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Comparative analysis of second- and third-trimester complete uterine rupture cases followed up in a tertiary hospital: a retrospective cohort study

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ABSTRACT

Aim: There are not many studies that compared the uterine rupture cases pertaining to different trimesters of pregnancy in terms of the changes in relevant risk factors and fetomaternal outcomes. In this context, this study was carried out to comparatively analyze the cases who were diagnosed with complete uterine rupture and gave birth in the hospital where this study was conducted in terms of the relevant risk factors and fetomaternal outcomes.

Material and Method: The population of this retrospective study consisted of patients who were diagnosed with complete uterine rupture and gave birth in our hospital between January 2015 and June 2022. Patients' demographic characteristics, cesarean section, labor induction histories, and fetal and maternal outcomes were recorded. The patients included in this study were divided into two groups based on the trimester when the complete uterine rupture occurred as second- and third-trimester complete uterine rupture groups. The groups were compared in terms of fetal, maternal, and obstetric outcomes.

Results: Out of the 56718 deliveries performed during the study period, a total of 27 complete uterine rupture cases, of whom 10 had second-, and 17 had third-trimester uterine rupture, were included in the study sample. Accordingly, the incidence of rupture was calculated as 0.047%. Of these 27 cases, 9 had re-pregnancy. Bilateral hypogastric artery ligation was performed in seven patients and six of these patients were in the third trimester rupture group. Of the 27 cases with complete uterine rupture, 19 had a cesarean section history. All 8 cases that did not have a cesarean section history had a complete uterine rupture in the third trimester.

Conclusion: Complete uterine rupture is associated with adverse maternal and fetal outcomes. Fertility-sparing surgery (primary repair) is the first-line therapy. The prognosis of second-trimester uterine ruptures is more unfavorable compared to third-trimester uterine ruptures from the fetal point of view yet more favorable from the maternal point of view.

Keywords: Hysterectomy, perinatal mortality, cesarean section, uterine rupture

INTRODUCTION

Uterine rupture is the rupture of the uterine wall during pregnancy or childbirth. Uterine ruptures are associated with maternal and neonatal morbidities and mortalities (1). The overall incidence of uterine rupture reported in the literature ranges between 1 in 1096 and 1 in 2900 (2,3).

The severity of fetal and maternal morbidity depends on the extent of uterine rupture. In some cases, the rupture may be beyond repair, and thus a hysterectomy may be required. Fertility is often not adversely affected if tubal ligation is not performed within the scope of uterine rupture repair. There are a limited number of studies on the fertility of complete uterine rupture cases who underwent uterine-sparing surgery (4–6).

Infection, trauma, or malignancy may also cause the uterus to rupture (7). However, uterus rupture is predominantly observed in pregnant women (7). The importance of uterine rupture has increased in recent years due to the increased incidence of vaginal birth after cesarean section (VBAC). VBAC implies having vaginal delivery in any pregnancy after giving birth via cesarean section in a former pregnancy. The risk of uterine rupture is one of the main issues to be considered when counseling patients about VBAC (8).

The most critical risk factor for uterine rupture is previous cesarean delivery, followed by malpresentation, dystocia, labor induction, delivery after 42 weeks of gestation, and preterm delivery (2,3,9).

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Misoprostol, a synthetic prostaglandin analog administered during pregnancy, is the most commonly used medication in second-trimester pregnancy terminations (10). Uterine rupture due to misoprostol use has been reported more frequently in multiparous women and women with uterine scarring and term pregnancy than in the second trimester (11). The increase in the rate of cesarean deliveries also causes an increase in the rate of cases terminated due to pregnancy scarring (10,11). The International Federation of Obstetrics and Gynecology (FIGO) has prepared a chart detailing the recommended use of misoprostol for various gynecological and obstetric indications in light of new evidence (12).

In view of the foregoing, the objective of this study is to review the fetal and maternal outcomes of the cases that were diagnosed with complete uterine rupture and gave birth in the hospital where this study was conducted and pregnancy outcomes in those who have had a repeat pregnancy.

MATERIAL AND METHOD

The study was carried out with the permission of Zeynep Kamil Women and Children's Diseases Training and Research Hospital, Clinical Researches Ethics Committee (Date: 07/12/2022, Decision No: 138). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

The population of this retrospective study consisted of patients who were diagnosed with complete uterine rupture and gave birth in our hospital between January 2015 and June 2022. Written informed consent could not be obtained from the patients due to the study's retrospective design.

Uterine rupture diagnosis was made based on the criteria outlined in the 2012 International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) with the diagnosis code 665.11 entitled "uterine rupture". Only the patients with complete uterine rupture, defined as the complete rupture of all layers forming the uterine wall, were included in the study sample. Patients with incomplete ruptures, who gave birth at the clinic where this study was conducted upon being referred from an external clinic with the prediagnosis of rupture, and patients who had a rupture due to placental invasion were excluded from the study.

Patients' maternal age, gravida & parity number, birth weight, gestational week, cause and site of rupture, duration of operation, length of stay in the intensive care unit, transfusion amount, and maternal and perinatal mortality data were recorded. Additionally, the onset of labor, the use of oxytocin and prostaglandin, the mode of delivery, the changes detected in cardiotocography, and the procedures performed during the operation were noted.

Among the obstetric risk factors, cesarean delivery history, presence of hypertensive disorder, amniotic fluid volumes, and premature membrane rupture history, if any, were recorded.

The patients included in the study sample were divided into two groups based on the trimester when the complete uterine rupture occurred as second- and third-trimester complete uterine rupture groups. The groups were then compared in terms of fetal, maternal, and obstetric outcomes.

The misoprostol dosages recommended in the updated FIGO guidelines were used in second-trimester pregnancy terminations (12). Patients who exceeded the dosages recommended by FIGO and required additional intervention were excluded from the study.

Subsequent pregnancies of all patients included in the study and the birth complications that occurred during these pregnancies were evaluated. Information on patients' fertility after rupture was obtained from the hospital records and through phone interviews conducted with the patients.

Statistical Analysis

The statistical analyses of the collected data were conducted using SPSS 22.0 (Statistical Product and Service Solutions for Windows, Version 22.0, IBM Corp., Armonk, NY, U.S., 2013) software package. The descriptive statistics obtained from the collected data were expressed as mean±standard deviation, percentage, and minimum-maximum values. Odds ratios (OR) and the respective 95% confidence intervals (CI) were calculated from the model. The probability (p) statistics of ≤ 0.05 were deemed to indicate statistical significance.

RESULTS

Out of the 56718 deliveries performed during the study period, a total of 27 complete uterine rupture cases, of whom 10 had second-, and 17 had third-trimester uterine rupture, were included in the study sample. Accordingly, the incidence of rupture was calculated as 0.047%. Demographic and obstetric characteristics of the cases are shown in **Table**.

There was no significant difference between the study groups in terms of age, gravida&parity numbers, height, weight, and the number of previous cesarean sections.

On the other hand, the rate of patients who developed disseminated intravascular coagulation (DIC), the rate of patients who required a hysterectomy, the estimated amount of bleeding, and the length of stay in the

intensive care unit were significantly more in the third-trimester rupture group than in the second-trimester rupture group, whereas widespread abdominal pain and monitoring of fetus in the abdomen were significantly more common in the second-trimester rupture group than in the third-trimester rupture group.

Table. Distribution of patients' demographic and obstetric characteristics by the trimester when the rupture has occurred

	Second-trimester rupture group (n=10)	Third-trimester rupture group (n=17)	p value
Gravida	3.30±0.94	4.29±2.36	0.130
Parity	2.10±0.73	2.76±2.27	0.280
Abortus	0.30±0.67	0.53±0.71	0.420
Survived	2.00±0.81	2.65±2.14	0.270
Age (years)	35.5±4.80	34.00±6.30	0.520
Height (cm)	158.4±4.80	161.4±3.90	0.085
Weight (kilograms)	88.2±15.40	78.94±9.69	0.110
The time between cesarean sections (years)	4.40±1.32	4.44±3.30	0.969
Number of cesarean sections	2.10±0.73	1.29±1.50	0.078
Rate of patients who had a hysterectomy	0%, (n=0)	23.5%, (n=4)	**0.041**
Rate of patients who had great artery ligation	20%, (n=2)	41%, (n=7)	0.256
Rate of patients who had disseminated intravascular coagulation	0%, (n=0)	23.5%, (n=4)	**0.041**
Rate of patients in whom fetus was monitored in the abdomen	60%, (n=6)	5.8%, (n=1)	**0.009**
Rate of patients with abdominal pain	100%, (n=10)	23.5%, (n=13)	**0.041**
Rate of patients with vaginal bleeding	60%, (n=4)	35.2%, (n=6)	0.819
Length of stay in the intensive care unit (days)	0.90±0.73	1.82±1.13	**0.030**

Of the 27 cases with complete uterine rupture, 19 had a cesarean section history. All 8 cases that did not have a cesarean section history had a complete uterine rupture in the third trimester. Two of these cases had a history of hysteroscopic septum resection, one had a history of myomectomy, and five had parity numbers greater than 5. Of the five patients with parity numbers greater than 5, two had fetal malposition, and three were administered a prostaglandin E2 analog for labor induction.

Live birth could not be achieved in any of the ten patients in the second-trimester rupture group. Pregnancy was terminated in six of these cases due to various trisomies and, in one case, due to structural anomalies. These seven cases were treated with misoprostol for termination. Misoprostol doses were administered according to FIGO guidelines. In the other three cases, spontaneous uterine rupture had already occurred at the time of admission to the hospital. All cases were taken to emergency laparotomy as soon as evidence of rupture was observed on ultrasound. Live birth occurred in 15 (88%) of the 17 patients in the third-trimester rupture group. When we examined these cases within themselves, fetal mortality was not observed in any of the VBAC and unscarred pregnant women who were followed up during labor. On the other hand, fetal loss already existed in the two cases with fetal loss during the first ultrasonographic examination of the patients performed at the time of their admission to the hospital. The mean (minimum-maximum) 1st-and 5th-minute APGAR scores of the cases in the third-trimester rupture group were 6.05 (min. 0, max. 8) and 7.94(min. 0, max. 10), respectively.

Analysis of the surgical interventions performed during the rupture revealed that bilateral hypogastric artery ligation was performed in seven patients and that six of these patients were in the third-trimester rupture group. In addition, hysterectomies were performed on four patients, three of which were in the third-trimester rupture group.

Transfusion was not needed in 8 cases, 6 of whom were in the second-trimester rupture group. The mean (minimum-maximum) erythrocyte suspension amounts in the second- and third-trimester rupture groups were 0.5 (min. 0, max. 2) units and 2.76 (min. 0, max. 8) units, respectively. Additionally, the mean (minimum-maximum) fresh frozen plasma transfusion amounts in the second- and third-trimester rupture groups were 0.5 (min. 0, max. 2) units and 0.88 (min. 0, max. 6) units, respectively.

Hysterectomy was required in four cases, and bilateral Pomeroy tubal ligation was performed in 6 cases. Of the remaining 17 cases, six stated that they were protected by various contraceptive methods, whereas a 32-year-old case could not get pregnant despite not using any contraceptive method for the last three years.

In terms of the presence of additional systemic disease, of the 27 cases, three had gestational diabetes mellitus, and two had chronic hypertension.

Analysis of the subsequent pregnancies revealed that nine cases had re-pregnancy (**Figure**). In six of these cases, on average, elective cesarean section was performed between the 36th and 37th weeks of gestation. It was learned that none of these six patients experienced any problems during pregnancy. A review of the surgical reports of these cases revealed that one case had intraoperative uterine dehiscence, one case had her pregnancy terminated twice by abortion between the 7th and 8th of gestation following rupture, one case had her amniotic membrane prolapsed from the uterine scar line to the abdomen at 27th week of gestation, and another case was in her 32nd week of gestation without any problems.

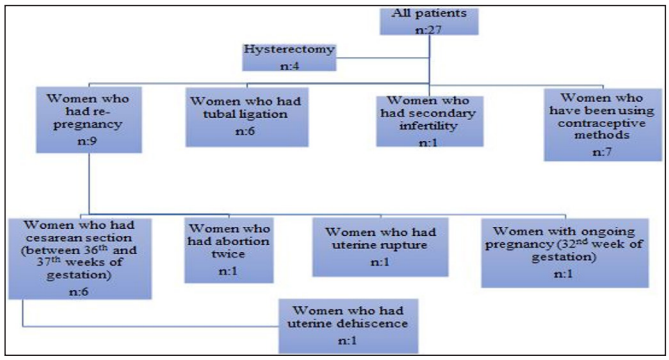

Figure. Patients' post-rupture fertility status

DISCUSSION

The incidence of uterine rupture was reported as 5.9 per 10,000 in the population-based systemic review of the World Health Organization (WHO) and 31 per 10,000 in facility-based studies (5). A study conducted in the Netherlands, including 371021 women, reported a comparable uterine rupture incidence to WHO (9). Similarly, the incidence of uterine rupture in this study was calculated as 4.2 per 10000.

A history of cesarean section is one of the primary risk factors for uterine rupture. The cesarean section rate and, ensuingly, the risk of obstetric complications have been on the rise globally (2,3,9). As a matter of fact, of the 27 complete uterine rupture cases included in this study, 19 had a history of cesarean section, two had hysteroscopic septum resection one year before the rupture, one had myomectomy one year before the rupture, and only four did not have any history of cesarean section. Of the five patients without any history of uterine surgery, two had presentation anomalies, and laparotomy was decided in the remaining three, given that vaginal bleeding did not stop despite postpartum medical treatment. The rupture sites were detected in the said three cases incidentally during the operation. They were administered prostaglandin for induction to prepare them for prenatal delivery, and tachysystole developed in all three. Numerous studies concluded that labor induction, grand multiparity, and malposition are risk factors for uterine rupture. In parallel, a significantly higher number of grand multiparous cases had a uterine rupture in this study (2,9,13,14).

In the literature, rupture of the scarless uterus has been associated with greater blood loss, higher incidence of hysterectomy, and higher composite maternal morbidity (death, hysterectomy, blood transfusion, or urological injury) than rupture of a scarred uterus (1). Similarly, in this study, cases with the rupture of the scarless uterus had significantly more blood loss and a significantly higher need for transfusion than those with the rupture of the scarred uterus. On the other hand, there was no significant difference between the two groups in terms of hysterectomy.

Although fetal complications such as the absence of a fetus in the abdomen and the absence of fetal heartbeat were significantly more common in the second-trimester rupture group, hysterectomy requirement, DIC development, and length of stay in the intensive care unit were significantly more common in the third-trimester rupture group.

It was reported in the literature that prolongation of the time between rupture and surgery increased maternal blood loss, the risk of coagulopathy, and fetal exposure to hypoxia (15). The neonatal mortality rates following uterine rupture reported in the literature ranged between 6% and 25% (5,16,17). In comparison, the material of this research did not include the data on the time that elapsed between uterine rupture and surgical intervention. However, the fact that live birth occurred in 15 of the 17 cases who developed uterine rupture in the third trimester and that the babies were given to their families after cesarean section suggests that the time between rupture and surgical intervention was not too long in these cases. On the other hand, the development of DIC without fetal heartbeat indicates more blood loss and a longer time between surgery and uterine rupture in the remaining two cases.

In a study by Gibbins et al. (1), the fetal mortality rate was reported as 10% and 2% in cases with a scarless uterus and scarred uterus, respectively. Another study reported the fetal mortality rate as 7.4% (18). Some studies reported that 1st- and 5th-minute APGAR scores decreased in cases with uterine rupture (2,3). In contrast, fetal loss was not observed in any of the patients who developed uterine rupture in the third trimester and were followed up during labor, and the mean 1st- and 5th-minute APGAR scores of these patients were better than expected. This study's low fetal loss rate might be attributed to the fact that the patients were followed up closely by a team with experience in all kinds of birth and that the time elapsed between rupture and surgery was short.

Recurrent rupture rates reported in the literature ranged between 4.9% and 33.3% in studies on pregnancies after uterine rupture repair (5,19). In comparison, the rate of patients who developed a uterine rupture in subsequent pregnancies in this study was 11.1%.

The primary strength of this study is that it is the first study to date that compared second-and third-trimester complete uterine ruptures. On the other hand, the primary limitation of this study was its retrospective design and limited sample size. Thus, large-scale case series are needed to corroborate the findings of this study.

CONCLUSION

The findings of this study revealed that uterine rupture was associated with adverse maternal and fetal outcomes and that the most critical risk factor for uterine rupture was previous cesarean delivery. Close prenatal follow-up and planned elective cesarean section will likely reduce the number of uterine rupture cases. Although second-trimester uterine ruptures have been associated with more negative fetal outcomes, such as the finding that the fetus has moved to the abdomen and that free fluid exists in the abdomen in ultrasound, and the absence of fetal heartbeat, the maternal prognosis associated with second-trimester ruptures was found to be better than that of the third-trimester ruptures. Families should be informed that the rupture may recur in subsequent pregnancies, and the ones with completed fertility should be encouraged to use contraceptive methods..

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Zeynep Kamil Women and Children's Diseases Training and Research Hospital, Clinical Researches Ethics Committee (Date: 07/12/2022, Decision No: 138).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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