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Original Article

Transvaginal sonographic characteristics of paraovarian borderline tumor

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Abstract: Parovarian cysts are common disorders which constitute 10-20% of adnexal masses in pathologically verified series. Most of these cysts are benign, and borderline parovarian tumors are rare and documented only as case reports in the literature. The study was aim to examine the sonographic features of parovarian borderline tumors for making an accurate preoperative diagnosis. Four patients (mean age 49 years, ranged from 35 to 75 years) with a pathological proven parovarian borderline tumor were retrospectively recruited. Preoperative transvaginal ultrasonography (TVS) and color Doppler ultrasonography were examined, and histological reports were analyzed. All tumors were correctly diagnosed as parovarian tumors at preoperative TVS. The cysts were hypoechoic and showed a variable number of papillary projections growing from the inner wall in 3 patients. Color Doppler examination of the papillae showed the presence of blood vessels in two of those three patients. In addition, histological analysis of the removed tumors demonstrated two parovarian serous borderline cystadenomas and two parovarian serous papillary borderline cystadenomas. TVS might be useful in making a preoperative diagnosis of borderline parovarian tumors.

Keywords: Parovarian cysts, borderline tumor, transvaginal sonography

Introduction

Parovarian cysts are common disorders which constitute 10-20% of adnexal masses in pathologically verified series [1]. Most of these cysts are benign, and borderline parovarian tumors are rare and documented only as case reports in the literature [2, 3]. These tumors are defined by epithelial proliferation and no stromal invasion [4]. Most parovarian tumors are simple cysts that can be diagnosed preoperatively by sonographic demonstration of a unilocular, thin-walled cyst near the ovary [5]. However, borderline parovarian tumors, similar to low malignancy potential ovarian tumors, are identified intraoperatively or postoperatively. To date, no reports have discussed the preoperative differentiation between benign and borderline parovarian tumors. In this study, we aimed to retrospectively evaluate the sonographic characteristics by transvaginal sonography (TVS) in 4 women with proven borderline parovarian tumors. The diagnosis was not known prior to surgery, so these sonographic characteristics may be useful in making a preoperative diagnosis of borderline parovarian tumors.

Materials and methods

From December 2008 to August 2012, four women (mean age 49 years, ranged from 35 to 75 years) had a pathological confirmed diagnosis of borderline parovarian tumor at Obstetrics and Gynecology Hospital, Fudan University (Shanghai, China). Those four patients had the results of TVS examination performed within 3 days before surgery stored on a hard disc. In addition, the serum levels of CA125, detailed surgical reports and histological analysis of the removed tumor were well documented. The study design and protocol were approved by our Institutional Review Board, and all patients gave written informed consent after the nature of the procedure was explained fully.

Ultrasound examinations were performed by senior doctors (working at the department of ultrasonic diagnosis for more than 5 years) via

Table 1. Clinical and pathological features of borderline parovarian tumors

Cases	Age	History	CA125 (Units/ml)	Site	Gross (cm)	Macroscopy	Microscopy	Follow-up times
1	43	Adnexal mass for 1 month	/	R	4×3×3	Inside: one papilla (diameter: 1.3 cm)	Serous papillary borderline cystadenoma	49 months no recurrence
2	75	Adnexal mass for 2 years	12.10	R	2.5×2.5×2.5	Inside: Four mini- papillae (diameter: 0.1-0.5 cm)	Serous papillary borderline cystadenoma	37 months no recurrence
3	35	Adnexal mass for 8 years	22.2	R	3×3×2.5	Inside: one neoplasm with papillae (diameter: 1 cm)	Serous borderline cystadenoma	32 months no recurrence
4	43	Menorrhagia for 7 years	324.1	R	5×4×4	Inside: two papillae (diameter: 0.1-0.2 cm)	Serous borderline cystadenoma	5 months no recurrence

Table 2. Preoperative sonographic characteristics of the parovarian cysts

Case	Shape	Size (mm)	Echogenicity	Papillae (mm)	Blood vessels in papillae	Ipsilateral ovary	Preoperative diagnosis
1	Oval	39×33×26	Anechoic	Present 13×12×10	Absent	Present	Parovarian cyst
2	Round	27×25×24	Hypoechoic	Present multi 6×5×4	Present	Present	Parovarian cyst
3	Oval	36×33×24	Hypoechoic	Present 19×18×10	Present	Present	Parovarian cyst
4	Oval	44×35×27	Hypoechoic	absent	/	Present (ovarian cyst)	Parovarian cyst

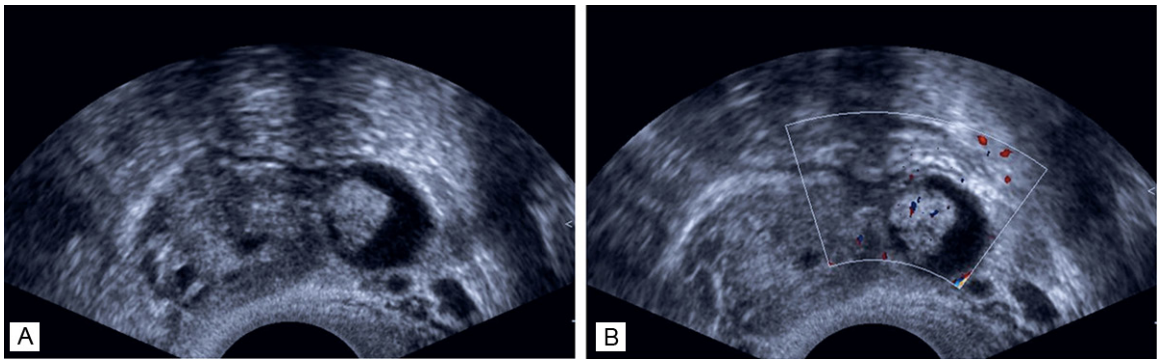

Figure 1. Transvaginal ultrasound images of case 3. A. The parovarian unilocular hypoechoic cyst was close to but separate from the ipsilateral ovary. Note the presence of the papilla growing from the cyst wall. B. The vascular signals within the papilla were shown.

Voluson 730 Pro (General Electric, Milwaukee, WI, USA). All examinations were carried out in a systematic manner with an enough examination time. First, TVS of the pelvic organs were performed with a 4.0-9.0 MHz broadband transducer on longitudinal and transverse sections to evaluate the anatomy of the uterus, the ovaries and the pouch of Douglas. When a cyst was observed in the pelvis, we tried to differentiate the structures around the cyst. Then, after the urinary bladder was filled, a transabdominal sonography (TAS) was performed using a 3.5-5.0 MHz convex transducer to evaluate the upper pelvis and the abdomen. Three diameters of the cyst were measured, and shape, content, thickness of the outer wall as well as presence of solid papillary projections were analyzed. Whenever a solid portion was visualized inside the cyst, the presence of blood vessels was assessed by means of color Doppler ultrasonography to detect blood flow. Ultrasonographic digital images were saved and stored on a hard disk for subsequent review and analysis. In all patients, the diagnosis was made visually at surgery by detecting the cyst adjacent to the ovary or ovarian cyst and pathologist confirmed the diagnosis of borderline parovarian tumors.

Results

The clinical and pathological features of four patients are shown in **Table 1**. Three of them were referred to our hospital for investigation of a pelvic mass and the remaining one was referred for menorrhagia. All of the pelvic masses were on the right side. The serum levels of CA125 were evaluated in three patients and were significantly increased in only one patient had combined endometriosis.

The sonographic characteristics of the borderline parovarian tumors are shown in **Table 2**. All these cysts appeared as well-defined round or oval cystic masses located close to but separated from the ipsilateral ovary or ovarian cyst (mean diameter 35 mm, ranged from 25 to 45 mm), and all of them were correctly diagnosed as parovarian tumors by preoperative TVS. One of them showed anechoic and the remaining showed hypoechoic. Among three patients, the cysts showed 1-4 papillary projections with volume of 0.5~2 cm^3 growing from the cyst wall (**Figure 1A**). The papillary projections seen at sonography were further confirmed by pathologic inspections. Tiny papillary (diameter at 0.1-0.2 cm) projections were found by pathologic examination in the forth cyst, but they were missed at ultrasonography. Color Doppler could detect vascular signals within the papillae in 2 patients (**Figure 1B**).

Surgical reports showed that the mass size was 2.5-4.5 cm, and neither metastasis nor invasive peritoneal implantation was found. In addition, the borderline tumor was demonstrated by intraoperative frozen section pathologic diagnosis. Among those four patients two women at reproductive age (35 and 43 years, respectively) had conservative operation; one underwent laparoscopy with right mesosalpinx cystectomy and uterine leiomyoma enucleation while another one underwent laparoscopy with right salpingectomy and left ovarian neoplasm resection. The remaining two women underwent laparoscopy with total hysterectomy and

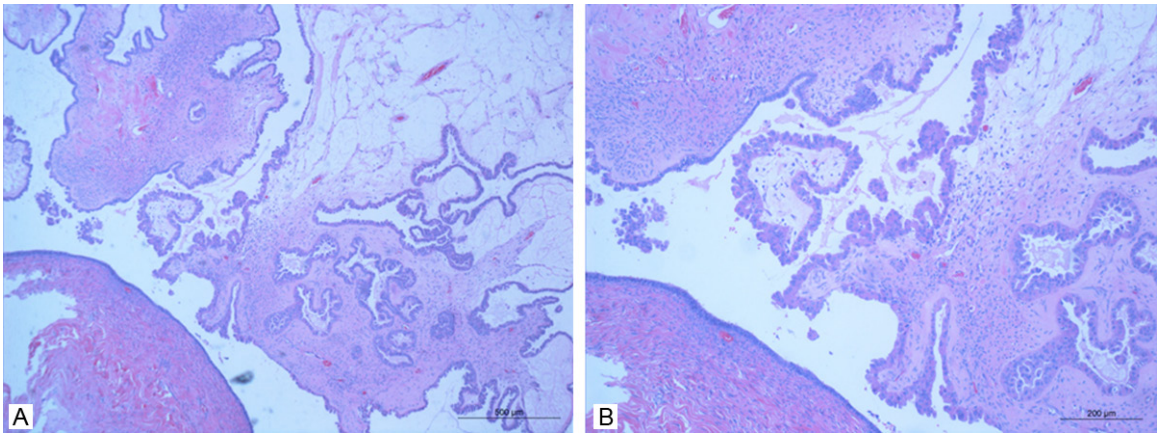

Figure 2. Photomicrograph of the parovarian borderline tumors (case 3). In some places of papillary structures, epithelial stratification was seen without nuclear atypia. (H-E staining with magnification at 10 and 40 in (A) and (B), respectively).

bilateral salpingo-oophorectomy. The histopathologic diagnosis of the mesosalpinx cyst was serous papillary borderline cystadenoma in two cases and serous borderline cystadenoma in another two cases (**Figure 2A** and **2B**). All of four women were free from disease 5 to 49 months after the operation.

Discussion

Findings presented here showed that the sonographic and histopathologic results correlated closely in all four cases of borderline parovarian tumors. Similar histopathologic findings of parovarian serous borderline cystadenomas or serous papillary borderline cystadenomas have previously been described [4, 6]. In contrast to most parovarian cysts without papillae, which are simple cysts at sonography [7], we found here that the majority of borderline parovarian tumors appeared unilateral round or oval hypoechoic cyst with one or more small nodular areas on the inner wall. In addition, some of borderline parovarian tumors showed the presence of blood vessels revealed by sonographic examination, which located close to but separated from the ipsilateral ovary or ovarian cyst. Pathologic examination showed that four masses had nodules. In one case, the nodules were not seen sonographically due to the tiny size. The characteristic sonographic appearance presented here might be useful for making a differential diagnosis of parovarian tumors.

When making a diagnosis of parovarian tumor, we should detect the separate ipsilateral ovary [5]. However, sometimes it may also be difficult to determine the origin of a mass that is at the extreme periphery of the ovary. The “split sign”, separating the two structures by pointing the tip of the vaginal probe and pushing between the ovary and the parovarian tumor, may be observed to help diagnosing [7]. Most other extraovarian masses are unlikely to be confused with parovarian cystadenomas by sonography. A hydrosalpinx may appear as an extraovarian cystic mass, but it is more likely to have a tubular shape and often has a folded configuration and “beads-on-a-string” sign [8]. Peritoneal inclusion cysts tend to surround the ovary and have “flapping sail sign” [9], and usually occur in women with a history of prior surgery or pelvic inflammatory disease. Benign parovarian cystadenomas have very similar sonographic manifestations with borderline parovarian tumors [10]. Thus, a comparative study should be made to help make a differential diagnosis.

The age of the cases was from 35 to 75 years, and there was no age tendency. Three patients had asymptomatic masses that were discovered on routine pelvic examination, probably due to the small size of mass. The serum CA125 levels of two patients were within normal limits, while another one with high levels of serum CA125 had endometriosis. These results suggest that the serum CA125 levels are not the specific marker of parovarian borderline tumors. In addition, malignant parovarian tumors have been reported in 2-3% of parovarian cystic masses studied by using histopathology [11], and it seems to be even less frequent in masses smaller than 5 cm [12]. In the pres-

ent study, however, the sizes of cystic masses in all four cases are smaller than 5 cm. Thus, the size of mass is also not the good index in making the diagnosis.

While there is no consensus on the optimal surgical treatment [2, 4, 6, 13], Villella et al [14] recently reported that patients desiring future childbearing potential may safely undergo a fertility-sparing operation. In the present study, the approaches have ranged from a simple mesosalpinx cystectomy to a total hysterectomy and bilateral salpingo-oophorectomy and the follow-up is satisfied.

Finally, it is noteworthy to point out that the present study has some limitations. First, the number of cases was small, though the rarity of this disease entity provides little opportunity for comprehensive observations. However, some findings can be cautiously made from the collected data, which may be useful before clinical treatment. Second, no comparative study with other parovarian benign tumors was performed. However, this study was intended to be a descriptive study, and we believe that a comparative study with a larger number of cases is needed to confirm the usefulness of the transvaginal sonographic examination of borderline parovarian tumors.

Disclosure of conflict of interest

None.

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