratio, 1.022 [95% CI, 0.770-1.358]; $P = .88$) showed a statistically significant linear relation to MPR, ($\chi^2_2 = 0.905$, $P = .64$ for model). Overall, within the grossly normal group, increased sampling (number of blocks submitted, block to size ratio, block groups) were not statistically significantly associated with increasing rates of microscopic positivity.

MPRs and number of blocks submitted in the grossly abnormal groups

For grossly abnormal cases, Table 1 shows the MPRs associated with each level of sampling in cases classified as grossly abnormal. The MPRs for the focally abnormal, multifocally abnormal, diffusely abnormal, and multifocally + diffusely abnormal subgroups were 66.4% (93/140), 91.1% (288/316), 96.8% (61/63), and 92.1% (349/379), respectively (Table 3). For the grossly abnormal group as a whole, the MPRs for the 1 to 2 block group (88%), 3 to 4 block group (87.1%), 5 to 6 block group (81.2%) showed no statistically significant differences ($P > .05$ for all pairwise comparisons). The MPRs for the more than 6 blocks group (68.2%) was statistically significantly lower than the other block groups (see "Discussion"). For the grossly abnormal subgroup as a whole, the MPR for 1 block sampled (79.4%) was statistically significantly lower than the MPR for 2 blocks sampled (93.5%) ($P = .001$).

Among the subgroups of grossly abnormal cases, for the focally abnormal subgroup ($n = 140$), there was no statistically significant difference between the MPRs for the 1 to 2 blocks group (70.1%) and those for the 3 to 4 blocks (73.0%) or 5 to 6 block (64.3%) groups (Table 3). The MPR for the more than 6 blocks group (28.6%) was statistically significantly lower than the MPRs for each of the other block groups. For the multifocally abnormal, diffusely abnormal, and diffusely + multifocally abnormal subgroups, there were no statistically significant differences in the MPRs between the block groups. Overall, sampling above the 1 to 2 blocks level was not clearly associable with a statistically significantly higher MPR.

MPRs, primary sites, tumor types, and other variables

Table 4 outlines the distribution of tumoral histotypes in the study cohort and their sites of origin. Overall, 759 (71.9%) cases were tubo-ovarian/peritoneal, 189 (18%) were uterine, and 107 (10.1%) were uterine/adnexal synchronous primaries or metastases involving the gynecologic tract. Gross omental involvement was present in 54.0% of the tubo-ovarian/peritoneal cases in contrast to only 24.3% of the endometrial cases. Similarly, the MPR for the grossly abnormal tubo-ovarian/peritoneal cases (86.8%) was statistically significantly higher than the MPR for the grossly abnormal uterine cases (71.7%, $P = .009$). Accordingly, we separately assessed MPRs for the uterine and tubo-ovarian/peritoneal cases for the various categories of sampling (1-2 blocks, 3-4 blocks, 5-6 blocks, and >6 blocks), with the goal of determining whether different sampling-related conclusions could be reached for each anatomic site. Our results for each of these sites (data not shown) were broadly consistent with the aforementioned findings for the entire cohort (ie, the MPR for 1-2 blocks is not statistically significantly lower than the MPR for 3-4 blocks, 5-6 blocks, or >6 blocks for the uterine and tubo-ovarian/peritoneal subgroups).

In addition, we assessed the effect of 3 variables in cases for which 1 to 2 blocks had been sampled within the grossly normal

Table 2 MPRs Stratified by Block to Size Ratio

MPR						
	Gross Category, n/No. (%)					
Block to size ratio[a]	Normal	Focal	Multifocal	Diffuse	Multifocal + diffuse	Any abnormality
1% to <10%	15/182 (8.2)	45/67 (67.2)	128/142 (90.1)	25/27 (92.6)	153/169 (90.5)	198/236 (83.8)
10% to <20%	12/190 (6.3)	19/33 (57.6)	88/96 (91.7)	21/21 (100)	109/117 (93.2)	128/150 (85.3)
20% to <30%	8/78 (10.3)	17/23 (73.9)	35/37 (94.6)	5/5 (100)	40/42 (95.2)	57/65 (87.7)
30% to <40%	2/29 (6.9)	4/5 (80.0)	12/13 (92.3)	5/5 (100)	17/18 (94.4)	21/23 (91.3)
≥40%	6/57 (10.5)	8/12 (66.7)	25/28 (89.3)	5/5 (100)	30/33 (90.9)	38/45 (84.4)
Total	43/536 (8.0)	93/140 (66.4)	288/316 (91.1)	61/63 (96.8)	349/379 (92.1)	442/519 (85.16)

Abbreviation: MPR, microscopic positivity rate.
[a]Percentages are computed based on the total number of blocks divided by the single widest dimension of the omental size.

Table 3 Grossly Abnormal Subgroups: MPR

Focal						
		1-2 blocks (n = 75)	3-4 blocks (n = 37)	5-6 blocks (n = 14)	>6 blocks (n = 14)	Total n = 140
	MPR, %	70.1	73.0	64.3	28.6	66.4
Multifocal						
		1-2 blocks (n = 142)	3-4 blocks (n = 99)	5-6 blocks (n = 48)	>6 blocks (n = 27)	Total (n = 316)
	MPR, %	95.8	89.9	83.3	85.2	91.1
Diffuse						
		1-2 blocks (n = 34)	3-4 blocks (n = 19)	5-6 blocks (n = 7)	>6 blocks (n = 3)	Total (n = 63)
	MPR, %	94.1	100	100	100	96.8
	MPR, %	1 block: 85	2 blocks: 96	3 blocks: 100	4 blocks: 100	
Multifocal + diffuse						
		1-2 blocks (n = 176)	3-4 blocks (n = 118)	5-6 blocks (n = 55)	>6 blocks (n = 30)	Total (n = 379)
	MPR, %	95.5	91.5	85.45	86.7	92.1

Abbreviation: MPR, microscopic positivity rate.

group and found no statistically significant differences in MPR between uterine and tubo-ovarian/peritoneal primaries (P = .34), cases in which the omentum's widest dimension was less than the cohort median size vs equal to or greater than the cohort median size (P = .63), and cases associated and not associated with neoadjuvant chemotherapy (P = .41). Subset analyses restricted to grossly normal cases of tubo-ovarian/peritoneal origin (n = 349) showed that the MPR for cases with 1 to 2 blocks submitted within the neoadjuvant chemotherapy–positive group was 19.0% (4/21) compared with 3.8% (4/104) in the neoadjuvant chemotherapy–negative group (P = .03). Further analysis of the same subset (grossly normal, tubo-ovarian/peritoneal origin) showed that within the neoadjuvant chemotherapy–positive group, the MPR for 1 to 2 blocks (4/21 [19.0%]) was not statistically significantly different than the MPR for 3 to 4 blocks (3/42 [7.1%]; P = .21), 5 to 6 blocks (7/94 [7.4%]; P = .20), and more than 6 blocks (2/18 [11.1%]; P = .67).

DISCUSSION

In the current analysis, the authors report findings from the largest study to date exploring the appropriate level of omentum sampling in neoplasms that involve the female genital tract, inclusive of grossly normal and abnormal omenta. Relatively few current guidelines are based on primary published data regarding the optimal sampling of grossly normal cases. The 2017 Royal College of Pathologists (RCP) dataset for histologic reporting of endometrial cancer recommends submitting 2 to 4 blocks "based on accepted current practice."[17] The RCP's 2025 "best practice recommendations," citing Doig and Monaghan,[14] note that if the omentum is grossly normal and "the ovary is malignant or borderline on gross inspection or histological examination," "thorough sampling is needed" of the omentum.[18] The 2019 endometrial cancer recommendations from the International Society of Gynecologic Pathologists (ISGyP) call for the submission of "1 representative section per 2 or 3 cm of maximal omental dimension or at least a total of 4 blocks of tissue"[19] when the omentum is grossly normal, citing the aforementioned RCP guidelines[17] and Usubutun et al.[15] The 2022 recommendations from the International Collaboration on Cancer Reporting on endometrial cancer endorsed the ISGyP statement, calling for "at least 4 blocks" to be submitted when the omentum is grossly negative.[20,21] Widely used textbooks on grossing give similarly variable recommendations.[22,23] Westra et al,[22] for example, note that "5 representative sections are usually sufficient, although some authorities recommend up to 10 sections." This absence of standardized recommendations has in turn resulted in variability at the institutional level, as evidenced by our review of a sampling of publicly available gross manuals, with some institutions making a distinction between the sampling necessary for grossly normal omentum when the primary is tubo-ovarian (10 sections) vs endometrial (4 sections), and a general variability in the number of sections that these manuals state should be submitted in this setting.[24,25]

In the current analysis of a large cohort, we could not identify a clear evidentiary basis for submitting more than 1 to 2 sections when the omentum is grossly normal. Using the specific framework of this study (block groups, block to size ratio, and number of blocks submitted), we did not find that sampling above 1 to 2 sections was associated with a statistically significantly higher rate of microscopic positivity. Omenta from patients after neoadjuvant chemotherapy may represent a group of cases with distinctive findings that require special handling. For grossly normal omenta associated with neoplasia of tubo-ovarian/peritoneal origin, the MPR for cases with 1 to 2 blocks submitted within the neoadjuvant chemotherapy–positive group was statistically significantly higher than the MPR for cases in the neoadjuvant chemotherapy–negative group (P = .027). This finding raises the possibility that post–neoadjuvant chemotherapy

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Table 4 Histologic Types, Presence of Omental Abnormality, and MPRs

Primary site and histologic type	Cases, No.	Cases with gross omental abnormality, No. (%)	Microscopically positive, No.	MPR for grossly abnormal cases, %	MPR for grossly normal cases, %
Ovary, fallopian tube, and peritoneum					
Serous carcinoma	412	312 (75.7)	297	95.2	22.0
Borderline tumor	117	20 (17.1)	7	35.0	3.1
Others	76	28 (36.8)	15	53.6	4.2
Low-grade endometrioid carcinoma	40	3 (7.5)	1	33.3	0
Sex cord stromal tumor	30	7 (23.3)	3	42.9	0
Clear cell carcinoma	19	4 (21.1)	4	100	0
Mixed carcinoma	19	6 (31.6)	3	50.0	23.1
Carcinosarcoma	18	13 (72.2)	12	92.3	0
Undifferentiated/poorly differentiated carcinoma	14	11 (78.6)	10	91.0	0
High-grade endometrioid carcinoma	13	5 (38.5)	4	80.0	0
Sarcoma	1	1 (100)	0	0	—
Subtotal	759	410 (54)	356	86.8	8.6
Uterus					
Serous carcinoma	49	13 (26.5)	10	76.9	8.3
Low-grade endometrioid carcinoma	45	6 (13.3)	2	33.3	2.6
High-grade endometrioid carcinoma	24	6 (25)	3	50.0	5.6
Carcinosarcoma	24	7 (29.2)	7	100	5.9
Mixed carcinoma	17	4 (23.5)	4	100	0
Sarcoma	11	3 (27.3)	2	66.7	0
Others	8	5 (62.5)	3	60.0	0
Clear cell carcinoma	7	1 (14.3)	1	100	16.7
Undifferentiated/poorly differentiated carcinoma	4	1 (25)	1	100	33.3
Subtotal	189	46 (24.3)	33	71.7	5.6
Metastatic	89	60 (67.4)	50	83.3	17.2
Synchronous	18	3 (16.7)	3	100	0
Total	1055	519 (49.2)	442	85.2	8.0

Abbreviation: MPR, microscopic positivity rate.

cases are more likely to appear grossly normal but still harbor microscopic disease.[26] Within the neoadjuvant chemotherapy–positive group of the same subset, the MPR for 1 to 2 blocks was not statistically significantly different than the MPR for 3 to 4 blocks, 5 to 6 blocks, or more than 6 blocks. These analyses were limited by small cohort sizes, however, and accordingly, more extensive sampling of the omentum may be necessary in the post–neoadjuvant chemotherapy setting, at least until the question can be specifically evaluated with larger datasets. For cases wherein the omentum is grossly abnormal in an unequivocal manner, prior studies appeared to show a broad-based consensus that 1 to 2 sections are sufficient.[17-23] Our findings largely validate this guideline. When our multifocally abnormal and diffusely abnormal groups are combined, the MPR was 95.5% at the 1 to 2 block sampling level and was not statistically significantly increased by higher levels of sampling. Our study also assessed, for the first time, the significance of "focal" abnormality, wherein there is a discrete abnormality in an otherwise unremarkable omentum. This group represented a substantial proportion of our cohort: 27% (140/519) of grossly abnormal cases and 13% (140/1055) of all cases. The overall MPR for the focally abnormal group was 66.4%, indicative of a statistically significant false-positive rate. There was no statistically significant difference between the MPR for the 1 to 2 block group (70.1%) and that of either the 3 to 4 block (73%) or the 5 to 6 block (64.3%) groups. The MPR for the more than 6 blocks group (28.6%) was statistically significantly lower than each of the other block groups. This finding may reflect the wide variety of gross aberrations that can plausibly be described as focally abnormal, large subsets of which are ultimately found to be devoid of microscopic abnormality. Similarly, cases with extensive sampling (>6 blocks) may overrepresent such cases because the prosector may be sampling them as though they are grossly normal if the gross abnormality is perceived to be equivocal. This group is arguably "intermediate" between the unequivocally grossly normal and abnormal cases and as such is most likely to show heterogeneity regarding what is considered focal abnormality. Future studies are required to further assess the question.

In the present analysis, the gross appearance of the omentum compared with its microscopically determined tumor-positive vs tumor-negative status was found to have an overall agreement of 85% (the "any abnormality" standard), representing the accuracy of gross assessment. This finding is less than the 97.1% and 97.3% accuracies previously reported in the studies of Doig and Monaghan[14] and Usubutun et al,[15] respectively. The discrepancy can be explained by a myriad of factors associated with differences in study design. For example, only ovarian cases were part of the studied cohort in Doig and Monaghan,[14] including benign tumors that inherently overrepresent the true-negative component of the accuracy analysis. Previous studies also variably excluded cases that were reportedly "fibrosed," several histotypes of ovarian neoplasia, uterine tumors, and metastatic tumors.[14-16] Our analysis included all cases, regardless of the presence or degree of omentum abnormality, and was centered on malignancies and borderline tumors. This approach reflects the practical reality that mass-forming involvement of the gynecologic tract, particularly the ovaries, may not have a clear histopathologic diagnosis at the time of grossing, but the associated omentum specimens are nevertheless grossed and sampled similar to those that do. Most importantly, a standard of "any abnormality" includes every level of gross abnormality, from focal (lower MPR) to diffuse (higher MPR); the latter standard was used in most prior studies and, if applied exclusively in the current study, would have resulted in an MPR of close to 97%. More generally, the findings in this study highlight the statistical significance of gross assessment in omentum sampling but also clearly demonstrates that the predictive ability of gross abnormalities for microscopically confirmed disease is imperfect.

There are some potential limitations associated with this study, most of which are inherent to its retrospective design, that should be considered in any conclusions that are ultimately drawn from it. Most notably, study cases were based on a review of pathology reports that were generated over a more than 20-year period, and as such, necessarily included descriptions from a spectrum of prosectors at widely varying levels of professional development, ranging from junior residents and pathologist assistant students to experienced pathologist assistants. There was likely some heterogeneity and interobserver variability regarding the presence, extensiveness, and descriptions of specific abnormalities. Our analysis presumed appropriate sectioning and evaluations by a multitude of individuals over a long period. Imbalances associated with the number of cases in each block group highlighted the aforementioned variability in practice inherent to the retrospective nature of the analysis. Furthermore, a block to size ratio for larger omenta may not reflect a perfectly proportionally increased level of sampling compared with smaller omenta. Future studies that mitigate these potential limitations would be prospective, submit a fixed number of blocks regardless of gross abnormality, and have cases be grossed by a single or limited group of prosectors. The strengths of this study include its large size, focus of malignancies and borderline tumors, and multifaceted examination of the issue.

In summary, our study suggests that in the setting of neoplasia involving the female genital tract, when an omentum has been appropriately sectioned, examined, and concluded to be grossly normal or multifocally/diffusely abnormal, submitting 1 to 2 sections results in an MPR that is not significantly lower than the MPR for the specific higher levels of sampling that were assessed herein, which suggests that any additional information obtained from such higher levels of sampling are limited. Future studies using data from different practice settings and different patient populations are required to further evaluate the question.

Conflicts of interest

The authors declare no conflict of interest.

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