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Clinical analysis of high risk factors for pelvic malignant tumors after hysterectomy for benign diseases

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Abstract

To analyze the clinicopathological characteristics of pelvic masses after hysterectomy for benign diseases, and to analyze the related factors of benign and malignant pelvic masses.

This study retrospectively analyzed the patients undergone reoperation for pelvic mass subsequently to hysterectomy for benign disease from January 2012 to December 2016 in Peking Union Medical College Hospital.

A total of 247 patients were enrolled in this study, of which 34.01% were diagnosed with malignant tumors, and 65.99% benign tumors. Comparing the clinicopathological data of patients with benign and malignant pelvic masses, significant differences were found between the 2 groups with regard to their ages of having hysterectomy and pelvic mass resection, and the time intervals between the onset of pelvic mass and hysterectomy. In addition, patients with malignant masses tended to complain of abdominal distension and abdominal pain, while most of those with benign masses were diagnosed during physical examination. Patients with malignant pelvic masses had medical imagines of mixed masses, extraovarian derivation, as well as elevated carbohydrate antigen-125 (CA 125). Multivariate analysis showed that ages of having hysterectomy, physical examination results, abnormal defecation, cystic and solid masses, and elevated CA 125 level were independent risk factors for benign and malignant pelvic masses.

For patients having pelvic masses following hysterectomy for benign diseases, if they had hysterectomy later in their lives, and their masses were not found during physical examination, and had abnormal defecation, mixed cystic solid mass as well as elevated serum CA 125, it is suggested that special attention should be paid to the possibility of malignant tumors.

Abbreviation: CA 125 = carbohydrate antigen-125.

Keywords: diagnosis, hysterectomy, malignant tumors, pelvic mass

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1. Introduction

Hysterectomy is the most common gynecological operation and is also considered as the final treatment of many common gynecological diseases, such as uterine fibroids, adenomyosis, endometrial intraepithelial neoplasia, and high grade cervical intraepithelial neoplasia. Researchers find that the incidence of pelvic mass after hysterectomy is as high as 50.7%, and 2.7% to 5.5% of the patients need reoperation.[1,2] However, there are only few relevant researches available.[3,4] This study reviewed the medical records of patients who had undergone surgery for pelvic masses after hysterectomy in Peking Union Medical College Hospital. The medical history and clinical features of patients with malignant masses were analyzed to assist the preoperative differential diagnosis of benign and malignant pelvic masses, to provide a basis for clinically early detection and treatment of high-risk patients with malignant tumors, and also to avoid unnecessary reoperations for benign pelvic masses, thus promoting clinical safety.

2. Methods and materials

2.1. Ethics

This study was approved by the Ethics Committee of Peking Union Medical College Hospital (No. S-K331).

2.2. Patients

ICD-9 disease code was used to identify patients who underwent surgeries in Peking Union Medical College Hospital for pelvic masses after hysterectomy due to benign disease from January 2012 to December 2016.

Inclusion criteria: Patients with clearly identified history of hysterectomy due to gynecological benign disease and underwent reoperation for pelvic mass during the required time period were included.

Exclusion criteria: Patients who underwent surgery for pelvic mass but had no history of hysterectomy, who had a uterine pathology of malignant tumors, and those whose surgery of pelvic mass was not performed in the specified period were excluded from the study.

Medical staff collected the medical records of patients enrolled in detail, including the ages of hysterectomy and the indications, the ages of the pelvic mass onset, the time intervals from the hysterectomy to the onset of pelvic mass, the oviduct or ovary being resected or remained in previous surgery, the main manifestations and imaging features at the time of pelvic mass onset, and the pathological types of the pelvic mass. According to the pathology of the pelvic mass, the patients were divided into benign group and malignant group. The clinicopathological characteristics of the 2 groups were compared and analyzed.

2.3. Statistics

The statistical analyses were performed using SPSS 23.0 (SPSS Inc., Chicago, IL). It was taken as a reference whether the pathology of pelvic mass was benign or malignant, and ROC curve was used to group the age of hysterectomy (<44 vs ≥44 years), the age of the operation for pelvic mass (<51 vs ≥51 years), and the time interval from the hysterectomy to the onset of pelvic mass (<7 vs ≥7 years) (Table 1). Continuous variables were summarized with medians and interquartile ranges (IQRs).

Table 1

Demographics data of patients with pelvic mass after hysterectomy.

	Number of cases	Percentage, %
Total number	247	
Total/subtotal hysterectomy		
Total hysterectomy	211	85.43
Subtotal hysterectomy	36	14.57
Unilateral/bilateral salpingectomy/salpingo-oophrectomy		
Hysterectomy	198	80.16
Hysterectomy + BS	14	5.67
Hysterectomy + USO	32	12.96
Hysterectomy + BSO	3	1.21
Surgical approach for hysterectomy		
Abdominal	204	82.59
Laparoscopy	29	11.74
Transvaginal	13	5.26
Unknown	1	0.41
Age at hysterectomy (median [IQR]; range, y)	43[(40,46), (22–59)]	
<44	125	50.61
≥44	122	49.39
Age of surgery for pelvic mass (median [IQR]; range, y)	50[(47,57), (30–79)]	
<51	127	51.42
≥51	120	48.58
The time interval from the hysterectomy to the pelvic mass onset (median [IQR]; range, y)	5[(2,10) (0.1–37)]	
<7	148	59.92
≥7	99	40.08
Pathology of hysterectomy		
Uterine leiomyoma	155	62.75
Adenomyosis	57	23.08
Endometriosis	31	12.55
Cervical intraepithelial neoplasia	12	4.86
Endometrial intraepithelial neoplasia	5	2.02
Vaginal massive hemorrhage	3	1.21
Cystic mole	2	0.81
Ovarian borderline mucinous adenoma	1	0.41
Unknown benign disease	29	11.74
Manifestation for medical consultation		
Physical examination findings	130	52.63
Abdominal pain	57	23.08
Abdominal distension and anorexia	41	16.59
Micturition	9	3.64
Abnormal bowel movements (habitual changes, bloody stools, painful stools)	7	2.83
Vaginal flow or bleeding	5	2.02
Palpation by oneself	3	1.21
Lower limb pain	2	0.81
Palpitation and shortness of breath	2	0.81
Unknown	4	1.62
Nature of pelvic mass		
Cystic	137	55.47
Solid	34	13.77
Mixed cystic solid	65	26.32
Unknown	11	4.45
Side		
Unilateral	139	56.27
Bilateral	30	12.15
Outside the ovary	72	29.15
Unknown	6	2.43
CA 125 (median ± SD; range)	20[(10.6, 67.5),(1–6000)]	
Normal range	150	60.72
Elevated	71	28.74
Undetected	26	10.52

BS = bilateral salpingectomy, BSO = bilateral salpingo-oophrectomy, CA 125 = carbohydrate antigen-125, IQR = interquartile range, SD = standard deviation, USO = unilateral salpingo-oophrectomy.

Table 2

Histological derivation and pathological distribution of pelvic malignant tumors after hysterectomy.

		Number of cases	Percentage, %
Site	Pathology	84	
Ovarian derived		64	76.19
	Serous carcinoma	32	38.10
	Mucous carcinoma	9	10.71
	Endometrioid carcinoma	6	7.14
	Clear cell carcinoma	4	4.76
	Sarcoma	3	3.57
	Undifferentiated carcinoma	2	2.38
	Primary PNET	1	1.19
	Granulocytoma	1	1.19
	Other uncertain classification	6	7.14
Peritoneal derived		4	4.76
	Serous adenocarcinoma	3	3.57
	Leiomyosarcoma	1	1.19
Pelvic extraovarian		11	13.10
	Leiomyosarcoma	6	7.14
	Endometrial stromal sarcoma	2	2.38
	Adenocarcinoma	2	2.38
	Malignant mesenchymal tumors with epithelial differentiation	1	1.19
Vaginal stump	Squamous cell carcinoma	2	2.38
Others		3	3.57
	Gastrointestinal stromal tumors	1	1.19
	Rectal adenocarcinoma	1	1.19
	Metastatic carcinoma	1	1.19

PNET = primitive neuroectodermal tumor.

Two groups were analyzed by independent *t* test, and multiple groups were analyzed by one-way ANOVA. The categorical variables were summarized with a rate, and chi-square test or Fisher exact test was used to perform analysis. Variables with $P < .05$ by univariate analysis were included in multivariate analysis, and logistic regression model was used for fitting with $P < .05$ being considered significance. All analyses were 2-sided, and significance was set at a $P < .05$.

3. Results

3.1. Demographics data of study population

Our study included 247 patients. The age range at the time of hysterectomy was 22 to 59 years old with 4 postmenopausal women, and the median age (quartile) was 43 (40, 46) years. Pathological diagnosis after hysterectomy showed that 62.75% of the cases (n = 155) were uterine leiomyoma, 23.08% (n = 57) adenomyosis, and 12.55% (n = 31) endometriosis. The median (quartile) age of surgery for pelvic mass was 50 (47, 57) years old, and the median time interval from hysterectomy to the onset of pelvic mass was 5 years. Referring to the chief complaints for pelvic mass, more than half of the patients found the pelvic mass incidentally by physical examination (52.63%), and the common manifestations were abdominal pain (23.08%), abdominal distension and anorexia (16.59%). A total of 55.47% of the patients had cystic mass, among which 13.77% were solid, 26.32% were mixed cystic solid mass, 56.27% were unilateral, 12.15% were bilateral, and 29.15% were derived outside the ovary. Referring to the tumor marker, 28.74% of patients had elevated serum carbohydrate antigen-125 (CA 125).

3.2. Pathology of the pelvic mass

Of the total 247 patients, 34.01% (n = 84) were diagnosed with malignant tumors confirmed by pathology, of which ovarian carcinoma accounted for 76.19%, peritoneal derived accounted for 4.76%, pelvic extraovarian derived accounted for 13.10%, vaginal stump cancers 2.38%, and the remaining 3.57% derived from gastrointestinal tract. A total of 82.81% (53/64) of ovarian carcinoma are ovarian epithelial carcinoma, of which serous carcinoma accounted for 60.38% (32/53), mucinous carcinoma 16.98% (9/53), endometrioid carcinoma 11.32% (6/53), and clear cell carcinoma 7.55% (4/53) (Table 2). A total of 65.99% (n = 163) out of the total 247 patients were diagnosed with benign tumors confirmed by pathology, of which 67.48% arose from ovary, 19.02% from fallopian tube, inflammation accounted for 12.27%, and cervical derived cases accounted for 3.07%, and other sources in the pelvic cavity accounted for 3.68%. It is worth emphasizing that the 16 patients with benign tumors had more than one pathological type. Among the benign ovarian diseases, endometriosis accounted for 31.82% (35/110), physiological cysts accounted for 23.64% (26/110), serous cystadenoma accounted for 19.09 (21/110), and mucinous cystadenoma accounted for 16.36% (18/110). A total of 64.52% (20/31) of fallopian tube deviation masses were hydrosalpinx, 25.81% (8/31) were mesenchymal cyst of oviduct, and 9.68% (3/31) were ovarian oviduct abscess. All of the inflammatory masses were encapsulated effusions (Table 3).

Table 3

Histological derivation and pathological distribution of pelvic benign tumors after hysterectomy.

		Number of cases	Percentage, %
Site	Pathology	163	
Ovarian derived		110	67.48
	Endometriosis	35	21.47
	Physiological cysts	26	15.95
	Serous cystadenoma	21	12.88
	Mucinous cystadenoma	18	11.04
	Fibroma	5	3.07
	Teratoma	3	1.84
	Epidermoid cyst	2	1.23
Fallopian tube		31	19.02
	Hydrosalpinx	20	12.27
	Mesenchymal cyst of oviduct	8	4.91
	Ovarian oviduct abscess	3	1.84
Inflammation	Encapsulated effusion	20	12.27
Cervix derived		5	3.07
	Cervical leiomyoma	4	2.45
	Cervical intraepithelial neoplasia grade 2	1	0.61
Pelvic		6	3.68
	Intravascular leiomyomatosis	4	2.45
	Pelvic leiomyoma	2	1.23
Arising from other organs		7	4.29
	Vaginal stump endometriosis	2	1.23
	Retroperitoneal neurogenic fibroma	1	0.61
	Inflammatory myofibroblastoma	1	0.61
	Mucous cystadenoma of appendix	1	0.61
	Pseudomyxoma peritonei	1	0.61
	Tuberculous peritonitis	1	0.6

Sixteen patients with benign tumors have 2 kinds of pathological type.

3.3. Comparison of preoperative clinical features of benign and malignant pelvic masses

When comparing the clinical characteristics of patients with benign and malignant pelvic masses, univariate risk analysis showed that the median age of hysterectomy in malignant group was older than that in benign group (median [IQR], 45.0 [41.0, 48.0] vs 43.0 [39.0, 45.0], $P=.0015$), and more patients in malignant group were over 44 years old (included). Their ages at the pelvic mass surgery were also older (median [IQR], 53.0 [49.5, 59.5] vs 49.0 [46.0, 54.0], $P<.001$). According to the ROC curve, more patients in malignant group were over 51 years old (included). The median interval between hysterectomy and the onset of pelvic mass was longer in malignant group than benign group (median [IQR], 7.0 [3.0, 11.5] vs 4.0 [1.0, 9.0], $P=.004$). Time grouping showed that more patients had time intervals of over 7 years in malignant group. Referring to the chief complaints of clinical visit, less patients in the malignant group were diagnosed through physical examination (21.43% vs 66.26%, $P<.001$). On the contrary, more patients in malignant group had abdominal distension and abnormal defecation than in benign group (34.52% vs 6.13%, $P<.001$; 10.71% vs 0.61%, $P<.001$). In malignant group, imaging tended to be mixed echo masses (51.19% vs 14.11%, $P<.001$) and the pelvic masses inclined to derive from extraovarian sites (35.71% vs 23.93%, $P<.001$). Preoperative CA 125 elevation was also significantly higher in malignant group (55.95% vs 12.27%, $P<.001$). There were no significant differences between benign and malignant groups referring to the surgical approaches, etiology of hysterectomy, total hysterectomy or subtotal hysterectomy, and simultaneous resection of fallopian tube or adnexa (Table 4).

In terms of the risk of ovarian malignant tumors, the results of this study showed that there was no significant difference between patients who only had hysterectomy and those who had resection of fallopian tubes at the same time (25.13% vs 29.03%, $P=1.0$). There was no significant difference in the incidence of ovarian serous cancer between them either (13.37% vs 15.15%, $P=.784$).

Multivariate analysis showed that the following are independent risk factors for subsequent benign and malignant pelvic masses: the age of hysterectomy (OR [95% CI], 3.88 [1.2–12.59], $P=.0239$), physical pelvic mass found through physical examination (OR [95% CI], 95% CI, 0.21 [0.07–0.64], $P=.0061$), abnormal defecation (OR [95% CI], 15.65 [1.12–219.5], $P=.0412$), mixed cystic solid mass of imaging (OR [95% CI], 5.13 [1.74–15.11], $P=.003$), and elevated serum CA 125 (OR [95% CI], 8.48 [3.05–23.61]; $P<.001$) (Table 5).

4. Discussion

Hysterectomy is one of the commonly used surgical methods for gynecological benign diseases, such as uterine fibroids, adenomyosis, severe endometriosis, endometrial, and cervical intraepithelial neoplasia. The diagnosis of pelvic masses is often difficult for patients who retain adnexa or ovaries after hysterectomy. Reoperation is under increased surgical risks due to previous surgical adhesion, anesthesia, and previous surgical etiology (eg, recurrence of endometriosis).[5–7] A small sample study in Pakistan reported that 19 out of 43 women with pelvic masses following total hysterectomy needed surgical treatment. The incidence of complications increased when there is a reoperation. Two cases had bowel injury, 2 cases had wound infection, and 1 had deep venous thrombosis.[4] Therefore, if we consider pelvic mass being encapsulated effusion or some other benign tumors, such as recurrence of ovarian cysts, we can consider carrying out nonsurgical treatment to reduce surgical complications, like regular observation, drug therapy, or ultrasound-guided puncture. However, proper treatment of malignant tumors may be delayed without definite pathology. There are few domestic and abroad reports on this clinical issue.[3,4] In this study, 247 patients with pelvic masses after hysterectomy due to gynecological benign diseases were analyzed for the clinical characteristics of benign and malignant pelvic masses. It is hoped that we can have a better understanding of the pathogenic characteristics, clinical characteristics, and the relation between the medical history and treatment methods for the patients with malignant tumors, which can help clinicians make more timely and accurate clinical decisions.

The proportions of simple hysterectomy, hysterectomy with unilateral adnexa, hysterectomy with bilateral fallopian tubes, and hysterectomy with bilateral adnexa in our study are similar to those of Shiber et al (80.16%, 12.96%, 5.67%, and 1.21% respectively in the former one; 76%, 17.6%, 4%, and 2.4% respectively in the latter one).[3] Shiber et al revealed that 82% of pelvic masses following hysterectomy are benign, and 18% were malignant. A total of 64.8% of the masses were ovarian origin, accounting for 63.4% of benign masses and 80% of malignant masses.[3] In this study, 65.99% of the patients had benign masses and 34.01% had malignant tumors. A total of 70.45% of the masses were ovarian origin, accounting for 63.22% of benign masses and 36.78% of malignant masses. Therefore, the proportion of benign and malignant masses and the proportion of benign and malignant masses derivate from ovary are similar in the 2 studies.

This study is the first one to compare the clinical data of patients with benign and malignant pelvic masses following hysterectomy. Univariate risk analysis showed that the median age of hysterectomy in malignant group was older than that in benign group (45.0 vs 43.0 years, $P=.0015$), and 61.90% of the patients in malignant group underwent hysterectomy after 44 years old (included). The median age of pelvic mass resection was also older in malignant group than that in benign group (53.0 vs 49.0 years, $P<.001$), and 69% of the patients in malignant group underwent pelvic mass resection after 51 years old (included). In addition, the median time interval between hysterectomy and onset of pelvic mass was longer in malignant group (7.0 vs 4.0 years, $P<.004$), and 58.33% of the patients in malignant group had surgical time intervals of more than 7 years. Therefore, we should be particularly vigilant against malignant tumors in patients with older ages of hysterectomy, older ages of pelvic mass resection, and longer intervals between 2 surgeries. In addition, the results of this study also suggest that more patients in malignant group had abdominal distension and abnormal defecation (34.52% vs 6.13%, $P<.001$; 10.71% vs 0.61%, $P=.0001$), while fewer patients had been found by physical examination (21.43% vs 66.26%, $P<.001$). Thus, it suggests that regular physical examination and early detection of pelvic mass followed by subsequent treatment may be beneficial to reduce advanced malignant tumors. Also, malignant tumors should be actively screened for patients with abnormal manifestations of gastrointestinal tract mentioned above. What is more, in accordance with the current consensus, the preoperative imaging of malignant pelvic masses tended to be mixed echo masses (51.19% vs 14.11%, $P<.001$), but it should not be neglected that 22.62% of the patients with malignant

Table 4

Univariate analysis of clinical characteristics of patients with benign or malignant pelvic mass after hysterectomy.

		Benign, %	Malignant, %	*P* value
		163 (65.99)	84 (34.01)	
Total/subtotal hysterectomy				.7732
Total hysterectomy		140 (85.89)	71 (84.52)	
Subtotal hysterectomy		23 (14.11)	13 (15.48)	
Unilateral/bilateral salpingectomy/salpingo-oophrectomy				.075
Hysterectomy		135 (84.66)	63 (75.00)	
Hysterectomy + BS		8 (4.91)	6 (7.14)	
Hysterectomy + USO		20 (12.27)	12 (14.29)	
Hysterectomy + BSO		0 (0)	3 (3.57)	
Surgical approach for hysterectomy				.6394
Abdominal		138 (84.66)	70 (83.33)	
Laparoscopy		17 (10.43)	9 (10.71)	
Transvaginal		6 (3.68)	5 (5.95)	
Unknown		2 (1.23)	0 (0)	
Age of hysterectomy (median [IQR])		43.0 (39.0,45.0)	45.0 (41.0,48.0)	**.0015**
<44		93 (57.06)	32 (38.10)	**.0048**
≥44		70 (42.94)	52 (61.90)	
Age of resection of pelvic mass (median [IQR])		49.0 (46.0,54.0)	53.0 (49.5,59.5)	<**.0001**
<51		101 (62.00)	26 (31.00)	<**.0001**
≥51		62 (38.00)	58 (69.00)	
Time interval between hysterectomy and pelvic mass onset, y		4.0 (1.0,9.0)	7.0 (3.0,11.5)	**.004**
<7		113 (69.33)	35 (41.67)	<**.0001**
≥7		50 (30.67)	49 (58.33)	
Pathology of hysterectomy				
Uterine leiomyoma	No	64 (39.26)	28 (33.33)	.3611
	Yes	99 (60.74)	56 (66.67)	
Adenomyosis	No	126 (77.3)	67 (79.76)	.6575
	Yes	37 (22.70)	17 (20.24)	
Endometriosis	No	143 (87.73)	73 (86.90)	.8529
	Yes	20 (12.27)	11 (13.10)	
Cervical intraepithelial neoplasia	No	155 (95.09)	80 (95.24)	.9597
	Yes	8 (4.91)	4 (4.76)	
Vaginal massive hemorrhage at delivery	No	160 (98.16)	84 (100)	.2109
	Yes	3 (1.84)	0 (0)	
Endometrial complex hyperplasia or intraepithelial neoplasia	No	161 (98.77)	81 (96.43)	.2152
	Yes	2 (1.23)	3 (3.57)	
Ovarian borderline mucinous adenoma	No	162 (99.39)	84 (100)	.4719
	Yes	1 (0.61)	0 (0)	
Cystic mole	No	163 (100)	82 (97.62)	**.0479**
	Yes	0 (0)	2 (2.38)	
Unknown benign disease	No	145 (88.96)	70 (83.33)	.2125
	Yes	18 (11.04)	14 (16.67)	
Manifestation for medical consultation				
Physical examination findings	No	55 (33.74)	66 (78.57)	<**.0001**
	Yes	108 (66.26)	18 (21.43)	
Abdominal distension and anorexia	No	153 (93.87)	55 (65.48)	<**.0001**
	Yes	10 (6.13)	29 (34.52)	
Abnormal bowel movements	No	162 (99.39)	75 (89.29)	**.0001**
	Yes	1 (0.61)	9 (10.71)	
Abdominal pain	No	128 (78.53)	59 (70.24)	.1501
	Yes	35 (21.47)	25 (29.76)	
Micturition	No	157 (96.32)	77 (91.67)	.1208
	Yes	6 (3.68)	7 (8.33)	
Lower limb pain	No	163 (100)	82 (97.62)	**.0479**
	Yes	0 (0)	2 (2.38)	
Vaginal flow or bleeding	No	159 (97.55)	83 (98.81)	.5041
	Yes	4 (2.45)	1 (1.19)	
Palpitation and shortness of breath	No	161 (98.77)	83 (100)	.3109
	Yes	2 (1.23)	0 (0)	
Palpation by oneself	No	163 (100)	82 (97.62)	.0479
	Yes	0 (0)	2 (2.38)	

(*continued*)

Table 4

(continued).

		Benign, %	Malignant, %	*P* value
Unknown	No	160 (98.77)	79 (94.05)	**.0348**
	Yes	2 (1.23)	5 (5.95)	
Nature of pelvic mass				**<.0001**
Cystic		119 (73.01)	19 (22.62)	
Solid		18 (11.04)	15 (17.86)	
Mixed cystic solid		23 (14.11)	43 (51.19)	
Soft tissue shadow (+unknown) (−unknown)		3 (1.84)	7 (8.33)	
Side				**<.0001**
Unilateral		104 (63.80)	35 (41.67)	
Bilateral		19 (11.66)	11 (13.1)	
Other resources (outside the ovary)		39 (23.93)	30 (35.71)	
Unknown		1 (0.61)	8 (9.52)	
CA 125 (median [IQR], U/mL)		15.7 (25,75)	205.7 (21.7,876.7)	**<.0001**
Normal range		129 (79.14)	19 (22.62)	**<.0001**
Elevated		20 (12.27)	47 (55.95)	
Unknown		14 (8.59)	18 (21.43)	

Abnormal bowel movements including changes of habits, bloody stools, and painful stools. BS = bilateral salpingectomy, BSO = bilateral salpingo-oophrectomy, CA 125 = carbohydrate antigen-125, IQR = interquartile range, USO = unilateral salpingo-oophrectomy.

masses still had cystic masses.[8–10] We should also pay attention to the extraovarian mass as indicated by imaging, because this was more common in malignant patients (35.71% vs 23.93%, $P < .001$). Preoperative elevated serum CA 125 was also significantly common in malignant group (55.95% vs 12.27%, $P < .001$; 205.7 vs 15.7 U/mL, $P < .001$). Therefore, we should also pay attention to the elevated CA 125 level in these patients. There were no significant differences between benign and malignant groups, referring to the surgical approaches (abdominal/laparoscopic/transvaginal), etiology of hysterectomy, total hysterectomy or subtotal hysterectomy, and simultaneous resection of fallopian tube or adnexa.

Table 5

Multivariate analysis of clinical characteristics of patients with benign or malignant pelvic mass after hysterectomy.

Parameter	OR (95%CI)	*P* value
Intercept		<.0001
Age group of hysterectomy (<44 vs ≥44)	3.88 (1.2–12.59)	**.0239**
Age group of resection of pelvic mass (<51 vs ≥51)	1.71 (0.44–6.58)	.437
Time interval between hysterectomy and pelvic mass onset 2–1	3.06 (0.95–9.84)	.0608
Extent of surgery 2–1		
Hys + BS vs Hys	3.25 (0.4–26.8)	.2727
Hys + USO vs Hys	1.03 (0.27–3.94)	.9645
Hys + BSO vs Hys	/	.993
Physical examination findings	0.21 (0.07–0.64)	**.0061**
Abdominal distension and anorexia	2.12 (0.49–9.27)	.3183
Abnormal bowel movements	15.65 (1.12–219.5)	**.0412**
Nature of pelvic mass		
Solid vs cystic	2.4 (0.58–9.96)	.229
Mixed cystic solid vs cystic	5.13 (1.74–15.11)	**.003**
Side		
Extraovarian vs unilateral adnex	0.88 (0.16–5.05)	.8891
CA 125 (abnormal vs normal)	8.48 (3.05–23.61)	**<.0001**

In multivariate analysis, the equation is of significance when the *P* value of the whole test is less than .0001. BS = bilateral salpingectomy, BSO = bilateral salpingo-oophrectomy, CA 125 = carbohydrate antigen-125, CI = confidence interval, Hys = hysterectomy, OR = odds ratio, USO = unilateral salpingo-oophrectomy.

However, multivariate analysis showed that the risk of malignant pelvic mass was 3.88 times higher in patients over 44 years old (included) after hysterectomy than in patients younger than 44 years old. Pelvic mass found by physical examination was 0.21 times higher than those with symptomatic mass to be malignant. The risk of malignancy in patients with abnormal defecation was 15.65 times higher than that in other patients. The risk of cystic solid mass was 5.13 times higher than that in patients with cystic mass, and the risk of malignant mass in patients with elevated serum CA 125 was 8.48 times higher than that in normal patients. These indicators are independently related to the subsequent occurrence of malignant pelvic mass. Thus, patients with these characteristics should be particularly active in screening out malignant tumors.

Moreover, recent research data showed that malignant transformation of fallopian tube can lead to ovarian cancer and peritoneal cancer, which is the theory of ovarian cancer deviation from fallopian tube.[11,12] Bilateral salpingectomy can indeed play a crucial role in the prevention of ovarian cancer, especially serous ovarian cancer.[13] Therefore, in 2015 ACOG recommended that bilateral salpingectomy and ovarian sparing were performed simultaneously during hysterectomy to prevent ovarian cancer.[14] However, the results of this study showed that there was no significant difference in the incidence of subsequent ovarian malignancies between the patients with or without simultaneous bilateral salpingectomy (25.13% vs 29.03%, $P = 1.0$). There was no significant difference in the incidence of ovarian serous cancer between the 2 groups (12.35% vs 15.15%, $P = .583$). It should be emphasized that the population in this study were those who had pelvic masses after hysterectomy instead of all the patients who underwent hysterectomy. Considering that the simultaneous salpingectomy may also reduce the proportion of pelvic benign lesions, the proportion of ovarian malignant tumors in this study may be affected by the reduction of benign diseases at the same time. We plan to carry out prospective research in the future to verify the impact and benefits of salpingectomy on pelvic benign and malignant tumors.

5. Conclusion

In conclusion, for patients having pelvic masses following hysterectomy due to benign gynecological diseases, special attention should be paid to exclude the possibility of malignant tumors and actively exploring surgery should be performed when they were older at the time of hysterectomy, were not diagnosed by physical examination, had symptoms of abnormal bowel movements, and had elevated serum CA 125 and cystic solid imaging features. On the contrary, for patients without the high-risk clinical characteristics mentioned above, whether nonsurgical treatment can be used to reduce surgery related risks and trauma still requires a larger sample size of prospective clinical research to provide evidence.

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