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## Signs, symptoms and complications of complete and partial uterine ruptures during pregnancy and delivery

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### ABSTRACT

**Objectives:** Uterine rupture is a rare but potentially catastrophic complication of pregnancy that requires rapid diagnosis. Classically, its signs and symptoms combine pain, fetal heart rate (FHR) abnormalities, and vaginal bleeding. The purpose of this study is to identify these signs and symptoms as well as the immediate complications of complete and incomplete (partial) ruptures of the uterine wall, whether or not they follow a previous cesarean delivery.

**Study design:** Retrospective study of case records from two university hospital maternity units, from 1987 to 2008.

**Results:** In a total of 97,028 births during the study period, we identified 52 uterine ruptures (0.05%): 25 complete and 27 partial. Most (89%) occurred in women with a previous cesarean delivery. In complete ruptures, FHR abnormalities were the most frequent sign (82%), while the complete triad of FHR abnormalities–pain–vaginal bleeding was present in only 9%. The signs and symptoms of partial ruptures were very different; these were asymptomatic in half the cases (48%). Neonatal mortality reached 13.6% among the complete ruptures; 27 and 40% of these newborns had pH < 6.80 and pH < 7.0, respectively. Among the incomplete ruptures, only 7.7% of the newborns had a pH < 7.0 and there were no deaths.

**Conclusion:** Although complete rupture of the uterus has a severe neonatal prognosis, the complete set of standard symptoms is present in less than 10% of cases. FHR abnormalities are by far the most frequent sign.

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### Introduction

Uterine rupture is a rare and potentially catastrophic event that most often occurs in women with a uterine scar (90% of cases). The rate of cesarean deliveries in industrialized countries continues to rise; in France it has climbed from 14% in 1991 to 20.8% in 2010 [1]. After large studies, the relative safety of vaginal deliveries in women with cesarean scar was demonstrated [2]. In 1988, the American College of Obstetricians and Gynecologists (ACOG) called into question the concept of “once a cesarean, always a cesarean” [3]. Similarly, the French College of Gynecologists and Obstetricians recommends that a trial of labor for vaginal delivery be offered to women with a previous cesarean by a low transverse incision [4].

We conducted a retrospective study to describe the frequency, signs, symptoms, and complications of uterine ruptures over a 21-year period in two French university hospital maternity units.

### Material and methods

This retrospective observational study was conducted among women who had a complete or partial rupture of a uterine scar during pregnancy at one of the two study centers. These two maternity units (one level 3 and one 2B) work collaboratively; they are geographically close and share several protocols, including that for trial of labor after cesarean (TOLAC): among women with previous cesarean, TOLAC should normally be considered only for those with a low transverse scar.

The patients were identified by a computerized search for the codes corresponding to complete and partial uterine ruptures between January 1, 1987 and December 31, 2008 (codes O90.0, O71.1 and O90.0/001). Data for the level 3 maternity unit is available only

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from 1996 to 2008. On the other hand, computerized files for the level 2B hospital were available only from 1987 to 2004.

Partial and complete ruptures were diagnosed when the diagnosis was evocated and the women came to laparotomy or by palpation of the uterine cavity. A partial rupture was diagnosed when a subperitoneal dehiscence of the myometrium was observed at the site of a previous scar, and a complete rupture when the visceral peritoneum was damaged, resulting in direct communication between the amniotic and peritoneal cavities. We collected the following information about the women: maternal age, parity, history of dilation and curettage, invasive mole, malformation, gynecologic surgery, the number and type of each cesarean from the subsequent pregnancy. The uterus was considered scarred when the woman had a history of a cesarean and unscarred otherwise. We also noted the characteristics of the pregnancy, labor, and delivery: mode of labor onset, mode of delivery, mode of discovery of the rupture, and timing of the appearance of its signs and symptoms. FHR abnormalities were defined as severe, profound and recurrent decelerations, variable or not, or as bradycardia. Variables recorded as indicators of maternal morbidity included the need for blood transfusion, bladder injuries, or the need for an emergency hysterectomy. The criteria for neonatal morbidity included: low umbilical cord arterial pH at birth (with thresholds set arbitrarily at 7.00 and 6.80), a 5 or 10 min Apgar score less than 7, or transfer to the neonatal intensive care unit (NICU).

The data collected were analyzed with Epi Info software (EPI Info 6.4, Atlanta, GA). Statistical comparisons were conducted with chi2 and Fisher exact tests for the qualitative variables and Kruskal and Wallis's non-parametric test for the quantitative variables. Percentages are reported with their 95% confidence intervals. Ranges are reported between square brackets. Tests were considered statistically significant when  $p < 0.05$ .

## Results

During the study period, 97,028 deliveries took place in the two hospitals, 10,023 of them after a previous cesarean (10.6% in the level-3 hospital, 10.0% in the level-2B hospital). During the same period, 52 uterine ruptures were identified: 25 complete ruptures and 27 partial. Among the complete ruptures, six occurred in unscarred uteri, at a frequency estimated at 0.07 per 1000 unscarred uteri (95% confidence interval [CI] 0.00–0.015). The other 19 complete ruptures occurred to women with previous cesareans, at a frequency estimated at 1.9 per 1000 deliveries with uterine scars (95% CI 1.1–2.9). The frequency of the 27 partial ruptures was estimated at 2.7 per 1000 deliveries with uterine scars (95% CI 1.7–3.9). The overall incidence rate of (complete and partial) uterine rupture was therefore 4.6 per 1000 (0.5%) deliveries with uterine scars (95% CI 3.3–6.2) and 0.5 per 1000 (0.05%) deliveries overall, with or without scars (95% CI 0.4–0.7).

Almost all the women were multiparous (98.1%) (Table 1). Most (88.5%) had at least one uterine scar, and always from previous cesareans.

Table 2 describes the modes of labor onset and delivery and the signs and symptoms of the rupture as well as maternal and neonatal conditions at birth. Labor most often began through induction of cervical ripening (44.2%). Nine women had planned cesareans, but only four were performed on the date planned (7.7%); the other five women had emergency cesareans for uterine rupture before the planned delivery date. Overall, 25% of the cases had vaginal deliveries, while half were emergency cesareans.

The sign leading to discovery of the rupture was FHR abnormalities in nearly half the cases (45.8%), and 25% of the women had abdominal pain or vaginal bleeding during labor. Although pathognomonic, the “loss” of fetal presentation and

**Table 1**  
Characteristics of the women and their pregnancies.

Maternal history	
Maternal age $\geq 35$ years	19 (36.5)
Multiparous	51 (98.1)
Number of previous pregnancies $\geq 4$	8 (15.4)
Curettage	15 (28.8)
Invasive mole <sup>a</sup>	2 (3.8)
Uterine malformation	2 (3.8)
Uterine scar	46 (88.5)
Type of uterine scar	
Single lower transverse cesarean	29 (63.0)
Single lower vertical cesarean	–
Single uterine body cesarean	3 (5.7)
Single cesarean, type unknown	8 (15.4)
Multiple cesareans <sup>b</sup>	6 (13.6)
Myomectomy	–
Time between uterine rupture and previous scar <sup>c</sup>	43.5 $\pm$ 41.7
<12 months	–
12 months	14 (31.8)
$\geq 25$ months	30 (68.2)
History of rupture	1 (1.9)
Current pregnancy	
External trauma	–
Pregnancy-related diabetes	7 (13.5)
Transverse presentation	3 (5.7)

<sup>a</sup> Including one case with a uterine body incision in the first trimester for an invasive mole.

<sup>b</sup> Three women had two, two had three and one had six previous cesarean sections. Two women, each with two previous cesareans, underwent induction for medically-indicated terminations of pregnancy.

<sup>c</sup> Time unknown for 2/46 patients.

**Table 2**  
Characteristics of delivery and maternal-fetal complications.

Mode of labor onset	
Spontaneous	18 (34.6)
Induction or ripening	23 (44.2)
Planned cesarean	4 (7.7)
Emergency cesarean before labor	7 (13.4)
Mode of delivery	
Vaginal	12 (23.1)
Cesarean	
Planned	4 (7.7)
For dystocia	9 (17.3)
Emergency	27 (51.9)
First sign, symptom or discovery of the rupture	
Fetal heart rate abnormality <sup>a</sup>	22 (45.8)
Abdominal pain	13 (25)
Vaginal bleeding during labor	12 (23.1)
“Loss” of presentation	8 (15.4)
Hematuria	2 (3.8)
Third-stage hemorrhage	7 (13.5)
Asymptomatic <sup>b</sup>	17 (32.7)
Newborn's condition <sup>a</sup>	
Gestational age (weeks)	38.4 $\pm$ 3.0 (27–41)
Prematurity < 37 weeks	6 (12.5)
Birth weight of newborn (g)	3200 $\pm$ 730 (1080–4440)
Birth weight $\geq 4000$ g	4 (8.3)
Apgar < 7 at 5 min	10 (20.8)
Apgar < 7 at 10 min	5 (10.4)
Neonatal arterial pH	7.10 $\pm$ 0.21
Neonatal arterial pH < 7.0	11 (22.9)
Neonatal arterial pH < 6.80	7 (14.6)
Transfer to NICU	11 (22.9)
Perinatal death	3 (6.3)
Maternal complications	
Urinary lesion	3 (5.8)
Severe hemorrhage with transfusion	17 (32.7)
Hysterectomy	4 (7.7)
Maternal deaths	–

<sup>a</sup> MITP and death in utero excluded (at 20, 23, 25, and 26 weeks)

<sup>b</sup> During the routine manual uterine examination or during the cesarean for another reason.

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