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## Vaginal Birth after Cesarean Delivery

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MANAGEMENT of labor after previous cesarean delivery continues to be a controversial area of obstetric practice. Neither repeat cesarean delivery nor a trial of labor are without risk. Currently, cesarean delivery is the most commonly performed operation, and repeat cesarean delivery is the most common indication. Although the prevalence of vaginal birth after cesarean delivery (VBAC) increased after publication of the National Institutes of Health Consensus Statement on cesarean child-birth in 1981,<sup>1</sup> reports of maternal and fetal complications<sup>2-5</sup> associated with VBAC have drawn attention to the problem of uterine rupture.<sup>6,7</sup> In 1999, the American College of Obstetricians and Gynecologists (ACOG) changed its practice bulletin for VBAC to state that a physician who is capable of monitoring labor and performing an emergency cesarean delivery be “immediately” available as opposed to “readily” available when women attempt VBAC.<sup>8</sup> This document also mandated the “immediate” availability of anesthesia and operative personnel for emergency cesarean delivery. Recently, ACOG issued the statement that “the college recognizes the implications such immediate availability has for smaller hospitals for the practice patterns of obstetricians and anesthesiologists, and for the incidence of VBAC in general. But while recognizing the possible difficulties this position may generate, this stand is taken in the interest of women’s health and patient safety.”<sup>9</sup> Because VBAC continues to be controversial and affects anesthesia practice, this clinical commentary examines the epidemiologic data surrounding the VBAC controversy and discusses the obstetric risk, anesthetic implications, and management of VBAC.

### Definition of Uterine Rupture

Uterine rupture refers to a separation of a uterine scar that is clinically apparent and results in fetal distress and maternal hemorrhage requiring emergency cesarean delivery or postpartum laparotomy.<sup>2</sup> Although the diagno-

sis may be difficult because of the variable presentation and degree of scar separation, fetal bradycardia is present in nearly 70% of cases and may be preceded by a nonreassuring fetal heart rate tracing. Fetal bradycardia is the most common sign of uterine rupture; other signs and symptoms include abdominal pain (7-10%), vaginal bleeding (3-5%), hemodynamic instability (5-10%), and recession of presenting part (< 5%) (fig. 1).<sup>10</sup> Although pain is not often associated with uterine rupture, some patients will complain of varying and/or upper abdominal pain resulting from blood and amniotic fluid produced by diaphragmatic irritation. The classic symptoms (*i.e.*, hypotension, fetal bradycardia, loss of contractions measured by intrauterine pressure catheterization, atypical abdominal pain, and vaginal bleeding) are present in only 17% of cases.<sup>10</sup> Uterine dehiscence refers to a sub-clinical separation of a previous uterine incision and is often, but not always, asymptomatic. Although transverse uterine scars are assumed to be safer and less vascular than classic uterine scars, delayed diagnosis and treatment of transverse scar rupture can still result in serious maternal and fetal complications.

### Vaginal Birth after Cesarean Delivery: Controversy

By the early twentieth century, the risk of uterine rupture in pregnant patients with a previous cesarean delivery had been identified. However, obstetric practice has changed significantly during the century, with the incidence of cesarean delivery increasing from 2% in 1900 to 24.7% in 1988.<sup>8</sup> This rate increase resulted from attempts by obstetricians to reduce the fetal morbidity and mortality from instrumented vaginal delivery. The increased use of continuous fetal heart rate monitoring has been associated with an increased incidence of cesarean delivery. In addition, the primary incision has changed from a classic uterine incision (*i.e.*, a long vertical incision in the upper portion of the uterus) to the current low transverse incision, which carries a much lower risk of uterine rupture than does the classic incision. Although reports from the 1980s and early 1990s described the relative safety of trial of labor among women with previous cesarean delivery,<sup>6,7,11</sup> and some insurers even refused to pay for repeat cesarean deliveries, several large studies confirmed a 1% risk of uterine rupture during trial of labor in patients with a history of previous low-transverse incision.<sup>6,12,13</sup> Many cases of uterine rupture had favorable maternal and perinatal

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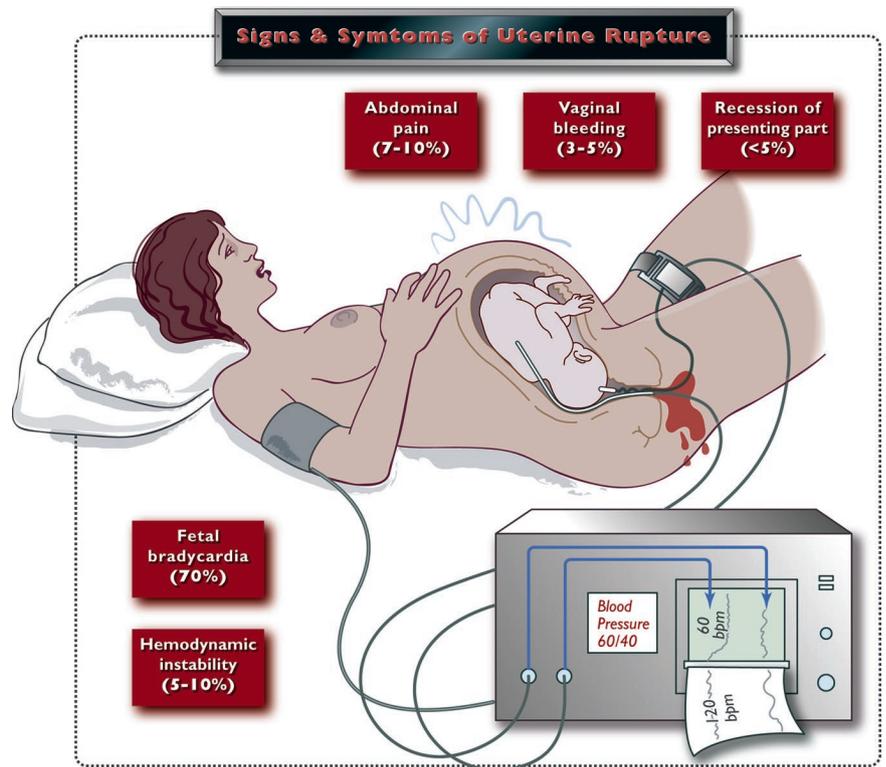


Fig. 1. Signs and symptoms of uterine rupture.

outcomes, but others did not.<sup>2-5</sup> One retrospective chart review of 38,027 deliveries at a university medical center found the incidence of uterine rupture to be 0.8% in women with previous cesarean delivery compared with 0.01% in women without such a history.<sup>14</sup> The authors emphasized the importance of early recognition of scar dehiscence or rupture and expeditious delivery to minimize major maternal and infant morbidities. They also stated that VBAC is “safe” for patients who are treated in hospitals capable of conducting increased surveillance and performing emergency cesarean delivery or exploratory laparotomy. In contrast, results from a community-based prospective cohort study of attempted VBAC ( $n = 754$ ) versus elective repeat cesarean delivery ( $n = 727$ ) found an incidence of uterine rupture of 1.6%.<sup>15</sup> These authors suggested that the increased rate of uterine rupture observed in their hospital is a more accurate representation of the actual rate of uterine rupture in community hospitals. However, at least two cases of uterine rupture in this series may be considered extraordinary risks. One case involved induction with misoprostol, a practice discouraged by ACOG.<sup>16</sup> The other case involved a woman with a history of two previous cesarean deliveries and an induction at 41 weeks gestation for a 12-lb infant. Such cases must be examined carefully to determine whether obstetric care followed usual standards. Obviously, all patients are not the same: parity, history of vaginal delivery, history of cesarean delivery for cephalopelvic disproportion, and maternal age can

affect study populations and the decision to attempt trial of labor after previous cesarean delivery.

Another area of concern in patients attempting VBAC is induction of labor. One recent population-based, retrospective cohort analysis of attempted VBAC observed that uterine rupture occurred at a rate of 24.5 per 1,000 among women with prostaglandin-induced labor versus 7.7 per 1,000 among women whose labor was induced without prostaglandins.<sup>4</sup> Uterine rupture was observed at a rate of 1.6 per 1,000 among women with repeated cesarean delivery without labor and 5.2 per 1,000 among women with spontaneous labor. If uterine rupture occurred, neonatal mortality increased by a factor of 10. However, the term *uterine rupture* was not clearly defined. In addition, the authors were unable to identify the specific prostaglandin preparation used. Despite these limitations, the ACOG Committee on Obstetric Practice recently issued a practice bulletin discouraging the use of prostaglandins for the induction of labor in patients attempting VBAC.<sup>16</sup> Although prostaglandin induction is discouraged in patients attempting VBAC, oxytocin administration has not been implicated in increasing the risk of uterine rupture in such patients.<sup>17</sup>

#### Indications and Outcome of VBAC

Vaginal birth after cesarean delivery is reported to be successful in 60–80% of attempts.<sup>8</sup> However, the rates reflect a selected population, and the exact number of women undergoing trial of labor is unknown. Successful VBAC is associated with lower morbidity than repeat

cesarean delivery (*i.e.*, fewer blood transfusions, fewer postpartum infections, fewer cases of hysterectomy).<sup>18</sup> Many women who have had one or two previous low-transverse cesarean deliveries without contraindications to vaginal birth are candidates for a trial of labor, but the risk of uterine rupture increases with the number of previous uterine incisions.<sup>19</sup> Although patients with a previous history of failure to progress do deliver vaginally, the cesarean section rate is lower than for patients with nonrecurring indications (*i.e.*, fetal distress, breech presentation).<sup>20</sup> Patients with a history of classic uterine incision are not candidates for VBAC.

Many women with a history of previous cesarean delivery have undergone a trial of labor without significant complications,<sup>6,7</sup> but most of these published reports resulted from deliveries at hospitals where obstetricians, anesthesiologists, and support personnel are “in-house” and immediately available to perform an emergency cesarean delivery. The most feared complication, uterine rupture, occurs in approximately 1% of cases. In a retrospective review of charts and fetal monitoring strips, 106 cases of uterine rupture were identified among 16,467 women who underwent a trial of labor with previous cesarean delivery. The authors reported that no infants suffered significant perinatal morbidity or mortality if delivery occurred within 17 min when the only fetal heart rate abnormality was a prolonged deceleration.<sup>3</sup> Although there were no cases of neonatal death in the 32 cases of only prolonged decelerations, three neonates experienced respiratory distress and one suffered from asphyxia. The authors also concluded that if the fetal heart rate pattern was nonreassuring (*e.g.*, loss of fetal heart rate variability with repetitive late decelerations) before the bradycardia, fetal hypoxic morbidity occurred as early as 10 min between the onset of the prolonged deceleration and delivery. Of 18 patients in whom the fetal heart rate abnormality was severe late decelerations followed by a prolonged late deceleration, there were two cases of neonatal death, four of asphyxia, and three cases of respiratory distress. Although retrospective chart reviews are often limited by selection bias, and this study population consisted largely of indigent Hispanic women with an unknown uterine scar, this likely represents the most severe spectrum of uterine rupture. A prolonged fetal heart rate deceleration can signal uterine rupture, but there are no data correlating the duration of final deceleration to neonatal outcome. Although this study is widely quoted, interpretation of the authors’ conclusions regarding specific times and outcome predictions, which are based on a retrospective

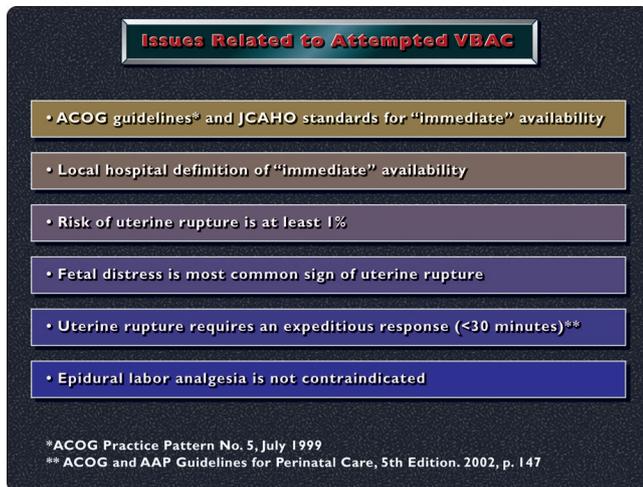
analysis of a high-risk population, should be approached with caution.

The 1999 VBAC practice bulletin states that a trial of labor should not be attempted when there is an inability to perform emergency cesarean delivery because of unavailable surgeon, anesthesia, sufficient staff, or facility.<sup>8</sup> In addition, 2002 Guidelines for Perinatal Care state that “any hospital providing an obstetric service should have the capability of responding to an obstetric emergency. No data correlate the timing of intervention with the outcome, and there is little likelihood that any will be obtained. However, in general, the consensus has been that hospitals should have the capability of beginning a cesarean delivery within 30 min of the decision to operate. Examples of indications that may mandate more expeditious delivery include hemorrhage from placenta previa, abruptio placentae, prolapse of the umbilical cord, and uterine rupture.”<sup>21</sup>

Much controversy followed the publication of the 1999 ACOG practice bulletin for VBAC, and obstetricians and anesthesiologists raised questions about the applicability of the “30-minute rule.” Although the 30-minute rule is not derived from evidence-based data, it states that any hospital sponsoring an obstetric service should be able to initiate a cesarean delivery within 30 min after the decision to proceed to surgery. Some indications, including uterine rupture, require a more expeditious response.<sup>21</sup> Many anesthesiologists and obstetricians have objected to the new VBAC recommendations because they have changed the requirements for in-house coverage of labor and delivery suites, especially in community hospitals. Although there was a 50% increase in VBAC attempts between 1989 and 1996, attempts declined 12% between 1999 and 2000, with an overall decrease of 27% between 1996 and 2000.<sup>22</sup> It is not clear how the 30-minute rule applies when the sole in-house anesthesiologist is already providing anesthesia for surgery.

The American College of Obstetricians and Gynecologists has not defined the term *immediately* in its 1999 practice bulletin, but it is assumed by many obstetricians and anesthesiologists to mean in-house coverage while a woman is in active labor. The Joint Commission on Accreditation of Healthcare Organizations also adopted the ACOG practice bulletin recommendations into its standards in 2001 and repeated this admonition in the 2002 standards.<sup>23</sup> ACOG contends that VBAC is a patient safety issue and a trial of labor is an elective procedure that can be planned for as with any other surgical procedure. However, even if elective induction is planned, labor is often unpredictable, and if a patient awaits spontaneous labor the elective nature of VBAC is nonexistent. In response to ACOG’s practice bulletin, the American Society of Anesthesiologists and ACOG issued a joint statement, the “Optimal Goals for Anesthesia Care in Obstetrics,” which was approved by the American Society of Anesthesiologists House of Delegates in 2000.\*

\* American Society of Anesthesiologists and American College of Obstetricians and Gynecologists: Optimal Goals for Anesthesia Care in Obstetrics, American Society of Anesthesiologists, 2000; [www.asahq.org/publicationsAndServices/standards/24.html](http://www.asahq.org/publicationsAndServices/standards/24.html). Accessed July 14, 2003.



**Fig. 2.** Issues related to attempted vaginal birth after cesarean delivery (VBAC).

This statement reiterated ACOG’s practice bulletin for the management of VBAC, stating that “in cases of VBAC, appropriate facilities and personnel, including obstetric anesthesia, nursing personnel, and a physician capable of monitoring labor and performing cesarean delivery” be “immediately available during active labor to perform emergency cesarean delivery,”\* without defining “immediately.”

*Anesthetic Management of VBAC*

**Epidural Analgesia.** The long-standing concern about the use of epidural analgesia for labor in patients attempting VBAC resulted from the concept that labor epidural analgesia could mask the pain of uterine rupture and delay its diagnosis. However, fetal distress is the most common and reliable sign of uterine rupture.<sup>10</sup> Several published reports suggest the safety of labor epidural analgesia during a trial of labor in patients with a history of previous cesarean delivery.<sup>24-26</sup> Although these studies were published at a time when more concentrated local anesthetics ( $\geq 0.125\%$  bupivacaine) were administered, and there was greater concern for nonrecognition and delayed diagnosis of uterine rupture during labor epidural analgesia, the overall incidence of uterine rupture was low, even with epidural analgesia. Despite the limitations of a small sample size and retrospective reporting in two of the three widely quoted studies, the likelihood of masking the pain of uterine rupture with even lower concentrations of epidurally administered local anesthetics seems unlikely. In addition, the 1999 practice bulletin *Vaginal Birth After Cesarean Delivery* by the American College of Obstetricians and Gynecologists states that “based on good and consistent scientific evidence, epidural analgesia may be used for VBAC” (fig. 2).<sup>8</sup>

The preponderance of evidence suggests that labor epidural analgesia may be used safely during a trial of

labor and does not affect the likelihood of successful VBAC.<sup>24,26</sup> Success rates for VBAC are similar in women who do and do not receive epidural analgesia, as well as in those women who receive other types of pain relief. Adequate pain relief may also encourage more women to choose trial of labor.<sup>8,26</sup> A functional epidural catheter can facilitate transition to surgical anesthesia if time allows and cesarean delivery or uterine exploration become necessary. The use of concentrated local anesthetics (e.g., 2% lidocaine, 2-3% 2-chloroprocaine) during labor may mask the breakthrough pain of uterine rupture, but epidural analgesia rarely masks the signs and symptoms of uterine rupture when diluted concentrations of local anesthetic with or without opioids are administered.<sup>8</sup> Breakthrough or varying pain during trial of labor may be indicative of uterine rupture and should be evaluated carefully.

During the past decade, combined spinal-epidural analgesia has become increasingly popular for labor analgesia. Although intrathecal opioid administration with or without local anesthetic prior to epidural analgesia potentially provides the best of both techniques, some epidural catheters will remain untested during the period of intrathecal analgesia. However, investigators have suggested that the epidural failure rate for spinal-epidural analgesia may actually be less than for conventional epidural analgesia.<sup>27</sup>

*Management of Uterine Rupture*

**Obstetric Management.** Obstetric management of frank uterine rupture includes immediate laparotomy and cesarean delivery. Although hysterectomy is the definitive procedure in some cases of uterine rupture, uterine dehiscence resulting from low-transverse scar separation is often discovered incidentally and can be repaired successfully without hysterectomy. Because uterine atony often follows uterine rupture, ligation of the uterine, ovarian, and hypogastric arteries can be helpful in reducing blood loss and preventing hysterectomy. However, venous bleeding often continues from the uterine vascular bed. Angiographic selective embolization of pelvic vessels is another treatment alternative in some patients, although this technique works best in patients with an identifiable presurgical risk of hemorrhage (e.g., placenta accreta).<sup>28</sup>

**Anesthetic Management.** Choice of anesthetic depends on maternal hemodynamic status, fetal status, amount of expected blood loss, and risk of cesarean hysterectomy. In their chart review of 21 cases of uterine rupture, Yap *et al.*<sup>14</sup> reported that 10 of the 21 deliveries or laparotomies were successfully managed intraoperatively with epidural anesthesia. Either regional or general anesthesia is an acceptable anesthetic choice if the mother and fetus are stable. In parturients with uncertain intravascular volume, spinal or epidural anesthesia may be unsafe because the sympathetic blockade

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produced by spinal or epidural anesthesia can impair the patient's ability to respond to hemorrhage.<sup>29</sup>

Fetal distress increases the urgency of delivery and general anesthesia may be necessary, especially in the absence of a preexisting epidural catheter. Although Leung *et al.*<sup>3</sup> state that the decision-to-incision interval may need to be less than 18 min in patients with prolonged decelerations not preceded by other fetal heart rate abnormalities, this time frame has not been suggested in any standard, guideline, or practice parameter. In addition, no society insists on this timing.

Preoperative preparation should include readiness for emergency cesarean delivery, laparotomy, and anticipated substantial blood loss. Although some patients are candidates for spinal or epidural anesthesia, prolonged surgical time and significant intravascular volume shifts may necessitate conversion to general anesthesia. In this situation, the risk of intubation and difficult airway can be further increased beyond the already increased risk in obstetric patients. Shifts of intravascular volume can cause significant perioperative changes in airway anatomy.<sup>30</sup> For VBAC patients, a blood specimen for *type and screen* should be sent on hospital admission to ensure the availability of blood if uterine rupture and hemorrhage occur.

### Conclusion

The safety of VBAC is documented for most patients attempting a trial of labor. However, the incidence of uterine rupture during trial of labor is at least 1%. Serious maternal and fetal morbidity or mortality occur in 10–25% of cases of uterine rupture.<sup>31</sup> The 1999 ACOG practice bulletin on VBAC<sup>8</sup> and the Joint Commission on Accreditation of Healthcare Organizations standards<sup>23</sup> now state that “because uterine rupture may be catastrophic, VBAC should be attempted in institutions equipped to respond to emergencies with physicians immediately available to provide emergency care.” The term *immediately* has replaced *readily* available. However, “the definition of immediate availability of personnel and facilities remains a local decision based on each institution's available resources and geographic location.”<sup>23\*</sup> Some hospitals have chosen to discontinue the practice of VBAC by offering repeat cesarean delivery or transfer of the patient to another hospital. Regardless of a hospital's decision to provide VBAC services, studies suggest that major morbidity and mortality can be minimized with close maternal and fetal monitoring and the immediate availability of all necessary personnel to perform an emergency cesarean delivery.<sup>14,15</sup>

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