Clinical characteristics, treatment status and complications in women with tube ovarian abscess and endometriosis: a retrospective study

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Abstract

Background: The aim of our present study was to investigate the clinical characteristics, treatment status and complications in women with endometriosis and tube ovarian abscess (TOA) to determine the possible association between TOA and endometriosis.

Methods: Medical records were used to analyze the clinical characteristics, treatment and complications. Twenty women who were diagnosed with TOA with endometriosis were compared with 93 women diagnosed as having TOA without endometriosis between January, 2008 and December, 2018. Statistical analysis was performed using SPSS Version 20.

Results: In this study, TOA patients with endometriosis were significantly more likely to have a lower age range (20–39 years) than the non-endometriosis group (11/20 (55.0%) vs 27/93 (29.0%), p=0.036). In addition, TOA patients with endometriosis were associated with a significantly lower rate of parity (11/20 (55.0%) vs 75/93 (80.6%), p=0.021), higher rates of infertility (8/20 (40%) vs 0/93 (0%), p=0.000) and a significantly lower incidence of elevated blood platelet counts (5/20 (25%) vs 43/93 (53.8%), p = 0.026). Furthermore, women with endometriosis had greater blood loss (347±445.77 vs 204.67±289.46, p=0.014) and an increased complication rate (3/20 (15%) vs 0/93 (0%), p = 0.000). Among the 3 patients who had complications in the endometriosis group, 2 patients had septic shock and 1 patient had intestinal obstruction. And 1 case who had septic shock followed by IVF treatment. There was no significance difference on other factors.

Conclusions: The present study indicated that endometriosis did not increase the difficulty and time of treatment in patients with TOA, but increased bleeding during surgery and serious complications. It is suggested that doctors should pay more attention to postoperative treatment and nursing in women with TOA and endometriosis, especially those who have a history of recent infertility treatment and related procedures.

Background

Tube ovarian abscess (TOA) is a complication of pelvic inflammatory disease (PID) that occasionally involves the adjacent tissues and organs in the pelvic cavity [1]. The presentations of TOA vary and include fever, lower abdominal-pelvic pain, and vaginal discharge. TOA often leads to long-term complications, such as pelvic adhesion, chronic pelvic pain, infertility and ectopic pregnancy [2]. The occurrence of TOA is affected by many factors, such as sexual activity, age, diabetes and some immune deficiency diseases. Although the incidence of TOA is still unclear, approximately one-third of patients with pelvic inflammatory disease have TOA [3].

Endometriosis is a chronic inflammatory estrogen-dependent disease and an immunologically aberrant condition that is prevalent in women of reproductive age. Impaired immune function is one of the causes of endometriosis, which promotes the occurrence of infection [4–5]. Moreover, the cyst wall is not
conducive to the treatment of infection, and periodic hemorrhage of the focus promotes the spread of infection [6–7]. In addition, endometriosis often causes 30–50% of affected women infertility.

Patients with endometriosis and infertility are usually treated with artificial assisted reproductive technology (ART), which may increase the risk of TOA and make it difficult to treat [8]. Thus, the risk of TOA in endometriosis patients may be increased.

Few studies have reported the presence of endometriosis in women with TOA. Meanwhile, these studies have mainly analyzed and compared clinical characteristics and antibiotic treatment [9–10]. However, whether TOA patients with endometriosis increase the difficulty of treatment and the risk of possible complications during the process of treatment remains to be elucidated.

The aim of our present study was to investigate the clinical characteristics, treatment status and complications in women with endometriosis and TOA to determine the possible association between TOA and endometriosis. In this study, we conducted a retrospective study to analyze whether TOA with endometriosis tends to be more serious and difficult to treatment.

**Methods**

In this retrospective study, we reviewed medical records in 168 women who were hospitalized at Peking University People's Hospital with the diagnosis of TOA between January 2008 and December 2018. Endometriosis and TOA were confirmed by pathology in this study. In our study, patients with appendicular abscess, a combination of malignant disease, pregnancy or puerperal period abscess, adenomyoma, hydrosalpinx fluid age over 55 or under 20 years and abandoned treatment were excluded. Finally, a total of 113 records were reviewed. The study was approved by the Ethics Committee of the Peking University People's Hospital. Informed consent was obtained from all participants. Data were collected from the patient's information systems.

The following clinical variables were retrieved: 1. demographic factors: age, menarche age, marital status, BMI, parity and infertility; 2. risk factors: history of current or previous PID, recent insertion or removal of an intrauterine device (IUD) (within 3 months), and recent pelvic surgery (within 6 weeks), history of in vitro fertilization (IVF); 3. clinical factors (at the time of index admission): abdominal pain, vaginal discharge, fever, red blood cell, white blood cell (WBC) and neutrophil counts, blood platelet counts (BPC), CA125, fibrinogen, C-reactive protein (CRP), procalcitonin (PCT), bacterial vaginosis (BV) status on cervicovaginal swabs, blood culture, bacterial culture when applicable; 4. management factors: duration of intravenous injection (IV) /oral antibiotics, duration of hospitalization, and management plan (medical, surgical), position of TOA, type of surgery (laparoscopy or laparotomy), complications.

According to the diagnosis and treatment plan of pelvic abscess in our hospital, all patients were treated with intravenous antibiotics on admission. After 48 hours of antibiotic treatment, if there was no significant improvement in symptoms, invasive surgery would be performed.
Statistics

Statistics Package for Social Sciences (SPSS 20, IBM, USA) was used for statistical analysis in this study. The measurement data were analyzed with Student’s t test or the Mann–Whitney test for nonnormally distributed data. The count data are expressed as percentages, and chi-square tests were used for intergroup comparisons. P value < 0.05 was considered statistically significant.

Results

During the 10-year study period, a total of 168 patients were initially diagnosed with TOA or pelvic abscess. Of these, 113 patients fulfilled the inclusion criteria. The final analysis was performed in 113 patients, which included 20 women with endometriosis as the study group and 93 women without endometriosis as the control group in Supplementary Fig. 1. Demographic data and clinical characteristics of the participants are shown in Table 1. Compared with the control group, women in the endometriosis group were more likely to have lower pregnancy parities (45.0% vs 19.4%, p = 0.021) and to have a higher risk of infertility history (40.0% vs 0.0%, p = 0.000). However, there was no statistically significant differences with regard to age at menarche, menopause, marital status and BMI. We still found that the risk of TOA was significantly higher in patients with endometriosis at the age of 20–39 (P = 0.036).

Table 1
The comparison of demographic factors between women endometriosis and non-endometriosis who were hospitalized for TOA.

| characteristics | Endometriosis (n = 20) | No endometriosis n = 93 | P       |
|-----------------|------------------------|-------------------------|---------|
| Age             |                        |                         | 0.036*  |
| 20–39           | 11/20 (55.0%)          | 27/93 (29.0%)           |         |
| 40–55           | 9/20 (45.0%)           | 66/93 (71.0%)           |         |
| Menarche age    | 13.65 ± 1.67           | 14.23 ± 1.63            | 0.847   |
| Menopause       | 1/20 (5.0%)            | 10/93 (10.8%)           | 0.686   |
| Married         | 19/20 (95.0%)          | 91/93 (97.8%)           | 0.446   |
| BMI             | 23.52 ± 3.19           | 23.58 ± 4.92            | 0.243   |
| Parity          |                        |                         | 0.021*  |
| 0               | 9/20 (45.0%)           | 18/93 (19.4%)           |         |
| ≥ 1             | 11 (55.0%)             | 75/93 (80.6%)           |         |
| Infertility     | 8/20 (40.0%)           | 0/93 (0.0%)             | 0.000*  |

Data are presented as mean ± SD, n (%). BMI Body Mass Index, TOA tube ovarian abscess.* P < 0.05.
As shown in Table 2, risk factors of increasing TOA were analyzed in the endometriosis group and the non-endometriosis group. The incidence for risk factors in the endometriosis group compared to the non-endometriosis group, such as history of gynecological surgery (40% vs 35.4%, p = 0.799), history of previous PID (5.0% vs 21.5%, p = 0.116), history of IVF (5.0% vs 0.0%, p = 0.177), recent insertion or removal of an intrauterine device (IUD) (40.0% vs 47.3%, p = 0.626), and the differences all had no statistical significance.

| characteristics                  | Endometriosis (n = 20) | No endometriosis (n = 93) | P   |
|----------------------------------|------------------------|---------------------------|-----|
| History of gynecological surgery | 8/20 (40.0%)           | 33/93 (35.4%)             | 0.799|
| History of pelvic inflammation   | 1/20 (5.0%)            | 20/93 (21.5%)             | 0.116|
| IVF                              | 1/20 (5.0%)            | 0/93 (0.0%)               | 0.177|
| Intrauterine ring                | 8/20 (40.0%)           | 44/93 (47.3%)             | 0.626|

Data are presented as n (%). IVF in vitro fertilization, TOA tube ovarian abscess.

The clinical symptoms and clinical characteristics of patients in the endometriosis group and non-endometriosis group are listed in Table 3. Fever (35% vs 37.6%) and abdominal pain (60.0% vs 76.3%) were common clinical symptoms in the endometriosis group and non-endometriosis group. The results shown the symptoms did not differ between the two groups. We also compared the red blood cell count and hemoglobin concentration between the two groups. We found the red blood cell count and hemoglobin concentration had no significance difference. Moreover, most of the elevated inflammatory markers did not differ between the endometriosis group and the non-endometriosis group, such as WBC count (45.0% vs 41.9%, p = 0.808), fibrinogen concentration (45.0% vs 58.4%, p = 0.324), neutrophils (50.0% vs 51.6%, p = 1.000), CRP (87.5% vs 89.7%, p = 1.000), and PCT (40.0% vs 36.4%, p = 1.000) at admission, other than the BPCs. The incidence of elevated BPCs was notably increased than that in the control group (75% vs 46.23%, p = 0.026). Table 3 shows that 75/113 (66.4%) of women had a CA-125 level drawn on presentation, 11/14 (71.4%) women in the endometriosis group had an elevated CA-125 level, 36/61 (59.0%) women in the non-endometriosis group had been elevated. While, no significance difference was shown on CA-125 level.
Table 3
Analysis of clinical symptoms and biochemical results between TOA women with and without endometriosis.

| characteristics          | Endometriosis (N = 20) | No endometriosis (N = 93) | P  |
|--------------------------|------------------------|---------------------------|----|
| Fever                    | 7/20 (35.0%)           | 35/93 (37.6%)             | 1  |
| Abdominal pain           | 12/20 (60.0%)          | 71/93 (76.3%)             | 0.164 |
| Red blood cell count     | 3.77 ± 0.52            | 3.93 ± 0.61               | 0.404 |
| Hemoglobin concentration | 111.67 ± 16.53         | 110.74 ± 19.01            | 0.373 |
| WBC increased            | 9/20 (45.0%)           | 39/93 (41.9%)             | 0.808 |
| Blood platelet increased | 5/20 (25.0%)           | 43/93 (46.2%)             | 0.026* |
| Fibrinogen increased     | 9/20 (45.0%)           | 52/93 (58.4%)             | 0.324 |
| Neutrophils increased    | 10/20 (50.0%)          | 48/93 (51.6%)             | 1.000 |
| CRP increased            | 7/8 (87.5%)            | 35/39 (89.7%)             | 1.000 |
| PCT increased            | 2/5 (40.0%)            | 4/11 (36.4%)              | 1.000 |
| CA125 increased          | 10/14 (71.4%)          | 36/61 (59.0%)             | 0.546 |
| Bacteria culture positive| 3/8 (27.3%)            | 23/46 (50.0%)             | 0.200 |
| Blood culture positive   | 2/6 (33.3%)            | 2/13 (15.4%)              | 0.557 |
| Secretion culture positive| 0/3 (0.0%)            | 5/11 (45.5%)              | 0.258 |

Data are presented as mean ± SD, n (%). WBC white blood cell count, CRP C-reactive protein, PCT procalcitonin, TOA tube ovarian abscess. * P < 0.05

In addition, bacteria cultures were sampled in 3/8 (27.3%) of the endometriosis group and 23/46 (50.0%) of the non-endometriosis group. A total of 2/6 (33.3%) of blood cultures taken in the endometriosis group and 2/13 (15.4%) in the non-endometriosis group at admission were culture positive; 0/3 (0.0%) cervicovaginal isolate secretion cultures taken in the endometriosis group and 5/11 (45.5%) in the non-endometriosis group were positive. However, there was no significance difference in the bacteria cultures, blood cultures and secretion cultures.

Table 4 shows a comparison of treatment between the endometriosis group and the non-endometriosis group. The duration of hospital stay, total treatment time, and antibiotic treatment time did not differ between the groups. Moreover, the approach did not differ between the groups, with a similar percentage of women undergoing laparotomy as compared to laparoscopic procedures (p = 0.773). Compared with the non-endometriosis group, the endometriosis group was significantly associated with surgical complications during the perioperative period (15.0% vs 0.0%, p = 0.000). Three patients had perioperative surgical complications in the endometriosis group, of whom 2 patients had septic shock and 1 patient
had intestinal obstruction. We also found significant differences between the endometriosis group and the non-endometriosis group with respect to operative blood loss (347 ± 445.77 vs 204.67 ± 289.46, p = 0.014). There were no significant differences between the groups regarding antibiotic replacement times, abscess location, emergency surgery, or relapse.

Table 4
Analysis management factors of TOA in women with endometriosis and without endometriosis.

| characteristics      | Endometriosis (n = 20) | No endometriosis (n = 93) | P  |
|----------------------|------------------------|---------------------------|----|
| Hospital stay        | 10.60 ± 8.56           | 11.76 ± 9.05              | 0.825 |
| Total treatment time | 14.40 ± 9.36           | 15.95 ± 11.29             | 0.351 |
| Antibiotic treatment time | 8.10 ± 5.61       | 12.22 ± 8.15              | 0.140 |
| Antibiotic replacement times |          |                          | 0.196 |
| 0                    | 10/20 (50.0%)          | 30/93 (32.3%)             |    |
| ≥ 1                  | 10/20 (50.0%)          | 63/93 (67.7%)             |    |
| Abscess location     |                        |                          | 1.000 |
| Tube ovary abscess   | 12/20 (60.0%)          | 55/93 (59.1%)             |    |
| Tube abscess         | 8/20 (40.0%)           | 38/93 (40.9%)             |    |
| Emergency surgery    | 2/20 (10.0%)           | 12/93 (13.3%)             | 0.773 |
| Blood loss           | 347 ± 445.77           | 204.67 ± 289.46           | 0.014* |
| Laparotomy           | 5/20 (25.0%)           | 20/93 (22.2%)             | 0.773 |
| Complication         | 3/20 (15.0%)           | 0/93 (0.0%)               | 0.005* |
| Relapse              | 1/20 (5.0%)            | 3/93 (3.1%)               | 0.547 |

Data are presented as mean ± SD, n (%). TOA tube ovarian abscess. * P < 0.05

Discussions

In this retrospective cohort study, we reviewed the presenting characteristics and clinical outcomes of TOA women with endometriosis. Among these women, abdominal pain, fever, a history of prior pelvic surgery and pelvic inflammation were common. In contrast, TOA patients with endometriosis were more likely to have lower pregnancy parities and a higher risk of infertility history. Characteristics and treatment of women with TOA were similar regardless of whether they were complicated with endometriosis. However, the endometriosis group was significantly more likely to have operative blood loss and complications.
When we stratified the patients by age, the incidence risk of patients with TOA and endometriosis was significantly increased in patients between ages 20 and 39 but not in those between ages 40 and 55. The reason may be that women between 20 and 39 years old are the main group affected by endometriosis. Endometriosis is characterized by the presence of an inflammatory reaction in the ectopic endometrial tissue along with an abnormal immune response, which may increase the risk of TOA [11–12]. Women with endometriosis who were nulliparous were much more likely to develop TOA than those who delivered no more than two children. The reason may be that a menstruation-free period during pregnancy suppresses the activity of the ectopic endometrium and influences the local immunity in the pelvic cavity. This result is consistent with a previous study [6]. Our study indicated that women with endometriosis were more likely to develop infertility. Endometriosis often causes infertility (30%-50% of affected women), which may increase infertility interventions, particularly IVF treatment and the risk of TOA [13–14].

The association of inflammatory markers with TOA in the presence or absence of endometriosis remains unclear. Several studies have shown that platelets are involved in regulating the inflammatory response and are elevated among TOA patients [15–17]. In the presence of inflammation, platelets are activated and release a large number of inflammatory and mitotic substances. Activation of platelets causes changes in endothelial cells and supports the chemotaxis and migration of inflammatory cells to the inflammatory site [18]. It has been reported that endometriosis is considered a hormonal disease and an inflammatory condition. Simultaneously, activated platelets play an important role in the occurrence and development of endometriosis [19–20]. In this study, platelet counts in the endometriosis group were compared with those in the non-endometriosis group. The incidence of elevated blood platelet counts in the study group was notably lower than that in the control group, possibly because endometriosis only activates platelets but does not elevate the platelet count.

Cancer Antigen 125 (CA 125) is a glycoprotein in the blood that is a tumor marker for epithelial cell ovarian cancer, which is derived from coelomic epithelia in the female genital tract, including the fallopian tube, endometrium, ovary, and peritoneum [21]. Some studies have reported that CA 125 is a marker of nonspecific peritoneal conditions and may be elevated in benign ovarian cysts, tube-ovarian abscess, endometriosis, hyperstimulation syndrome, ectopic pregnancy and fibroids [22–23].

Several studies have found that CA-125 serum levels were related to the occurrence of TOA and have a prognostic role during conservative parenteral antibiotic therapy [15, 23]. However, few studies have examined the difference in CA-125 levels in TOA patients based on endometriosis. In our study, the results showed no obvious difference in the CA-125 level between the endometriosis and non-endometriosis groups. It is possible that patients with TOA and endometriosis may not exhibit severer inflammation in the pelvic cavity than other TOA patients do.

This study reported that patients with TOA and endometriosis had more serious perioperative surgical complications than the non-endometriosis group. Among the 3 patients who had complications in the endometriosis group, most (2/3, 66.7%) had septic shock. Through further analysis, we found that 1 case
had septic shock followed by IVF treatment. Infertility treatment and related procedures undermine the integrity of the ovarian sac, which increases the risk of TOA [24]. Endometriosis is a risk factor for the infection of pelvic organs. However, the incidence of TOA after in vitro fertilization and oocyte removal is very low in patients suspected of endometriosis by ultrasound [25]. Several case reports described sporadic cases of abscesses as serious post-ART complications [26–28]. Consumptive coagulation dysfunction is a serious complication of septic shock. If not treated in time, it may be life-threatening. Therefore, we should pay more attention to patients with TOA and endometriosis followed by infertility treatment and the associated procedures.

The present study was not without any limitations. As this is a retrospective study, it is inherently limited by the possibility of type II error. Moreover, the sample size of patients is limited, and this was a single center study. This result needs to be further validated in a multicenter study for more patients. In addition, to be able to use antibiotics, the treating physicians may alter the management plan and may also change the clinical process.

**Conclusions**

In summary, the characteristics and treatment of TOA patients with endometriosis are similar to those without endometriosis. Both groups tend to be antibiotic resistant and often require surgery. However, endometriosis more often causes serious complications and surgical bleeding in TOA patients. Doctors should pay more attention to postoperative treatment and nursing in women with TOA and endometriosis, especially those who have a recent history of infertility treatment and associated procedures.

**Abbreviations**

TOA: Tube ovarian abscess; PID: pelvic inflammatory disease; ART: artificial assisted reproductive technology; IUD: intrauterine device; IVF: in vitro fertilization; WBC: white blood cell; BPC: blood platelet counts; CRP: C-reactive protein; BV: bacterial vaginosis; PCT: procalcitonin; IV: intravenous injection.

**Declarations**

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**Authors’ contributions**

All authors contributed to the study conception and design. H Li: data collection, data analysis, manuscript writing. Xh Chang: data analysis, manuscript writing and editing. Y Zhao: data management,
manuscript editing. Y Wang: data collection, manuscript editing. Hl Zhu: protocol development, data
management, manuscript writing and editing. All authors read and approved the final manuscript.

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interpretation, or writing of the manuscript.

Availability of data and materials

The all datasets used and/or analyzed during the current study are available from the corresponding
author on reasonable request.

Ethics approval and consent to participate

The study was approved by the Ethics Committee of the Peking University People's
Hospital. Informed consent was obtained from all participants.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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