A Case Series of Uterine Rupture: Lessons to be Learned for Future Clinical Practice

Revicky Vladimir · Muralidhar Aruna ·
Mukhopadhyay Sambit · Mahmood Tahir

Received: 25 July 2011 / Accepted: 11 July 2012 / Published online: 16 January 2013
© Federation of Obstetric & Gynecological Societies of India 2013

Abstract

Objective In this article, we try to discuss risk factors and diagnostic difficulties for uterine rupture.

Methods Case series of 12 cases of uterine rupture observed in the Norfolk and Norwich University Hospital in the UK, with an average yearly birth rate of 6,000 deliveries, over a 6-year period.

Results In the present case series, there was no maternal mortality, and uterine rupture was a rare occurrence (12 in 36,000 births). Uterine rupture is associated with clinically significant uterine bleeding, fetal distress, expulsion or protrusion of the fetus, placenta or both into the abdominal cavity, and the need for prompt cesarean delivery and uterine repair or hysterectomy. The risk factors for rupture include previous cesarean sections, multiparity, malpresentation and obstructed labor, uterine anomalies, and use of prostaglandins for induction of labor. Previous cesarean section is, however, the most commonly associated risk factor. The most consistent early indicator of uterine rupture is the onset of a prolonged, persistent, and profound fetal bradycardia.

Conclusion In this case series, we suggest that the signs and symptoms of uterine rupture are typically nonspecific, which makes diagnosis difficult. Delay in definitive therapy causes significant fetal morbidity. The inconsistent signs and the short time in prompting definitive treatment of uterine rupture make it a challenging event. For the best outcome, vaginal birth after previous cesarean section needs to be looked after in an appropriately staffed and equipped unit for an immediate cesarean delivery and advanced neonatal support.

Keywords Uterine rupture · Risk factor · Previous cesarean section · Prolonged bradycardia

Introduction

Uterine rupture is defined as a full-thickness separation of the uterine wall and the overlying serosa. It is a rare peripartum complication associated with severe maternal and neonatal morbidity and mortality [1]. Unscarred uterus is the least susceptible to rupture [2]. Grand multiparity, neglected labor, malpresentation, breech extraction, and uterine instrumentation are all predisposing factors for uterine rupture. Gardeil et al. [2] demonstrated that there were no cases of uterine rupture among 21,998 primigravidas, and only 2 (0.0051 %) occurred among 39,529 multigravidas with no uterine scar. However, an eightfold increased incidence of uterine rupture of 0.11 % (1 in 920) has been noted in developing countries and is linked with a

Revicky V., Specialty Registrar · Muralidhar A.,
Specialty Registrar · Mukhopadhyay S., Consultant
Department of Obstetrics and Gynecology, Norfolk and Norwich
University Hospital, Colney Lane, Norwich NR4 7UY, UK

Mahmood T. (✉), Reviewer and Research Facilitator
Office of Research and Clinical Audit, Lindsay Stewart R&D Centre,
Royal College of Obstetricians & Gynecologists, 27 Sussex Place,
Regent's Park, London NW1 4RG, UK
e-mail: tmahmood@rcog.org.uk

higher-than-average incidence of neglected and obstructed labor due to inadequate access to medical care [2]. Previous cesarean section is the main risk factor for uterine rupture [3]. Overall incidence of uterine rupture in the developed countries is around 74 in 10,000 [4]. There is emerging evidence of increased morbidity and mortality following vaginal birth after previous cesarean section (VBAC) due to uterine rupture [4]. This evidence, together with medico-legal fears, has led to a decline in clinicians offering and women accepting planned VBAC in the UK and North America [5]. However, there is a different situation in developing countries since the incidence of uterine rupture is far higher (1 in 106) [6].

Consequences of uterine rupture depend on the time between diagnosis of uterine rupture and delivery and can be divided to fetal and maternal. Fetal consequences are admission to neonatal intensive care unit, fetal hypoxia or anoxia, and neonatal death. Maternal consequences are hemorrhage, hypovolemic shock, bladder injury, need for hysterectomy, and a maternal death. On the other hand, morbidity and mortality following rupture of the uterus depend on the level of medical care [7].

In this case series, we try to discuss risk factors and diagnostic difficulties for uterine rupture observed in the

Norfolk and Norwich University Hospital in the UK, with an average yearly birth rate of 6,000 deliveries, over a 6-year period. We describe 12 cases of uterine rupture.

Case Series

Case of CF

A primiparous woman presented in labor for VBAC at 39 + 2 weeks of gestation. Cardiotocogram (CTG) was applied and showed preterminal trace (Fig. 1). Emergency cesarean section was undertaken within 15 min. Placenta was separated, and the fetus was found in the abdominal cavity. Apgar score was 4 at 1 min, and the arterial pH was 6.53. There was a uterine rupture along the previous scar and downward toward the cervix with extension of the tear centrally toward the bladder. Gross hematuria was noted intraoperatively. Urologists' opinion was sought. Uterus and bladder were repaired in two layers by standard techniques. A urinary catheter was left in situ for 2 weeks. Antibiotics were continued for a week. Mother had an uneventful recovery. Although uterine rupture is a well-described complication of vaginal birth after cesarean

Fig. 1 Preterminal CTG trace

section, simultaneous bladder rupture as in this case is reported sporadically. A search of the recent literature revealed some such case reports [8].

In this case, the bladder injury may have resulted from uterine rupture with bladder adhesions from previous surgery. Lydon-Rochelle et al. [8] reported significant maternal bladder injuries in 8 % of women (7 of 91) whose uterus ruptured compared with 240 of 20,004 control patients (1.2 %) in whom rupture did not occur.

The visceral peritoneum overlying the uterus remained intact, indicating that the intrauterine pressure was wholly transmitted to the bladder. We feel that uterine pressure transmitted to a bladder previously weakened and immobilized by adhesions and distended with trapped urine led to the bladder laceration. This case illustrates the importance of continuous cardiotocography as well as the importance of identifying bladder injury especially in the presence of gross hematuria.

Case of SB

A multiparous lady with one previous cesarean section at 39 + 4 weeks of gestation came with spontaneous rupture of membranes. Oxytocin augmentation was started the next day, and 2 h later, she was found to be 4 cm dilated with fore-waters intact, and hence, artificial rupture of membranes was performed. Some early decelerations were

found on the CTG trace when she was 7 cm dilated. An hour later, bradycardia was noted to be 60 beats per minute (Fig. 3). Clear liquor was noted. Emergency cesarean section was undertaken within 10 min, and a baby girl was found to be in the abdominal cavity; the entire scar rupture was noted. The arterial cord pH was 6.981 and the venous cord pH was 6.976. The Apgar scores were 4 at 1 min and 7 at 5 min. The most important factor for the development of fetal acidosis has been reported as complete extrusion of the fetus and placenta into the maternal abdomen [9].

Menihan [9] found that 10 out of 11 fetuses (91 %) who were born after uterine rupture had an umbilical-artery cord pH level of less than 7.0, and 5 (45 %) had 5-minute Apgar scores of less than 7.

Case of JF

A 31-year-old lady was admitted in early labor. She had had a previous cesarean section for failed ventouse. She was admitted in early labor. She progressed to full dilation. An hour later, CTG recorded prolonged atypical variable decelerations (Fig. 4). Emergency cesarean section was decided upon as instrumental delivery was not considered appropriate. Partial scar dehiscence was noted. Prolonged, late, or recurrent variable decelerations or fetal bradycardia are often the first and only signs of uterine rupture. Bujold and Gauthier showed that abnormal patterns in fetal heart

Fig. 2 Example of normal CTG

Fig. 3 Bradycardia on CTG

Fig. 4 Atypical variable decelerations on CTG

rate were the first manifestations of uterine rupture in 87 % of patients [10]. Further studies found similar results [9, 11].

Case of TR

This extraordinary case demonstrated the occurrence of rupture of posterior uterine wall unrelated to the anterior previous cesarean section scar. A 32-year-old lady, with one previous cesarean section, presented at 40 + 3 weeks at 8-cm dilatation. She had no gynecological history of note. Four hours later, no further progress had occurred. She declined a cesarean section at that time. Two hours later, abdominal pain and fresh vaginal bleeding were noted. Cardiotocogram was reassuring, and urine was clear.

Emergency cesarean section was later performed. On laparotomy, fresh blood was found in the peritoneal cavity. There was an actively bleeding 2-inch-long posterior tear. Previous scar was found intact. There was no communication between the cavity and the rupture. The posterior tear was successfully repaired. There are only a few reported cases in the literature of posterior uterine rupture in labor through normal uterine tissue in women with previous cesarean section [12, 13].

Case of ES

This was a case of spontaneous onset of labor in a lady with previous cesarean section. Her cervix was found to be 7 cm dilated with the vertex noted at the spines. Later, she

experienced a sudden onset of severe abdominal pain. Uterine rupture was suspected, and an emergency cesarean section was performed under general anesthesia. Partial fetal extrusion was found with complete scar rupture. Uterus was exteriorized, and two-layer closure was done. Sudden or atypical maternal abdominal pain occurs more rarely than fetal heart rate decelerations or bradycardia [8]. In a review of 10,967 patients undergoing VBAC, only 22 % of complete uterine ruptures presented with abdominal pain, and 76 % presented with signs of fetal distress diagnosed by continuous electronic fetal monitoring [8].

Case of SR

A 28-year-old lady, with one previous cesarean section, was admitted at 11 days post-term for VBAC. She had an induction of labor with a Prostin following cervical assessment which revealed a Bishop's score of 5. Rapid progress to 9 cm occurred, and the CTG revealed a pathological trace with low variability and atypical variable decelerations (Fig. 5). Emergency cesarean section was performed.

Uterine rupture through the previous scar was noted. The incidence of scar rupture with prostaglandin induction was reported to be 87 in 10,000 cases [7]. During induction of labor, women undergoing VBAC should be monitored closely, with access to electronic fetal monitoring and with immediate access to cesarean section.

Case of LS

A multiparous woman was admitted with spontaneous rupture of membranes at 37 weeks of gestation and was

being observed in antenatal ward. She had had a previous cesarean section for abruption leading to a stillbirth. Couvelaire uterus was diagnosed, and post-partum hemorrhage was arrested by a B-Lynch suture.

She developed sudden severe abdominal pain the next morning. The cardiotocography showed deep decelerations (Fig. 6). An emergency cesarean section was performed, and uterine rupture at the previous scar was noted on delivery with the baby found in the peritoneal cavity. No bleeding was noticed from the scar. This case required prompt intervention despite lack of any external signs of uterine rupture without any signs of labor. Previous abruption and couvelaire uterus have not been reported as risk factors for uterine rupture. However, several case reports have highlighted previous B-Lynch sutures as a risk factor for uterine rupture [14].

Case of DT

A woman in her fourth pregnancy, presented with active vaginal bleeding during her pregnancy, having had no previous antenatal care. Ultrasound assessment revealed a twin pregnancy estimated to be about 22–23 weeks gestation. Fetal heart motion was not demonstrable in either twin. She had had three normal deliveries in the past. Continued severe vaginal bleeding and acute abdominal pain prompted a cesarean section. A blood loss of 3,500 ml was noted with a concurrent rupture and abruption. Gross disparity in the fetal weights prompted a diagnosis of possible twin–twin transfusion syndrome. Routine repair was performed. Concurrent presentation of abruption of placenta and ruptured uterus is extremely rare. There are only few cases described in the past [14].

Fig. 5 Atypical variable decelerations with reduced variability CTG

Case of RT

A 22-year-old primigravida was admitted for medical termination of pregnancy for fetal abnormality at 22 + 2 weeks of gestation following intracardiac KCl administration. She had a history of one previous cesarean section. After the second dose of misoprostol, she was reviewed by a consultant as she was feeling unwell. She was then assessed and found to be hypotensive and tachycardic. USS suggested a ruptured uterus. Laparotomy revealed an inverted T-shaped rupture. The fetus was within the amniotic sac in peritoneal cavity. Routine closure was performed. Blood loss was estimated to be 1,500 ml.

Case of AK

A 28-year-old primigravida presented at 37 weeks to the triage area on labor ward with reduced fetal movements and sudden onset of abdominal pain. A pathological CTG prompted an emergency cesarean section (Fig. 7). She was known to have a placenta praevia. Intraoperatively, a bi-cornuate uterus with the rudimentary horn containing a morbidly adherent placenta accreta was found. Concurrent rupture of the horn was noted with profuse bleeding. Fetus was found in peritoneal cavity. The rudimentary horn was excised. The blood loss was estimated at 3,500 ml. This case demonstrates that pregnancies implanted in the

Fig. 6 Deep decelerations on CTG

Fig. 7 Pathological CTG

rudimentary horn of the uterus pose special risk for those women undergoing induction of labor, with a uterine rupture rate of up to 81 % [15]. Previous obstetric history or palpation for the uterine contour as well as ultrasound may provide clues in diagnosing uterine anomalies which may help in predicting the various complications. Consideration should be given to performing three-dimensional ultrasonography or magnetic resonance imaging examinations to determine their nature of uterine anomalies [16]. Caution should be exercised if prostaglandins are considered for use in this setting [15].

Case of AE

A woman with one previous cesarean section progressed to full dilatation in spontaneous labor at term. She then pushed for 1 h with no presenting part visible. Vaginal examination revealed a brow presentation. Emergency cesarean section was performed, and ruptured uterus was noted intraoperatively. She had had two previous normal vaginal deliveries followed by a cesarean section. Blood stained urine was noted. The lower uterine segment had ruptured with bladder adherent to it. Uterine closure was

Chart 1 Flow chart of management of VBAC

performed in a single layer. Although previous vaginal deliveries offer some protection from uterine rupture, factors such as multiparity and malpresentation have to be taken into account in risk assessment [17].

Case of LB

A woman booked with an independent midwife for home birth having had two previous cesarean sections, despite counseling encouraging a hospital delivery. She declined transfer to the hospital until 4 h after full dilatation. She agreed to a cesarean section an hour after admission. At cesarean section, after 6 h of full dilatation, uterine rupture was noted. This case demonstrates that community midwives sometimes face situations like these and need to be equipped and be aware of the potential complications of devastating nature and act appropriately.

There is an evidence of no significant difference in the risk of uterine rupture following VBAC with one previous cesarean section compared with two or more cesarean births [18, 19]. These studies were retrospective; hence, interpretation of these findings requires caution (Chart 1).

Discussion

The above series suggest that the signs and symptoms of uterine rupture are typically nonspecific, which makes diagnosis difficult. Delay in definitive therapy causes significant fetal morbidity. The inconsistent signs and the short time in prompting definitive treatment make it a challenging event. In the present case series, there was no maternal mortality, and uterine rupture was a rare occurrence (12 in 36,000 births). Uterine rupture is associated with clinically significant uterine bleeding, fetal distress, expulsion or protrusion of the fetus, placenta or both into the abdominal cavity, and the need for prompt cesarean delivery and uterine repair or hysterectomy. The risk factors for rupture include previous cesarean sections, multiparity, malpresentation and obstructed labor, uterine anomalies, and the use of prostaglandins for induction of labor. Previous cesarean section is, however, the most commonly associated risk factor [3]. Compared with elective pre-labor cesarean section, odds of scar rupture increased for emergency pre-labor cesarean section (OR 8.63; 95 % CI 2.6–28.0), spontaneous labor (OR 6.65; 95 % CI 2.4–18.6), and induced labor (OR 12.60; 95 % CI 4.4–36.4) [20]. The most consistent early indicator of uterine rupture is the onset of a prolonged, persistent, and profound fetal bradycardia [9–11]. Other signs and symptoms of uterine rupture, such as abdominal pain, abnormal progress in labor, and vaginal bleeding, seem to be less consistent than bradycardia in establishing the appropriate diagnosis (Table 1). The Royal

Table 1 Warning signs of an impending uterine rupture

Signs of uterine rupture

Prolonged, persistent or profound fetal bradycardia
Other abnormality on CTG
Abdominal pain, acute onset scar tenderness
Abnormal progress in labor, prolonged first or second stage of labor
Vaginal bleeding
Cessation of previously efficient uterine activity
Loss of station of the presenting part
Maternal tachycardia, hypotension or shock

Table 2 List of good clinical practice points

List of good clinical practice points

Antenatal counseling and risk assessment
Consultant involvement
Suitable staffed and equipped delivery suite
Continuous intrapartum care and maternal monitoring
Continuous electronic fetal monitoring
Resources for immediate cesarean section within 30 min
Consultant involvement in induction and augmentation of labor
Epidural anesthesia is not contraindicated
Advanced neonatal resuscitation

College of Obstetricians and Gynecologists recommends a 30-min decision to delivery time interval for emergency cesarean sections. However, delivery within this time cannot always prevent severe hypoxia and metabolic acidosis in the fetus or serious neonatal consequences. In the case of fetal or placental extrusion through the uterine wall, irreversible fetal damage can be expected before that time [9]. Therefore, such a recommendation is of limited value in preventing major fetal and neonatal complications. On the other hand, action within this time may prevent maternal exsanguinations and maternal death. For the best outcome, VBAC needs to be looked after in an appropriately staffed and equipped unit where immediate facilities for cesarean delivery and advanced neonatal support are available (Table 2) [7].

References

1. Ofir K, Sheiner E, Levy A, et al. Uterine rupture: risk factors and pregnancy outcome. *Am J Obstet Gynecol*. 2003;189:4.
2. Gardeil F, Daly S, Turner MJ. Uterine rupture in pregnancy reviewed. *Eur J Obstet Gynecol Reprod Biol*. 1994;56:107–10.
3. Smith JG, Mertz HL, Merrill DC. Identifying risk factors for uterine rupture. *Clin Perinatol*. 2008;35:85–99.

4. Landon MB, Hauth JC, Leveno KJ, et al. Maternal and perinatal outcomes associated with a trial of labor after prior cesarean delivery. *N Engl J Med*. 2004;351:2581–9.
5. Yeh J, Wactawski-Wende J, Shelton JA, et al. Temporal trends in the rates of trial of labor in low-risk pregnancies and their impact on the rates and success of vaginal birth after cesarean delivery. *Am J Obstet Gynecol*. 2006;194:144.
6. Ezegwui HU, Nwogu-Ikojo EE. Trends in uterine rupture in Enugu, Nigeria. *J Obstet Gynaecol*. 2005;25:260–2.
7. Smith GC, Pell JP, Pasupathy D, et al. Factors predisposing to perinatal death related to uterine rupture during attempted vaginal birth after caesarean section: retrospective cohort study. *BMJ*. 2004;329:375.
8. Lydon-Rochelle M, Holt VL, Easterling TR, et al. Risk of uterine rupture during labor among women with a prior cesarean delivery. *N Engl J Med*. 2001;345:3–8.
9. Menihan CA. Uterine rupture in women attempting a vaginal birth following prior cesarean birth. *J Perinatol*. 1998;18:440–3.
10. Rodriguez MH, Masaki DI, Phelan JP, et al. Uterine rupture: are intrauterine pressure catheters useful in the diagnosis? *Am J Obstet Gynecol*. 1989;161:666–9.
11. Hawe JA, Olah KS. Posterior uterine rupture in a patient with a lower segment caesarean section scar complicating prostaglandin induction of labor. *BJOG Int J Obstet Gynaecol*. 1998;104:857–8.
12. Bromham DD, Anderson RS. Uterine scar rupture in labour induced with prostaglandin E2. *Lancet*. 1980;2:485–6.
13. Golan A, Sandbank O, Rubin A. Rupture of the pregnant uterus. *Obstet Gynecol*. 1980;56:549–54.
14. Ndaboine ME, Kihunrwa A. An unusual case of placenta abruption complicated with ruptured uterus: case report. *Internet J Gynecol Obstet*. 2010;13:13.
15. Nahum GG. Uterine anomalies. How common are they, and what is their distribution among subtypes? *J Reprod Med*. 1998;43: 877–87.
16. Pal K, Majumdar S, Mukhopadhyay S. Rupture of rudimentary uterine horn pregnancy at 37 weeks gestation with fetal survival. *Arch Gynecol Obstet*. 2006;274:325–6.
17. Landon MB, Leindecker S, Spong CY, et al. The MFMU Cesarean Registry: factors affecting the success of trial of labor after previous cesarean delivery. *Am J Obstet Gynecol*. 2005;193: 1016–23.
18. Landon MB, Spong CY, Thom E, et al. Risk of uterine rupture with a trial of labor in women with multiple and single prior cesarean delivery. *Obstet Gynecol*. 2006;108:12–20.
19. Tahseen S, Griffiths M. Vaginal birth after two caesarean sections (VBAC-2)—a systematic review with meta-analysis of success rate and adverse outcomes of VBAC-2 versus VBAC-1 and repeat (third) caesarean sections. *BJOG Int J Obstet Gynaecol*. 2010;117:5–19.
20. Al-Zirqi I, Stray-Pedersen B, Forsen L, et al. Uterine rupture after previous caesarean section. *BJOG*. 2010;117:809–20.