Journal of Biosciences and Medicines, 2025, 13(11), 26-36
https://www.scirp.org/journal/jbm
ISSN Online: 2327-509X
ISSN Print: 2327-5081

A Case of Uterine Rupture with Hemorrhage Caused by Torsion of a Pedunculated Uterine Fibroid in Late Pregnancy, with a Review of the Literature

Huanqin Zhang*, Weihua Yang*, Jingjie Ma*, Huifen Gao*, Xiaoju Liang#

Department of Obstetrics, Guangming District People's Hospital, Shenzhen, China
Email: #214216797@qq.com

How to cite this paper: Zhang, H.Q., Yang, W.H., Ma, J.J., Gao, H.F. and Liang, X.J. (2025) A Case of Uterine Rupture with Hemorrhage Caused by Torsion of a Pedunculated Uterine Fibroid in Late Pregnancy, with a Review of the Literature. *Journal of Biosciences and Medicines*, **13**, 26-36.
https://doi.org/10.4236/jbm.2025.1311003

Received: August 18, 2025
Accepted: October 27, 2025
Published: October 30, 2025

Abstract

Uterine rupture and hemorrhage resulting from torsion of a pedunculated uterine fibroid represent a rare clinical condition occurring during pregnancy. Due to the lack of specificity and the diversity of clinical manifestations, clinical diagnosis is challenging and may only be confirmed during emergency surgery. It is recognized as one of the severe acute abdominal emergencies in obstetric practice. In this case report, the patient was diagnosed with a subserosal uterine fibroid prior to pregnancy, which exhibited significant enlargement following conception. In the late stage of pregnancy, she was admitted due to premature rupture of membranes, with no signs of acute abdomen. After complete cervical dilation, due to failure of fetal head descent, a cesarean section was performed. Intraoperatively, the uterine fibroid was found to have undergone a 720˚ torsion; as a result of the traction from fibroid torsion, partial rupture of the uterine myometrium occurred, with a rupture measuring approximately 3 cm × 1 cm and active bleeding observed. The fibroid was completely excised, and the wound was sutured and hemostasis achieved, with a favorable prognosis. This case highlights that for pregnant patients with subserosal uterine fibroids, there is an increased risk of pedunculated fibroid torsion, particularly after labor onset, when the degree of torsion more readily increases; traction between the pedicle and uterine myometrium can result in uterine rupture. Therefore, if obstetric indications arise during the trial of labor, or if the patient experiences significant abdominal pain, dynamic ultrasound monitoring during labor may be necessary to assess for conditions such as intra-abdominal bleeding. In such cases, transitioning to a cesarean section

*Co-first author.
#Corresponding author.

should be considered to avoid adverse pregnancy outcomes. This article reviews relevant domestic and international literature to summarize the clinical characteristics of this condition, thereby enhancing clinical recognition.

Keywords

Uterus, Leiomyoma, Pedicle Torsion, Uterine Rupture, Late-Stage Pregnancy

1. Introduction

Uterine fibroids are common benign tumors in the field of gynecology and obstetrics. During pregnancy, hormonal fluctuations may lead to rapid growth and an increased risk of degeneration of uterine fibroids. When a fibroid is pedunculated, torsion of the pedicle may occur, potentially resulting in uterine rupture if not managed promptly. Uterine rupture due to fibroid pedicle torsion is a rare yet severe acute abdominal condition in obstetrics. Currently, the clinical diagnosis is challenging because of nonspecific symptoms, and failure to promptly recognize the condition can pose serious risks to both maternal and fetal safety. In this article, we present a case of uterine rupture and hemorrhage caused by torsion of the pedicle of a uterine fibroid that occurred in our hospital in recent years, and review the relevant literature, both domestic and international, to summarize its clinical features, as well as share clinical experience in managing this disease.

2. Clinical Data

A 28-year-old patient, gravida 1 para 0, was admitted to our hospital on 13 January 2025 due to 37 + 5 weeks of amenorrhea, presenting with vaginal fluid discharge and lower abdominal distension and pain for one hour. The patient conceived naturally; the last menstrual period was 24 April 2024. Pre-pregnancy physical examination and ultrasound revealed a uterine fibroid located above the uterus (measuring 4.3 cm × 3.5 cm × 4.7 cm), with distinct margins. At 7+ weeks of gestation, color Doppler ultrasound in our hospital indicated an early intrauterine pregnancy and a uterine fibroid (located at the upper segment of the uterine body, measuring approximately 6.5 cm × 4.5 cm × 2.8 cm, well defined, internal echoes heterogeneous). At 12+ weeks, NT screening showed NT 1.2 mm, with a uterine fibroid visualized on the left side of the uterus (measuring 6.4 cm × 4.0 cm), with clear boundaries. Down syndrome screening and NIPT both indicated low risk. Thalassemia gene analysis suggested α-thalassemia, while the husband's thalassemia gene testing was normal. At 23 + 3 weeks, anomaly scan revealed no fetal structural abnormalities and identified a uterine fibroid on the left side of the uterus (measuring 6.3 cm × 3.9 cm) with clear boundaries; no change was observed in the posterior echo. During the second trimester, 0GTT results were 4.84 - 11.66 - 8.18 mmol/L, and a diagnosis of gestational diabetes was made; blood glucose was well controlled through dietary and exercise management. At 37+

weeks, fetal ultrasound indicated an intrauterine pregnancy with a single live fetus. Group B Streptococcus (GBS) was negative in late pregnancy. At 37 + 5 weeks at 2:00, the patient experienced clear vaginal fluid discharge without apparent cause, accompanied by irregular lower abdominal distension and pain, and no vaginal bleeding. The patient was admitted to the emergency department with the following diagnoses: "1) Premature rupture of membranes; 2) Gestational diabetes (A1); 3) Pregnancy complicated with uterine fibroids; 4) α-thalassemia; 5) Primigravida, intrauterine pregnancy at 37 + 5 weeks, L0A, threatened labor."

On admission, physical examination revealed: body temperature 36.5˚C; heart rate 68 beats/min; respiratory rate 20 breaths/min; blood pressure 136/79 mmHg. The patient was alert and oriented, with no significant abnormalities detected on heart and lung auscultation. The abdomen was distended, and there was no tenderness or rebound pain throughout the abdomen. Obstetric examination showed: abdominal distension; fundal height 32 cm; abdominal circumference 92 cm; LOA; fetal heart rate 140 beats/min; irregular uterine contractions were palpable; estimated fetal weight was 2900 g; absence of edema in both lower limbs. Vaginal examination: cervical os admitted 1 finger; cervix soft and centered; cervical canal uneffaced; fetal head presenting; station S-3; ruptured membranes; clear amniotic fluid; Bishop score 3. After admission, procalcitonin was 0.069 ng/ml, total bile acids 32.47 μmol/L, genital tract mycoplasma nucleic acid test positive, with no significant abnormalities identified in complete blood count and coagulation tests. Color Doppler ultrasound demonstrated intrauterine pregnancy with a single live fetus; estimated fetal weight was 2572 ± 376 g; fetal heart rate 128 beats/min; placenta located at the mid-upper segment of the posterior uterine wall. The patient and her family were informed of the risks associated with premature rupture of membranes and trial of vaginal delivery in the context of pregnancy complicated by uterine fibroids. Both the patient and her family understood and requested a trial of labor, and close monitoring of maternal and fetal conditions as well as labor progression was instituted. At 2:00 am, the patient experienced spontaneous membrane rupture with clear amniotic fluid, followed by spontaneous onset of labor at 4:00 am. At 13:30, the cervix was fully dilated to 10 cm, S = 0, LOA, clear amniotic fluid, and category I fetal heart monitoring. At 14:30, vaginal examination revealed S + 1, LOA, clear amniotic fluid, contractions occurring every 5 minutes and lasting 20 seconds; secondary uterine inertia was considered, and oxytocin was administered intravenously to augment contractions. At 15:30, vaginal examination revealed S+1, caput succedaneum measuring 5 cm × 4 cm, clear amniotic fluid, category I fetal heart monitoring. In light of the current clinical condition—full cervical dilation for 2 hours, fetal head failing to descend for 2 hours, and no evident progress in labor—fetal descent arrest was considered and secondary uterine inertia; therefore, lower segment cesarean section was planned. Intraoperatively, approximately 200 ml of fresh blood with clots was observed in the pelvi-abdominal cavity. A live male neonate was delivered smoothly; neonatal Apgar scores were 10 at 1 minute, 10 at 5 minutes, and 10 at 10 minutes; birth weight

was 2860 g. The placenta and membranes were delivered intact; oxytocin 10 units intravenously and 10 units injected directly into the uterine body. Uterine contractility was suboptimal; carbetocin 100 mcg intravenously was administered to promote uterine contraction, after which contractions improved. The uterine incision was sutured as per routine. Bilateral adnexal exploration revealed no obvious abnormalities. A pedunculated uterine fibroid was identified on the anterior uterine wall near the fundus (see Figure 1); the fibroid was encapsulated by the omentum; measuring approximately 6 cm × 4 cm × 3 cm; exhibiting 720˚ torsion; with a pedicle length of 5 cm and diameter of 0.5 cm. Active bleeding was present at the twisted pedicle, adjacent to the myometrium. Partial rupture of the myometrial layer was noted, with a rupture measuring approximately 3 cm × 1 cm (see Figure 2). The uterine fibroid and the corresponding portion of the omentum were excised entirely. The surgical site was sutured and both the surgical site and uterine incision were examined for bleeding and oozing; none was observed. The abdominal wall was closed in layers. The excised uterine fibroid and omentum were submitted for pathological examination. Intraoperative blood loss totaled 300 ml; 1,000 ml intravenous fluids were administered; the indwelling urinary catheter drained 250 ml of yellow urine. The patient's intraoperative status remained stable, with a postoperative blood pressure of 130/83 mmHg. Postoperative

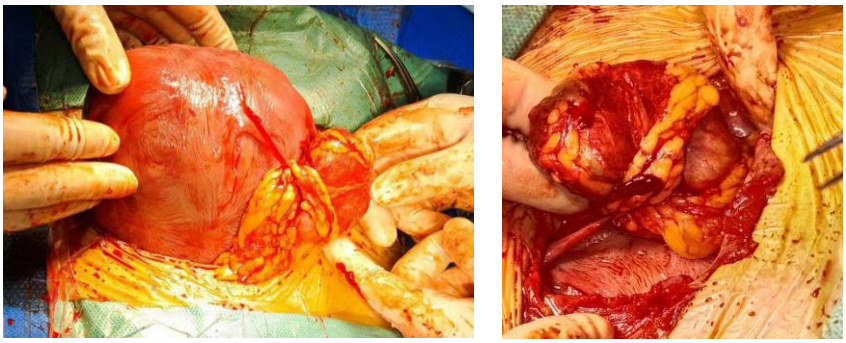

Figure 1. A pedunculated subserosal uterine fibroid can be seen near the fundus on the anterior wall of the uterus, with the fibroid measuring approximately 6 cm × 4 cm × 3 cm.

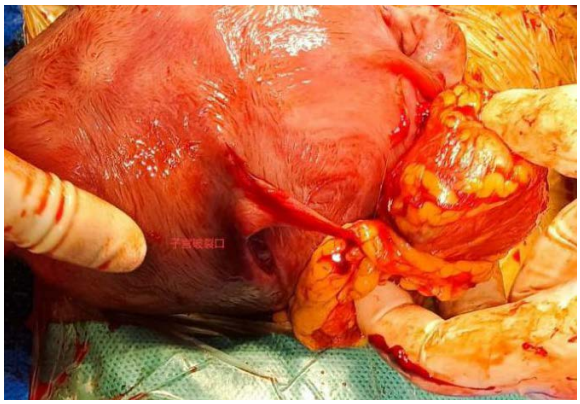

Figure 2. Myoma torsion caused partial rupture of the uterine myometrium, with a rupture opening approximately 3 cm × 1 cm in size visible.

management included routine administration of antibiotics for infection prevention, uterotonic agents, intravenous fluids, thrombosis prophylaxis, and other symptomatic and supportive measures. On postoperative day 4, color Doppler ultrasound of the uterine adnexa showed no obvious abnormalities. On postoperative day 5, the patient was clinically stable and discharged. Pathological report: (uterus) leiomyoma with extensive ischemic infarction.

3. Discussion

3.1. Incidence and Growth Characteristics of Uterine Fibroids During Pregnancy

Uterine fibroids represent common benign tumors in women encountered in obstetrics and gynecology. As the average age of childbearing in women is delayed and with advances in ultrasound imaging technologies, the detection rate of uterine fibroids during pregnancy has been increasing annually. The incidence of these tumors is approximately 25% among women of reproductive age; among them, pregnant women with uterine fibroids comprise 0.5% - 1% of all fibroid patients and account for 0.65% - 3.9% of the overall pregnant population [1]. Most pregnant women with uterine fibroids are asymptomatic during pregnancy; however, the anatomical location and size of uterine fibroids can lead to different symptoms. Pain is the most frequent complication associated with uterine fibroids during pregnancy, with an incidence as high as 15%. The most common cause of pain is "red degeneration" of the fibroid or fibroid torsion [2]. The impact of concomitant uterine fibroids on pregnancy outcomes depends on factors such as fibroid size, location, type, and associated complications.

Currently, the growth characteristics of uterine fibroids during pregnancy are attracting widespread attention. However, effective studies on the growth potential of fibroids during pregnancy—a period marked by substantial changes in hormone levels and multi-organ function—remain insufficient [3]. Existing research indicates that, due to the unique hormonal milieu of pregnancy, fibroids may enlarge with increasing gestational age. Nevertheless, changes in fibroid size during gestation display a nonlinear correlation with gestational age. Following conception, elevated estrogen and progesterone bind to estrogen receptors on smooth muscle fibroid cells, effectively stimulating proliferation in vitro. As the secretion of these hormones rises during pregnancy, fibroids may enter a pronounced proliferative phase, with tumor enlargement being most notable in early and mid-pregnancy. In certain cases, giant uterine fibroids may even lead to pedicle torsion [4]. With the progression of pregnancy, expansion of the amniotic cavity and uterine growth may induce local vascular changes in the fibroid, resulting in regional ischemia that may impede fibroid growth in late gestation [5]. After delivery, following hormonal withdrawal, most enlarged fibroids tend to regress spontaneously. Regarding the present case, the patient's fibroid was measured at approximately 4.3 cm × 3.5 cm × 4.7 cm before pregnancy. In early pregnancy, the fibroid expanded to 6.5 cm × 4.5 cm × 2.8 cm; in mid-pregnancy, it was measured at 6.3

cm × 3.9 cm; and intraoperatively in late pregnancy, no significant change in size was observed when compared to early and mid-pregnancy. Consequently, for pregnant women with uterine fibroids, special attention should be paid to fibroid changes during early and mid-gestation. For those with significant fibroid growth, prenatal management should be intensified and comprehensive assessment implemented to optimize maternal and fetal safety.

3.2. The Impact of Pregnancy Complicated by Uterine Fibroids on the Course of Labor

The course of labor encompasses the entire process of childbirth and is influenced by various factors, including uterine contractions and the birth canal. Studies have demonstrated that pregnancy complicated by uterine fibroids can alter the normal polarity and intensity of uterine contractions, predisposing to uterine inertia and prolonged labor [6]. During the first stage of labor, smooth muscle fibroids located in the lower uterine segment may hinder the descent and engagement of the fetal presenting part, resulting in a high floating presentation and slow cervical dilation, thereby impeding the progress of labor. In the second stage, uterine fibroids may lead to uterine inertia, causing slow descent of the fetal presenting part. Prolonged compression by the fetal head on tissues in the lower uterine segment and perineum may result in edema and overstretching of muscle fibers, further prolonging labor. Pergialiotis V *et al.* [7] performed a meta-analysis on the association between the duration of the second stage of labor and adverse maternal and neonatal outcomes, showing that a prolonged second stage increases the risk of complications in both mothers and neonates. This may induce secondary uterine inertia and elevate the rates of vaginal assisted delivery and cesarean section. Evidence suggests that the diameter of uterine fibroids is positively correlated with the cesarean section rate among women with uterine fibroids [8]. Retrospective studies report that women with large fibroids (diameter >5 cm) have significantly higher rates of postpartum hemorrhage and cesarean section, an increased risk of fetal malpresentation, and that intramural fibroids are particularly prone to cause postpartum hemorrhage [9] [10]. Wang Xiaoxian *et al.* [11] suggest that for uterine fibroids with a diameter <6 cm, vaginal delivery with moderate trial of labor may be appropriate, whereas for fibroids ≥6 cm in diameter, elective cesarean section is recommended to avoid the risks associated with failed vaginal trial of labor. However, there is currently no relevant literature or guidelines supporting this conclusion, and further clinical validation is required. Additionally, in late pregnancy, the uterus enlarges rapidly (with a volume reaching 500 - 1000 times that of the non-pregnant uterus), resulting in a shift in its center of gravity. Pedunculated subserous fibroids are susceptible to rotation or torsion due to gravity. Given that the pedicles of subserous fibroids are usually slender with a single blood supply, torsion may readily cause ischemia. If the fibroid is located on the anterior or lateral uterine wall, fetal movement or uterine contractions may further increase the risk of torsion.

In this case, the patient, a primipara, was admitted due to premature rupture of

membranes and exhibited no signs of acute abdomen. Both the patient and her family strongly desired vaginal delivery. Spontaneous labor began two hours after the rupture of membranes. The first stage of labor lasted 9 hours and 30 minutes. During the second stage, secondary uterine inertia developed. Despite intravenous oxytocin administration, there was no significant progress in labor, and the descent of the fetal head was arrested. Consequently, an emergency cesarean section was performed to terminate the pregnancy. Intraoperatively, a large subserosal myoma was identified at the uterine fundus near the anterior wall; the myoma had undergone 720˚ torsion, resulting in incomplete uterine rupture. However, the patient did not show marked symptoms of acute abdomen, with no notable abdominal tenderness or rebound pain. This takes into account that after the onset of labor, the patient's regular uterine contraction pain may mask the pain caused by tumor torsion, making it difficult for the patient to report abdominal pain as the primary complaint. This patient did not undergo painless delivery. If painless delivery had been administered, the symptoms of acute abdominal conditions would have been even more challenging to differentiate and diagnose. This underscores the need for clinicians to closely monitor the impact of fibroid size and location on the birth canal and fetus in pregnant women with uterine fibroids. Especially after the onset of labor, subserosal fibroids situated on the anterior or lateral uterine wall may have an increased risk of torsion during contractions, raising the possibility of uterine rupture due to torsion. A comprehensive assessment and timely intervention, as well as the scientific and standardized selection of delivery methods, are necessary to prevent adverse pregnancy outcomes.

3.3. Reasons Why Pedicle Torsion of Fibroids during Pregnancy Can Easily Lead to Uterine Rupture

Pedicle torsion of uterine fibroids is an uncommon complication, most frequently occurring when subserosal fibroids with pedicles become twisted. If not promptly managed, this condition can result in uterine rupture and pose a life-threatening risk to the patient. The incidence is notably higher among pregnant patients and those in labor, necessitating heightened clinical attention. According to the literature, subserosal fibroids with slender pedicles are predisposed to torsion arising from changes in body position or external forces [12]. During pregnancy, uterine contractions and the onset of labor can induce pedicle torsion exceeding 360˚, which interrupts blood flow, provokes further constriction, and leads to ischemic necrosis. Moreover, 6 - 12 hours following fibroid torsion, ischemic necrosis triggers the release of inflammatory mediators (IL-6, TNF-α), resulting in inflammatory infiltration of the adjacent myometrium and increasing myometrial tissue fragility [13]. Enlargement of the necrotic, edematous fibroid mass, along with traction from uterine contractions, predisposes weak areas—such as the fibroid's attachment site—to rupture. The risk of rupture is further elevated during pregnancy due to thinning and stretching of uterine muscle fibers combined with traction and torsion [14]. Studies indicate that, given the relatively poor blood supply to the posterior uterine wall, ruptures most commonly occur in this region [15].

In the present case, the patient was found to have a subserosal uterine fibroid prior to pregnancy, which enlarged to 6 cm × 4 cm × 3 cm in late gestation. Following cesarean section and laparotomy, revealed approximately 200 ml of fresh blood with clots within the pelvic and abdominal cavities. Surgical exploration identified the fibroid exhibiting a 720˚ torsion, resulting in partial rupture of the uterine myometrium and active bleeding. The fibroid was completely resected, the wound was sutured, and hemostasis was achieved, with a favorable prognosis. Therefore, clinicians should maintain vigilance for pedicle torsion of subserosal fibroids in pregnant patients with large uterine fibroids, given the distinct physiological changes of pregnancy. The risk of pedicle torsion increases further after labor onset; severe torsion may result in uterine rupture, and diagnosis may be particularly challenging, necessitating a high level of clinical suspicion.

3.4. Reasons Why Uterine Fibroids Are Prone to Rupture during Pregnancy

Uterine fibroid rupture results from the interplay of multiple factors, encompassing vascular abnormalities and hormonal regulation among other multidimensional mechanisms. Although most fibroids are asymptomatic, under certain conditions such as pregnancy, trauma, or rapid growth, they may rupture, leading to serious complications including intra-abdominal hemorrhage, infection, or even shock. During pregnancy, increased uterine blood flow and elevated internal pressure within the fibroid heighten the risk; when patients with concurrent pregnancy and uterine fibroids enter labor, uterine contractions or increased intra-abdominal pressure during vaginal delivery may both precipitate compression and rupture of the fibroid [16]. The high-estrogen and progesterone state characteristic of pregnancy promotes fibroid cell proliferation and inhibits collagen synthesis, thereby weakening tissue integrity and accelerating the rupture process. Furthermore, literature indicates that pedunculated subserosal uterine fibroids are more prone to torsion, which can induce ischemic necrosis and markedly increase the risk of rupture [17]. In this case, intraoperative findings during cesarean section revealed a 720˚ torsion of a subserosal uterine fibroid, where traction on the fibroid's pedicle resulted in rupture and hemorrhage of the uterine myometrium. Although this patient experienced uterine rupture and bleeding due to fibroid torsion without fibroid rupture, this scenario nonetheless highlights for clinicians that in patients with pedunculated subserosal uterine fibroids, the risk of fibroid pedicle torsion increases after entering labor. Vigilance is warranted regarding the potential for fibroid rupture exacerbation induced by pedicle torsion; clinicians should conduct comprehensive risk assessment and develop individualized prevention and management strategies to enhance early clinical identification capability.

3.5. The Relationship between Pregnancy Complicated by Uterine Fibroids and Premature Rupture of Membranes

The incidence of premature rupture of membranes (PROM) is approximately 8% - 12%. According to studies, the risk of PROM is significantly higher in pregnant

patients with uterine fibroids than in those without fibroids (6.8% vs 0.5%, P = 0.01). Furthermore, patients with large fibroids (diameter > 5 cm) exhibit a higher rate of PROM compared to those with small fibroids (diameter < 5 cm) [18] [19]. This increased risk may be attributed to elevated intrauterine pressure from larger or multiple fibroids, which promotes apoptosis of fetal membrane cells, enhances inflammatory activity, increases membrane fragility, and lowers the threshold for rupture, thereby inducing PROM [20]. In the current case, the patient, a primigravida, experienced sudden PROM at 37+ weeks of gestation. Although the patient was diagnosed with gestational diabetes during pregnancy and subsequently tested positive for nucleic acid in the reproductive tract after admission, the occurrence of PROM may be influenced by multiple factors. Nevertheless, this case highlights the importance for clinicians to remain vigilant for PROM and subsequent delivery in pregnant women with large uterine fibroids during prenatal examinations; this warning is particularly significant for those who are not yet at term. PROM is the most direct cause of preterm birth, with over 50% of PROM patients expected to deliver within one week [21].

4. Summary

With the increasing maternal age at childbirth and advancements in imaging technology, both the incidence and detection rates of pregnancy complicated by uterine fibroids are rising. The unique hormonal milieu of pregnancy can cause fibroids to enlarge with advancing gestational age, most notably during early and mid-pregnancy. Enhanced prenatal management is warranted for patients exhibiting significant fibroid enlargement. Pedunculated subserosal fibroids carry a high risk of pedicle torsion, particularly following the onset of uterine contractions and labor, when the degree of torsion may increase. Traction between the fibroid pedicle and the uterine myometrium can result in uterine rupture, representing a serious obstetric abdominal emergency. Clinical manifestations are often nonspecific, particularly after the onset of labor, making clinical diagnosis even more challenging and prone to misdiagnosis; in many cases, definitive diagnosis is only achieved during emergency surgery. Therefore, for patients with pregnancy complicated by uterine fibroids who enter labor, prompt intervention is recommended if primary or secondary uterine inertia or prolonged labor occurs, in order to assess whether fibroids are contributing factors and prevent adverse pregnancy outcomes.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Lang, J.H. (2017) Chinese Expert Consensus on the Diagnosis and Treatment of Uterine Fibroids. *Chinese Journal of Obstetrics and Gynecology*, **52**, 793-800.

[2] Ouyang, D.W., Economy, K.E. and Norwitz, E.R. (2006) Obstetric Complications of

Fibroids. *Obstetrics and Gynecology Clinics of North America*, **33**, 153-169. https://doi.org/10.1016/j.ogc.2005.12.010

[3] Liao, H., Zhou, X., Zhang, C., Cheng, Y.F. and Li, F. (2021) Effects of High-Intensity Focused Ultra-Sound Ablation of Uterine Fibroids on Endometrial Receptivity and Sex Hormone Levels. *Chinese General Practice*, **24**, 88-90.

[4] Tsuji, I., Fujinami, N., Kotani, Y., Tobiume, T., Aoki, M., Murakami, K., *et al.* (2015) Reproductive Outcome of Infertile Patients with Fibroids Based on the Patient and Fibroid Characteristics; Optimal and Personalized Management. *Gynecologic and Obstetric Investigation*, **81**, 325-332. https://doi.org/10.1159/000441788

[5] Ludwig, P.E., Huff, T.J., Shanahan, M.M. and Stavas, J.M. (2019) Pregnancy Success and Outcomes after Uterine Fibroid Embolization: Updated Review of Published Literature. *The British Journal of Radiology*, **93**, Article ID: 20190551. https://doi.org/10.1259/bjr.20190551

[6] Han, N.Y. and Wang, X. (2020) Clinical Study on the Correlation between Duration of Labor and Postpartum Hemorrhage. *Chinese Journal of Obstetrics and Gynecology*, **55**, 673-678.

[7] Pergialiotis, V., Bellos, I., Antsaklis, A., Papapanagiotou, A., Loutradis, D. and Daskalakis, G. (2020) Maternal and Neonatal Outcomes Following a Prolonged Second Stage of Labor: A Meta-Analysis of Observational Studies. *European Journal of Obstetrics & Gynecology and Reproductive Biology*, **252**, 62-69. https://doi.org/10.1016/j.ejogrb.2020.06.018

[8] Michels, K.A., Velez Edwards, D.R., Baird, D.D., Savitz, D.A. and Hartmann, K.E. (2014) Uterine Leiomyomata and Cesarean Birth Risk: A Prospective Cohort with Standardized Imaging. *Annals of Epidemiology*, **24**, 122-126. https://doi.org/10.1016/j.annepidem.2013.10.017

[9] Ekine, A.A., Lawani, L.O., Iyoke, C.A., *et al.* (2015) Review of the Clinical Presentation of Uterine Fibroid and the Effect of Therapeutic Intervention on Fertility. *American Journal of Clinical Medicine Research*, **3**, 9-13.

[10] Fagherazzi, S., Borgato, S., Bertin, M., Vitagliano, A., Tommasi, L. and Conte, L. (2014) Pregnancy Outcome after Laparoscopic Myomectomy. *Clinical and Experimental Obstetrics & Gynecology*, **41**, 375-379. https://doi.org/10.12891/ceog19442014

[11] Wang, X.X., Han, L. and Liu, X. (2017) Clinical Analysis of Vaginal delivery in Pregnancy Complicated with Uterine Fibroids. *China Medical Engineering*, **25**, 30-32.

[12] (2021) Management of Symptomatic Uterine Leiomyomas: ACOG Practice Bulletin, Number 228. *Obstetrics & Gynecology*, **137**, e100-e115.

[13] Chen, Y.H., Lin, H.C., Chen, S.F. and Yang, M.J. (2020) Uterine Rupture Caused by Torsion of a Pedunculated Leiomyoma during Pregnancy: A Case Report and Literature Review. *Journal of Obstetrics and Gynaecology Research*, **46**, 789-795.

[14] Rahn, D.D., Carberry, C., Sanses, T.V., *et al.* (2020) The Role of Relaxin in Cervical and Uterine Remodeling during Pregnancy: Implications for Fibroid-Associated Complications. *American Journal of Obstetrics & Gynecology*, **223**, 377.e1-377.e 7.

[15] García-Sánchez, Á., Pérez-Medina, T., Martínez-Payo, C., *et al.* (2022) Risk Factors and Threshold Analysis for Uterine Rupture in Patients with Uterine Fibroids: A Multicenter Study. *Archives of Gynecology and Obstetrics*, **305**, 321-330.

[16] Azouz, E., Aloui, H., Frikha, H., Rami, H., Minjli, S., Omri, A., *et al.* (2025) Intraperitoneal Rupture of a Degenerated Uterine Fibroid during Pregnancy: A Case Report and Literature Review. *Radiology Case Reports*, **20**, 1452-1455.

https://doi.org/10.1016/j.radcr.2024.11.073

[17] Parker, W.H. (2007) Etiology, Symptomatology, and Diagnosis of Uterine Myomas. *Fertility and Sterility*, **87**, 725-736. https://doi.org/10.1016/j.fertnstert.2007.01.093

[18] Rizwan, N., Abbasi, R.M. and Jatoi, N. (2009) Retained Placenta Still a Continuing Cause of Maternal Morbidity and Mortality. *Journal of the Pakistan Medical Association*, **59**, 812-814.

[19] Klatsky, P.C., Tran, N.D., Caughey, A.B. and Fujimoto, V.Y. (2008) Fibroids and Reproductive Outcomes: A Systematic Literature Review from Conception to Delivery. *American Journal of Obstetrics and Gynecology*, **198**, 357-366. https://doi.org/10.1016/j.ajog.2007.12.039

[20] Lam, S., Best, S. and Kumar, S. (2014) The Impact of Fibroid Characteristics on Pregnancy Outcome. *American Journal of Obstetrics and Gynecology*, **211**, 395.e1-395.e5. https://doi.org/10.1016/j.ajog.2014.03.066

[21] Girault, A., Le Ray, C., Chapron, C., Goffinet, F. and Marcellin, L. (2018) Leiomyomatous Uterus and Preterm Birth: An Exposed/Unexposed Monocentric Cohort Study. *American Journal of Obstetrics and Gynecology*, **219**, 410.e1-410.e7. https://doi.org/10.1016/j.ajog.2018.08.033