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Case Report

# *In vitro* fertilization complicated by rupture of tubo-ovarian abscess during pregnancy

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ABSTRACT

*Objective:* Pelvic abscess during pregnancy is an uncommon complication, but can lead to adverse perinatal outcomes during pregnancy.
*Case report:* We present a patient who developed rupture of a tubo-ovarian abscess during pregnancy following *in vitro* fertilization and embryo transfer. Thirty-eight reported cases are reviewed, and transvaginal oocyte retrieval, genital tract infections, endometrioma, and previous pelvic surgery are considered as risk factors for pelvic abscess during pregnancy.
*Conclusion:* Prolonging gestational duration when an infection situation is allowed is the principle of treatment.


## Introduction

The development of a pelvic abscess during pregnancy is rare and often missed during clinical practice. It can lead to adverse pregnancy outcomes, such as spontaneous pregnancy loss, preterm birth, premature rupture of membranes, chorioamnionitis, perinatal infection, and even fetal and maternal death [1]. It is important for clinicians to know the risk factors, characteristics, and treatment for pelvic abscess during pregnancy [2].

## Case Report

The patient was a 33-year-old woman, gravid 2, para 0, who presented to the emergency room at a gestation of 31 weeks and 2 days with lower abdominal pain for 8 hours. In August 2013, she received ultrasound-guided transvaginal oocyte retrieval (TVOR) and embryo transfer for bilateral tubal obstruction. She received no prophylactic antibiotics after *in vitro* fertilization therapy. Thirty days after the embryo transfer, an ultrasound examination confirmed a twin pregnancy that was appropriate for the gestational age. At 31 weeks and 2 days gestation, the patient presented to our emergency room with sudden onset of severe left lower quadrant abdominal pain, nausea, and vomiting. On admission, she had a temperature of 37.4°C. An abdominal examination revealed marked generalized tenderness, rebound tenderness, guarding and palpable uterine contractions, which lasted 20–25 seconds and occurred at a frequency of one in 15 minutes. A pelvic ultrasound (Figure 1) revealed a 6.7 cm × 5.6 cm × 5.1 cm diameter solid and cystic mass with an irregular contour in the left adnexal region and two intrauterine fetuses. There was a moderate amount of free fluid in the cul-de-sac. At this point, a diagnosis of threatened premature labor and torsion and rupture of the left adnexal mass was suspected. Magnesium sulfate treatment was started for threatened preterm labor, and dexamethasone was administered to enhance fetal lung maturity.

Her condition aggravated after admission. After 8 hours of admission, the patient began to fidget and her abdominal pain increased in severity. Her blood pressure dropped to 85/40 mmHg, pulse rate accelerated to 140–150/min, and her temperature was 39.8°C. The fetal heart rates were 176 beats/min and 182 beats/min. Uterine contractions that lasted 20–25 seconds and occurred at a frequency of 5–7 minutes were recorded. A routine blood test showed that the white blood cell count was 18.54 × $10^9$/L, with 86.3% granulocytes. The presumptive diagnosis of fetal distress, acute peritonitis, and septic shock was made. The patient underwent an emergent exploratory laparotomy and cesarean section to terminate gestation. Soon after the abdominal cavity was reached, ~1000 mL of yellow, odorless pus in the abdominal space was observed. The uterus was hyperemic and covered with purulent

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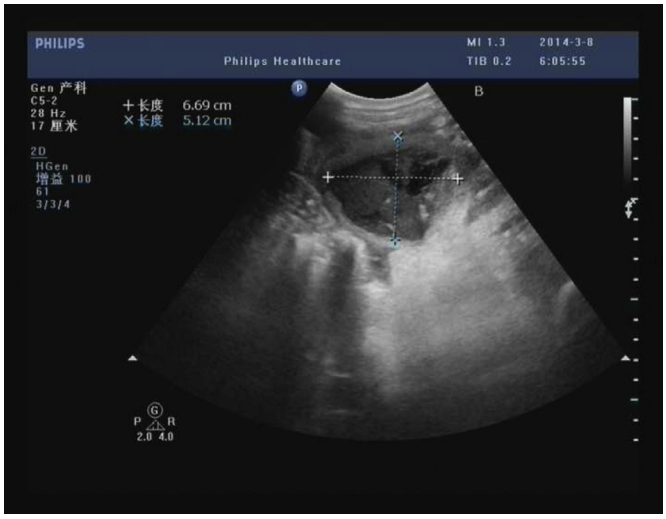


**Figure 1.** A 6.7 cm × 5.6 cm × 5.1 cm diameter solid and cystic mass with an irregular contour was revealed in the left adnexal region.

exudate. A cesarean section was performed, and healthy male twins were delivered. The color and clearness of the amniotic fluid was normal. The right fallopian tube was hyperemic and edematous, and the fimbria was open. The right ovary was hyperemic and 4 cm × 4 cm × 3 cm in diameter. A left adnexal mass, which was approximately 12 cm × 10 cm × 10 cm in diameter, was hyperemic and covered with pus. The mass arose from the left ovary, and normal ovarian tissue was missing. There was a rupture site in the mass, the length of which was 8 mm. Pus could be easily extruded from the mass. The left fallopian tube was intumescent, hyperemic, and edematous. The appendix was normal. Left-sided salpingo-oophorectomy was performed. Pelvic drains were left *in situ*. A culture of vaginal secretions on admission grew *Escherichia coli* and *Streptococcus fecalis*. *Streptococcus fecalis* grew in the culture obtained from the peritoneal fluid. Histopathological examination showed chronic purulent inflammation, pyosalpinx, and perisalpingitis in the left tube. Chronic purulent inflammation was observed in the left ovary.

Intravenous antibiotics were administered for 14 days postoperatively according to the drug sensitivity test and all drains were removed on postoperative Day 10. The mother was discharged 2 weeks after delivery in a stable condition. Both premature infants were healthy and discharged 4 weeks after delivery.

## Discussion

The incidence of pelvic abscess during pregnancy is rare. A systematic search was performed in the PubMed database from 1954 to July 2014. The following search term was applied to all published English articles: "(pelvic abscess OR tubo-ovarian abscess OR ovarian abscess) AND (gestation OR gestational OR pregnant OR pregnancy)". The bibliographies of relevant articles were also hand-searched to identify further potentially eligible studies. A total of 38 cases of pelvic abscess during pregnancy were revealed in our literature review (Table 1) [1–36]. To provide a reference for clinical practice, we reviewed the etiology, clinical characteristics, and treatment of pelvic abscess during pregnancy.

### *Etiology and risk factors*

During pregnancy, the immune status of pregnant women alters, which is necessary to allow mothers to tolerate genetically different fetal tissues [30]. However, when pregnant women with a suppressed immune system have risk factors during pregnancy, infection is more likely to recur or disseminate, and symptoms are hard to notice. Risk factors associated with the development of pelvic abscesses during pregnancy are summarized as follows (Table 1). (1) TVOR is considered a risk factor for the formation of a pelvic abscess during pregnancy. During TVOR, vaginal microorganisms may inoculate into the impaired ovary, or bacteria from a preexisting pelvic infection may be reactivated and disseminate into the impaired ovary [36,37]; (2) reactivation of chronic pelvic inflammatory disease or appendicitis during pregnancy is another risk factor for abscess formation [28]; (3) the bloody content of the endometrioma may serve as a culture medium for bacteria and facilitate the spread of infection [38]. The pseudocapsule of the endometriomata may prevent antibiotics from overcoming bacteria [28]. In addition, endometriosis may increase the risk of abscess formation, because locally impaired immunity in the pelvic cavity makes the patient vulnerable to infection [39]; (4) women with previous pelvic surgery are more likely to develop a pelvic abscess during pregnancy; and (5) lower genital tract infections may ascend and result in a pelvic abscess.

### *Symptoms and diagnosis*

According to the 38 reviewed cases of pelvic abscess during pregnancy, the time of symptom onset is highly variable, ranging from 5 days to 287 days of gestation (mean, 116.5 days; standard deviation, 73.2 days). The symptoms of pelvic abscess during pregnancy are variable, mainly including abdominal pain, fever, peritoneal irritation, vomiting, nausea, and abnormal vaginal discharge. An ultrasound usually reveals a cystic mass, or solid and cystic mass in the adnexal region. Free fluid may be observed by ultrasound as well. A computerized tomography scan and magnetic resonance imaging can be performed if necessary [23]. The pathogens of pelvic abscess during pregnancy are variable (Table 1). *Escherichia coli* (9/38, 23.7%) and *Peptostreptococcus* species (9/38, 23.7%) were the most commonly found microorganisms in pelvic abscesses.

In the present case, a culture of her vaginal secretion grew *Streptococcus fecalis*, which was the same as the culture of peritoneal fluid. We assumed that microorganisms of the vagina may inoculate into the impaired ovary when TVOR was performed and lead to the formation of a pelvic abscess. Furthermore, the suppressed immune system during pregnancy may have resulted in the reactivation of previous pelvic inflammation and increased the susceptibility to a subsequent pelvic abscess.

### *Treatment*

The treatment of pelvic abscesses during pregnancy is difficult. Prolonging gestational duration when an infection situation is allowed is the principle of treatment. Surgical interventions and antibiotic therapy are all choices for treatment. In 36 surgical cases, ultrasound-guided drainage was performed in five cases, with recurrence in two cases. Laparotomy with resection of the abscess occurred in 23 cases with recurrence in one case. Laparotomy/laparoscopy with aspiration or abscess drainage was performed in eight cases with recurrence in three cases. In our literature review, pregnancy loss occurred in 14 cases, 13 of which underwent surgical interventions. In one case, rupture of the left pyosalpinx occurred and acute peritonitis was treated with expectant management. The patient died of sepsis at 25 weeks' gestation.

Gjelland et al [40] reported that ultrasound-guided transperitoneal or transvaginal drainage of abscess allows antibiotics to control the infection more effectively. The reported incidence of a residual abscess requiring further surgery despite repeated

**Table 1**
Clinical features in 38 cases of pelvic abscess during pregnancy.

| Study | Onset (GA) | Risk factors | Surgical intervention | | Maternal & neonatal outcomes | Bacterial study |
|---|---|---|---|---|---|---|
| | | | Procedure | Time of intervention | | |
| [3] Lowrie et al (1951) | 7 mo | None | Laparotomy-excision of diseased tube & cornu of the uterus, CS | 7 mo | Live NB at GA 7 mo, but died within 48 h | *Escherichia coli* (pus) |
| [4] Cummin et al (1951) | 17 wk & 4 d | None | Laparotomy- right SO, appendectomy | 18 wk | Abortion on postoperative 12 h | *Hemolytic anaerobic streptococci* (abscess) |
| [5] Evans et al (1959) | 6 wk | Previous vaginal infection | Not performed | Not performed | Both mother & baby died at GA 25 5/7 wk | *Anaerobic streptococci*, gram negative bacilli (pus) |
| [6] Baydoun et al (1961) | 13 wk & 5 d | Previous vaginal infection | (1) Abdominal paracentesis<br>(2) Laparotomy-right ovary excision, drain placement | (1) 14 wk & 5 d<br>(2) 15 wk & 2 d | Induced abortion on postoperative d 9 ( GA 17 2/7 wk) | *Streptococcus fecalis, E. coli* (peritoneal fluid) |
| [7] Dudley et al (1970) | 16 d | Chronic salpingitis | (1) Culdocentesis<br>(2) Laparotomy-hysterectomy, bilateral SO | (1) 16 d<br>(2) 18 d | Spontaneous abortion during laparotomy | Negative mycotic & acid-fast studies |
| [8] Hunt et al (1974) | 22 wk | Chronic pelvic pain | Laparotomy- CS, subtotal hysterectomy, dissection of bilateral TOA | 25 wk & 3 d | Healthy NB at GA 25 3/7 wk, CS | *Proteus mirabilis* (abscess) |
| [9] Jafari et al (1977) | 41 wk | None | Laparotomy-CS, left SO, right Pomeroy tubal ligation | 41 wk | Healthy NB at GA 41 wk, CS | *Peptococcus* (abscess) |
| [10] Maroo et al (1978) | 14 wk | Chronic abdominal pain | Laparotomy-left SO | 14 wk | Healthy NB at term, VD | Negative (pus) |
| [11] Fuselier et al (1978) | 23 wk & 4 d | PID | Colpotomy, drain placement | 24 wk & 1 d | Healthy NB at GA 32 wk, VD | Gram-positive diplococcic, Gram-negative rods (pus) |
| [12] Stubbs et al (1985) | 10 wk | Previous cervicitis | Laparotomy-right SO, drain placement | 14 wk | Induced abortion on postoperative d 24 | *Neisseria gonorrhoeae* (cervical), *Bacteroides* species (pus) |
| [13] Orr et al (1986) | 25 wk | None | Laparotomy-CS excision of pelvic abscess | 31 wk | Live NB at GA 31 wk, CS, but died of septic complications at 48 h | *E. coli, Klebsiella* (blood) |
| [14] Sauer et al (1986) | 16 wk | None | (1) Laparotomy-excision of abscess<br>(2) CS | (1) 16 wk<br>(2) 32 wk | Healthy NB at least GA 32 wk, CS | NA |
| [15] de Clercq et al (1987) | 24 d | Chronic abdominal pain since previous abortion | Laparotomy-right SO, drain placement | 26 d | Healthy NB at GA 40 wk, CS | *Actinomyces israelii* (pus) |
| [16] Davey et al (1987) | 23 wk | None | Laparotomy- right SO, subphrenic abscess incision & drainage | 4 h after delivery | Intrauterine fetal death at GA 28 wk | *Peptostreptococcus* (abscess) |
| [17] Dashow et al (1990) | 7 wk & 2 d | Pelvic surgery, chronic pelvic pain | Laparotomy-abscess incision & drainage | 8 wk & 1 d | Healthy NB at GA 39 wk, CS | *E. coli, Bacteroides* species (abscess) |
| [18] Sukcharoen et al (1992) | 16 wk | NA | Laparotomy | NA | CS | *Actinomyces* |
| [19] Padilla (1993) | 5 wk | TVOR, endometrioma, pelvic surgery | LSC-abscess incision & drainage | 22 d after TVOR | Follow-up until GA 7 wk, alive | Negative |
| [20] Zweemer et al (1996) | After delivery | TVOR, pelvic surgery, pelvic adhesion | Laparotomy-excision of ovarian abscess | 7 wk after CS | Healthy NB at GA 38 1/7 wk, CS | *Peptococcus* (abscess) |
| [21] Younis et al (1997) | 5 wk | TVOR, endometrioma, pelvic surgery | Not performed | Not performed | Healthy NB delivered at term | NA |
| [22] Laohaburanakit et al (1999) | 32 wk | None | Laparotomy-CS, hysterectomy, bilateral SO, appendectomy | 32 wk | Healthy NB at GA 32 wk, CS | *Bacteroides fragilis*, *Peptostreptococcus* (pus) |
| [23] Sherer et al (1999) | 25 wk | Pelvic surgery | (1) Laparotomy- resection of necrotic tissue, drain placement<br>(2) Percutaneous CT-guided drainage | (1) 25 wk<br>(2) 28 wk | Healthy NB at GA 38 wk, CS | *Klebsiella pneumonia* (pus) |
| [24] den Boon et al (1999) | 25 wk & 4 d | TVOR, endometrioma, pelvic surgery | Laparotomy- pelvic abscess incision & drainage | 25 wk & 6 d | NB at GA 26 wk, VD, 1st boy was alive, 2nd boy died 9 wk postpartum | *Staphylococcus aureus*, mixed anaerobic bacteria (peritoneal) |
| [25] Yalcin et al (2002) | 15 wk | None | Laparotomy-right SO, drainage placement | 15 wk | Fetal demise on postoperative d 4 | NA |
| [25] Yalcin et al (2002) | 9 wk | None | Laparotomy- irrigation & drainage placement | 9 wk | Fetal demise on postoperative d 2 | NA |
| [26] Erdem et al (2002) | 34 wk | Endometrioma, pelvic surgery | Laparotomy-CS, right SO | 34 wk | Healthy NB at GA 34 wk, CS | *Klebsiella pneumoniae* (pus) |

| | | | | | | |
|---|---|---|---|---|---|---|
| [27] Jahan et al (2003) | 5 wk | TVOR, endometrioma | (1) LSC-drainage<br>(2) LSC-incision & drain placement | (1) 3 wk & 4 d<br>(2) 4 wk & 3 d | NB with cardiac abnormality at GA 37 wk, CS | NA |
| [28] Matsunaga et al (2003) | 16 wk | TVOR, endometrioma, hydrosalpinx | Laparotomy- left SO | 15 d after delivery | Late abortion at GA 22 wk | *Staphylococcus* (placenta, umbilical cord, amniotic membrane, vaginal, abscess) |
| [29] Khawaja et al (2005) | 25 wk | None | Laparotomy-CS, drain placement | 25 wk | Healthy NB at GA 25 wk, CS | GBS[k], mixed anaerobic bacteria (pus) |
| [30] Kepkep et al (2006) | 13 wk | IUD removal, pelvic pain | Laparotomy-SO, appendectomy | A mo after abortion | Spontaneous abortion at GA 14 5/7 wk | *Nocardia* (abscess) |
| [31] Sharpe et al (2006) | 13 wk | TVOR, endometrioma | Percutaneous drain | 23 d after CS | Healthy NB at GA 31 wk, CS | *Staphylococcus viridans, E. coli, Bacteroides, Peptostreptococcus* (abscess); *S. viridians* (blood) |
| [32] Chen et al (2008) | 28 wk & 4 d | Vaginal GBS infection | Laparotomy- CS, right SO | 29 wk & 2 d | Healthy NB at GA 29 2/7 wk, CS | *E. coli*, GBS (cervical) |
| [33] Al-Kuran et al (2008) | 9 wk | TVOR | (1) Laparotomy-appendectomy, drain placement<br>(2) US-guided aspiration<br>(3) Laparotomy | (1) 10 wk<br>(2) 19 wk<br>(3) 1 d after abortion | Spontaneous abortion at GA 21 wk | *E. coli* (pus) |
| [34] Craggs et al (2009) | 30 wk | Endometriosis, pelvic surgery | (1) Laparotomy-appendectomy, drain placement<br>(2) Laparotomy-CS, right SO | (1) 30 wk & 5 d<br>(2) 31 wk & 3 d | NB at GA 31 3/7 wk, CS | *E. coli, Veillonella parvula, Bacteroides fragilis, Enterobius vermicularis* (pus) |
| [2] Navada et al (2011) | 26 wk & 5 d | Pelvic surgery | Laparotomy-CS, right SO, appendectomy | 29 wk & 4 d | Healthy NB at GA 29 4/7 wk, CS | No aerobic organism (pus) |
| [35] Yalcinkaya et al (2011) | 5 d after TVOR | TVOR | US-guided drainage, posterior colpotomy, T-drain placement | 9 d after TVOR | Healthy NB at GA 38 wk, VD | NA |
| [1] Patounakis et al (2012) | 6 wk | TVOR, endometriosis | Laparotomy-left SO | 12 wk | Spontaneous abortion on postoperative d 1 | *Streptococcus anginosus* (abscess) |
| [36] Kim et al (2013) | 7 wk | TVOR, endometrioma, previous vaginitis | LSC-dissection of pelvic abscess | 14 wk & 3 d | Healthy NB at GA 37 3/7 wk, VD | Negative |
| This case | 20 wk | TVOR, PID, Tuberculous meningitis | Laparotomy- CS, left SO, drain placement | 31 wk & 2 d | Healthy NB at GA 31 2/7 wk, CS | *E. coli* (vaginal); *S. fecalis* (vaginal, pus) |

CS = caesarean section; GA = gestational age; GBS = *Group B Streptococcus*; IUD = Intrauterine device; LSC = laparoscopy; NA = not available; NB = newborn; PID = pelvic inflammatory disease; SO = salpingo-oophorectomy; TUB = tubo-ovarian abscess; TVOR = transvaginal oocyte retrieval; US = ultrasound; VD = vaginal delivery.

ultrasound guided aspiration is 6.6% [41]. Surgical intervention, using laparotomy or laparoscopy with drainage of the abscess and excision of infected tissue is generally performed in cases of diagnostic uncertainty or when medical therapy is inadequate [27]. However, surgical intervention may increase the susceptibility of pregnant women, especially those in the first trimester, to abortion and preterm birth. Therefore, it is appropriate to manage by considering both the infection severity and gestational weeks when treating pelvic abscess during pregnancy. Drain placement is one important measure to prevent postoperative recurrence.

In our case, symptoms of acute peritonitis and septic shock appeared at 31 weeks and 2 days gestation, which indicated the diagnosis of tubo-ovarian abscess rupture. Meanwhile, fetal distress was suspected. In addition, it was difficult to address the abscess when the enlarged gravid uterus was in the abdominal cavity. Therefore, a cesarean section and left-sided salpingo-oophorectomy were performed at the same time.

A pelvic abscess in pregnancy is rare. Detailed medical history and physical examination are needed to obtain an accurate diagnosis and prompt treatment, which are very important for good pregnancy outcomes. In addition, surgical indications should be strictly mastered prior to *in vitro* fertilization. Women with untreated reproductive tract infections are not appropriate for TVOR, because of the potential for pelvic abscess during pregnancy.

## Conflicts of interest

The authors declare that they have no conflicts of interest.

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