OBSTETRICS

Maternal and fetal morbidity associated with uterine rupture of the unscarred uterus

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OBJECTIVE: We sought to report obstetric and neonatal characteristics and outcomes following primary uterine rupture in a large contemporary obstetric cohort and to compare outcomes between those with primary uterine rupture vs those with uterine rupture of a scarred uterus.

STUDY DESIGN: This was a retrospective case-control study. Cases were defined as women with uterine rupture of an unscarred uterus. Controls were women with uterine rupture of a scarred uterus. Demographics, labor characteristics, and obstetric, maternal, and neonatal outcomes were compared. Primary rupture case outcomes were also compared by mode of delivery.

RESULTS: There were 126 controls and 20 primary uterine rupture cases. Primary uterine rupture cases had more previous live births than controls (3.6 vs 1.9; $P < .001$). Cases were more likely to have received oxytocin augmentation (80% vs 37%; $P < .001$). Vaginal delivery was more common among cases (45% vs 9%; $P < .001$). Composite maternal morbidity was higher among primary uterine rupture mothers (65% vs 20%; $P < .001$). Cases had a higher mean estimated blood loss (2644 vs 981 mL; $P < .001$) and higher rate of blood transfusion (68% vs 17%; $P < .001$). Women with primary uterine rupture were more likely to undergo hysterectomy (35% vs 2.4%; $P < .001$). Rates of major composite adverse neonatal neurologic outcomes including intraventricular hemorrhage, periventricular leukomalacia, seizures, and death were higher in cases (40% vs 12%; $P = .001$). Primary uterine rupture cases delivering vaginally were more likely to ultimately undergo hysterectomy than those delivering by cesarean (63% vs 9%; $P = .017$).

CONCLUSION: Although rare, primary uterine rupture is particularly morbid. Clinicians must remain vigilant, particularly in the setting of heavy vaginal bleeding and severe pain.

Key words: cesarean delivery, maternal morbidity, peripartum hysterectomy, uterine rupture

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Uterine rupture is a rare pregnancy complication that can result in severe maternal and fetal morbidity and mortality. The majority of uterine ruptures occur in the setting of a previous uterine scar, typically from a previous cesarean delivery hysterotomy; significantly less is known about the rupture of an unscarred uterus (primary uterine rupture). The overall rate of uterine rupture ranges from 1 in 1235−4366, but the rate of primary uterine rupture is much lower and is estimated to range from 1 in 16,840−19,765 in the developed world.[1-3]

Data regarding primary uterine rupture are limited mostly to case reports. These reports have described this complication in a wide range of clinical scenarios, including cases in the setting of trauma, oxytocin and uterine hyperstimulation, connective tissue disease, chronic prednisone use, and higher-order multiple gestation. Two case series have been described, one with 10 women with idiopathic primary uterine rupture (without a history of major trauma)[2] and another comparing 26 women with primary rupture to 27 women with rupture in the setting of a previous uterine scar.[4] Cases with no identifiable risk factors, some even in the absence of labor, have also been described.[5-13] Primary uterine rupture occurring without labor is often preceded by a period of vague abdominal pain and nausea, followed by sudden, severe abdominal pain and fetal compromise. From these limited data, risk factors for primary uterine rupture have been proposed, and include malpresentation, oxytocin use, abnormal placentation, previous invasive mole, grand multiparity, prior midtrimester uterine

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instrumentation, uterine anomalies, macrosomia, and fetopelvic disproportion.[14]

Historically, maternal and neonatal outcomes following uterine rupture have been poor. It may be inferred that outcomes following primary rupture are equally poor, but data are scant given the rarity of this complication. In these limited reports, rupture of an unscarred uterus was associated with a perinatal death rate of 12-35%[2,13,15] and a rate of maternal hysterectomy of 20-31%.[2,13]

We sought to report obstetric and neonatal characteristics and outcomes following primary uterine rupture in a large contemporary obstetric cohort. We also sought to compare risk factors and outcomes between those with primary uterine rupture compared to those with uterine rupture of a scarred uterus.

Materials and Methods

A retrospective chart review of women with uterine rupture was performed at 2 perinatal referral centers, 2000 through 2012. Subjects were identified using *International Classification of Diseases, Ninth Revision* code search of medical records, billing lists, and obstetric databases. This study was approved by the institutional review boards at the University of Utah Health Sciences Center and Intermountain Healthcare, both in Salt Lake City, UT.

Patients were included if a full-thickness defect in the myometrium with visible chorioamniotic membrane or fetal parts was documented during pregnancy. Primary uterine rupture cases were those without a history of uterine surgery involving myometrial incision (ie, cesarean delivery or myomectomy). Demographic information, obstetric outcomes, delivery information, and neonatal outcomes were abstracted by physician researchers. Charts were extensively searched for evidence of maternal connective tissue disease, chronic steroid use, previous gynecologic surgeries, and any known müllerian malformations. Primary uterine rupture cases and scarred uterine rupture controls were compared with regard to baseline characteristics, antenatal and intrapartum course, and maternal and neonatal outcomes. The primary outcomes were major composite maternal morbidity and major composite neonatal neurologic morbidity. Major composite maternal morbidity was defined as death, hysterectomy, blood transfusion, and/or genitourinary injury. Major composite neonatal neurologic morbidity was defined as interventricular hemorrhage, periventricular leukomalacia, seizures, and/or death. Secondary outcomes included maternal estimated blood loss, need of neonatal intensive care unit admission, and a 5-minute Apgar score <7.

Maternal and neonatal outcomes following primary uterine rupture were also stratified by mode of delivery. Study data were collected and managed using Research Electronic Data Capture tools hosted at the University of Utah.[16] Research Electronic Data Capture is a secure, World Wide Web–based application designed to support data capture for research studies, providing (1) an intuitive interface for validated data entry; (2) audit trails for tracking data manipulation and export procedures; (3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for importing data from external sources.

Continuous variables were analyzed with Student *t* test. Data were analyzed via χ^2, Fisher exact test, and analysis of variance as appropriate. Statistical significance was set at $P < .05$. Data were analyzed using software (Stata, version 12.1; StataCorp LP, College Station, TX).

Results

In all, 146 women experienced uterine rupture during the study period, including 20 primary uterine rupture cases. During this time period, there were 440,610 deliveries at all of the included institutions. Thus, the incidence of primary uterine rupture was 4.54 per 100,000 deliveries. Demographic and baseline characteristics were compared between those with uterine rupture of an unscarred vs scarred uterus and are listed in Table 1. Maternal age at time of rupture was similar between groups, as was history of miscarriage, tobacco use, and medical history of hypertension and asthma. There were no individuals with maternal connective tissue disease, chronic steroid use, or known müllerian malformation. Overall, 19 women had previous dilation and curettage procedures, 14 in the scarred uterine rupture group and 5 in the primary uterine rupture group. There were 2 women in the scarred uterine rupture

TABLE 1
Demographics and baseline characteristics among primary uterine rupture cases and scarred uterine rupture controls

Characteristic	Primary uterine rupture cases (n = 20)	Scarred uterine rupture controls (n = 126)	*P* value
Maternal age, y (SD)	32.5 (5.4)	32.1 (15.2)	.92
Caucasian	17 (85)	80 (63)	.74
Mean no. of previous live births (SD)	3.6 (1.47)	1.9 (1.0)	< .001
Median no. of previous cesareans (IQR)	0	1 (1–2)	< .001
≥1 prior losses <20 wk	9 (45)	37 (29.4)	.162
Current tobacco use	0 (0)	9 (8.2)	.29
Hypertension	1 (5)	3 (2.36)	.447
Asthma	1 (5)	4 (3.2)	.524

Data are n (%) unless specified.

IQR, interquartile range.

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