

# Pregnancy Outcomes in Patients With Prior Uterine Rupture or Dehiscence

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**OBJECTIVE:** To report obstetric outcomes in a series of women with prior uterine rupture or prior uterine dehiscence managed with a standardized protocol.

**METHODS:** Series of patients delivered by a single maternal-fetal medicine practice from 2005 to 2013 with a history of uterine rupture or uterine dehiscence. Uterine rupture was defined as a clinically apparent, complete scar separation in labor or before labor. Uterine dehiscence was defined as an incomplete and clinically occult uterine scar separation with intact serosa. Patients with prior uterine rupture were delivered at approximately 36–37 weeks of gestation or earlier in the setting of preterm labor. Patients with prior uterine dehiscence were delivered at 37–39 weeks of gestation based on obstetric history, clinical findings, and ultrasonographic findings. Patients with prior uterine rupture or uterine dehiscence were followed with serial ultrasound scans to assess fetal growth and lower uterine segment integrity. Outcomes measured were severe morbidities (uterine rupture, hysterectomy, transfusion, cystotomy, bowel injury, mechanical ventilation, intensive care unit admission, thrombosis, reoperation, maternal death, perinatal death).

**RESULTS:** Fourteen women (20 pregnancies) had prior uterine rupture and 30 women (40 pregnancies) had prior uterine dehiscence. In these 60 pregnancies, there was 0% severe morbidity noted (95% confidence interval [CI] 0.0–6.0%). Overall, 6.7% of patients had a uterine dehiscence seen at the time of delivery (95% CI 2.6–15.9%). Among women with prior uterine rupture, the rate was 5.0% (95% CI 0.9–23.6%), whereas among

women with prior uterine dehiscence, the rate was 7.5% (95% CI 2.6–19.9%).

**CONCLUSION:** Patients with prior uterine rupture or uterine dehiscence can have excellent outcomes in subsequent pregnancies if managed in a standardized manner, including cesarean delivery before the onset of labor or immediately at the onset of spontaneous preterm labor.

(*Obstet Gynecol* 2014;123:785–9)

DOI: 10.1097/AOG.000000000000181

**LEVEL OF EVIDENCE: III**

Uterine rupture, which refers to a complete disruption of all uterine layers including the serosa, is a severe complication with associated maternal and neonatal morbidity and mortality. The incidence in an unscarred uterus is approximately one in 10,000 births,<sup>1</sup> whereas in women with prior cesarean delivery, the incidence is approximately 1%.<sup>2,3</sup> Although it most frequently occurs during labor, it can occur before labor as well. For women with a history of a uterine rupture, the known risk of subsequent pregnancies is limited to case reports and case series and the recurrence risk of uterine rupture ranges in the literature from 0% to 33%.<sup>4–6</sup> Based on this risk of recurrence, some suggest that women with prior uterine rupture should no longer attempt pregnancy.<sup>4</sup> However, women in these published case series with recurrent rupture include those who did not have comprehensive prenatal care and simply presented with a recurrent rupture. Therefore, it is possible that with close surveillance and cesarean delivery before the onset of labor, one could reduce the risk of recurrent uterine rupture for these patients. However, currently, there is no consensus regarding optimal management for patients with prior uterine rupture.

Uterine dehiscence refers to an incomplete uterine scar separation with intact serosa. They are frequently clinically occult and incidentally noted at

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**Financial Disclosure**

The authors did not report any potential conflicts of interest.

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ISSN: 0029-7844/14



the time of cesarean delivery or found on ultrasonographic examination of the lower uterine segment during the second or third trimester. The incidence of this complication is unknown because it could go unrecognized in the setting of a successful vaginal delivery without inspection of the lower uterine segment. Management of patients with a history of uterine dehiscence in a prior pregnancy is also controversial, although many would suggest cesarean delivery at or near term for these patients.

In our practice, we have a standardized protocol for management of patients with prior uterine rupture or uterine dehiscence, which includes serial ultrasound scans with assessment of the lower uterine segment and fetal growth as well as cesarean delivery before labor. Our objective was to report obstetric outcomes in a series of patients with prior uterine rupture or uterine dehiscence managed according to this standardized protocol.

## MATERIALS AND METHODS

After Biomedical Research Alliance of New York institutional review board approval was obtained, the charts of all patients greater than 24 weeks of gestation delivered by a single maternal-fetal medicine practice between 2005 (when our computerized medical record was created) and 2013 were reviewed. Baseline characteristics and pregnancy outcomes were obtained from the computerized medical record. For this series, we included all patients with a history of uterine rupture or uterine dehiscence. For the purpose of this study, uterine rupture was defined as a clinically apparent, complete scar separation in labor or before labor. We did not include in this group women with prior uterine perforations (such as during dilatation and curettage) or prior ruptured corneal ectopic pregnancies. Uterine dehiscence was defined as an incomplete and clinically occult uterine scar separation with intact serosa.

In our practice, patients with prior uterine rupture are delivered at approximately 36–37 weeks of gestation or earlier in the setting of preterm labor. Patients with prior uterine dehiscence are delivered at approximately 37–39 weeks of gestation based on obstetric history, clinical findings, and ultrasonographic findings. The decision whether to perform amniocentesis before delivery to assess fetal lung maturity and the decision whether to administer corticosteroids before delivery in patients with prior uterine rupture or uterine dehiscence was not uniform over the study period and was individualized based on clinical circumstances and contemporary management guidelines. For this reason (as well as the infrequency of neonatal

respiratory distress at term in general), we did not include neonatal respiratory distress as an outcome for this study. Patients with prior uterine rupture or uterine dehiscence are followed with serial ultrasound scans (approximately every 4 weeks) to assess fetal growth and lower uterine segment integrity. If a patient were found to have a sonographically apparent uterine window seen on ultrasonography (ie, no identifiable myometrium in the lower uterine segment), we would likely recommend delivery before 37 weeks of gestation (or earlier) and possibly undergo admission to the hospital for observation. All patients with prior uterine rupture or uterine dehiscence are instructed to contact us immediately if they have any signs or symptoms of labor, at which time they would immediately be brought into the office or hospital for evaluation.

Gestational age was determined by last menstrual period and confirmed by ultrasonography in all patients. The pregnancy was redated if there was a more than 5-day discrepancy up to 14 weeks of gestation or a more than 7-day discrepancy after 14 weeks of gestation. If the pregnancy was the result of in vitro fertilization, gestational age was determined from in vitro fertilization dating.

The outcomes reported are severe morbidities (uterine rupture, hysterectomy, transfusion, cystotomy, bowel injury, mechanical ventilation, intensive care unit admission, thrombosis, reoperation, maternal death, and perinatal death). We also report less severe morbidities such as placenta previa, placenta accreta, the finding of uterine dehiscence at delivery, a newborn 1-minute Apgar score less than 7, and 5-minute Apgar score less than 7. Outcome incidences and 95% confidence intervals are reported.<sup>7</sup>

## RESULTS

Over the course of the study period there were 44 women with 60 pregnancies who had prior uterine rupture or uterine dehiscence. Fourteen women (20 pregnancies) had prior uterine rupture and 30 women (40 pregnancies) had prior uterine dehiscence. These 60 pregnancies comprised the case series.

Baseline characteristics of the case series are shown in Table 1. The majority of women in the study were white and few had chronic medical conditions. The mean maternal age was  $33.0 \pm 5.2$  years and the mean prepregnancy body mass index (calculated as  $\text{weight (kg)/[height (m)]}^2$ ) was  $24.5 \pm 5.0$ .

The study group had a 0% incidence of severe morbidity (95% confidence interval [CI] 0.0–6.0%). Pregnancy outcomes are shown in Table 2. There were no recurrent uterine ruptures in our study group.



**Table 1. Baseline Characteristics of the Population**

Characteristic	Value
No. of cases	60
Maternal age (y)	33.0±5.2
Prepregnancy BMI (kg/m <sup>2</sup> )	24.5±5.0
Prior cesarean deliveries	
0–1	5 (8.3)
2	23 (38.3)
3	20 (33.3)
4 or more	12 (20.0)
In vitro fertilization	2 (3.3)
White race	60 (100)
Anticoagulation	1 (1.7)
Chronic hypertension	1 (1.7)
Diabetes	1 (1.7)
Gestational	1 (1.7)
Pregestational	0 (0)
Leiomyomas	2 (3.3)
Prior myomectomy	1 (1.7)
Uterine anomaly	4 (6.7)
Preeclampsia	0 (0)

BMI, body mass index.

Data are mean±standard deviation or n (%) unless otherwise specified.

However, 6.7% of patients in the study group were found to have a uterine dehiscence at the time of delivery (95% CI 2.6–15.9%). Among women with prior uterine rupture the rate was 5.0% (95% CI 0.9–23.6%), whereas among women with prior uterine dehiscence, the rate was 7.5% (95% CI 2.6–19.9%).

The gestational ages at delivery ranged from 34 1/7 weeks to 39 4/7 weeks. Two (3.3%) patients delivered before 36 weeks of gestation. One patient

had prior uterine rupture and developed preterm labor at 34 6/7 weeks of gestation and was delivered at that time. The other patient had prior uterine dehiscence and developed preterm labor at 34 1/7 weeks of gestation and was delivered at that time. Of the 58 remaining patients without preterm labor, 30 (51.7%) patients underwent amniocentesis for fetal lung maturity before delivery, and the range of the gestational ages at delivery for these patients was between 36 1/7 and 38 3/7 weeks. In the uterine rupture group, all patients (aside from the one in preterm labor) were delivered between 36 1/7 and 37 4/7 weeks of gestation, except four patients who declined delivery at 36–37 weeks of gestation (respective gestational ages at delivery: 38 1/7, 38 2/7, 38 6/7, and 39 0/7 weeks). None of these four patients went into spontaneous labor before delivery. In the uterine dehiscence group, two patients went into spontaneous labor before their scheduled cesarean delivery and were delivered at that time (at 37 4/7 and 38 6/7 weeks of gestation, respectively). The gestational ages at delivery are summarized in Figure 1 as a flow diagram.

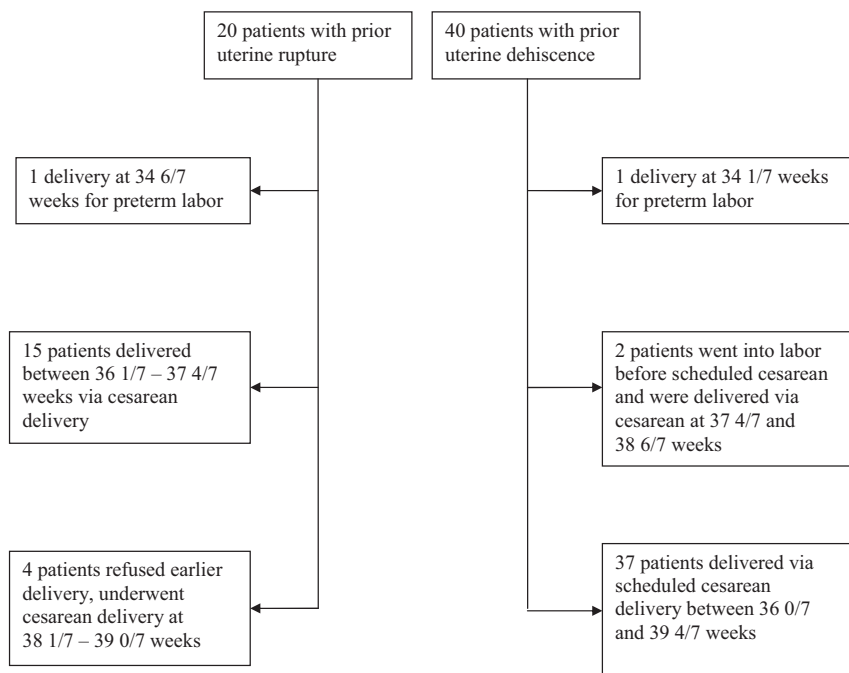
No patients were found on ultrasonographic screening to have a significant uterine window requiring admission to the hospital or earlier delivery than planned. As such, no patients were admitted to the hospital before delivery for the indication of prior uterine rupture, prior uterine dehiscence, or current uterine dehiscence. No patients were delivered before their planned delivery date as a result of fetal growth restriction or oligohydramnios noted on ultrasonography.

**Table 2. Pregnancy Outcomes in Patients With a History of Prior Uterine Rupture or Dehiscence**

Outcome	Prior Uterine Rupture (n=20)	Prior Uterine Dehiscence (n=40)	Combined (N=60)
Gestational age at delivery (wk)	36.9±1.0	37.5±1.2	37.3±1.1
Birth weight (g)	2,945±414	3,110±402	3,055±410
Uterine dehiscence	5.0 (0.9–23.6)	7.5 (2.6–19.9)	6.7 (2.6–15.9)
Placenta previa	0.0 (0.0–16.1)	0.0 (0.0–8.7)	0.0 (0.0–6.0)
Placenta accreta	0.0 (0.0–16.1)	0.0 (0.0–8.7)	0.0 (0.0–6.0)
Uterine rupture	0.0 (0.0–16.1)	0.0 (0.0–8.7)	0.0 (0.0–6.0)
Hysterectomy	0.0 (0.0–16.1)	0.0 (0.0–8.7)	0.0 (0.0–6.0)
Transfusion	0.0 (0.0–16.1)	0.0 (0.0–8.7)	0.0 (0.0–6.0)
Cystotomy	0.0 (0.0–16.1)	0.0 (0.0–8.7)	0.0 (0.0–6.0)
Bowel injury	0.0 (0.0–16.1)	0.0 (0.0–8.7)	0.0 (0.0–6.0)
Mechanical ventilation	0.0 (0.0–16.1)	0.0 (0.0–8.7)	0.0 (0.0–6.0)
Intensive care unit admission	0.0 (0.0–16.1)	0.0 (0.0–8.7)	0.0 (0.0–6.0)
Thrombosis	0.0 (0.0–16.1)	0.0 (0.0–8.7)	0.0 (0.0–6.0)
Reoperation	0.0 (0.0–16.1)	0.0 (0.0–8.7)	0.0 (0.0–6.0)
Maternal death	0.0 (0.0–16.1)	0.0 (0.0–8.7)	0.0 (0.0–6.0)
Perinatal death	0.0 (0.0–16.1)	0.0 (0.0–8.7)	0.0 (0.0–6.0)
1-min Apgar less than 7	0.0 (0.0–16.1)	0.0 (0.0–8.7)	0.0 (0.0–6.0)
5-min Apgar less than 7	0.0 (0.0–16.1)	0.0 (0.0–8.7)	0.0 (0.0–6.0)

Data are mean±standard deviation or % (95% confidence interval).





**Fig. 1.** Flow diagram of gestational ages at delivery.

*Fox. Outcomes in Patients With Prior Uterine Rupture. Obstet Gynecol 2014.*

## DISCUSSION

In this series, we report that patients with prior uterine rupture or uterine dehiscence can have uncomplicated pregnancies if followed closely and delivered by elective cesarean before the onset of labor or at the onset of preterm labor. Among 20 pregnancies with prior uterine rupture and 40 pregnancies with prior uterine dehiscence, we had no patients with a recurrent uterine rupture or any severe complication. We did find that 6.7% of these patients had a uterine dehiscence seen at the time of delivery, suggesting that these patients should not labor and supporting our protocol for delivery before the onset of labor. For obvious reasons, we did not have a control group of patients with prior uterine rupture or uterine dehiscence who were allowed to labor.

Our 0% incidence of severe complications needs to be understood in the context of our sample size of 60 pregnancies as well as in the context of our protocol of delivery before labor. Therefore, we presented 95% CIs as well. Based on our sample size, we are 95% confident that the incidence of one of the severe morbidities is less than 6.0%.

Certain prior case series suggested that the risk of recurrent rupture was higher. Usta et al<sup>5</sup> reported outcomes in 12 patients (24 pregnancies) with prior uterine rupture who conceived over a 25-year period in Lebanon. They reported a 33% risk of recurrent uterine rupture, the majority of which occurred in the preterm period with the onset of preterm labor. However, it is unclear whether these patients were being followed

closely during pregnancy. Chibber et al<sup>4</sup> reported outcomes in 22 patients with prior uterine rupture over a 25-year period in Saudi Arabia. Two patients had recurrent uterine rupture and died, but both were noted to have “sparse antenatal care.” The other 20 patients had excellent outcomes. Lim et al<sup>6</sup> reported outcomes for five patients with prior uterine rupture in The Netherlands. All five were delivered before the onset of labor and none had recurrent uterine rupture. They also reported their result from a literature review on this topic showing a low risk of uterine rupture. Our data are similar to Lim et al and suggest that close management of patients with prior uterine rupture will likely minimize the risk or recurrent uterine rupture.

We are unaware of published series regarding patients with prior uterine dehiscence but not uterine rupture. However, we believe that delivering these patients before the onset of labor is prudent, because they are likely at an increased risk for uterine rupture compared with other patients with prior cesarean deliveries. A controlled trial to study this question is very unlikely to be undertaken; therefore, the optimal management for these patients remains uncertain.

We cannot be certain that our specific management protocol for patients with prior uterine rupture or uterine dehiscence is the only one, or even the ideal one, for patients with prior uterine rupture or uterine dehiscence. It is possible that delivery at a different gestational age or a different antenatal ultrasound frequency would achieve similar results. In fact, in our



series, no patients were admitted to the hospital or delivered at an earlier gestational age than planned based on ultrasonographic findings. Therefore, it is possible that patients with prior uterine rupture or uterine dehiscence do not require serial ultrasound scans to assess the lower uterine segment. Our patients are also made aware of the risks of having prior uterine rupture or uterine dehiscence and this education itself may have contributed to our good outcomes, because patients with any signs of labor are instructed to notify us immediately and are evaluated promptly. As a result of the rarity of uterine rupture and uterine dehiscence, it is unlikely that prospective trials to determine the ideal management strategy will be undertaken, and obstetricians are left to their best clinical judgment in managing these patients. We present one strategy that appears to be associated with good outcomes.

In conclusion, patients with prior uterine rupture or uterine dehiscence can have excellent outcomes in subsequent pregnancies if managed in a standardized manner, particularly with cesarean delivery before the onset of labor or immediately at the onset of spontaneous preterm labor.

## REFERENCES

1. Zwart JJ, Richters JM, Ory F, de Vries JI, Bloemenkamp KW, van Roosmalen J. Uterine rupture in The Netherlands: a nationwide population-based cohort study. *BJOG* 2009;116:1069–78.
2. Landon MB, Hauth JC, Leveno KJ, Spong CY, Leindecker S, Varner MW, et al; National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network. Maternal and perinatal outcomes associated with a trial of labor after prior cesarean delivery. *N Engl J Med* 2004;351:2581–9.
3. Landon MB, Spong CY, Thom E, Hauth JC, Bloom SL, Varner MW, et al; National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network. Risk of uterine rupture with a trial of labor in women with multiple and single prior cesarean delivery. *Obstet Gynecol* 2006; 108:12–20.
4. Chibber R, El-Saleh E, Al Fadhli R, Al Jassar W, Al Harmi J. Uterine rupture and subsequent pregnancy outcome—how safe is it? A 25-year study. *J Matern Fetal Neonatal Med* 2010;23:421–4.
5. Usta IM, Hamdi MA, Musa AA, Nassar AH. Pregnancy outcome in patients with previous uterine rupture. *Acta Obstet Gynecol Scand* 2007;86:172–6.
6. Lim AC, Kwee A, Bruinse HW. Pregnancy after uterine rupture: a report of 5 cases and a review of the literature. *Obstet Gynecol Surv* 2005;60:613–7.
7. Newcombe RG. Two-sided confidence intervals for the single proportion: comparison of seven methods. *Stat Med* 1998;17: 857–72.

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rev 7/2013

