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A Case Report and Literature Review of Spontaneous Uterine Rupture in Mid-Pregnancy in a Non-Scarred Uterus

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Abstract: To report a rare case of spontaneous uterine rupture in mid-pregnancy in a non-scarred uterus and to review the literature to explore its etiology, diagnosis, treatment, and prognosis for clinical reference, a retrospective analysis of a case of spontaneous uterine rupture in mid-pregnancy was conducted, documenting the patient's clinical presentation, diagnostic process, surgical treatment, and postoperative recovery. Relevant literature was systematically reviewed to summarize the mechanisms, diagnostic methods, treatment strategies, and prognosis of spontaneous uterine rupture in non-scarred uteri. The case involved a mid-pregnancy female who experienced spontaneous uterine rupture without significant trauma or history of cesarean section. The patient presented with abdominal pain, vaginal bleeding, and symptoms of shock. Ultrasound and MRI confirmed the diagnosis, and emergency exploratory laparotomy and repair were performed. The patient recovered well postoperatively with no significant complications. Literature review indicates that spontaneous uterine rupture in non-scarred uteri, though rare, may be associated with uterine structural abnormalities, excessive stretching during pregnancy, and abnormal placental implantation. Early diagnosis and prompt surgical intervention are crucial for improving prognosis. Spontaneous uterine rupture in mid-pregnancy in a non-scarred uterus is a rare and severe obstetric emergency. Early detection and timely treatment are essential to reduce maternal and fetal complications. This study provides valuable insights into the diagnosis and management of this rare condition, emphasizing the importance of comprehensive prenatal screening and early intervention. Further research is needed to understand its mechanisms and optimize treatment strategies to enhance clinical alertness and management.

1. Case Report

Patient Information: A 38-year-old multiparous female presented with "amenorrhea for 17 weeks and lower abdominal pain for 1 day" on February 25, 2024, at 03:30. The patient had regular menstrual cycles (5-7 days every 30 days) with no dysmenorrhea. Last menstrual period (LMP) was October 25, 2023. She tested positive for urine HCG after 37 days of amenorrhea and had persistent

early pregnancy symptoms such as nausea and dry heaving. She had not undergone regular prenatal check-ups.

Clinical Presentation: On February 24, 2024, at 08:00, the patient experienced sudden onset of lower abdominal pain without any obvious trigger. The pain was intermittent and worsened slightly after defecation, with no sensation of rectal fullness. She did not seek medical attention at that time. By February 24, 2024, at 21:00, the abdominal pain had intensified, although there was no vaginal bleeding, prompting an emergency visit.

Initial Diagnosis and Admission: An outpatient ultrasound revealed an intrauterine pregnancy with a single live fetus. The fetal heart rate was slightly elevated, and there was evidence of pelvic and abdominal effusion. The initial diagnosis was "threatened abortion, G2P1, intrauterine pregnancy at 17 weeks with pelvic and abdominal effusion," and the patient was admitted.

Physical Examination on Admission:

- Temperature: 36.3°C
- Pulse: 103 beats per minute
- Respiration: 20 breaths per minute
- Blood Pressure: 111/74 mmHg
- General Condition: Alert, with mild anemia
- Cardiopulmonary Examination: Normal
- Abdominal Examination: Abdomen soft, uterine fundus located 2 transverse fingers below the umbilicus, mild tenderness in the lower abdomen, sensitive uterus, irregular weak contractions palpable

Gynecological Examination:

On February 25, 2024, at 03:30 with complaints of "amenorrhea for 17 weeks and lower abdominal pain for 1 day." The patient had regular menstrual cycles and a positive urine HCG test after 37 days of amenorrhea. She experienced early pregnancy symptoms such as nausea and dry heaving and had not undergone regular prenatal check-ups.

On February 24, 2024, the patient developed sudden lower abdominal pain without any apparent cause. The pain was intermittent and worsened after defecation. She did not seek medical attention until the evening, when the pain intensified. Outpatient ultrasound showed an intrauterine pregnancy with a single live fetus and pelvic and abdominal effusion.

Upon admission, she had mild anemia and an elevated white blood cell count. Initial blood tests showed a hemoglobin level of 87 g/L and a white blood cell count of 14.28 x 10^9/L. The patient was treated with bed rest and symptomatic management. Dynamic monitoring via ultrasound and blood tests was performed.

On February 26, 2024, the patient's blood test results showed stable white blood cell count and hemoglobin levels. An abdominal ultrasound on February 27 indicated decreased pelvic and abdominal effusion. Despite this, the patient continued to experience intermittent abdominal pain. A consultation with the general surgery department ruled out appendicitis.

By February 28, 2024, the patient reported worsening abdominal pain. A follow-up ultrasound showed no significant changes in the appendix region. On February 29, 2024, the patient's condition deteriorated with increased abdominal pain, anemia, and elevated inflammatory markers. Emergency bedside ultrasound revealed intrauterine pregnancy with persistent pelvic and abdominal effusion.

An emergency exploratory laparotomy was performed, revealing about 1000 mL of blood and clots in the pelvic cavity. The uterus was enlarged and had a 2 cm x 2 cm rupture in the lower segment and a 5 cm x 5 cm rupture at the fundus. The ruptures were irregular with active bleeding. The fetus, estimated to be around 19 weeks, was extracted from the uterine fundus. The placenta was adherent to the myometrium and was removed. A 1 cm x 1 cm rupture was repaired, and approximately 3000 mL of blood loss was managed with transfusions, as shown in Fig. 1.

The patient recovered well post-operatively and was discharged after 5 days.

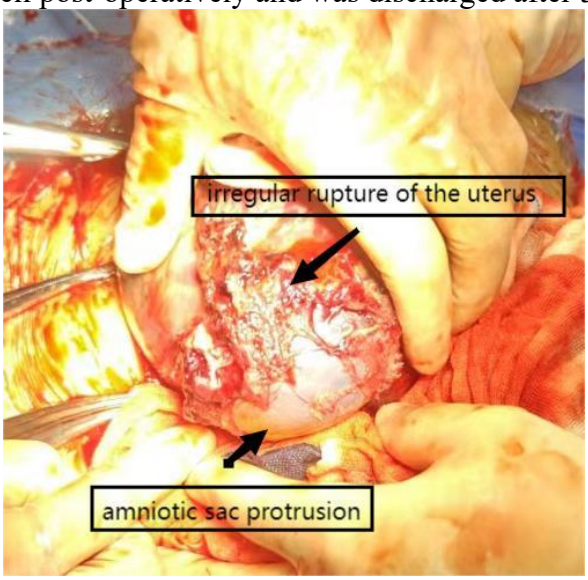

Figure 1: Schematic diagram of the lesion.

2. Mid-Pregnancy Uterine Rupture: Incidence, Diagnosis, and Etiology

2.1 Incidence

Spontaneous uterine rupture refers to a complete rupture of the uterine muscle layer and serosa during pregnancy or childbirth, leading to acute maternal hemorrhage, shock, fetal distress, intrauterine fetal death, and severe cases endangering both maternal and perinatal life. From 1976 to 2021, literature reported 2,084 cases of uterine rupture among 2,951,297 pregnancies, giving an overall incidence of 1 in 11,146 pregnancies (0.07%). Spontaneous rupture of a non-scarred uterus is even rarer, with reported rates of 1 in 150,000. As of March 2024, fewer than 10 papers on spontaneous rupture of a non-scarred uterus are published in the CNKI database, highlighting its extreme rarity and the need for further research.

2.2 Clinical Presentation

The clinical manifestations of spontaneous uterine rupture include progressively worsening abdominal pain, vaginal bleeding, maternal hypovolemia, shock, or severe abdominal hemorrhage. Early detection can reduce maternal and fetal complications. However, some cases report no obvious clinical symptoms, leading to severe maternal and fetal outcomes. Diagnosis often relies on a combination of symptoms, signs, and auxiliary examinations [1]. Non-typical clinical symptoms can complicate diagnosis and timely management. Additionally, due to the rarity of spontaneous uterine rupture, many young gynecologists lack experience, further complicating diagnosis. Non-scarred uterine rupture often presents with more subtle symptoms compared to scarred uterine rupture, making timely identification challenging and increasing the risk of misdiagnosis or missed diagnosis, with potentially more severe complications [2].

This report discusses a case of spontaneous mid-pregnancy rupture of a non-scarred uterus, initially presenting with abdominal pain and abdominal effusion. The absence of surgical or trauma history and normal findings on gynecological ultrasound led to diagnostic difficulties. The patient's condition deteriorated with increasing abdominal pain and rapid drop in hemoglobin, prompting emergency laparotomy [3].

2.3 Etiology

According to research by Xiaocen Niu [4] and colleagues, the most common factors associated with uterine rupture are:

1) Scarred Uterus: 66.7%
2) Placenta Invasion: 22.2%
3) Uterine Malformations: 22.2%
4) Obstetric Procedures: 16.7%
5) Placenta Previa: 1.1%

Sun Qing [5] and colleagues have identified a history of miscarriage surgery as a high-risk factor for spontaneous rupture of a non-scarred uterus. Uterine perforation or false passages caused by induced abortions often heal spontaneously or through conservative treatment, forming uterine scars that can lead to spontaneous uterine rupture in future pregnancies. Dwivedi [6] and colleagues found that among cases of uterine rupture occurring before 24 weeks of gestation, one-third were due to congenital uterine developmental anomalies, one-third were associated with abnormal placental implantation, and one-third had no clear risk factors. Research by Dan [7] and colleagues indicated that irregular prenatal care and a history of gynecological or obstetric surgery are significant risk factors during pregnancy. Among these, scarred uteri are the primary risk factor, followed by placental invasion, abnormal placenta, and ectopic pregnancy surgeries.

From this, it can be inferred that a scarred uterus remains the most common factor associated with uterine rupture. In non-scarred uteri, the history of induced abortion stands out as a unique risk factor, with other contributing factors including congenital uterine anomalies, placental invasion, and a history of uterine surgeries.

3. Analysis of Misdiagnosis Process:

3.1 Patient History

Upon admission, the patient had no clear history of surgery or trauma. Obstetric ultrasound indicated an intrauterine pregnancy with a viable fetus but did not describe the uterine myometrial condition. This lack of detailed information initially interfered with the diagnosis. Although there was fluid in the pelvic cavity, the patient's hemoglobin levels remained stable, and the fluid volume appeared to decrease, leading to a conservative treatment approach without further invasive exploration. It was not until the patient's abdominal pain worsened and intra-abdominal bleeding increased that exploratory surgery was performed.

3.2 Examination

In the early stages of pregnancy, the patient did not undergo regular check-ups or early ultrasounds, making it impossible to determine if there were abnormal gestational sac positions earlier. Upon admission, a pelvic MRI was not performed promptly to assess the nature and source of the pelvic and abdominal fluid. During the surgical exploration, a uterine rupture was discovered. It was only after further inquiry into the patient's history that the family revealed a history of incomplete abortion with medication four months prior to this pregnancy. The increased incidence of uterine damage or perforation due to induced abortion procedures likely contributed to the subsequent uterine rupture in this pregnancy.

Some researchers have reported cases of misdiagnosed complete uterine rupture in their analysis, with all ten cases initially misdiagnosed. Four cases were misdiagnosed as threatened miscarriage or threatened preterm labor, two as gastrointestinal infections, and one each as appendicitis, cholecystitis,

pancreatitis, and fetal distress. This underscores that spontaneous uterine rupture in non-scarred uteri is often more subtle compared to scarred uteri, making timely diagnosis more challenging and leading to higher rates of misdiagnosis and missed diagnosis.

4. Prevention of High-Risk Factors for Non-Scarred Uterus

4.1 Clinical Examination

When assessing pregnant women with abdominal pain, especially those with pelvic or abdominal fluid, clinicians should always consider the possibility of uterine rupture, regardless of whether the patient has a history of surgery. If the patient has a history of induced abortion, curettage, or other uterine surgeries, or iatrogenic injuries, heightened vigilance is necessary. Regular monitoring and comprehensive assessment are crucial to identifying potential complications early.

4.2 Patient History

It is essential to thoroughly inquire about the patient's surgical history, particularly past induced abortions or curettages. Some patients may conceal their history of such procedures due to personal reasons. Others may not recognize these procedures as surgeries, especially if they believe they do not involve incisions or scarring. Clinicians should employ effective communication skills to elicit accurate patient histories. For patients presenting with abdominal pain and pelvic or abdominal fluid during pregnancy, it is important to perform further imaging studies such as MRI to clearly define the source of the fluid and to rule out serious conditions like uterine rupture.

5. Conclusion

Uterine rupture is a critical obstetric emergency that poses a significant threat to the safety of both the mother and the perinatal child. It requires clinicians to prioritize early recognition, prompt diagnosis, and immediate management. Cases of spontaneous uterine rupture in the mid-pregnancy period in non-scarred uteri are extremely rare and demand a multidimensional approach from clinicians. It is essential to ensure timely diagnosis to avoid misdiagnosis and missed diagnosis, ultimately safeguarding maternal and fetal health.

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