

# Intraperitoneal hemorrhage during pregnancy and parturition

## Case reports and literature review

Yalan Xu, PhD<sup>a</sup>, Yuxiang Zhou, PhD<sup>b</sup>, Junshu Xie, PhD<sup>a</sup>, Xiuju Yin, PhD<sup>a</sup>, Xiaohong Zhang<sup>a,\*</sup>

### Abstract

We aim to investigate the diagnosis, treatment, and prognosis of intraperitoneal hemorrhage during pregnancy and parturition.

Three cases with intraperitoneal hemorrhage during pregnancy and parturition admitted to our hospital from Jan. 2008 to Jan. 2018 were included in this study. One case showed fetal distress. Abdominal ultrasonography and abdominal CT showed pyoperitoneum in 2 cases. Abdominal puncture was performed in 2 patients, and noncoagulant blood was collected. The indications of emergency caesarean section in 3 cases were intraperitoneal hemorrhage. The etiology included rupture of posterior wall of uterus, rupture of blood vessel on uterine surface, and rupture of inflammatory vessel on uterine surface, respectively. The average volume of intraperitoneal bleeding was 2630 ml, and the average transfusion volume was 1530 ml. Caesarean section, and suture hemostasis were performed in 3 cases. The gestational age of delivery were 40<sup>+6</sup> weeks, 40<sup>+2</sup> weeks, and 25<sup>+5</sup> weeks, respectively. There were 1 stillborn fetus and 2 live infants. All the puerperas were cured and discharged.

Intraperitoneal hemorrhage in pregnancy is rare and is easily misdiagnosed. The mortality of pregnant women and perinatal infant is high. Therefore, early diagnosis, and timely operation is important.

**Abbreviation:** Hb = hemoglobin.

**Keywords:** acute abdominal symptoms, intraperitoneal hemorrhage, pregnancy

## 1. Introduction

Spontaneous abdominal hemorrhage was initially reported in pregnant women in 1909.<sup>[1]</sup> Twenty years later, Watkins proposed the concept of abdominal apoplexy,<sup>[2]</sup> in which intraperitoneal vascular rupture and hemorrhage with unknown cause were classified within the scope of such condition. Spontaneous hemoperitoneum and idiopathic hemoperitoneum are also commonly used to describe the massive abdominal hemorrhage during pregnancy or parturition.

To date, intraperitoneal hemorrhage during pregnancy or delivery is a rare condition, with a high mortality among pregnancy and perinatal infant. In order to investigate the diagnosis, treatment and prognosis of intraperitoneal hemorrhage during pregnancy and parturition, we retrospectively analyzed 3 cases with intraperitoneal hemorrhage during pregnancy and parturition between January 2008 and January 2018.

### 1.1. Case 1

A 31-year-old woman referred to our hospital on August 19, 2010 at a gestational age of 40<sup>+6</sup> weeks and paroxysmal pain in lower abdomen for >1 hour. She denied histories of trauma. On physical examination, the findings were as follows: temperature, 37°C; pulse, 70 bpm; respiration, 20 per minute; and blood pressure, 110/78 mmHg. Uterine height and abdominal circumference were 30 cm and 95 cm, respectively. Fetal outcrop was noticed. The fetal heart was 148 bpm. Uterine contraction was about 2 to 3 per minute. Blood routine examination indicated the level of hemoglobin (Hb) was 103.1 g/L. A fetus of 3520 g was delivered, and the 1-minute, 5-minute, and 10-minute Apgar score were 10. The patient complaint of abdominal distension 3 hours postpartum, and the blood pressure was 85 to 100 / 60 to 70 mmHg. The heart rate was 85 to 100 bpm. The Hb was 74.8 g/L. Abdominal CT and abdominal ultrasonography indicated presence of free fluid in the abdominal cavity. Open exploration was performed after general anesthesia. Massive abdominal hemorrhage was found, and an area of 4 × 2 cm existed in the lower left posterior wall of uterus. Meanwhile, active bleeding was seen on the surface. The appearance of bilateral oviducts and ovaries was normal. An area of 1 × 0.5 cm

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All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1964 and later versions. Informed consent was obtained from all patients for being included in the study.

The authors have no conflicts of interests to disclose.

<sup>a</sup> Department of Obstetrics and Gynecology, Peking University People's Hospital, Beijing, China, <sup>b</sup> Department of Obstetrics and Gynecology, Mentougou District Hospital, Beijing, China.

\* Correspondence: Xiaohong Zhang, Department of Obstetrics and Gynecology, Peking University People's Hospital, Beijing 100044, China (e-mail: happyxh713@sina.com).

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was removed from the posterior wall of uterus, and pathological examination was performed. The volume of hemorrhage and blood transfusion were about 3600 ml and 1600 ml, respectively. Pathological report after operation showed decidua tissues and some smooth muscle tissues, which may be associated with the endometriosis.

### 1.2. Case 2

A 29-year-old woman presented to our hospital on February 12, 2013 at a gestational age of 40<sup>+2</sup> weeks, combined with less amniotic fluid for 1 day. Two years ago, left ovarian cyst about 5.0 cm in size was found and no treatment was given. Membrane ruptured naturally at 19:45 on February 12, 2013. Oxytocin intravenous drip was given to strengthen uterine contractions at 8:45 on February 13. Fetal heart monitoring showed that the fetal heart decelerated with a ratio of 69 to 88 bpm. Oxytocin intravenous drip was terminated immediately. Persistent oxygen inhalation of oxygen was performed accordingly. The fetal heart continued to slow down, and fetal distress was considered. Cesarean section was performed in the transverse incision of lower segment of uterus under local anesthesia. About 1500 ml intraoperative hemoperitoneum was found in the operation. A full-term male infant was delivered. Left appendage and the left posterior wall of the uterus were adhered to the posterior wall of the pelvic and abdominal cavity. Meanwhile, multiple blood clot and active bleeding were seen. Combined with the medical history, intraperitoneal hemorrhage was suspected. The causes were unknown. Then the patient was transferred to abdominopelvic cavity exploration. Diffuse adhesion zone and blood clot were found in the posterior wall of uterus during the operation. The left ovary was adhered to the left posterior wall of the uterus and the posterior lobe of the broad ligament. The diameter of endometriosis cyst in left ovary was about 3 × 4 × 5 cm, and the rupture showed a length of 2 cm. There was no active bleeding. No chocolate like liquid was seen around the left ovary. Chocolate-like liquid was seen in the content of the capsule. Multiple inflammatory adhesions were found in the left posterior wall of the uterus, the blood vessel on the surface was opened. Multiple active bleeding was seen, and a local hematoma of 4 × 4 × 11 cm was formed on the serosal surface of the uterus. Then the left ovarian cyst was removed. The volume of hemorrhage and blood transfusion were about 2000 ml and 800 ml, respectively. The weight of the newborn was 3390 g, the 1-minute Apgar score was 6 (muscle tension- 2, breath-1, heart rate-1), the 5-minute and 10-minute Apgar score were 9 (muscle tension-1). The mother and child were recovered and discharged.

### 1.3. Case 3

A 38-year-old woman was referred to our hospital on August 28, 2014 at a gestational age of 25<sup>+5</sup> weeks (IVF-ET), paroxysmal pain in lower abdomen for 24 hours, and aggravation for 3 hours. The G4P1 woman had a history of giving birth to a full-term, 3800 g boy in 2002. She underwent induced abortions twice previously. The patient had a history of laparoscopic surgery. Abdominal pain occurred 1 day ago. After admission, the lower abdominal pain continued to increase, and the pubis pain was positive. Physical examination findings were as follows: BP, 100/66 mmHg; HR, 105 times/minute; fetal heart was 125 to 140 bpm. Laboratory examination findings were as follows:

WBC,  $9.39 \times 10^9/L$ ; percentage of neutrophils, 93.0%; and Hb, 73 g/L. The hematuria amylase and myocardial injury markers were normal. Emergency abdominal ultrasonography and abdominal CT indicated large amounts of effusion in abdominal cavity. Noncoagulant blood was drawn out from the abdominal cavity. Open exploration was performed. Large peritoneal tension, and extensive blue staining were seen in the operation. The intra-abdominal hemorrhage was about 2000 ml. The active bleeding was seen near the posterior lobe of broad ligament on the left posterior wall of uterus. Extensive hyperemia, edema, and inflammatory exudation were found in the surrounding tissues. Low segment cesarean section was performed. The volume of hemorrhage and blood transfusion were about 2400 ml and 2200 ml, respectively. A dead fetus was delivered, and the pregnant was discharged finally with satisfactory conditions.

## 2. Discussion

Abdominal apoplexy is similar to stroke caused by spontaneous hemorrhage of intracranial vessels. It refers to massive abdominal hemorrhage due to spontaneous blood vessels rupture in the abdominal cavity.<sup>[3]</sup> In 1964, Hanna et al reported three pregnant women with spontaneous intraperitoneal hemorrhage, including rupture of vein on the surface of anterior uterine wall at a gestational age of 22 weeks, in addition to rupture of left renal vein at a gestational age of 40 weeks, and rupture of splenic artery after vaginal delivery at a gestational age of 38 weeks.<sup>[4]</sup> In addition, there are some spontaneous hemorrhage during the pregnancy or delivery, such as rupture of variceal vein on uterine surface,<sup>[5,6]</sup> rupture of vessels in proper ligament of ovary,<sup>[7]</sup> and spontaneous bleeding caused by rupture of vascular on uterine leiomyoma.<sup>[8,9]</sup> In 1983, the first case was initially reported in China mainland.<sup>[10]</sup> Then more than 50 cases were reported in the past 30 years. With the improvement of diagnosis and treatment, the maternal mortality decreased from 49.3% to 3.6%, but the perineonate mortality showed no significant improvement (31%–36%).<sup>[6,11–13]</sup> Vascular rupture of tunica serosa uteri could occur at any stage of pregnancy. Increasing evidence showed that 61% occurred before delivery, 18% occurred during delivery, and 21% occurred at the early stage of puerperium.<sup>[13,14]</sup>

Idiopathic intraperitoneal hemorrhage was different from spontaneous hemorrhage in nature. Specific location of bleeding could be observed in spontaneous hemorrhage through surgery. However, specific hemorrhage site was not identified in idiopathic intraperitoneal hemorrhage through surgery. Maya et al<sup>[15]</sup> reported a case with idiopathic intraperitoneal hemorrhage in late pregnancy, who showed sudden abdominal pain with shock at 29 weeks of pregnancy, and intraperitoneal hemorrhage of 3500 ml. However, no hemorrhage site was found during laparotomy. The hemorrhage was no longer available appear after surgery. The fetus was delivered at a gestational age of 37 weeks.

The common causes of intraperitoneal hemorrhage associated with pregnancy are abortion or rupture of ectopic pregnancy, rupture of uterine scar, penetrating implantation of placenta, rupture of corpus luteum in early pregnancy. However, intraperitoneal hemorrhage with uncommon causes has also been reported, and rare causes are associated with rupture of uterine-ovarian vessels, bleeding of varicose vein on uterine surface, and hemorrhage of splenic vein, celioaneurysm or hemangioma.<sup>[5]</sup>

The pathogenesis of the disease is unclear, and the associated risk factors are as follows:<sup>[116,17]</sup>

- (1) The blood supply of the uterus showed significant increase during pregnancy. The gravid uterus compressed the inferior vena cava. The pelvic blood flow was blocked. The pressure of the uterine vein was increased. The uterus subserous vein and the parauterine vein were superficial, and the vessel wall was thin and without venous valves. Increase abdominal pressure caused by coughing, defecating and sexual life, and external force could lead to its rupture and hemorrhage.
- (2) The uterus subserous vein and the parauterine vein were more superficial, circuitous in pregnancy complicated with endometriosis or inflammation. The blood vessels were prone to brittle and ruptured under the invasion of endometriosis.
- (3) Malformed uterus or blood vessels could also be spontaneously ruptured on the basis of these lesions. Brosens et al<sup>[11]</sup> reported that 90% of the blood vessels rupture located in the posterior wall of uterus and para-uterine tissue, and 52% of the patients with blood vessels rupture combined with endometriosis. Therefore, endometriosis is considered as the main risk factor for spontaneous rupture of uterine vessels during pregnancy.

It was worth noting that intraperitoneal hemorrhage was associated with endometriosis in 2 cases. In the rest 1 case, intraperitoneal hemorrhage was associated with local inflammation. Case 1 showed no history of endometriosis, but the site of hemorrhage was the focus of endometriosis on the posterior wall of uterus. The possible mechanism was that the progesterone with high concentration during pregnancy led to a high degree of decidualization of the endometriosis.<sup>[18]</sup> The lesion was brittle. With the increase of gestational weeks, the uterine volume showed increase, and the blood supply during pregnancy was abundant. Hemorrhage occurred under the uterine contraction local pressure.

Case 2 had a history of non-pure cysts in the left ovary, with obvious local adhesions. During the operation, multiple adhesions were found in the left posterior wall of the uterus. The blood vessels on the surface were irritated, and many active bleedings were found. Case 3 showed spontaneous rupture and hemorrhage of the left posterior wall of uterus, with obvious local adhesions. It was suggested that pregnant women with the history of endometriosis, pelvic adhesion and inflammatory diseases before pregnancy should be paid attention to the risk of spontaneous rupture bleeding during pregnancy and labor.

Spontaneous rupture of uterine vessels in pregnancy is characterized by sudden acute abdomen with hypovolemic shock. The localization of abdominal pain is usually not certain, which accompanied by symptoms of nausea, vomiting, dizziness, anal distension. Physical signs included different degrees of tenderness and rebound pain, muscle tension, and shifting dullness. The symptoms of shock were not obvious in the early stage. The blood supply of uterus and placenta showed decline due to the redistribution of blood flow in various organs. Fetal distress in uterus often occurred earlier than the change of blood pressure and heart rate in the maternal body, and even died in the uterus at the time of visit. Differential diagnosis should be made with uterine rupture, placental abruption, HELLP syndrome, rupture of hepatic/splenic aneurysm, and appendicular perforation. For the persistent abdominal pain with unknown cause during pregnancy, the possibility of intraperitoneal hemorrhage should be warned, and vital signs and Hb should be closely

monitored. Intraperitoneal hemorrhage<sup>[11]</sup> is difficult to be found through abdominal ultrasound examination in pregnant patients. Further vaginal ultrasound or CT examination is needed, but the bleeding site is still unclear. The diagnosis could be identified through cul-de-sac or abdominal puncture, but the loss of the pregnant uterus should be avoided. Upon presence of non-coagulant blood in the puncture, the exploratory laparotomy should be performed at the same time of anti-shock therapy to save the life of parturient.

The spontaneous rupture hemorrhage of uterine vascular during pregnancy is rare. Upon diagnosis, regardless of the type of fetal condition, exploratory laparotomy should be immediately performed. On this basis, the safety of pregnancy women should be firstly considered, followed by consideration of the survival of the fetus. Therefore, early diagnosis is the key point for the pregnant safety. The location of hemorrhage should be found, suture and compression hemostasis should be given. Whether low-segment cesarean section is performed at the same time should be based on the conditions of operation and fetus. If the location of hemorrhage could not be found because of gravid uterus occlusion, or suture is difficult caused by high gravid uterus tension. Therefore, low-segment cesarean section was suggested, and further exploration should be performed after delivery. Suture should be performed as soon as possible to stop hemorrhage. If the probability of fetal survival is high, and the conditions for rescuing premature infants are available, caesarean section could be performed after hemostasis. After hemostasis, if the fetus is assessed to have a small gestational age, lower probability of survival, or intrauterine death has occurred, the operation is terminated, under stable conditions. Uterine trauma should be avoided, and induced labor could be performed after operation. Vaginal delivery was advised. If the fetus is survived, the mode of delivery was determined after re-evaluation. It is reported that there are cases of full term spontaneous delivery after uterine vascular rupture repair during mid trimester of pregnancy (22–27 weeks).<sup>[19,20]</sup> Hypovolemic shock is the most common outcome in pregnant women. Heavy heart burden caused by massive transfusion during operation could lead to acute left heart failure. It has been reported that shock pregnant women with a long time of placenta hypoperfusion may present placental abruption after the recovery of blood pressure.<sup>[21]</sup>

The clinical features of intraperitoneal hemorrhage during pregnancy in these 3 cases were as follows: three cases had acute abdomen and 1 had fetal distress. Abdominal ultrasonography and abdominal CT performed in 2 cases showed seroperitoneum. Two patients underwent abdominal puncture, and noncoagulant blood was drawn. The indications of emergency exploratory laparotomy in the 3 cases were intraperitoneal hemorrhage, which were caused by rupture of posterior wall of uterus, blood vessels on uterine surface, and inflammatory vessels on surface of uterus. The average amount of intraperitoneal hemorrhage was 2630 ml, and the average amount of blood transfusion was 1530 ml. Caesarean section and suture hemostasis were used in the 3 cases. The gestational weeks were 40<sup>+6</sup> weeks, 40<sup>+2</sup> weeks and 25<sup>+5</sup> weeks, respectively. There were 1 fetal death, and 2 live infants. The parturient was cured and discharged. Table 1 summarized the reported cases of intraperitoneal hemorrhage caused by various causes. Due to the difficulty of identifying early symptoms, the amount of intraperitoneal hemorrhage was 1140 to 6840 ml. Therefore, this disease should be warned and dynamically observed. Seroperitoneum and progressive decline of Hb should consider the possibility of intraperitoneal

**Table 1**  
**Intraperitoneal hemorrhage during pregnancy.**

| Author                           | Age | Times of pregnancy and partuaiton | Gestational weeks of onset | Clinical symptoms   | Amount of hemorrhage (ml) | Bleeding part  | Outcome of gravida | Outcome of neonatus  |
|----------------------------------|-----|-----------------------------------|----------------------------|---|---------------------------|--|--------------------|--|
| Huang <sup>[22]</sup>            | 24  | G1P0                              | 32 wk                      | Abdominal pain  |                           | Mesenteric vascular rupture and hemorrhage   | Death              | Death  |
|                                  | 39  | G2P0                              | 19 wk                      | Dizziness, Abdominal pain, left renal pain, dizziness, acratia  | 5000                      | Mesenteric vascular rupture and hemorrhage   | Death              | Death  |
| Hanna <sup>[4]</sup>             | 27  | G2P0                              | 23 wk                      | Severe pain in the lower abdomen  | 1140                      | Hemorrhage of venous blood vessels on the surface of the anterior wall of the uterus | Recovery           | A 3315g infant was spontaneously delivered at 40th week, and survived                  |
|                                  | 38  | G6P5                              | 41 + 3 wk                  | Mild pain in the left waist for 1 week, severe tremor, paleness, shivering  | 6840                      | Left adrenal vein hemorrhage   | Recovery           | Dead fetus in uterus   |
|                                  | 27  | G4P1                              | 42 wk                      | Severe pain in the upper abdomen, radiating to the hypochondrium, pain in the shoulder, severe pain in the left chest | 1710                      | Splenic artery   | Recovery           | Dead fetus in uterus   |
| Doger <sup>[6]</sup>             | 26  | G1P0                              | 32 wk                      | Upper abdominal pain, nausea, vomiting  | 300-400                   | Rupture and hemorrhage in placenta percreta of right posterior wall of uterus        | Recovery           | Twin live fetus survived   |
| Diaz-Murilo <sup>[5]</sup>       | 35  | G1P0                              | 37 wk                      | Sudden waist and abdominal pain, aggravated back pain   | Medium dose               | The range of varices of the left uterine angular vein was 7 cm                       | Recovery           | Survival through cesarean section delivery   |
| Munir <sup>[7]</sup>             | 32  | G3P2                              | 38 wk                      | Strong left lower abdominal pain, radiating to shoulders  | 3000                      | Posterior bruise of broad ligament   | Recovery           | Survival   |
| Ekane <sup>[8]</sup>             | 34  | G5P1                              | 1 h after delivery         | Dizziness, shortness of breath, agitation, hypovolemic shock  | 2000                      | Venous vascular hemorrhage on the surface of the mass in the fundus of the uterus    | Recovery           | Survival   |
| Doerga-Bachasingh <sup>[9]</sup> | 33  | G1P0                              | 10 weeks                   | Nausea, vomiting, abdominal pain  | 4500                      | Venous hemorrhage in the hysteromyoma pedicle  | Recovery           | Twin fetus survived through uterine-incision delivery                                  |
| Maya <sup>[15]</sup>             | 30  | G3P1 + 1                          | 29 weeks                   | Lower abdominal pain, syncope   | 3500                      | No bleeding site was found in exploratory laparotomy                                 | Recovery           | A live infant was delivered through uterine-incision delivery at 37 <sup>th</sup> week |

hemorrhage, exploratory laparotomy should be performed as early as possible.

Spontaneous rupture of uterine blood vessels during pregnancy is a rare condition. For patients with acute abdominal pain during pregnancy, especially in those accompanied by abnormal maternal hemodynamics or fetal distress, its possibility should be highly suspected. Early diagnosis and timely operation are crucial for the safety of pregnant women and perineonates.

**Author contributions**

- Conceptualization:** Yalan Xu.
- Data curation:** Yuxiang Zhou.
- Formal analysis:** Yuxiang Zhou.
- Funding acquisition:** Yuxiang Zhou.
- Investigation:** Junshu Xie.
- Methodology:** Junshu Xie.
- Project administration:** Junshu Xie, Xiuju Yin.
- Resources:** Xiuju Yin.
- Software:** Xiuju Yin.
- Supervision:** Xiuju Yin.
- Validation:** Xiaohong Zhang.
- Visualization:** Xiaohong Zhang.
- Writing – original draft:** Yalan Xu.
- Writing – review & editing:** Xiaohong Zhang.

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