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Third-Trimester Spontaneous Uterine Rupture After Ultrasound-Guided High-Intensity Focused Ultrasound Therapy

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To editor:

Uterine rupture, despite its low incidence, is a severe obstetric complication that is associated with adverse maternal and neonatal outcomes. Previous uterine scarring is a known risk factor for uterine rupture. Uterine scars can form from hysterotomy after abdominal/hysteroscopic myomectomy, cesarean delivery, or hysteroscopic surgery. Over the past few decades, ultrasound-guided high-intensity focused ultrasound (USgHIFU) has emerged as a non-invasive therapeutic tool and has found wide application for the safe and effective management strategy of uterine fibroids and adenomyosis.[1] Although some pregnant patients that underwent USgHIFU-based treatment experienced a few obstetric complications, there is still insufficient clinical evidence relating to the real impact of USgHIFU.[2] Here, we report a case of spontaneous rupture of the anterior uterine wall at 36 weeks of gestational weeks in a patient who had previously received USgHIFU therapy. The patient has given her consent to publish the clinical information in the journal.

Case presentation

A 29-year-old woman (gravida 3, para 0) presented with a history of dysmenorrhea. Magnetic resonance imaging revealed an adenomyoma measuring 6.7 × 6.2 × 4.8cm in the anterior uterine wall. She had undergone USgHIFU ablation in 2018. Four years later, she naturally conceived and her antenatal care was uneventful. At 9:00 PM on July 10, 2022, she presented to the Emergency Obstetrics Department of our hospital because of a pregnancy at 36 gestational weeks and irregular contractions for 2+ hours. Ultrasonography indicated no abnormalities in all indicators. Fetal heart rate (FHR) monitoring was normal. Irregular uterine contractions were evident but with weak intensity. A vaginal examination showed that the cervix was tightly closed, and there was no evidence of vaginal bleeding or fluid build-up. Inpatient observation was recommended, but the patient chose to return home. On July 11, 2022, at 04:00 AM, she returned to our department and was hospitalized. She still had irregular abdominal pain. Clinical examination showed that her body temperature was 36.5°C, pulse rate was 90 beats/min, blood pressure was 100/74 mm Hg, and oxygen saturation was 100%. Vaginal examination still showed that the cervix was tightly closed; no vaginal bleeding or fluid build-up was found, and FHR monitoring at the time was a category III with absent variability and recurrent variable decelerations. Because of acute fetal distress, the patient was directly transferred to the operating room for a cesarean delivery. After successful anesthesia induction, the FHR could not be detected and the woman's heart rate increased to 131–151 beats/min, although her blood pressure remained normal. Meanwhile, the shape of her abdomen had changed owing to descension of the uterine fundus. The buttocks of the fetus appeared on the right side of the abdomen. We considered uterine rupture and performed an emergency cesarean delivery. After entering the abdominal cavity, we noted a massive hemoperitoneum caused by the rupture of the anterior uterine wall. A hemoperitoneum with approximately 1000 mL of blood was recovered. The right arm of the fetus was exposed outside of the ruptured uterus, although the fetal body remained in the uterine cavity. A baby girl was delivered weighing 2,450 g, and the Apgar scores were 2 at 1 minute, 7 at 5 minutes, and 8 at 10 minutes. The neonate was immediately admitted to the Neonatology Department. Twenty units of oxytocin were injected into the uterine wall after delivery of the newborn.

The placenta was completely delivered, and no placental abruption occurred. After removing the blood and clots, a T-shaped (13 cm horizontally and 8 cm vertically) tear in the anterior wall and active bleeding from the uterine rupture were found (Fig. 1). Two layers of uninterrupted stitches restored the uterine integrity (Fig. 2). The uterus and pelvis showed no abnormalities. Inspection of the patient's liver showed no evidence of rupture. The surgery took 90 minutes, and the estimated total blood loss was 1300 mL. We transfused 3.5 U of red blood cells and 400 mL of blood plasma. The patient's postoperative course was regular, and she was discharged 8 days later.

Discussion

Spontaneous uterine rupture during pregnancy is very rare and involves nonspecific signs and symptoms that can easily and even endanger the life of the mother and fetus. In this case, the patient only experienced irregular abdominal pain

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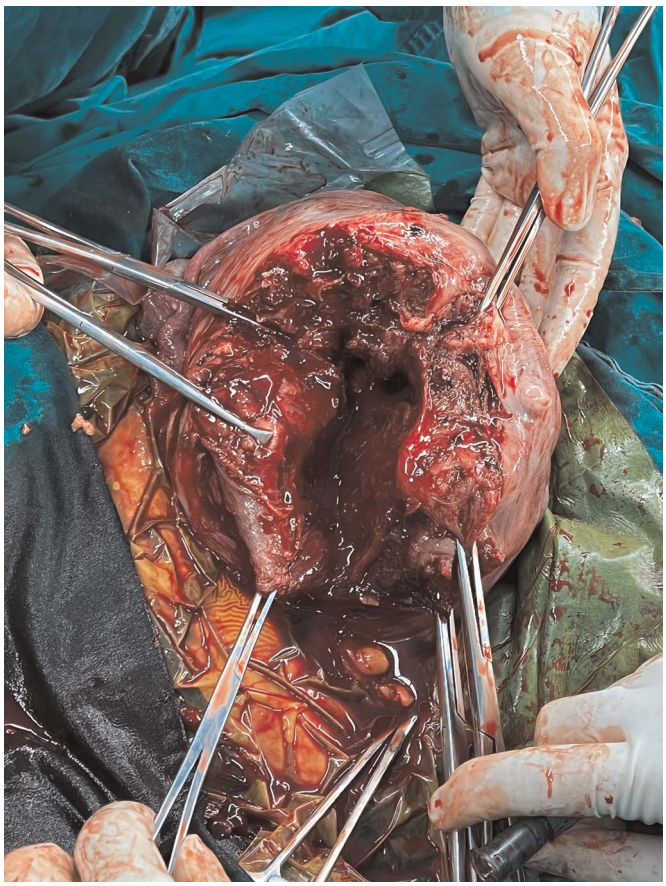

Figure 1. T-shaped tear in the anterior uterine wall, measuring 13 cm horizontally and 8 cm vertically, with active bleeding observed after removal of blood and clots.

and distention, without symptoms of vaginal bleeding or shock. According to the three-tier FHR system, the FHR of the patient at the time of hospital admission was category III FHR. We considered fetal distress *in utero* and immediately decided to perform an emergency laparotomy. After combined spinal-epidural anesthesia, we could not detect the fetal heartbeat and observed changes in the shape of the uterus upon abdominal visualization and an increase in the patient's heart rate. Our team quickly made a diagnosis of uterine rupture and delivered the fetus within 3 minutes. Fortunately, both the patient and neonate had a good outcome.

The most common causes of uterine rupture during pregnancy are a history of previous cesarean delivery or transabdominal and trans-laparoscopic uterine surgery occurring at a mean gestational age of 36.81 ± 6.16 weeks.[3] Sun *et al.*[4] found that some patients who experienced spontaneous uterine rupture had no significant risk factors. The patient in our case was treated by USgHIFU for adenomyoma of the anterior uterine wall. With USgHIFU, an ultrasound beam propagates through the soft tissue as a high-frequency pressure wave. This is a non-invasive technique that does not cause damage to the directly adjacent tissues and is capable of producing coagulative necrosis at a precise focal point within the body. Increasingly, research has proven that USgHIFU is a safe and effective method for the treatment of uterine fibroids and adenomyosis,[3] with minimal adverse reactions, rapid recovery, and fewer complications.[5] Torres-de la Roche *et al.*[6] pointed out that USgHIFU is a safe and effective uterine-sparing treatment, especially for women who wish to preserve their fertility.

The mean time for conception after USgHIFU is shorter than that after laparoscopic myomectomy (LM). Wu *et al.*[7] compared the pregnancy outcomes between USgHIFU ablation and LM and found that the mean time to pregnancy was 13.6 ± 9.5 months after USgHIFU and 18.9 ± 7.3 months after LM ($P<0.05$). It is recommended that contraceptive time after USgHIFU ablation is 1 year.[7,8] The USgHIFU group also had a lower rate of cesarean delivery and a higher spontaneous delivery rate.[7] A systematic review showed that after USgHIFU treatment of fibroids, 366 pregnancies were reported with one fetal intrauterine death, six placenta previas, and no uterine ruptures.[9] When it comes to patients with adenomyosis or adenomyoma, previous studies have more focused more on HIFU to reduce adenomyosis lesions, patients' pain and bleeding symptoms, and the impact on patient's quality of life. In several published, small-sample studies, no uterine rupture occurred during gestation or delivery, and these.[10] However, there are insufficient high-quality comparative and randomized controlled trials regarding fertility and pregnancy outcomes for comparison, especially in patients with adenomyosis or adenomyoma.

Because the patient in our case had only one child, there were fertility requirements in the future. We aimed to repair

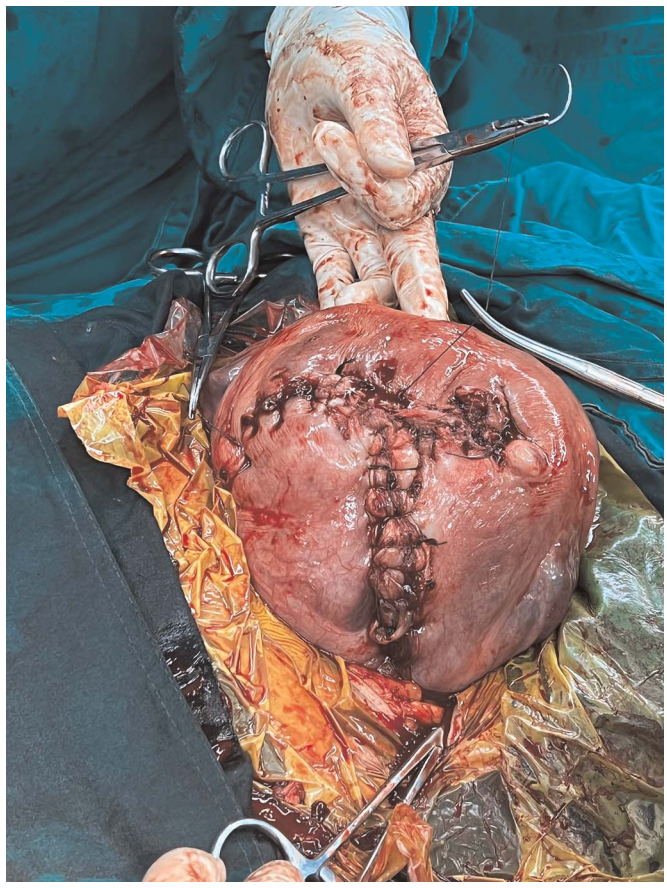

Figure 2. Two layers of uninterrupted stitches were used to restore uterine integrity.

the rupture of the uterus and preserve its reproductive function. According to the recent Uterine Rupture International Data Acquisition study, gestational age and birth weight seemed to be not affected in subsequent pregnancies.[3] It is recommended that patients with a history of uterine rupture undergo elective cesarean delivery at approximately 36–37 weeks of gestational age or earlier in the setting of preterm labor.[11]

Conclusion

As a non-invasive treatment method, the safety and effectiveness of USgHIFU in the treatment of adenomyosis-related symptoms have been confirmed. However, there are insufficient data regarding pregnancy outcomes.

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Authors Contributions

All authors contributed to the study's conception and design. The surgery was performed by Hongying Qian, Jie Shui, Juanjuan Yang, Jiayi Zhang and Yun Shi contributed to data collection, collation, and analysis. Juanjuan Yang, Jiayi Zhang, Jie Shui searched the literature. The first draft of the manuscript was written by Juanjuan Yang and Jiayi Zhang. Hongying Qian was responsible for supervision, writing, reviewing, and editing.

Conflicts of Interest

None.

Data Availability

Data sharing not applicable to this article as no datasets were generated or analyzed during the current study.

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