Spontaneous rupture of unscarred uterus secondary to placental percreta in the third trimester of pregnancy after IVF and embryo transfer: a case report

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Background: It is very rare for a young woman to experience spontaneous rupture of an unscarred uterus. Clinicians usually have a low clinical index of suspicion and may underestimate the possibility of a uterine rupture, leading to neonatal mortality in particular circumstances. We presented an incidence of spontaneous rupture of an unscarred uterus induced by placenta percreta in the third trimester of pregnancy. *Case*: A 27-year-old woman with an unscarred uterus, at a gestation of 31 weeks and 4 days, was presented with the right epigastric pain and vomiting after 10 hours of admission. Relevant symptomatic treatment was prescribed but did not release the related symptoms. Furthermore, an emergent exploratory laparotomy and cesarean section were conducted after the presence of hypotension and abnormal fetal heart rate, during which a spontaneous rupture of an unscarred uterus occurred, resulting in stillbirth and intraperitoneal hemorrhage. The pathological examination confirmed placental percreta as the cause of the rupture. *Conclusions*: IVF-ET may be a risk factor of UR and placental percreta. Potential uterine rupture should be considered for pregnant women receiving IVF-ET when they complain of abdominal pain and abnormal fetal heart rate. This case highlights the importance of identifying the risk factors for placental percreta so that patients at risk would benefit from an antenatal detection of abnormal placentation.

Keywords

Uterus rupture; Placenta percreta; IVF-ET

1. Introduction

Uterine rupture (UR), a condition of disrupted myometrium and serosa of the uterus, is a severe obstetric complication that bodes for high perinatal and maternal morbidity and mortality. Patients who received a previous uterine surgery (including cesarean section or hysteromyomectomy) run a higher risk of rupture than those without [1, 2], accounting for 1 in 8000 to 15,000 deliveries globally [3]. As it is challenging to detect atypical uterine rupture at the early stage, the delayed proper treatment usually results in adverse outcomes for mothers and infants [4]. Placenta accreta is a serious complication of caesarean scar pregnancy. When it is diagnosised early, approaches, such as uterine artery emboli-sation (UAE) followed by hysterectomy and use of ureteral stents, can achieve significant benefits of reducing severe hemorrhage and urinary tract injury [5, 6]. This paper presented an incidence of a placenta percreta-induced spontaneous rupture of an unscarred uterus in a pregnant woman without apparent risk factors. In our case, the atypical symptom was similar to that of surgical abdomen and, therefore, the possibility of a potential uterine rupture was ignored, which resulted in neonatal mortality. The case study may bring insight into the potential link between UR and *in vitro* fertilization and embryo transfer (IVF-ET) pregnancy.

2. Case presentation

A 27-year-old woman, in a gestation of 31 weeks and 4 days (her second pregnancy), reported preterm premature rupture of the membrane and complained of abdominal pain for 7 hours. Four years before, she had been admitted for extrauterine pregnancy in the right fallopian tube and as a consequence, she had undergone laparoscopic salpingectomy. She had tried but failed to conceive naturally during the following 4 postsurgical years. Therefore, she conceived through *in vitro* fertilization and embryo transfer at an outside hospital and received prenatal care elsewhere. On admission, the general examination showed a pulse of 103 beats/min, a blood pressure of 118/78 mm Hg, and a temperature of 37 °C. Abdominal examination revealed a soft and non-tender abdomen, a weak uterine contraction, and a fundal height consistent with the gestation age. Vaginal examination showed a closed cervix and a ruptured fetal membrane (indicated by clear amniotic fluid). Color Doppler ultrasonography showed a live cephalic fetus (the parameters of fetal growth consistent with the 30-week gestation), a fetal heart rate of approximately 140 bpm, and an amniotic fluid index (AFI) of 3.3 cm, no obvious abnormalities of the placenta on the fundus, and observable left uterine wall. Upon admission, routine blood tests showed the following normal results: WBC, 11.3×10^9/L; NE%, 74.0%; HGB, 11.3 g/dL; PLT, 193×10^9/L; normal coagulation function and liver en-

zymes. Given the gestation phase of only 31 weeks and 4 days, an intravenous magnesium sulfate infusion (2.0 g/day) was commenced for fetal neuroprotection and tocolysis. Antenatal corticosteroids were administered. The patient's pain reduced since admission. At 23:00 on the same night of admission, she complained of right epigastric pain and vomited. Physical examination reported stable vital signs and upper abdominal tenderness, without rebound tenderness or guarding. Clinicians speculated the possibility of acute surgical abdomen, such as gallstones and pancreatitis. The pain and vomiting persisted despite symptomatic treatment 1.5 hours later, and patient appeared pale on visual examination. An emergent physical examination showed a pulse of 120 beats per minute, a respiration of 19 beats/min, and a blood pressure of 90/50 mm Hg. The NST showed an FHR of 90 beats/min. The blood tests reported: WBC, 16.4×10^9/L; NE%, 78.0%; HGB, 7.5 g/dL; PLT, 60.0×10^9/L, and normal amylase and lipase levels. Subsequent emergent exploratory laparotomy revealed hemoperitoneum in the abdominal cavity. A lower segmental cesarean section was performed to find blood-stained amniotic fluid, and a stillborn neonate (weighed 1.59 kg) was uneventfully delivered from the cephalic presentation. An 8-cm—wide rupture site was observed on the fundus adjacent to the left cornual area covered with blood clots. Placental tissue extruded in the left cornual region of the uterus was firmly attached to the left uterine corn wall and was partially removed due to difficulty. Attempt was made to repair the laceration and oversewing was achieved by a two-layer closure with No. 1-0 Vicryl (Ethicon Inc, San Angelo, TX, USA). Intraoperative blood loss was estimated to be 3000 mL during surgery. The patient received an intraperitoneal transfusion of 8 units of packed red blood cells, 1000 mL of fresh frozen plasma, 1 unit of pooled platelets, and 2.5 g of cryoprecipitate postoperatively. Postoperative antibiotic treatment was prescribed. On the next day, a routine blood examination reported a hemoglobin level of 10.9 g/dL. A pathological report confirmed placental percreta. On postoperative day 6, the woman was discharged and advised to postpone pregnancy for the next 2 years.

3. Discussion

It is well-established that UR is one of the dire or morbid or severe obstetric complications that may lead to fetal and maternal mortality. The risk factors include previous cesarean delivery or curettage, breech extraction, neglected transverse lie, prolonged labor, macrosomic fetus, multiparity, and labor augmentation [7]. IVF-ET has been linked with increased heterotopic pregnancy and multiple gestations among women receiving transferred multiple embryos. Moreover, IVF-ET and salpingectomy can also contribute to uterine rupture [8–11]. In the current case, the patient had a previous right laparoscopic salpingectomy and received IVF-ET. Before the pathological confirmation report, the uterine scar from the salpingectomy was speculated to cause the spontaneous uterine rupture in this patient. However, the

salpingectomy was only a simple bilateral procedure and did not involve the uterus corners. Moreover, the uterine rupture site was situated in the fundus next to the left cornual area and did not involve the right cornu. Therefore, the previous surgical history may not be a strong argument for possible causes of UR. Available studies have indicated IVF-ET as a sole risk factor at the absence of any previous uterine surgery [12] and speculated the potential intrauterine manipulation-induced damage at the time of IVF-ET [10].

Other less common causes of UR include morbidly adherent placenta (placenta accreta, increta, or percreta), congenital anomalies, trauma, and sacculation of the entrapped retroverted uterus. In the current case, the placenta was adherent to the left uterine cornu and was histopathologically-confirmed as placental percreta, the severest form of placenta accreta, which can theoretically result in uterine rupture. Morbid placental adherence can be categorized into three different conditions: placenta accreta, with placental tissues engaging the decidual surface of the myometrium; placenta increta, with placental villi intruding more deeply into the myometrium; and placenta percreta, with chorionic villi penetrating through the uterine serosa and surrounding organs such as the bladder involved [13].

Risk factors for placenta percreta include dilatation and curettage for abortion, previous manual removal of the placenta and previous uterine surgeries (cesarean delivery, myomectomy, and metroplasty) [14–16]. In the current case, the patient had no known risk factors for placental percreta. Next, other rare iatrogenic risk factors were reviewed for possible contribution to the placental percreta, including maternal age, smoking during pregnancy, uterine anomalies, and IVF pregnancy [13, 15, 17, 18]. In this particular case, IVF pregnancy was the risk factor. The patient may have covered up previous surgical history of uterine instrumentation such as curettage. IVF pregnancies are an established risk factor for low placentation. Thus, IVF might be associated with an increased placental percreta. In a population-based cohort study, 10% of placenta percreta cases occurred in primiparous women who became pregnant through IVF [19]. The increasing contribution of ART pregnancies to placental adhesion may be attributed to: (1) primary decidua deficiency as a result of local trauma at the uterine wall; (2) abnormal maternal response to trophoblast invasion [20].

Placenta percreta can result in various complications, including severe haemorrahge, placental villi-induced invasion of adjacent organs such as the bladder and a spontaneous rupture of the uterus. Prior to the acute presentation, an early diagnosis would be invaluable for managing such cases. Women with suspected placenta percreta should deliver their infants in a tertiary hospital, where multidisciplinary care is accessible to decrease mortality via management choices such as hysterectomy preceded by preventive uterine artery embolisation [5] and reducing urinary tract injury with ureteral stents during cesarean hysterectomy [6]. The diagnosis of placental percreta before delivery is clinically not feasible, es-

pecially when without the presence of any risk factors. Previous studies document that prior to delivery, placenta percreta remains undiagnosed in one-half to two-thirds of the total cases [17, 21]. Therefore, identifying the risk factors for placenta percreta remains a priority and both localization and implantation of the placenta in potential affected patients should be examined by 3-dimensional power Doppler or magnetic resonance imaging [22, 23]. For high-risk patients, the uterine wall and placentation should be carefully examined during the antenatal period to rule out a potential placenta percreta. Antenatal diagnosis of placenta percreta is crucial for designing a promising therapy and has been proven to decrease maternal morbidity and mortality [15, 17].

Sudden and severe abdominal pain has been the commonest manifestation of spontaneous rupture, which may be accompanied by vaginal bleeding, shock and fever. In the current case, no acute abdominal pain and vaginal bleeding, and no obvious ultrasonographic abnormalities were found. The patient showed atypical symptoms, such as vomiting, nausea, upper abdominal pain, and initial stable clinical signs. Obstetricians may suspect a potential surgical abdomen. As the abdominal pain is similar to that of an emergent preterm delivery, a potential uterine rupture can be easily overlooked. Early surgical intervention and effective resuscitation of the mother and fetus are crucial for successful management of uterine rupture [24–26]. In this particular case, due to the atypical clinical symptoms, we overlooked the potential uterine rupture, leading to neonatal mortality and a close miss of the mother.

Therefore, a high clinical vigilance is crucial in avoiding diagnostic delay and initiating prompt surgical intervention to minimize maternal and fetal morbidity and mortality. A possible uterine rupture should be suspected in women complaining of abdominal pain and abnormal fetal heart rate, especially for those receiving *in vitro* fertilization. UR may be detected in most susceptible patients by detailed ultrasonography [27, 28]. The common ultrasound features of a uterine rupture include an empty uterus and a gestational sac above the uterus. Other sonographic manifestations include large uterine mass with gas bubbles and intrauterine blood [29]. Ultrasonography can provide a quick preliminary examination of the integrity of the uterine wall, assisting the decision on immediate surgical intervention.

4. Conclusions

The case reported here signifies due timely attention to the catastrophic intraperitoneal hemorrhage of the mother and mortality of the fetus in spontaneous rupture cases associated with placenta percreta. Diagnostic difficulties may be attributed to the disease rarity, nonspecific clinical presentation, and the absence of the apparent risk factors. This case highlights the association between IVF-ET and placenta percreta, and the connection between IVF-ET and uterine rupture. Placenta percreta can be antenatally detected by 3-dimensional power Doppler or magnetic resonance imaging. Therefore, women receiving IVF-ET should be carefully examined by ultrasonography to detect abnormal placentation in the first trimester. Furthermore, extra vigilance should be exercised for women conceived through IVF-ET when they are presented with acute abdominal pain and abnormal fetal heart rate.

Abbreviations

IVF-ET, the *in Vitro* Fertilization and Embryo Transfer; UR, uterine rupture.

Author contributions

All authors contributed to the study conception and design. Material preparation, data collection were performed by YZZ, XYZ. The first draft of the manuscript was written by YZZ, XYZ and LC. All authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Ethics approval and consent to participate

The research was approved by the Ethics Committee of Fujian Provincial Maternity and Children's Hospital (ethical approval code: FY18155). Written informed consent was obtained from the patient for publication of the present case report.

Conflict of interest

The authors declare no conflict of interest.

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