Obstetric emergencies

Anesthesiology Clinics Volume 21, **Issue 1**, Pages 111-125 (March 2003)

Chantal Crochetière

Many anesthesiologists fear obstetric emergencies because they represent one of the most extreme challenges in the profession. Obstetric emergencies can be life threatening to the mother-to-be, the fetus, or both, bleeding can be catastrophic, and timely intervention is important. This article focuses on common and some less common critical obstetric events in which the anesthesiologist plays an important role. These events include obstetric hemorrhage, fetal compromise, and special situations, such as pregnancy-induced hypertension (PIH), difficult airway, morbid obesity, and maternal cardiac arrest.

Obstetric hemorrhage

Hemorrhage is the underlying causative factor in at least 25% of maternal deaths in industrialized and underdeveloped countries [1]. The incidence may be increasing mainly because of the increased rate of cesarean section and the complications that ensue (previa, accreta, and vaginal birth after cesarean).

A better understanding of the causes and management of obstetric hemorrhage is a valuable guide to adequate resuscitation. Maternal physiology is well prepared for hemorrhage, with an increase in blood volume of approximately 1 to 2 L (estimated blood VOLUME = 6 L), a hypercoagulable state, and the “tourniquet” effect of uterine contractions on the blood vessels. Blood loss can occur rapidly, however, because the gravid uterine blood flow is in the order of 600 to 900 mL/min. Resuscitation can be inadequate because of an underestimation of blood loss that is often partially or completely covert and difficult to measure. Maternal response to bleeding can be misleading because vital signs may remain near normal until more than 30% of blood volume is lost, and tachycardia can be attributed to pregnancy, stress, pain, and delivery. Pregnant women also have an increased susceptibility to develop disseminated intravascular coagulopathy [2].

Causes of maternal hemorrhage are classified by their timing of occurrence. Causes of antepartum hemorrhage (4% of pregnancies) [3] include placenta previa, abruptio placenta, and uterine rupture. Postpartum hemorrhage (10% of deliveries) [4] can be defined as a blood loss after delivery of more than 500 mL, any amount of blood loss that threatens the woman's hemodynamic stability, or a 10% decrease in hematocrit from admission. Causes of early postpartum hemorrhage (first 24 hours) include uterine atony, genital lacerations, retained placenta, and uterine inversion. The causes of postpartum hemorrhage can be thought of as the four Ts: tone, tissue, trauma, and thrombin [5]. Parturients with

antepartum hemorrhage are also at risk for postpartum bleeding. Different causes and management are discussed by order of frequency of occurrence (Table 1).

Table 1. Obstetric hemorrhage

Cause	Incidence	Timing
Genital tract lacerations	1:8	Postpartum
Uterine atony	1:20 – 1:50	Postpartum
Abruptio placenta	1:80 – 1:150	Antepartum
Retained placenta	1:100 – 1:160	Postpartum
Placenta previa	1:200	Antepartum/postpartum
Placenta accreta	1:2000 – 1:2500	Antepartum/postpartum
Uterine rupture	1:2300	Antepartum/postpartum
Uterine inversion	1:6400	Postpartum

Genital tract lacerations

Genital trauma always must be eliminated first if the uterus is firm in a bleeding postpartum parturient. Genital lacerations are a common cause of bleeding but rarely result in massive bleeding unless large vessels are involved or if the bleeding occurs after the patient has been transferred to the postpartum unit. Rarely, bleeding from genital tract lacerations extends into the retroperitoneal space. Retroperitoneal hematomas are dangerous because they can become large and develop insidiously, and treatment often requires exploratory laparotomy, blood transfusion, and possibly a hysterectomy [6].

Uterine atony

Uterine atony is the most common cause of significant obstetric bleeding; it may occur alone or in association with placenta previa, placental abruption, or retained placenta. Atony is the most common complication that leads to blood transfusion. Many factors are associated with uterine atony: multiple gestation, macrosomia, polyhydramnios, high parity, prolonged labor, excessive use of oxytocin, and chorioamnionitis. An atonic uterus may contain up to 1 L of blood.

Although hemorrhage is common, life-threatening hemorrhage is less frequent. Each hospital should have a protocol for the management of a bleeding parturient [7]. Because timing is of the essence, all members of the obstetric team should be familiar with the protocol (Box 1).

Box 1:

Bleeding parturient management

* Provide early diagnosis, treat the cause
* Follow general principles of resuscitation (airway, breathing, circulation)
* Call for help
* Begin second large-bore intravenous line
* Order blood tests (hemoglobin, coagulation screen, cross-match)
* Order blood (hematology consultation?)
* Provide crystalloid/colloid (pentastarch) to maintain isovolemia
* Start high-pressure infusion system
* Begin arterial line (serial hemoglobins, coagulation studies)
* Provide air warming blanket
* Provide autotransfusion device?
* Begin central venous pressure line (after stabilization)
* Begin prompt treatment of clotting disorders
* Monitor urine output
* Consider use of vasopressors

The key to eliminating the need for a hysterectomy is the immediate and aggressive use of uterotonic drugs. Oxytocin (40 U/L) infused under pressure is the first-line drug. Higher concentrations might provoke hemodynamic instability and fluid overloading (antidiuretic effect). Oxytocin has an immediate effect, so there should not be more than a few minutes delay in adding other drugs if rapid improvement in uterine tone does not occur. 15-Methyl prostaglandin F2alpha (Hemabate) 250 microg, preferably used as an intramyometrial injection for a faster onset than with intramuscular use, is currently the second choice in many hospitals. Hemabate may succeed in controlling hemorrhage when all other treatments have failed [8]. Intravenous administration is not recommended in North America. Hemabate should be used with caution in a parturient with asthma because it has the potential to cause bronchoconstriction and intrapulmonary shunting [9]. Doses may be repeated every 15 minutes but should not exceed a total dose of 2 mg.

Ergonovine (an ergot alkaloid), 0.2 mg intramuscularly, can be used when intramyometrial Hemabate is contraindicated. Ergonovine, given as an intramuscular injection, has a faster onset (a few minutes) when compared to Hemabate. Ergonovine is contraindicated in patients with hypertension (chronic or PIH) and coronary artery disease. The onset is immediate if the intravenous route is chosen, but the dose should be fractionated (0.06 mg at a time). Cases of myocardial infarction and cardiac arrest have been described after the use of ergot derivatives [10].

Uterine massage, arterial embolization, or laparotomy may be necessary to control hemorrhage from an atonic uterus. Uterine packing, an “old fashioned” treatment, seems to be making a come back and should be considered for stabilizing a bleeding patient or a patient with disseminated intravascular coagulopathy [11,12]. Amniotic fluid embolism may present as uterine atony without pulmonary symptoms. In that situation, disseminated intravascular coagulopathy is the predominant problem, and treatment with blood products should be aggressive [13]. Uterine exploration or laparotomy in a bleeding parturient may be necessary. Anesthetic considerations are summarized in box 2.

Box 2:

Anesthesia for a postpartum bleeding parturient

General anesthesia (rapid sequence induction)
*
Opioids
*
Ketamine 1 mg/kg or etomidate 0.3 mg/kg
*
Succinylcholine 1.5 mg/kg
*
Volatile agents or total intravenous anesthesia
*
Regional anesthesia (hemodynamically stable patient, examination under anesthesia or curettage)
*
T7-S4 block
*
Epidural (in situ) lidocaine 2%: 10 mL ± epinephrine 1:200,000
*
Spinal (no coagulopathy) bupivacaine 0.75%: 1 mL ± fentanyl 25 É g

General anesthesia is mandatory when the patient needs a laparotomy or is hemodynamically unstable. One should be prepared for massive bleeding because hysterectomy may be the final treatment. One may have to consider total intravenous anesthesia during general anesthesia because all volatile agents [14] may worsen uterine atony. Regional anesthesia may be an option in a stable patient who needs uterine or genital tract exploration but the anesthesiologist needs at least a T7 block if manual uterine exploration is likely. Sedation is less

than ideal because a thorough examination of the genital tract, including uterine exploration, is a painful procedure. In a patient at risk for aspiration, sedation may cause the loss of protective airway reflexes in the immediate postpartum period.

Abruptio placenta

Placental abruption is defined as separation of the placenta from the decidua basalis before delivery of the fetus. Associated conditions are hypertension (chronic or PIH), premature rupture of membranes, previous abruption, high parity, smoking, cocaine abuse, trauma, and decompression of polyhydramnios. The fetal status, the maternal hemodynamics, and the coagulation status correlate with the degree of placental separation. Hemorrhage may be obvious or concealed (up to 2.5 L). A concealed hematoma increases intrauterine pressure, and amniotic debris may be forced through open venous sinuses, provoking disseminated intravascular coagulopathy (10%). Sonographic examination is not reliable in detecting abruptio placenta.

If the coagulation profile is normal and the woman is hemodynamically stable, epidural analgesia can be used to control labor pain. Cesarean section is reserved for situations such as fetal distress or heavy maternal bleeding combined with minimal cervical dilatation. Emergency cesarean section may become necessary at any time because further placental separation may cause fetal death. General anesthesia is indicated for prolonged fetal bradycardia or a hemodynamically unstable or coagulopathic parturient. Regional anesthesia may be used in less dramatic situations, but hypotension must be treated promptly and appropriately. During surgery, coagulopathy and uterine atony, secondary to a Couvelaire uterus, may occur. Couvelaire uterus is the widespread extravasation of blood into the myometrium, and it impairs uterine contraction. Hysterectomy may be required. In cases of massive abruption, intensive resuscitation of the newborn is essential and, if the infant is hypovolemic, blood transfusion may be lifesaving.

Retained placenta

Retained placental fragments are a leading cause of early and delayed postpartum hemorrhage. Treatment is manual removal, and choice of anesthesia has been discussed previously (see box). General anesthesia with any volatile agent (1.5–2 minimum alveolar concentration (MAC)) may be necessary for uterine relaxation. Nitroglycerin, 50 to 250 microgm intravenously or two puffs (800 microgm) inhaled [15], is clinically an effective uterine relaxant and is worth a try in any case of a contracted uterus. Nitroglycerin neither promotes separation of an adherent

placenta nor provides analgesia. On rare occasions, a retained placenta is an undiagnosed placenta accreta, and massive bleeding may occur during attempted manual removal.

Placenta previa

A placenta previa occurs when placental implantation takes place in the lower segment of the uterus in front of the fetal presentation. It varies in degree and may be total, partial, or marginal. Risk factors include prior placenta previa, uterine scar, advanced maternal age, and multiparity. Placenta previa accounts for one third of antepartum bleeding but rarely puts the life of the mother or the fetus at risk because the bleeding usually stops spontaneously. Antepartum bleeding is the result of placental separation during cervical dilatation and lengthening of the lower uterine segment. Diagnosis is confirmed by ultrasound in more than 95% of cases. Transvaginal sonography differentiates a marginal previa from a low-lying placenta so a double set up examination is rarely necessary [16]. An elective cesarean section is planned as soon as the fetus reaches maturity.

With massive blood loss and a hemodynamically unstable mother, cesarean section under general anesthesia is the best way to deliver the infant and stabilize the mother. If bleeding has stopped and the mother is hemodynamically stable, regional anesthesia can be used after careful assessment. If one strongly suspects a placenta accreta, it may be safer to use general anesthesia. Postpartum hemorrhage may occur when the surgical incision goes through an anterior placenta, there is poor contractile capacity of the implantation site (lower uterine segment being less muscular), or there is a placenta accreta. The hypovolemic newborn may need resuscitation.

Placenta accreta

Placenta accreta is defined as an abnormal implantation of the placenta in the uterine wall, of which there are three types: (1) accreta vera, in which the placenta adheres to the myometrium without invasion into the muscle, (2) increta, in which it invades into the myometrium, and (3) percreta, in which it invades the full thickness of the uterine wall and possibly other pelvic structures, most frequently the bladder. After delivery, the placenta does not completely separate and severe, life-threatening blood loss may result. The link between previous cesarean section, placenta previa, and placenta accreta is well established [17,18]. In a patient with a previous cesarean section and a placenta previa, the risk of accreta is 14% to 24%; this risk increases for a patient with two (23%) or three (47%) previous

cesarean sections. Unfortunately, most cases of placenta increta and percreta require a hysterectomy. It is currently the leading cause of emergency obstetric hysterectomy [19].

Preoperative diagnosis of placenta increta and percreta is usually possible using transvaginal ultrasound in the third trimester [20]. In some patients, MRI can evaluate the extent of invasion [21]. Preoperative placement of balloon catheters in the hypogastric arteries (via axillary or femoral arteries) under light sedation may prove helpful to control bleeding before hysterectomy. Massive hemorrhage is still possible even with balloon catheters already in place because of heavy collateral vascularization. Experienced surgeons and radiologists are needed. The baby is delivered via a uterine incision remote from the placenta (when possible), the placenta is left in situ, the uterus is closed, and hysterectomy is performed after the balloon catheters are inflated.

Regional anesthesia may be appropriate in many cases of placenta previa and repeat cesarean section, but one must remember that immediate conversion to general anesthesia may be required. General anesthesia may be safer when an antenatal diagnosis of placenta increta or percreta is made. Aggressive resuscitation is required for massive hemorrhage. Manual aortic compression and vasopressors may be needed to stabilize the patient until the hemorrhage is controlled [22].

Uterine rupture

The most frequent variety of disruption is uterine scar separation. Uterine rupture involves separation of the old incision with possible extension and rupture of the fetal membranes, with either all or part of the fetus extruded into the peritoneal cavity. The incidence of uterine rupture has increased from less than 1% to 3% in the last 10 years because of the increased incidence of vaginal birth after cesarean [23,24]. The most common sign of uterine rupture is a nonreassuring fetal heart rate pattern, with variable decelerations that may evolve into late decelerations, bradycardia, and loss of fetal heart rate. Severe abdominal pain is rarely a presenting symptom [25]. Uterine repair is appropriate for most cases, and blood loss is usually moderate. Hysterectomy is rarely needed. Significant fetal mortality and morbidity still occur because of the high possibility of anoxia; prompt response is vital. Physicians or neonatologists should be immediately available to resuscitate the newborn [26]. General anesthesia is mandatory for cases with fetal compromise or maternal hemodynamic instability.

Uterine inversion

An atonic uterus and an open cervix allow the uterus to “turn inside out” through the birth canal. Fundal pressure and inappropriate traction on the umbilical cord to hasten placental delivery contribute to uterine inversion. Prompt repositioning of the uterus is mandatory and if this fails, transfer to the operating room should be immediate because blood loss may be rapid. Administration of general anesthesia (with endotracheal intubation and a volatile halogenated agent) is the most proven method for producing the uterine relaxation needed for reduction of the inversion. Case reports suggest that nitroglycerin may obviate the need for general anesthesia [27,28]. Nitroglycerin may be tried but should not delay the induction of general anesthesia. Fluid resuscitation should take place at the same time. Once the uterus is replaced, all medications that cause uterine relaxation should be stopped. Uterotonic treatment should be started to prevent uterine atony.

Fetal compromise

Definition

Excluding premature infants, up to 23% of cases of cerebral palsy are related to intrapartum asphyxia [29]. The consequences of unrecognized or poorly managed emergencies can be devastating. A well-coordinated team that consists of an anesthesiologist, obstetrician, neonatologist/pediatrician, and nurses is one of the most important elements in the care of a compromised fetus. There must be uniform agreement on the terms used to describe the fetus at risk.

The American College of Obstetrician and Gynecologists (ACOG) has suggested that the term “fetal distress” be replaced with the term “nonreassuring fetal status,” which describes the clinician's interpretation [30]. Clinicians rely on indirect parameters such as fetal heart rate, fetal acid-base status, and, more recently, fetal pulse oximetry. All of these parameters are subject to interpretation. Nonreassuring status describes compromised fetal gas exchange (asphyxia) and, at the extreme, there can be a complete cessation of fetal gas exchange (ie, fetal anoxia). Complete cord occlusion, sustained bradycardia, uterine rupture, and ongoing tetanic uterine contractions are examples of complete cessation of gas exchange (anoxia). Fetal anoxia can be lethal in less than 10 minutes [31]. All hospitals need a well-planned emergency protocol to distinguish the different kinds of “unplanned” or “emergency” cesarean sections to help delineate an optimal time frame for delivery.

In utero resuscitation

Before deciding on an intervention (forceps, cesarean section) the obstetrician or the anesthesiologist or both should ensure that in utero fetal resuscitation has been attempted. Supplemental oxygen to the mother, adequate maternal positioning, discontinuation of oxytocin, normalization of blood pressure, and tocolysis in cases of uterine hypertonus are all effective maneuvers. These steps may allow a fetus to deliver vaginally if delivery is imminent or give time to induce anesthesia for cesarean section less urgently (non-stat). If these measures are not rapidly effective, the parturient should be transferred to the operating room for operative delivery.

Choice of anesthesia

It is critical that the obstetrician communicate the severity of the fetal heart rate abnormality to the anesthesiologist (Table 2). If fetal anoxia is presumed (prolonged bradycardia, cord prolapse with bradycardia, uterine rupture, maternal hemodynamic instability), delivery should take place as soon as possible (stat). There is less than 10 minutes between the onset of fetal anoxia and permanent fetal brain damage [31]. Rapid sequence induction of general anesthesia is preferred for most cases of stat cesarean section. The mother's life should not be endangered if the fetus is compromised, however. If general anesthesia is contraindicated, regional anesthesia or, rarely, local anesthetic infiltration is more appropriate [32]. Continuing internal fetal monitoring until delivery allows ongoing assessment [33]. Delivery of the scalp electrode, along with the infant, should not increase the risk of maternal infection [34].

Table 2. Anesthesia for fetal compromise

Rapid history
Clear antacid (sodium citrate)
100% O2 for 3–5 min or 4 vital capacity breaths
Continue to monitor fetal heart rate
Airway evaluation
Optimal maternal positioning (left uterine displacement and airway)
Check the intravenous line
Regional
Spinal 12–15 mg hyperbaric bupivacaine
15 microgm fentanyl (optional)
0.1–0.2 mg morphine (optional)

Epidural
20–30 mL 3% 2-chloroprocaine
or
15–20 mL 2% lidocaine + epi 1/200 000

General
Induction when surgeon ready to start

Ketamine 1 mg/kg or
Thiopentone 4–6 mg/kg

1–2 microgm/kg fentanyl
Succinylcholine 1.5 mg/kg
Cricoid pressure
02 –100% until delivery
Volatile agent: 1 — 1.5 MAC

Abbreviation: MAC, minimum alveolar concentration.

Regional anesthesia is the preferred anesthetic technique for pregnant women and can be used in most cases of emergency cesarean section (dystocia, variable decelerations with recovery, failed forceps). Epidural analgesia for labor should be encouraged in patients at high risk for operative delivery (multiple gestations, PIH, diabetes, cardiomyopathy, macrosomia, intra-uterine growth retardation (IUGR)). Preservation of uterine blood flow gives the fetus the best chance to survive with the fewest sequelae. To achieve this, maternal positioning should be optimal, hypotension should be aggressively prevented and treated with appropriate vasopressors, increased uterine venous pressure from uterine hypertonus should be treated, and adequate anesthesia must be administered to prevent an increase in catecholamines.

Neonatal resuscitation

Each hospital should decide who is responsible for neonatal resuscitation. Ideally this decision does not include the anesthesiologist, because there are situations when the anesthesiologist is unavailable to take care of the baby. Nevertheless, anesthesiologists who work in obstetrics should reassess their knowledge of neonatal resuscitation regularly.

Special considerations

Occasionally the anesthesiologist is confronted with a parturient with an “explosive” combination of risk factors, such as a difficult airway, PIH, morbid obesity, other medical conditions, and an obstetric emergency. Ideally, a woman with medical problems has been seen in consultation in the antepartum period; otherwise, a consultation should be arranged as soon as she is admitted to hospital. Epidural anesthesia during labor must be encouraged in patients with potential complications. The patient and her obstetrician should understand that a mother's life should not be jeopardized to save a compromised fetus.

Difficult airway

Anesthesiologists must have a plan for the parturient at risk for difficult or failed intubation. The incidence of failed intubation is higher in the obstetric population than in the general population. Many authors have estimated the incidence as between 1:250 and 1:750 [35,36]. Fortunately, failed ventilation by mask is rarer than failed intubation. Pharyngolaryngeal edema, weight gain, enlarged breasts, full dentition, and the urgency of the situation place the parturient at increased risk for difficult intubation. Careful preoperative evaluation is essential because deterioration in airway status may occur during labor [37]. The Mallampati classification used alone is imprecise. If combined with other predictors of difficult airway criteria (thyromental distance, neck extension), the specificity and sensitivity of the preoperative assessment are improved [38]. Optimal maternal position (sniffing) should be achieved in every patient before induction, even for a stat cesarean section. In obstetrics, the first attempt at intubation should be the best attempt. Assistants should be trained to apply cricoid pressure. Should intubation attempts fail and there is no fetal compromise or other obstetric emergency, the patient should be awakened. Once the patient is awake, regional anesthesia or awake intubation can be performed.

When general anesthesia is given for fetal compromise and the patient cannot be intubated but mask ventilation with cricoid pressure is adequate, the anesthesiologist should call for help and proceed with the case. When the lungs can be ventilated easily with a face mask after a failed intubation, the laryngeal mask airway offers little advantage [39]. The laryngeal mask airway may promote gastric regurgitation and may prevent escape of regurgitated stomach contents from the pharynx, which “provokes” pulmonary aspiration. Surgery can start when the patient is well anesthetized using a volatile agent in 100% oxygen. The surgeon can provide local anesthetic infiltration while the anesthesiologist deepens anesthesia. Fundal pressure and uterine exteriorization should be avoided.

If a parturient cannot be intubated or ventilated by mask, one must provide oxygen rapidly to the patient. An esophageal-tracheal combitube, a laryngeal mask airway, and a percutaneous cricothyrotomy kit should be readily available. As a last resort, a surgical cricothyrotomy should be performed. Anesthesiologists are encouraged to familiarize themselves with various airway devices in the event of a difficult airway. Cesarean section should wait until the patient is stabilized. In this situation, the anesthesiologist is unable to attend to the neonate, so another physician should be called or the obstetrician should resuscitate the baby.

Pregnancy-induced hypertension

A high proportion of patients with PIH and adverse criteria (ie, severe preeclampsia) need anesthesia for cesarean section for fetal indications (prematurity, IUGR, breech) and, less often, because of rapid deterioration of the mother. Most of the time, a stat cesarean section is not required, so one has a few minutes to prepare. Epidural analgesia is advantageous in women with severe preeclampsia because it increases uteroplacental blood flow [40] and improves maternal blood pressure control during painful contractions [41]. If the patient does not have an epidural, she should have one placed, if time permits. Spinal anesthesia also can be used cautiously with strict attention to blood pressure control [42]. The anesthesiologist should decide on the lowest acceptable blood pressure before the birth of the baby. There is probably no need to aim for a blood pressure less than 160/100. Ephedrine is still the best vasopressor, but small incremental doses (2.5 mg) are advised to avoid rebound hypertension. Prehydration should be limited to 1 L in patients with normal oxygen saturation and respiratory rate. This fluid replaces the blood that is lost (minimum 300 mL) during surgery. In some patients, neuraxial block is contraindicated because of concurrent coagulopathy, active bleeding, or a compromised fetus.

The main goal of general anesthesia in patients with severe preeclampsia is to prevent hemodynamic instability during intubation and extubation. An overt hypertensive response may lead to cerebral complications. Conversely, aggressive use of vasodilators in a hypovolemic, hemoconcentrated woman may precipitate hypotension that could threaten the fetus further. The pressor response to laryngoscopy can be reduced by the use of various medications. The commonly used drugs are either labetalol (20 mg bolus up to 1 mg/kg) alone or combined with nitroglycerin bolus (50–100 microgm) or fentanyl sodium nitroprusside (2 microgm /kg) or both or remifentanil (0.1–0.5 microgm /kg/min). Rarely, an infusion of nitroprusside (0.1 microgm /kg/min) with direct arterial monitoring is necessary.

Morbid obesity

Unfortunately, in the last decade, the number of obese (20% in excess of ideal weight) parturients has increased in all industrialized countries. Morbid obesity is defined as a body weight more than twice the ideal weight or body mass index [weight/height2 (Kg/m2)] of more than 35. In the parturient, many complications are associated with morbid obesity, especially with android obesity (truncal distribution of fat) [43] or excessive gestational weight gain (more than 15 kg) [44](Box 3). It is suggested that the increased incidence of cesarean section is caused by anatomic distortion of the birth canal by intrapelvic, perineal, and vaginal wall fat deposits [45].

Box 3:

Complications associated with maternal morbid obesity

*

Chronic hypertension or PIH

*

Insulin-dependent diabetes

*

Coronary artery disease

*

Difficult airwayInduced labor, prolonged labor, difficult deliveryIncreased primary cesarean section rate (> 50%) [51]

*

Increased perinatal mortality [52]

*

Pulmonary embolismWound infection

*

Increased maternal death [53]

The anesthesiologist should discuss the anesthetic implications of morbid obesity with the obese patient and her obstetrician before labor begins. Consultation with anesthesia during pregnancy is ideal but, failing that, a consultation should be conducted on admission to the labor suite. A “stat” cesarean section, for a compromised fetus, could prove unrealistic and dangerous for many morbidly obese parturients.

Evaluation of the airway is most important. The cardiovascular, respiratory, and gastrointestinal systems must be reviewed. Depending on the clinical situation, a chest radiograph, electrocardiogram, and arterial blood gas and liver function tests

should be done. Measurement of oxygen saturation in the sitting and supine positions provides an easy way to assess the degree of airway closure and the potential for deterioration with further decreases in functional residual capacity. Blood pressure should be measured with the correct size cuff; occasionally an arterial line is necessary. When labor begins, reliable, peripheral venous access should be secured; if not, a central line should be inserted. Fetal heart rate and intensity of contractions may prove difficult to evaluate, and direct internal monitoring is usually necessary. An appropriately sized labor bed, operating table, and adequate personnel for transport are required.

Epidural analgesia provides numerous advantages for obese parturients, including the flexibility to extend the block for emergency cesarean section. There is a higher failure rate of the epidural, but reliable epidural analgesia can be obtained in most obese parturients. The epidural catheter should be well secured. A malpositioned catheter should be replaced early; continuous spinal analgesia is an alternative.

Regional anesthesia should be used for cesarean section unless contraindicated or not feasible for technical reasons. An H2 blocker, metoclopramide, and sodium citrate should be given before induction of anesthesia, even if regional anesthesia is planned. Access to the airway and comfort are facilitated greatly by careful positioning of the parturient. Epidural, spinal, combined spinal-epidural, or continuous spinal anesthesia can be used depending on the clinical situation. Hypotension should be treated promptly, and one must remember to displace adequately the uterus and the panniculus. Intraoperative fetal death has been reported in a parturient with an epidural, probably secondary to hypotension caused by retraction of a large panniculus [46]. Local anesthetic requirements are decreased in all pregnant women; further diminution of doses in obese parturients is not recommended because of the serious consequences of unsatisfactory anesthesia [47]. The level of anesthesia must be tested carefully and must be adequate before surgery starts. Sedation for the obese parturient requires extreme vigilance.

If general anesthesia is “inevitable” and a difficult airway is anticipated, the airway should be secured either by awake direct laryngoscopy and intubation or awake fiberoptic intubation. The alternative is for the surgeon to use local anesthetic infiltration, provided that he or she is familiar with the technique. Ventilation by mask may prove difficult or impossible in a morbidly obese patient. If the airway appears favorable, after 3 to 5 minutes of denitrogenation, rapid sequence induction with thiopentone, 4 to 6 mg/kg ideal body weight (maximum 500 mg), and succinylcholine, 1 to 1.5 mg/kg of total body weight (maximum 200 mg), should give good intubation conditions. If the patient cannot be intubated or mask ventilated, a laryngeal mask airway or a combitube should be inserted rapidly; cricothyrotomy may prove difficult to accomplish in obese patients.

Appropriate analgesia, supplemental oxygen, O2 saturation monitoring, pulmonary physiotherapy, prophylactic heparin, and early mobilization may help prevent postoperative complications.

Maternal cardiac arrest

Fortunately, the need for cardiac resuscitation of a parturient is infrequent (1:30,000) [48]. The incidence of cardiac arrest may be increasing because of advanced maternal age, survival of women with medical conditions, and the use of cocaine [49]. Pulmonary embolism, cardiac disease, hemorrhage, PIH, hypoxia, hypotension, drug overdose, sepsis, and trauma are some of the causes. Standard resuscitative measures and procedures should be used without modification, remembering that it is essential to maintain left uterine displacement during resuscitation. After 20 weeks of gestation, aortocaval compression may prevent adequate resuscitation, so cesarean section should be initiated within 5 minutes of cardiac arrest to achieve the most favorable outcome for the mother and her newborn [50]. Open cardiac massage by an experienced surgeon should be considered if cesarean section fails to improve the maternal condition. Cardiopulmonary bypass can be lifesaving in rare situations (massive embolism) but is not a standard of care. Cesarean section should be attempted, even if more than 5 minutes has passed, because many newborns with a normal outcome have been delivered 11 to 15 minutes after maternal cardiac arrest [50].

Summary

Obstetric hemorrhage is still a significant cause of maternal morbidity and mortality. Prevention, early recognition, and prompt intervention are the keys to minimizing complications. Resuscitation can be inadequate because of underestimation of blood loss and misleading maternal response. A young woman may maintain a normal blood pressure until sudden and catastrophic decompensation occurs. All members of the obstetric team should know how to manage hemorrhage because timing is of the essence. Good communication with the blood bank ensures timely release of appropriate blood products.

A well-coordinated team is one of the most important elements in the care of a compromised fetus. If fetal anoxia is presumed, there is less than 10 minutes to permanent fetal brain damage. Antepartum anesthesia consultation should be encouraged in parturients with medical problems.

References

[1]. Thomas T. Maternal mortality. In: Birnbach DJ, Gatt SP, Datta S, eds. *Textbook of obstetric anesthesia*. New York: Churchill-Livingstone 2000:733-743

[2]. Weiner C. The obstetrics patient and disseminated intravascular coagulation. *Clin Perinatol*. 1986;13:705-717 MEDLINE

[3]. Green JR. Placenta previa and abruptio placentae. In: Creasy RK, Resnik R, eds. *Maternal fetal medicine*. (3rd edition) Philadelphia: WB Saunders 1994:602-619

[4]. Li XF, Fortney JA, Kotelchuch M, et al. The postpartum period: the key to maternal mortality. *Int J Gynecol Obstet*. 1996;54:1-10 Abstract | Abstract + References | PDF (682 KB) | MEDLINE | CrossRef

[5]. Schuurmans N, Mackinnon C, Lane C, et al. Prevention and management of postpartum haemorrhage. *Journal of the Society of Obstetricians and Gynaecologists of Canada*. 2000;88:271-281

[6]. Fliegner JRH. Postpartum broad ligament haematomas. *J Obstet Gynaecol Br Commonw*. 1971;78:184-189 MEDLINE

[7]. Mantel G, Buchmann E, Rees H, et al. Severe acute maternal morbidity: a pilot study of a definition for a “near miss”. *Br J Obstet Gynaecol*. 1998;105:985-990

[8]. Oleen MA, Mariano JP. Controlling refractory atonic postpartum hemorrhage with Hemabate sterile solution. *Am J Obstet Gynecol*. 1990;162:205-208 MEDLINE

[9]. O'Leary AM. Severe bronchospasm and hypotension after 15-methyl prostaglandin F2-alpha in atonic postpartum haemorrhage. *International Journal of Obstetric Anesthesia*. 1994;3:42-44 MEDLINE | CrossRef

[10]. Tsui BCH, Stewart B, Fitzmaurice A, et al. Cardiac arrest and myocardial infarction induced by postpartum intravenous ergonovine administration. *Anesthesiology*. 2001;94:363-364 MEDLINE

[11]. Bobrowski RA, Jones TB. A thrombogenic uterine pack for postpartum hemorrhage. *Obstet Gynecol*. 1995;85:836-837 MEDLINE | CrossRef

[12]. Maier RC. Control of postpartum hemorrhage with uterine packing. *Am J Obstet Gynecol*. 1993;162:317-323 MEDLINE

[13]. Bastien JL, Graves JR, Bailey S. Atypical presentation of amniotic fluid embolism. *Anesth Analg*. 1998;87:124-126 MEDLINE

[14]. Yamakage M, Tsujiguchi N, Chen X, et al. Sevoflurane inhibits contraction of uterine smooth muscle from pregnant rats similarly to halothane and isoflurane. *Can J Anesth*. 2002;49:62-66

[15]. Bell E. Nitroglycerin and uterine relaxation. *Anesthesiology*. 1996;85:683 MEDLINE

[16]. Terui K. Antepartum hemorrhage. In: Birnbach DJ, Gatt SP, Datta S, eds. *Textbook of obstetric anesthesia*. New York: Churchill-Livingstone 2000:392-417

[17]. Clark SL, Koonings P, Phelan JP. Placenta previa/accreta and prior Cesarean section. *Obstet Gynecol*. 1985;66:89-92 MEDLINE

[18]. Miller DA, Chollet JA, Goodwin TM. Clinical risk factors for placenta previa-placenta accreta. *Am J Obstet Gynecol*. 1997;177:210-214 MEDLINE

[19]. Zelop CM, Harlow BL, Frigoletto FD, et al. Emergency peripartum hysterectomy. *Am J Obstet Gynecol*. 1993;168:1443-1448 MEDLINE

[20]. Lerner JP, Deane S, Timor-Tritsch IE. Characterization of placenta accreta using transvaginal sonography and color Doppler imaging. *Ultrasound Obstet Gynecol*. 1995;5:198-201 MEDLINE

[21]. Thorp JMJ, Councell RB, Sandridge DA, et al. Antepartum diagnosis of placenta previa percreta by magnetic resonance imaging. *Obstet Gynecol*. 1992;80:506-508 MEDLINE

[22]. Kamani AAS, Gambling DR, Christilaw J, et al. Anaesthetic management of patients with placenta accreta. *Can J Anaesth*. 1987;34:613-617 MEDLINE

[23]. Rageth JC, Juzi C, Grossenbacher H. Delivery after previous cesarean: a risk evaluation. *Obstet Gynecol*. 1999;93:332-337 MEDLINE | CrossRef

[24]. Sachs B, Kobelin C, Castro M, et al. The risks of lowering the cesarean-delivery rate. *N Engl J Med*. 1999;340:54-57 MEDLINE | CrossRef

[25]. Leung AS, Leung EK, Paul RH. Uterine rupture after previous cesarean delivery: maternal and fetal consequences. *Am J Obstet Gynecol*. 1993;169:945-950 MEDLINE

[26]. American College of Obstetricians and Gynecologists . *Vaginal birth after previous cesarean delivery: clinical management guidelines for obstetricians-*

gynecologists. ACOG Committee Opinion. Washington, DC: American College of Obstetricians and Gynecologists 1999

[27]. Caponas G. Glyceryl trinitrate and acute uterine relaxation: a literature review. *Anaesth Intensive Care*. 2001;29:163-177 MEDLINE

[28]. Riley ET, Flanagan B, Cohen SE, et al. Intravenous nitroglycerin: a potent uterine relaxant for emergency obstetric procedures. Review of literature and report of three cases. *International Journal of Obstetric Anesthesia*. 1996;5:264-268 MEDLINE | CrossRef

[29]. Truwit CL, Barkowich AJ, Koch TK, et al. Cerebral palsy: MR findings in 40 patients. *AJNR Am J Neuroradiol*. 1992;13:67-78 MEDLINE

[30]. American College of Obstetricians and Gynecologists . *Inappropriate use of the terms fetal distress and birth asphyxia. ACOG Committee Opinion*. Washington, DC: American College of Obstetricians and Gynecologists 1998

[31]. Frölich MA. Anesthesia for presumed fetal jeopardy. In: Birnbach DJ, Gatt SP, Datta S, eds. *Textbook of obstetric anesthesia*. New York: Churchill-Livingstone 2000:267-280

[32]. Cooper MG, Feeney EM, Joseph M, et al. Local anaesthetic infiltration for caesarean section. *Anaesth Intensive Care*. 1989;17:198-212 MEDLINE

[33]. Petrikovsky BM, Cohen M, Tancer ML. Usefulness of continuous fetal heart rate monitoring during cesarean section. *Am J Obstet Gynecol*. 1989;161:36-37 MEDLINE

[34]. Chestnut DH. Anesthesia for fetal distress. In: Chestnut DH, ed. *Obstetric anesthesia*. (2nd edition) St. Louis: Mosby 1999:493-507

[35]. Barnardo PD, Jenkins JG. Failed tracheal intubation in obstetrics: a 6-year review in a UK region. *Anaesthesia*. 2000;55:685-694 MEDLINE | CrossRef

[36]. Rocke DA, Murray WB, Rout CC, et al. Relative risk analysis of factors associated with difficult intubation in obstetric anesthesia. *Anesthesiology*. 1992;77:67-73 MEDLINE

[37]. Farcon EL, Kim MH, Marx GF. Changing Mallampati score during labour. *Can J Anaesth*. 1994;41:50-51 MEDLINE

[38]. Crosby ET, Cooper RM, Douglas MJ, et al. The unanticipated difficult airway with recommendations for management. *Can J Anaesth*. 1998;45:757-776 MEDLINE

[39]. Asai T, Vaughan RS. Misuse of the laryngeal mask airway. *Anaesthesia*. 1994;49:467-469 MEDLINE

[40]. Jouppila P, Jouppila R, Hollmén A, et al. Lumbar epidural analgesia to improve intervillous blood flow during labor in severe preeclampsia. *Obstet Gynecol*. 1982;59:158-161 MEDLINE

[41]. Ramanathan J, Coleman P, Sibai B. Anesthetic modification of hemodynamic and neuroendocrine stress responses to cesarean delivery in women with severe preeclampsia. *Anesth Analg*. 1991;73:772-779 MEDLINE

[42]. Gambling DR, Writer D. Hypertensive disorders. In: Chestnut DH, ed. *Obstetric anesthesia*. (2nd edition) St. Louis: Mosby 1999:875-920

[43]. Crane S, Wojtowyca M, Dye T, et al. Association between pre-pregnancy obesity and the risk of cesarean delivery. *Obstet Gynecol*. 1997;89:213-216 MEDLINE | CrossRef

[44]. Cnattingius S, Bergstrom R, Lipworth L, et al. Prepregnancy weight and the risk of adverse pregnancy outcomes. *N Engl J Med*. 1998;338:147-152 MEDLINE | CrossRef

[45]. Garbaciak JA, Richter M, Miller S, et al. Maternal weight and pregnancy complications. *Am J Obstet Gynecol*. 1985;152:238-245 MEDLINE

[46]. Hodgkinson R, Husain FJ. Caesarean section associated with gross obesity. *Br J Anaesth*. 1980;52:919-923 MEDLINE

[47]. Ekelof NP, Jensen J, Poulsen J, et al. Weight gained during pregnancy does not influence the spread of analgesia in the term parturient. *Acta Anaesthesiol Scand*. 1997;41:884-887 MEDLINE

[48]. Rees GA, Willis BA. Resuscitation in late pregnancy. *Anaesthesia*. 1988;43:347-349 MEDLINE

[49]. Johnson MD, Luppi CJ, Over DC. Cardiopulmonary resuscitation. In: Gambling DR, Douglas MJ, eds. *Obstetric anesthesia and uncommon disorders*. Philadelphia: WB Saunders 1998:51-74

[50]. Katz VL, Dotters DJ, Droegemueller W. Perimortem cesarean delivery. *Obstet Gynecol*. 1986;68:571-576 MEDLINE

[51]. Hood DD, Dewan DM. Anesthesia and obstetric outcome in morbidly obese parturients. *Anesthesiology*. 1993;79:1210-1218 MEDLINE

[52]. Perlow JH, Morgan MA, Montgomery D, et al. Perinatal outcome in pregnancy complicated by massive obesity. *Am J Obstet Gynecol*. 1992;167:958-962 MEDLINE

[53]. Endler GC, Mariano FG, Sokol RJ, et al. Anesthesia-related maternal mortality in Michigan 1972 to 1984. *Am J Obstet Gynecol*. 1988;159:187-193 MEDLINE