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Review Article

Primary fallopian tube cancer: Domestic data and up-to-date review

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ABSTRACT

Primary fallopian tube carcinoma (PFTC) is a rare gynecological malignancy with the following characteristics: its preoperative diagnosis is easy to miss or delay because of a lack of specific symptoms and signs; it is difficult to distinguish from serous epithelial ovarian cancer or primary peritoneal serous carcinoma during or even after operation because they have the same histopathological features; and there is uncertainty regarding the optimal management because of the lack of available standard guidelines. All of these factors contribute to the major challenge of undertaking a comprehensive study of this disease. To improve our understanding of this rare disease, the domestic data were summarized first. We searched PubMed on this topic, using the term "primary fallopian tube tumor and Taiwan" (from January 1, 1990 to November 3, 2013) and identified 15 published articles, but only 11 studies focused on the outcome of patients with PFTC in Taiwan. These limited data were not enough to increase our knowledge in dealing with this disease; therefore, the addition of large series or published review articles addressing this topic was needed. According to these reports, we concluded: (1) the main type of PFTC was serous type, often poorly differentiated; (2) the diagnosis of PFTC is frequently missed or delayed; (3) PFTC is often of an earlier International Federation of Gynecology and Obstetrics (FIGO) stage than is epithelial ovarian cancer (EOC), because of the appearance of earlier but nonspecific symptoms or signs, such as abdominal pain, vaginal bleeding, and watery discharge or mass; (4) the most important clinicopathological prognostic factor was FIGO stage; (5) the therapeutic strategy is still uncertain, but is often based on the guidelines for treating EOC. An intensive surgical effort such as a complete surgical resection or optimal cytoreduction surgery with a minimal residual tumor followed by a platinum-paclitaxel combination chemotherapy with/without targeted therapy (for example, antiangiogenesis agents) may provide the best possibility of disease-free or overall survival.

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Introduction

Primary fallopian tube carcinoma (PFTC) is a very rare gynecologic malignancy, even though its true incidence may be

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underestimated as a result of its having the same surgical findings or pathological features as serous-type epithelial ovarian carcinoma (EOC) or primary peritoneal serous carcinoma (PPSC) [1,2]. Treatment is normally based on the same guidelines as those used for EOC, because PFTC tends to spread intraperitoneally. However, there is no doubt that the optimal management of PFTC is still uncertain, because of the rarity of the disease. Although PFTC is very similar to serous-type EOC, there are still a few differences between the two. For example, PFTC tends to recur in the retroperitoneal nodes and distant sites more than does EOC [3]. PFTC is more frequently found at an early stage, but EOC is often diagnosed at an advanced stage [1]. Abdominal pain is often found in patients with PFTC, because tubal distension may result in this nonspecific symptom [1]. The shorter history of symptoms in PFTC than in EOC allows detection at an earlier stage in patients with PFTC [4]. PFTC shows a propensity for microscopic distant metastases, compared with the macroscopic intraperitoneal metastasis of EOC [5].

Similar to EOC [6,7], complete surgical staging in early-stage [International Federation of Gynecology and Obstetrics (FIGO) stage I/II] PFTC and extensive and optimal debulking surgery in late-stage (FIGO III/IV) PFTC, including cytology, total hysterectomy, bilateral salpingo-oophorectomy, retroperitoneal lymph node dissection, appendectomy, omentectomy, and excisional biopsy for all suspicious lesions, provided the best chance of cure. However, because of the propensity of PFTC for microscopic distant metastases and the relatively high risk of recurrence despite complete tumor excision in the early stage, postoperative chemotherapy was highly recommended [8,9], although some opposed this suggestion [1].

In an earlier report [9], we found that two Stage IA patients without adjuvant chemotherapy had died of the disease: one experienced recurrence 765 days after completion of the surgery and the other, 1012 days postsurgery. Although complete and thorough surgical intervention for Stage I PFTC is important, some authors did not favor the use of postoperative adjuvant therapy, especially in Stages IA and IB disease without tumor infiltration of the serosa or without pre- or intra-operatively ruptured tumors [1]. Even so, we suggest that postoperative adjuvant chemotherapy may play a crucial role in the successful management of surgicopathological Stage I PFTA, even in Stage IA cases; especially if the tumor size is > 2 cm in diameter [8]. Another study included 25 patients with complete staging for PFTC, followed by multiagent chemotherapy [9]. In that report, even though 44% of patients with PFTC ($n = 11$) were early stage and more than 90% of patients ($n = 9$) received postoperative combination chemotherapy [cyclophosphamide, adriamycin, and cisplatin], the prognosis was still poor. The cumulative disease-free survival rate was only 36% [9]. Because of the poor outcomes and the rarity of PFTC, we believe it is necessary to review this topic to improve our understanding of this rare disease. We summarized all domestic data and updated the information as a reference for future management of this rare but relatively lethal disease.

Literature review

We searched PubMed on this topic, using the term "primary fallopian tube tumor and Taiwan" (from January 1, 1990 to November 3, 2013), and identified only 15 published articles [9–23]; however, 11 studies discussed patients with PFTC in Taiwan [9–19]. In addition, only three papers showed a series of case studies [10–12], with patient numbers ranging from 12 to 25. To further update our knowledge of this rare disease, other large series were also included in this review [4,8,24–48].

The domestic data, including the three papers, were obtained from two institutions, and data from larger series of patients with PFTC ($>$ 30 patients), including published review articles, are summarized in Table 1.

Clinical presentation

Because PFTC is often asymptomatic, a specific preoperative diagnosis is extremely difficult, and the usual clinical diagnosis is an ovarian tumor or pelvic inflammatory disease (PID) [1]. The most common symptoms and signs are abdominal pain, which may be colicky as a result of forced tubal peristalsis or dull as a result of tubal distension, and vaginal bleeding or watery discharge [1]. These symptoms or signs might allow for an earlier stage of PFTC to be diagnosed. In addition, in patients who complain of lower abdominal pain in association with vaginal bleeding and/or watery discharge (16.7%) or tubo-ovarian abscess (25%), the possibility of PFTC should be considered [11]. However, the incidence of PID is definitely far higher than that of PFTC, and PID is a medical illness usually treated conservatively with antibiotics, not surgery [49,50].

The domestic data (Table 1) showed that although abdominal pain might be one of the most frequently noted symptoms ($>$ 50%), fewer than 50% of all patients with PFTC were found at an earlier stage (FIGO I/II) [9]. By contrast, abdominal pain, vaginal bleeding or discharge, or even a pelvic mass seemed to be similarly frequently reported in studies from Western countries (Table 1), but in more than 50% of patients with PFTC the diagnosis was made at an earlier stage (FIGO I/II). The Latzko triad of symptoms, including an intermittent, profuse, serosanguinous vaginal discharge, a colicky pain, often relieved by the discharge, and abdominal or pelvic masses, has been reported in $\leq$ 15% of patients with PFTC [1].

An early cervicovaginal cytological diagnosis in cases of silent PFTC is a more difficult issue [51], although cervicovaginal smears might reveal cases of otherwise unsuspected PFTC. The anatomical site of PFTC allows an early diagnosis by cervicovaginal smear, because the malignant cells, which may exfoliate from the primary tumors, migrate through the fallopian tube and are deposited in the vaginal pouch or cervix canal. Some characteristic features of cervicovaginal smears might suggest the possibility of PFTC; these include the clean background, which disappears when liquid-based cytology is used, the small number of malignant cells, and the papillary grouping of overlapped neoplastic cells [52]. Moreover, the lack of tumor diathesis appears to be an intriguing and almost constant, although nonspecific, finding [50].

Imaging evaluation

Imaging routinely carried out for any suspicious gynecologic cancers includes ultrasound, computed tomography (CT), and magnetic resonance imaging (MRI) [53]. PFTC is difficult to diagnose radiologically, and most cases are preoperatively diagnosed as ovarian carcinomas [54]. Several single case reports in the literature [55,56], including ours [17], describe the ultrasound, CT, and MRI findings of PFTC.

Ultrasound is an essential imaging technique in the diagnostic workup of patients with gynecological lesions, including PFTC. Anechoic or low-level echoes with papillary projections or intraluminal masses revealed on ultrasound is an indication of PFTC; however, most of the echographic appearances of the fallopian tube are nonspecific, mimicking other pelvic diseases such as tubo-ovarian abscess, ovarian tumor, and ectopic pregnancy [53]. The appearance of PFTC is usually based on the dominant component—the solid tumor or the hydrosalpinx, which may be altered with serial imaging, reflecting the change in the amount of serous fluid within the tube. The former appears as a sausage-shaped adnexal mass and the latter appears as a fluid-filled tubular adnexa structure, containing nodular or papillary solid components, or a multilocular cystic mass with a cog-and-wheel appearance [57].

Table 1
Studies of primary fallopian tube carcinoma, including domestic data.

Study	No./Age	S/S (%)	Stage (%)	Factors	F-U	5-y DFSR or 5-y OSR, mo[a] (%)
Lau et al (2013) [11]	16/63	Pain (50); Mass (69)	I/II (31); III/IV (69)	CSR[b]	40	73 (95 mo)
Ou et al (2011) [12]	12/54	Mass (50)	I/II (50); III/IV (50)	Stage	38	64
Wang et al (1998) [10]	25/57	Pain (48)	I/II (44); III/IV (56)	NA	89	36
Pectasides et al (2009) [4]	64/61	NA	I/II (45); III/IV (55)	Stage, CSR	40	(70, all); 62 (I/II); 38 (III/IV)
Rosen et al (1994) [8]	68/60	P (NA)	I (74); II (26)	Grade, age	72	24 (51, all)
Rose et al (1990) [24]	40/NA	P (48)	NA	2nd - look	91	28 (15, all)
Barakat et al (1993) [25]	35/NA	NA	I/II (23); III/IV (75)	CSR	50	(19, all)
Hellström et al (1994) [26]	128/56	NA	I/II (74); III/IV (26)	Stage, grade, C/T	NA	NA
Pfeiffer et al (1989) [27]	52/60	P (69); V (62)	I/II (67); III/IV (33)	Stage; LN	46	22 (37, all); (64, I); (40%, II); (6, III/IV),
Rosen et al (1994) [28]	66/62	NA	I/II (55); III/IV (45)	Stage	NA	29 (all); 65 (50, I/II); 24 (14, III/IV)
Zheng et al (1997) [29]	52/NA	NA	I/II (17); III/IV (56)	Stage, p53	42	(19, all)
Vaughan et al (1998) [30]	37/57	V (46); P (32)	I/II (73); III/IV (27)	Stage	NA	37 (37, all); 78 (69, I); 40 (26, II); 9 (0, III)
Wolfson et al (1998) [31]	72/61	NA	I/II (61); III/IV (39)	Stage	48	(45, OSR); (27, DFSR)
Rosen et al (1999) [32]	143/63	NA	I/II (61); III/IV (39)	Stage, grade, CSR	29	48 (59, I/II); 28 (19, III/IV); (43, all)
Klein et al (1999) [33]	158/NA	NA	NA	CSR	42	43 vs. 21 (III, LND vs. - LND)
Alvarado-Cabrero et al (1999) [34]	105/59	V (38); M (24)	I/II (75); III/IV (25)	Stage	NA	NA
Rosen et al (2000) [35]	63/61	NA	I/II (56); III/IV (44)	Stage	NA	45 (43, all); 137 (59, I/II); 21 (19, III/IV)
Klein et al (2000) [36]	95/NA	NA	I (69); II (31)	CSR	NA	(83 vs. 58 by CSR)
Hefler et al (2000) [37]	53/65	NA	I/II (43); III/IV (57)	Stage, marker	NA	(60, all)
Baekelandt et al (2000) [38]	151/61	P (50); M (69)	I/II (54); III/IV (46)	NA	NA	(73, all)
Obermair et al (2001) [39]	36/59	V (42); P (39)	I (55); II/III/IV (45)	CSR, stage	70	68 (58, all)
Gadducci et al (2001) [40]	88/59	P (34); V (32); M (66)	I/II (47); III/IV (53)	Stage, CSR, age	NA	56 (57, all)
Klein et al (2002) [41]	41/62	NA	I/II (54); III/IV (46)	Stage, LN	NA	NA
Kosary et al (2002) [42]	416/NA	NA	I/II (31); III/IV (49)	NA	NA	(95, I); (75, II); (69, III); (45, IV)
Heintz et al (2003) [43]	176/NA	NA	I/II (52); III/IV (46)	NA	NA	(56, all)
Riska et al (2006) [44]	60/61	NA	I/II (25); III/IV (75)	Grade, marker	NA	29 (33, all)
Moore et al (2007) [45]	96/58	NA	I/II (52); III/IV (48)	NA	NA	(26, 3-y DFSR) (59, 3-y OSR)
Wethington et al (2008) [46]	1576/NA	NA	I/II (47); III/IV (50)	Age, stage, CSR	NA	(64, all); (81, I; 65, II; 54, III)
Shamshirsaz et al (2011) [47]	36/69	P (19); M (14)	I/II (61); III/IV (39)	Stage, laterality, marker	40	(34, all)
Alvarado-Cabrero et al (2013) [48]	127/64	V (58); P (42); M (39)	I/II (72); III/IV (28)	Stage	NA	(56, all); (62, I); 16, II); (7, III) (0, IV)

Age = mean or median age in years; CSR = complete surgical resection, including the absence of gross residual disease or similar to fewer and smaller-sized residual tumors or achievement of optimal debulking surgery; C/T = postoperative adjuvant multiagent chemotherapy; F-U = mean or median follow-up (months); Factors = prognostic factors; 5-Y DFSR = 5-year disease-free survival rate; 5-Y OSR = 5-year overall survival rate; Grade = cellular differentiation, including good, moderate and poor differentiation; LN = lymph node metastases or lymphovascular invasion; LND = lymphadenectomy; M (Mass) = abdominal or pelvic or adnexa mass; Marker = preoperative serum markers, such as carbohydrate antigen (CA) 125 and human chorionic gonadotropin beta; NA = no data available; No. = number of patients; P (Pain) = abdominal pain, fullness or gastrointestinal symptoms; S/S = most common symptom and signs; 2nd-look = negative laparotomy, including second-look or third-look, similar to CSR; Stage = International Federation of Gynecology and Obstetrics [FIGO] stage; V (VB & VD) = vaginal bleeding and/or vaginal discharge.
[a] median or mean.
[b] review articles.

On CT scan, a mass lesion has attenuation similar to that of other pelvic soft tissue, but enhances less than the myometrium [54]. A solid papillary intratubal mass allows for easy prediction of PFTC [58]. With regard to MRI, we reported a case of preoperatively diagnosed PFTC based on a high degree of suspicion [premenopausal woman, vaginal spotting and watery discharge, and no apparent adnexal mass and no dysmenorrhea, but an elevated serum level of carbohydrate antigen (CA) 125], and typical MRI features—the solid tumor component of the PFTC was homogeneously or heterogeneously isointense or hyperintense on T2-weighted images, hypointense on T1-weighted images, and demonstrated enhancement after intravenous administration of gadolinium-diethylene-tetraamine pentaacetic acid (Gd-DTPA) [17], hyperintensity on T2-weighted images, and hypointensity or hyperintensity of hemorrhage on T1-weighted images of the hydrosalpinx component [57,58].

Tumor markers

Many tumor markers have been reported to be valuable preoperatively to increase diagnostic accuracy and postoperatively to monitor the response after treatment or detect tumor recurrence during follow-up. CA 125 was the most commonly used, and is often expressed by PFTC→ 80% of patients with PFTC have elevated pretreatment serum levels of CA 125 [54]. Hefler et al [37] reported that the median serum CA 125 in patients with PFTC preoperatively was 183 U/mL, and found that the sensitivity, specificity, positive predictive value, and negative predictive value of serum CA 125 levels in the follow-up of patients with PFTC were 92%, 90%, 67%, and 98%, respectively. In addition, the serum CA 125 level was found to correlate independently with disease-free survival and overall survival of patients with PFTC [37,47], adequately reflect patient response to chemotherapy, and precede the clinical or radiologic diagnosis of recurrent disease in 90% of patients with a median lead time of 3 months (range, 0.5–7 months) [37].

Another marker—the beta-subunit of human chorionic gonadotropin—has also been reported to be a prognostic factor independent of stage and histology in patients with PFTC [44]; however, no further study has reconfirmed this finding.

Pathology

Cases were defined as patients identified as having PFTC per diagnostic criteria established by Hu et al [59] and revised by Sedlis [60,61]. The criteria are as follows: (1) the main tumor arises from the endosalpinx; (2) the histological pattern reproduces the epithelium of the tubal mucosa; (3) the transition from benign to malignant tubal epithelium is demonstrable; and (4) the ovaries or endometrium are either normal or contain a tumor that is smaller than the tumor in the tube. More than 90% of PFTC was papillary serous adenocarcinoma, which is graded with respect to differentiation and amount of solid components [1].

Table 2
International Federation of Gynecology and Obstetrics stage of primary fallopian tube carcinoma.

Stage (TNM)	
0 (Tis)	Carcinoma *in situ*
I (T1)	Carcinoma confined in the fallopian tubes
IA (T1a)	Tumor confined to one tube without infiltrating the serosal surface
IB (T1b)	Tumor confined to both tubes without infiltrating the serosal surface
IC (T1c)	Tumor confined to one or both tubes while infiltrating the serosal surface or with positive malignant cells in the ascites or positive *peritoneal washing*
II (T2)	Tumor involving both tubes with pelvic extension
IIA (T2a)	Tumor extension and/or metastases to uterus and/or ovary
IIB (T2b)	Tumor extension to other pelvic organs
IIC (T2c)	Stage IIA or IIB with positive malignant cells in the ascites or positive peritoneal washing
III (T3 and/or N1)	Tumor involving one or both tubes with peritoneal implants outside the pelvis and/or positive regional lymph nodes
IIIA (T3a)	Microscopic peritoneal metastases outside the pelvis
IIIB (T3b)	Macroscopic peritoneal metastases outside the pelvis $\leq$ 2 cm in greatest dimension
IIIC (T3c and/or N1)	Macroscopic peritoneal metastases outside the pelvis > 2 cm in greatest dimension and/or positive regional lymph nodes
IV (M1)	Distant metastases beyond the peritoneal cavity. Positive pleural cytology and/or liver parenchymal metastases

TNM = tumor, nodes, and metastases system.

Stage

PFTC spreads in much the same manner as EOC, principally by the transcoelomic exfoliation of cells that implant throughout the pelvic and peritoneal cavity [3]. However, as mentioned previously, PFTC seems to be more frequently detected in an earlier stage than does EOC. In general, > 50% of patients with PFTC had Stages I and II disease (Table 1). Domestic data seemed to support the equal distribution of earlier and advanced stages of PFTC (50% vs. 50%, Table 1); early-stage EOC was also common in Taiwan [62–65]. Therefore, the distribution of early-stage EOC or PFTC seemed to be similar in the domestic data. Data from the literature review indicated that patients with PFTC have a higher rate of retroperitoneal and distant metastases than those with EOC [1,3]. PFTC is richly permeated with lymphatic channels that drain into the para-aortic lymph nodes through infundibulopelvic lymphatics, with involvement in 33% of patients with all stages of disease [66], and almost equal involvement of the para-aortic and pelvic lymph nodes [54]. Because lymph node metastases are common in patients with PFTC, lymphadenectomy is highly recommended for these patients. Klein et al [33] found that radical lymphadenectomy increased the median survival to 43 months [95% confidence interval (CI) 20–66], compared to 21 months (95% CI 10–32) without lymphadenectomy, suggesting that radical lymphadenectomy in tumors of equal size may markedly prolong survival.

Koo et al [67] further found that selective pelvic or para-aortic lymphadenectomy could miss lymph node involvement and lead to an error in staging, suggesting that comprehensive retroperitoneal lymphadenectomy, including both para-aortic and pelvic lymphadenectomy, would be an important procedure, based on the findings that the rates of isolated pelvic and para-aortic lymphatic metastases were 2.4% and 22.0%, respectively. Furthermore, Deffieux et al [68] suggested that the left para-aortic chain above the level of the inferior mesenteric artery was the site that was most frequently involved, even when the fallopian tubal cancer was on the opposite side, although the authors did not provide good reasons for this. It is possible that many of the Stage I patients were understaged in an older series because of the lack of surgical retroperitoneal assessment, which resulted in a worse prognosis for these patients.

The staging of PFTC is based on the FIGO EOC staging system, which requires a complete surgical approach (Table 2). Many published articles have suggested that the FIGO stage is the most important independent prognostic factor for patients with PFTC (Table 1). Kosary and Trimble [42] used the National Cancer Institute's Surveillance, Epidemiology, and End Results program to identify 416 patients with PFTC, and found that 5-year survival by FIGO stage was as follows: Stage I (n = 102), 95%; Stage II (n = 29), 75%; Stage III (n = 52), 69%; Stage IV (n = 151), 45%. Wethington et al [46] also reported similar findings: the 5-year survival rate for Stage I tumors was 81%, and cancer-specific survival was 65% (95% CI 57–75) and 54% (95% CI 48–60) for Stages II and III, respectively. As such, the reported survival for Stages I and II diseases has ranged from 37% to 95%, and for Stages III and IV tumors, from 0% to 69% [46].

Treatment

Complete removal of the tumor is the goal of standard therapy for PFTC, similar to the surgical management of EOC [69–73]. In addition to FIGO stage, complete resection with no or minimal residual tumors has also been reported to be the most important independent prognostic factor for both disease-free survival and overall survival (Table 1). Complete resection is emphasized only for advanced-stage PFTC. However, even in early-stage PFTC, complete resection of the tumor is also important [1]. Klein et al [36] found that complete resection, including additional radical lymphadenectomy, provided a remarkably better 5-year survival rate of 83%, whereas patients with total hysterectomy and bilateral salpingo-oophorectomy achieved a 5-year survival rate of only 58% (p = 0.12). In addition, neither chemotherapy nor irradiation significantly benefitted overall survival (p = 0.813 for patients with total hysterectomy and bilateral salpingo-oophorectomy; p = 0.795 for those with additional lymphadenectomy) [36]. The possible reason is the prognostic value of correct staging, which maintains that the FIGO stage is the most important classic prognostic factor in PFTC. Thus, as shown earlier in this article, surgery without lymphadenectomy may result in underestimating the clinical stage; i.e., some of the cases graded as Stages I or II during operation should really be classified as Stage IIIC, because metastases of the lymph nodes must be expected in as many as 30% of cases intraoperatively staged as Stage II [33].

The high proportion of lymph node metastases makes PFTC appear to be a generalized systemic disease, even in early-stage PFTC, or FIGO Stage I PFTC, and this makes the intensified use of chemotherapy altogether plausible [36]. However, some authors considered that Stages IA and IB disease may not require extra adjuvant treatment (as for patients with EOC), except early-stage patients with tumors infiltrating the serosa or with preoperatively or intraoperatively ruptured tumors, who should receive chemotherapy [1]. In our previous study on surgicopathological Stage I PFTC, which supported the concept of Rosen et al [32] that patients with FIGO IA PFTC, in particular, should receive adjuvant treatment, we found that the trend toward the use of adjuvant chemotherapy might benefit survival [9].

The combination of platinum and a taxane has been a cornerstone of treatment of PFTC for more than 15 years [74]. The addition of a third cytotoxic drug, whether in triplet combinations or sequential doublets, provides no benefit [75]. However, improvement might come through changes in scheduling, dose intensity, or delivery [76], especially in light of the better survival in the Japanese Gynecologic Oncology 3016 study [77] and its extensive trial [74] than in conventional treatment, with a hazard ratio (HR) of 0.79 (95% CI 0.63–0.99, $p = 0.039$). Very few data with regard to PFTC can be extracted from the literature. Several authors using cisplatin-based chemotherapy for patients with advanced-stage PFTC reported overall response rates of 53–92% [53]. Data from small series, including our previous report [9], showed the possible value of cyclophosphamide, doxorubicin (epirubicin), and cisplatin (the cyclophosphamide, adriamycin, and cisplatin, CAP or cyclophosphamide, epirubicin, and cisplatin, CEP regimen). However, based on domestic data, including ours (Table 1), we would favor the use of a combination of platinum and a taxane as a choice for patients with PFTC after complete resection of tumors, because a trend toward improved survival was found in recent reports after introducing the use of this combination.

Outcomes

The 5-year disease-free or overall survival rate in the domestic data ranged from 36% to 73% regardless of stages, which was similar to other published data with reported survival ranging from 36% to 95% (Table 1). Possible reasons for this, in addition to the aforementioned reasons, are improvements in surgical technique and better teamwork [78–80], which result in a better chance of optimal debulking surgery—complete tumor resection, which might contribute to prolonged overall survival in patients with PFTC.

Conclusion

In conclusion, PFTC showed the following characteristics: (1) the main type of PFTC was the serous type, often poorly differentiated; (2) the diagnosis of PFTC is frequently missed or delayed; (3) PTFC is often an earlier FIGO stage than is EOC, because of the appearance of earlier but nonspecific symptoms or signs, such as abdominal pain, vaginal bleeding, and watery discharge or mass; (4) the most important clinicopathological prognostic factor was FIGO stage; (5) the therapeutic strategy, which is often based on the guidelines for treatment of EOC, and although still uncertain, includes an intensive surgical effort such as complete surgical resection or optimal cytoreductive surgery with minimal residual tumor, followed by platinum-paclitaxel combination chemotherapy with/without targeted therapy (for example, antiangiogenesis agents), which may provide the best possibility of disease-free or improved overall survival.

Conflicts of interest

The authors have no conflicts of interest relevant to this article.

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