Pregnancy Outcomes and Associated Factors for Uterine Rupture: An 8 Years Population-based Retrospective Study

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Research Article

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Abstract

Background: Uterine rupture is an obstetrical emergency with serious undesired complications for laboring mothers resulting in fatal maternal and neonatal outcomes. The aim of this study was to assess the incidence of uterine rupture, its association with previous uterine surgery and vaginal birth after caesarean section (VBAC), and the maternal and perinatal implications.

Methods: This is a population-based retrospective study. All pregnant women treated for ruptured uterus in one center between 2013 and 2020 were included. Their information retrieved from the medical records department were retrospectively reviewed.

Results: A total of 209,112 deliveries were included and 41 cases of uterine rupture were identified. The incidence of uterine rupture was 1.96/10 000 births. 16 (39.0%) had maternal and fetal complications. There were no maternal deaths secondary to uterine rupture, while perinatal fatality related to uterine rupture was 7.3%. Among all case, 38 (92.7%) were scarred uterus and 3 (7.3%) were unscarred uterus. The most common cause of uterine rupture was previous cesarean section, while cases with a history of laparoscopic myomectomy were more likely to have serious adverse outcome. 24 (59%) of the ruptures occurred in anterior lower uterine segment. Fetal heart rate monitoring changes were the most reliable signs for rupture.

Conclusions: Incidence of uterine rupture in the study area was consistent with developed countries. Further improvement in obstetric care and strong collaboration with referring health facilities was needed to ensure maternal and perinatal safety.

Background

Uterine rupture (UR) is a full-thickness separation of the uterine wall through breaching during pregnancy, labor or immediately after delivery[1–3]. According to the world health organization, the average incidence of UR is 5.3 / l0000[1]. UR is one of the most dangerous obstetric problems and a life-threatening emergency. It is an important cause of maternal and perinatal morbidity and mortality[4–6]. Maternal mortality ranges between 1% and 13% and neonatal mortality between 74% and 92 %[1]. The determinant factors for maternal and fetal outcomes of UR differ across geographical boundaries due to different socio-demographic status, the availability and accessibility of routine obstetric care and health system effectiveness. Analyzing outcomes and factors associated with maternal and fetal complications of UR in the study area is important to prevent and improve clinical management by designing policies and strategies.

Although the occurrence of UR is relatively rare, it is more frequent in low-income compared to high-income countries[7, 8]. In high-income countries, the greatest risk factor is a scarred uterus, typically from a previous cesarean delivery. Risks for UR are also related to factors such as parity, obstructed labor, induction of labor, use of prostaglandins, and/or breech presentation[1, 7, 9]. VBAC(vaginal birth after caesarean section)is an important option to reduce caesarean section rate. But in China, many hospitals

are reluctant to attempt a TOLAC (trial of labour after caesarean delivery) for increasing the risks of severe adverse outcomes, such as UR and fetal or neonatal death. However, reports on UR and its maternal and perinatal outcomes for such delivery are lacking in China. As to scarred uterus, previous studies have generally concentrated on the outcome of UR mostly in patients with previous cesarean section, and few have described the outcome in patients with other gynecological surgery history.

The aim of this study was to analyze all cases of UR in our hospital during the period 2013–2020 to assess the incidence, the associations with previous caesarean, other gynecological surgery history, and the maternal and perinatal implications of UR.

Methods

Study design and participants

A retrospective analysis of UR cases was conducted at Shanghai First Maternity and Infant Hospital, Tongji University School of Medicine, from June 1, 2013 to December 31, 2020. This hospital is a tertiary referral center for critical and severe diseases of pregnant and delivery women and has the largest number of deliveries in East China region. This study was approved by the Ethics Review Committee of Shanghai First Maternity and Infant Hospital, Tongji University School of Medicine (KS20268).

We excluded cases with: pregnancies before 20 weeks, uterine dehiscence, traumatic of motor vehicle accidents.

Variables of the study

Patients with UR were divided in two groups according to maternal and/or fetal complications or not, and compared. Maternal complication was defined by estimated postpartum hemorrhage (blood loss volume more than 500ml after vaginal birth or more than 1000ml after caesarean section), hysterectomy, obstetric injury (genital and/or urinary injury) and maternal death. Neonatal complication was defined as Apgar score < 7 at 5 min, neonatal intensive-care unit (NICU) admission, and neonatal death[10, 11]. A complete UR was defined as tearing in all layers of the uterine wall, including the serosa and amniotic membranes. An incomplete UR was defined as tearing in the muscular layers, with intact serosa or amniotic membranes[12].

We retrieved the charts of UR cases and collected independent variables : 1) socio-demographic characteristics (age, parity, education and place of residence; 2) pregnancy and labor related variables (previous cesarean section, ectopic pregnancy, uterine myomectomy and other uterine operation history, intrauterine operation; 3) clinical symptoms and signs 4) maternal and fetal outcomes (delivery method, blood loss and transfusion, postpartum hemorrhage, ICU, birth weight, 5-minute Apgar score < 7).

Data processing and analysis

All collected data were rechecked for completeness and coded. Then the data were entered and cleaned using Epidata 3.1 software. Data are expressed as mean ± standard deviation, or median (25th-75th percentile). The normality of variables was assessed. Differences between two groups were compared with the Student's t-test and the Mann–Whitney U test for continuous variables: mean and median, respectively, and with the $\chi 2$ test or Fisher's exact test for categorical variables. We used the Spearman coefficient to assess the correlation between UR rate and VBAC rate. Multivariable logistic regression analysis was performed to examine the association of included variables with UR. Odds ratios (OR) were presented with 95% confidence intervals (CI). Statistical analyses were performed using SPSS software, version 22.0 (SPSS Inc., Chicago, IL, USA). A *p* value of less than 0.05 was considered statistically significant.

Results

During the study period, 41 UR were identified among a total of 209,112 deliveries. The incidence of UR was 1.96/10 000 births. There were no maternal deaths, hysterectomy, and obstetric injury secondary to UR in our study. Among all cases, there were 16(39.0%) cases with complication and 25(61.0%) cases without. 15 (36.6%) were complete rupture cases, and 26 (63.4%) incomplete rupture cases. 38(92.7%) were scarred uterus and 3 (7.3%) were unscarred uterus.

The total number of deliveries and the rates scarred uterus and VBAC increased over the eight years. However, the proportion of UR remained consistent (Figure. 1). UR rate was not associated with VBAC rate (correlation coefficient: -0.095, $p = 0.826$).

Demographic data and clinical characteristics of mothers and fetuses between UR and non-UR were presented in Table 1. Patients in UR group were significantly older and more than half (58.5%) of them were over 35 years old, compared with 18.8% of the non-UR group. The mean gravidity of the case women of the UR group was 2.95 ± 1.41, significantly higher than that of the non-UR group (1.85 ± 1.09). The proportion of primiparity in non-UR group (72.7%) were significantly higher than UR group (24.4%). There was a statistically significant difference in the gestational age at delivery (39.0 ± 1.6 vs. 37.04 ± 3.52), birth weight (3296.9 ± 470.1 vs. 3016.59 ± 755.1) and maternal hospital stay (4.3 ± 4.1 vs 7.7 ± 5.3) between the groups ($p < 0.05$). Compared to the non-UR group, the proportion of gestational hypertension (7.3% vs. 1.1%), artificial reproductive technology (12.2% vs. 4.0%), cesarean delivery (100% vs 39.9%), postpartum hemorrhage (31.7% vs. 1.5%), preterm birth (39.0% vs. 6.6%), and 5-minute Apgar score < 7 (19.5% vs. 1.0%) were significantly higher in the UR group ($p < 0.05$).

Table 1
Characteristics of mothers and newborns in study.

	Non-UR	UR	*p* value
Mothers			
Age (years)	30.9 ± 4.0	35 ± 3.78	< 0.001*
> 35 y	39313 [18.8]	24 [58.5]	< 0.001*
Gravidity	1.85 ± 1.09	2.95 ± 1.413	< 0.001*
Primiparity	152024[72.7]	10[24.4]	< 0.001*
Gestational diabetes mellitus	22793[10.9]	6[14.6]	0.605
Gestational hypertension	2300[1.1]	3[7.3]	0.002*
Artificial reproductive technology	8365 [4.0]	5[12.2]	0.023*
Hospital stay	4.30 ± 4.10	7.71 ± 5.28	< 0.001*
Postpartum hemorrhage	3137 [1.5]	13[31.7]	< 0.001*
Deliveries/Newborns			
Cesarean delivery	83436[39.9]	41 [100]	< 0.001*
Gestational age (weeks)	39.00 ± 1.60	37.04 ± 3.52	0.001*
Preterm birth (< 37 weeks)	13801 [6.6]	16[39.0]	< 0.001*
Birth weight (g)	3296.9 ± 470.1	3016.59 ± 755.1	0.022*
Macrosomia	11083 [5.3]	1[2.4]	0.639
5 min Apgar < 7	2091 [1.0]	8[19.5]	< 0.001*
Values are expressed as mean ± standard deviation or number.			
UR, Uterine rupture			

Table 2 displayed the occurrence of obstetrical risk factors in complicated and not complicated UR groups. Among all patients with UR, 16 (39.0%) had maternal and fetal complications. Compared with not complicated UR, women in complicated UR group had higher proportions of primiparity, uterine myomectomy history, artificial reproductive technology use, blood transfusion, intensive care unit (ICU) admission, and complete UR. Complicated UR group also presented a larger amount of bleeding, a longer

hospital stay, a higher probability of preterm birth, multiple pregnancy, a smaller rupture gestational weeks, a lower birth weight and prevalence of previous cesarean history.

Table 2
Characteristics of mothers and newborns in complicated and not complicated uterine rupture

	Complicated	Not complicated	P
	16	25	/
Mothers			
Age (years)	35.77 ± 4.38	34.56 ± 3.64	0.357
> 35 y	10[62.5]	14[56]	0.680
Gravidity	3(1.5-4)	3(2-3.5)	0.517
Primiparity	8[50]	2[8]	0.002*
Intrauterine operation	10[62.5]	12[48]	0.364
Gestational diabetes mellitus	2[12.5]	4[16]	0.757
Gestational hypertension	3[18.75]	0[0]	0.053
Artificial reproductive technology	4[25]	1[4]	0.045*
Scarred uterus	13[81.25]	25[100]	0.053
Previous cesarean	6[37.5]	22[88]	0.001*
Previous UM	5[31.25]	1[4]	0.016*
Previous cornual pregnancy	3[18.75]	2[8]	0.305
TOLAC	2[12.5]	8[32]	0.156
Rupture of GA	36.14(30.86–37.86)	38.71(37.43–39.79)	0.001*
Interval since last operation	4(2.5–6.5)	4(3-6.5)	0.584
Diagnosed in surgery	10[62.5]	10[40]	0.16
Blood loss	1250(1100–2675)	300(300–400)	<0.001*
Transfusion	8[50]	1[4]	0.001*
Intensive care unit	11[68.75]	1[4]	<0.001*
Hospital stay	7(5-10.5)	5(4–7)	0.043*

Values are expressed as mean ± standard deviation, number, or median (Q1–Q3).

TOLAC, trial of labour after caesarean delivery; GA, gestational age; NICU, neonatal intensive care unit; UM, uterine myomectomy;

	Complicated	Not complicated	P
Abnormal fetal heart rate	11[68.75]	6[24]	0.005*
Vaginal bleeding	7[43.75]	6[24]	0.007*
Abdominal pain	11[68.75]	12[48]	0.192
Other symptoms	0[0]	5[20]	0.137
Emergency indication	13[81.25]	14[56]	0.096
Complete UR	9[56.25]	6[24]	0.036*
Deliveries/Newborns			
Preterm birth (< 37 weeks)	10[62.5]	6[24]	0.014*
Twins	4[25]	0[0]	0.018*
Birth weight (g)	2970(1740–3500)	3200(2945–3635)	0.040*
Values are expressed as mean ± standard deviation, number, or median (Q1–Q3).			
TOLAC, trial of labour after caesarean delivery; GA, gestational age; NICU, neonatal intensive care unit; UM, uterine myomectomy;			

Patients' rate with abnormal fetal heart rate (68.8% vs. 24.0%) and vaginal bleeding (43.8% vs. 24.0%) were significantly higher in the UR group with maternal and fetal complications. In complicated group, the range of ruptured gestational week was 23 to 40 weeks. In not complicated group, the earliest and the latest ruptured gestational week were 35 weeks and 40 weeks. No maternal death was observed. The perinatal fatality attributable to UR was 7.3%. 21 (51.2%) mothers were diagnosed with UR preoperatively, 20 (48.8%) were diagnosed intraoperatively. The diagnosed time and the proportion of TOLAC were similar in the 2 groups (p = 0.16; 0.156).

Multiple logistic regression analysis was employed to examine whether signs and symptoms were associated with the presence of UR with complication (Table 3). The model, which included all signs and symptoms as independent variables, showed that abnormal fetal heart rate emerged as a significant and independent factor associated with the complicated UR compared with other signs. (OR = 12.45; 95% CI: 1.16-133.54; p < 0.05). Other clinical signs were not statistically different.

Table 3
Signs and symptoms of rupture uterus presented in a multi-variable analysis

	OR	95%CI		P
Abnormal fetal heart rate	12.446	1.16	133.54	0.037*
Vaginal bleeding	0.807	0.055	11.932	0.876
Abdominal pain	2.062	0.356	2.062	0.419
Other symptoms	0	0	/	0.999

Figure 2 shows the rupture sites involved. 24 (59%) cases were anterior lower uterine segment; 3 (7%) cases had posterior segment rupture; 9 (22%) cases were ruptured at the lateral segment; and 4 (10%) cases were fundal segment rupture and one ruptured more than one place (2%).

Detailed clinical information on all UR cases following laparoscopic myomectomy is shown in Table 4.

Table 4
Detailed surgical findings and obstetric outcomes of the six cases with uterine rupture following laparoscopic myomectomy

Patient	1	2	3	4	5	6
Age(yr)	30	39	44	33	37	32
Year of surgery	2014	2007	2013	2015	2018	2016
Number of myoma removed	5	1	2	2	2	2
Myoma type	IM	IM	IM,SS	IM	IM, SS	IM
Myoma size(cm)	6,3*4	6	5,1.5	3*2	6,1	6,2
Uterine incision	MP	MP	MP	MP	MP	MP
Cavity entered	No	No	No	No	No	No
Hemostasis type	BP,S	BP,S	BP,S	BP,S	BP,S	BP,S
Stitches	3 Layers	2 Layers	2 Layers	2 Layers	2 Layers	2 Layers
Anti-adhesion agents	No	No	No	DM	DM	Yes
Interval from surgery to pregnancy(yr)	2	9	5	3	2	4
Gestational week of rupture	31.43	36.43	37.43	30.29	23	35.43
Labor	No	No	No	No	No	No
Volume of bleeding(ml)	3250	800	2000	2500	2850	1250
Number of fetuses	1	1	1	1	1	1
Fetal survival	No	Yes	Yes	No	No	Yes
Maternal survival	Yes	Yes	Yes	Yes	Yes	Yes

BP, bipolar electrosurgery; DM, data missing; IM, intramural; MP, monopolar electrosurgery; S, suture; SS, subserosal;

Discussion

UR in pregnancy is rare, but when it occurs the consequences can be life-threatening to both mother and fetus [13, 14]. The occurrence of UR varies in different parts of the world. Globally, the incidence of UR is 0.07% with the tendency of being lower in developed countries than developing countries[1] [15]. The rate of UR in our study was 0.0196%, consistent with the rate of developed countries. There were no cases of maternal death due to UR in our study.

There has been wide variation in the aetiology UR over years[16–18], where the increase rate of TOLAC and the use of uterotonics have created the two most common predisposing factors in the developed countries[9, 15, 19, 20]. However, the major causes of UR in developing countries are both obstetric and non-obstetric multitude of factors: multi-gravidity, teen-age pregnancy, old primi, poor socio-economic status, previous cesarean section scar, unsupervised labor and unwise use of uterotonic agents[4].

Our study showed that the key risk factor of UR was the presence of scar, and previous cesarean section is the most important cause of uterine scarring. Therefore, to reduce UR rate, we need to strictly control the indication of cesarean section so as to reduce the rate of cesarean section. Globally, cesarean delivery rates have been steadily increasing over the past 20–30 years[21–23]. A major contributor to this has been elective repeat cesarean sections. Approximately one-third to half of elective cesareans are performed because of a history of cesarean delivery[21, 24, 25]. Routine elective repeat cesarean section for all women with a prior cesarean section is not universally advocated, desired, or without risk. Furthermore, multiple cesarean sections also carry the increased risk of placenta previa and placenta accrete with future pregnancies[26]. And such a policy would result in significant financial cost [27]. However, VBAC limited such problems. As another mode of birth after caesarean section, VBAC is associated with fewer complications, such as shorter maternal hospitalization, less blood loss, and a decreased incidence of puerperal infections and thrombotic events[28]. TOLAC is a safe option for most people and 75% women may be successful[29].Recent years, VBAC has been supported as a way to decrease related complications and slow the increase in cesarean births to some extents. In Norway, all mothers with one previous caesarean section are offered a chance of TOLAC unless there is an absolute contra-indication. The TOLAC rate is high with 51%, and 80% succeed[30]. VBAC is being advocated by more and more countries, but in China, the VBAC rate was only 9.6% in 2016, as compared to 12.4% in the United States in the same year[31, 32].While TOLAC is accepted practice in hospitals with advanced medical equipment and obstetric skills, it is still controversial. A successful VBAC is associated with fewer complications compared with elective repeat cesarean delivery, whereas a failed TOLAC is associated with more complications[33]. We can see TOLAC has gone through three stages in US. Stage one, VBAC rates had increased from 5% in 1985 to 28.3% by 1996 as recommendations favored TOLAC; Stage two, the VBAC rate had decreased to 8.5% by 2006 as the number of UR and other complications related to TOLAC increased. Some hospitals stopped offering TOLAC altogether; Stage three, VBACs had been on the rise again since 2016 and increased to 13.3% by 2018, when a balance between TOLAC and safety was reached[32, 33]. U.S experience is worth learning and most part of China is going through the stage two, so we can see the reversal of the VBAC. Therefore, promoting TOLAC in China and ensuring the safety is needed. In our study, we were expecting UR rates to be higher as people attempted a TOLAC increased. However, this was not the case here and ruptures occurring after TOLAC were not more serious. Our hospital is one of the three hospitals with the largest number of births in China, and Shanghai is one of the most advanced medical treatment areas in China, which is close to developed countries, so we have rich medical experience to reduce the occurrence of UR and ensure the maternal and perinatal safety. Our study provides evidence that under the condition of strict control and indication, TOLAC is safe and reliable and worth carrying out. With the implementation of the policy of encouraging

birth in China, more and more second-child pregnant women choose to attempt a TOLAC, the rate of cesarean section and consequent risk of UR will decline as a whole, and the national medical burden and financial expenditure can be reduced.

The other two causes of uterine scarring in our study are previous myomectomy and previous cornual pregnancy. All our cases with a previous myomectomy surgery were performed by laparoscopy. With the rise of minimally invasive techniques, laparoscopic surgeries are being performed in greater numbers today than ever before. Despite overwhelming evidence that laparoscopic myomectomy is minimally invasive and associated with fewer perioperative complications, there is one concern that is still under debate, i.e., does laparoscopic myomectomy increase risk of subsequent UR? Some previous studies showed there was no difference between laparoscopic and open myomectomy on the risk of UR while others demonstrated that laparoscopic procedure increased this risk compared to open approach because it was believed to result in incompletely repaired muscle defects[34–37]. The use of powered instruments, limited instrumentation use and impossibility of palpation might be the reasons. Some techniques including multi-layer closure of the myometrium and limited use of electrosurgical energy should be adhered to by surgeons to decrease the risk[37]. In our study, it seems to lead to more serious outcomes regarding the six UR cases following laparoscopic myomectomy. Among them four had excessive blood loss above 2000 ml and presented signs of hemorrhagic shock, three had the worst outcome, i.e., the fetuses did not survive. They might even be influenced by long-term sequelae, which can adversely affect subsequent pregnancies. The removed myoma size and number in UR patients were within average range of normal cases of laparoscopic myomectomy, which is consistent with other studies[37, 38].And there is no evidence indicating the best contraception period prior to pregnancy after myomectomy to avoid UR. Currently this interval varies by facility [34].Some suggested 12 months might be adequate while others concluded there was no safe interval[34, 38, 39]. In our study, the only UR case without serious complication after laparoscopic myomectomy had an interval for nine years, which is the longest. Thus, it seems to keep the duration of the contraception period longer will be safer for patients with a history of laparoscopic myomectomy. Therefore, clinicians must remain vigilant, particularly in patients with a history of laparoscopic myomectomy. And whatever the cause of scar uterus, special monitoring is needed during pregnancy and childbirth to ensure the health of the mother and newborn.

In contrast to UR in women attempting TOLAC, the UR in women with unscarred uteruses occurs often completely unexpectedly. We found an incidence of UR among women with no previous uterine scar was 3/209112 deliveries, which was in agreement of the incidence found by Thisted et al based on data from the Danish Medical Birth Registry[20]. All three UR cases in our study were uncompleted UR found during the cesarean section with almost the same maternal and fetal complications rates as scarred uterus. Among them, two (2/3) were multiple pregnancy with uterus contraction before the cesarean section, one fell to birth vaginally because of obstructed labour. Our findings suggest that multiple pregnancy and obstructed labour are two major risk factors for UR in patients without a history of previous uterus surgery, which is in line with the recent reports published by Gibbins et al, Vandenberghe et al and Vilchez et al [40–42].

Timely detection of UR is conducive to improving maternal and infant outcomes. Symptoms are the only indicators that change dynamically, which can provide first-hand information for the doctors. In the past, caregivers were taught to look for classic signs such as sudden tearing uterine pain, vaginal hemorrhage, cessation of uterine contractions, Bandl's ring and regression of the fetus[43, 44]. However, some studies have shown that these signs are not specific and often absent[43, 45]. Our study shows that the change of the fetal heart rate is the most reliable presenting clinical symptom. Most of the cases also presented with abnormal pain and vaginal bleeding. Alertness to these signs is the key to the timely rescue and successful management. Other studies have the same conclusions consistent with ours[43, 45].

The most common site of rupture was in the lower uterine segment (58.5 %) in our study, which was the scar site of the previous cesarean section. This result is consistent with the findings of the study done by Rizwan et al[4], in which 80 % of the rupture was observed in the lower uterine segment.

Our study has several strengths: (1)a population-based single-centered study, (2) covering a large period between 2013 and 2020, (3) Because all patients delivered in a medical institution, we have a complete and systematic review of all medical records. All patients were followed up six weeks after delivery and no serious complications were found after discharge. Also, the study is limited to Shanghai subjects and has limitations owing to the retrospective design. It only represents the level of developed regions in China. The situation in other parts of china is still unknown, so further research is needed to understand the generalizability of the study findings.

In conclusion, UR is a disastrous and fatal event for obstetricians and patients. In order to reduce maternal and infant mortality, obstetricians should give enough attention to the pregnant women with high risk factors by strengthening the monitoring. TOLAC is a safe and worth promoting type of delivery for the patients, and still has a long way to go in Shanghai and China.

Abbreviations

CI, confidence intervals

ICU, intensive-care unit

NICU, neonatal intensive-care unit

OR, Odds ratios

TOLAC, trial of labour after cesarean delivery

UR, uterine rupture

VBAC, vaginal birth after a caesarean section

Declarations

Ethics approval and consent to participate

This study was approved by the Ethics Review Committee of Shanghai First Maternity and Infant Hospital, Tongji University School of Medicine (reference number: KS20268). We declare that all methods of this study were performed in accordance with the relevant guidelines and regulations (Declaration of Helsinki). Permission to access charts of mothers for retrieving data obtained from Shanghai First Maternity and Infant Hospital. Because the study was a retrospective chart review, the Ethics Review Committee of Shanghai First Maternity and Infant Hospital, Tongji University School of Medicine has waived the requirement of the informed consent for this study. However, confidentiality was maintained when handling each case files.

Consent for publication

Not required.

Availability of data and materials

Data are available upon reasonable request. Prospective scientists who are interested in are welcomed to contact the corresponding author via e-mail.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

SW and MY participated in interpretation of data and involved in drafting the manuscript. JP, XZ, YW and QS analyzed the data and critically revised the manuscript. CZ, GW and XH made substantial contributions to conception and design, interpreted the data, and critically revised the manuscript. All authors read and approved the final manuscript.

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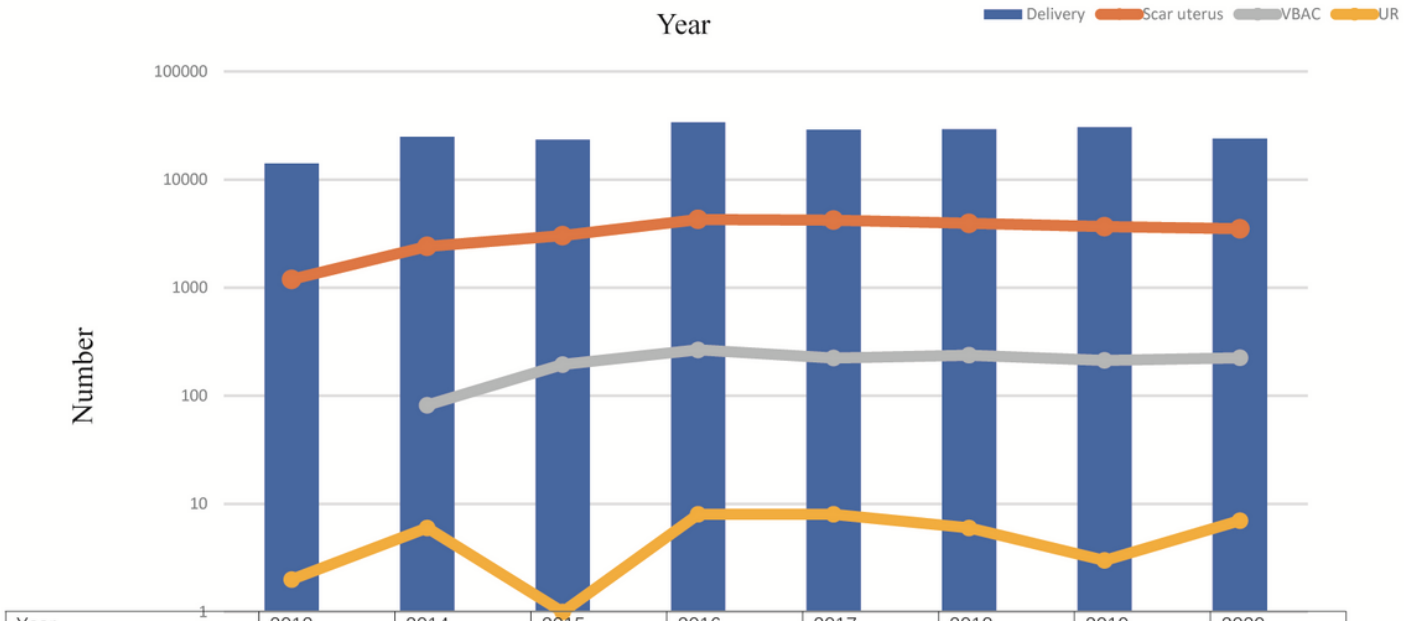
Figures



Year	2013	2014	2015	2016	2017	2018	2019	2020
Scar uterus(%)	8.49	9.67	12.95	12.66	14.60	13.46	12.01	14.58
VBAC(%)	0.00	3.40	6.43	6.20	5.31	6.04	5.80	6.41
UR(1 in 10,000)	1.42	2.41	0.43	2.36	2.77	2.05	0.98	2.91

Figure 1

Trend of uterine rupture, scar uterus and VBAC at Shanghai First Maternity and Infant Hospital, 2013–2020

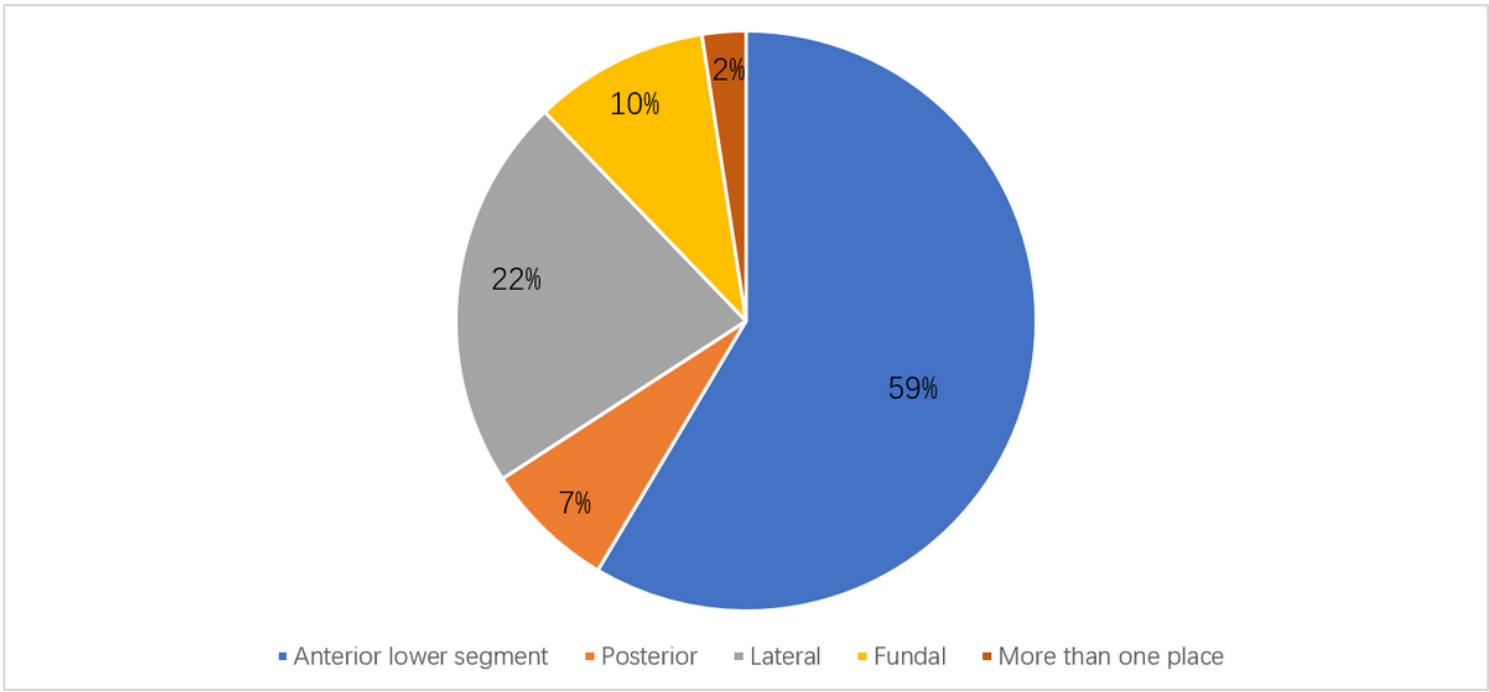


Figure 2

Site of uterine rupture