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Just Another Day on Labor and Delivery: Morbid Obesity and Preeclampsia

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Stem Case and Key Questions Content

A G2P1 37-year-old woman with a 37 week singleton gestation is admitted to the Labor and Delivery unit. She has been diagnosed with preeclampsia, and her admission blood pressure is 165/102 mm Hg. The patient's height is 5 feet 3 inches, and she weighs 355 pounds. She is complaining of a headache that has been present for the past 4 - 5 hours.The fetal heart tracing is normal. The obstetrician has decided to proceed with labor induction and asks you to evaluate the patient.

1. What medical history should you obtain from the patient?

The patient states that the only medications she is currently taking are prenatal vitamins and glyburide. She denies any previous history of chronic hypertension. She becomes short of breath with climbing one flight of stairs and has also been told that she snores loudly when sleeping. Those symptoms have not changed significantly during the pregnancy. She was diagnosed with gestational diabetes earlier in the pregnancy for which the glyburide was prescribed.

2. What areas will you focus on in your physical examination?

3. Do you want any diagnostic work-up of her cardiac status before proceeding with labor induction? If yes, which tests do you want and why?

4. What laboratory tests should be obtained in this patient?

On physical examination, the patient has a Mallampati Class III airway. She has a large fat pad across the back of her shoulders that limits neck extension. Her cardiac examination reveals a regular rhythm, a heart rate of 86 bpm and no murmurs. Her lungs are clear to auscultation. An ECG shows normal sinus rhythm as well as increased QRS voltage and left axis deviation suggesting left ventricular hypertrophy. Magnesium sulfate therapy has just been started for preeclampsia.

5. What monitoring will you utilize during labor?

6. Will you place any invasive monitors? If yes, what invasive monitors will you use?

7. Will you treat her blood pressure of 165/102 mm Hg?

During your anesthetic evaluation, the patient tells you that she wants some form of pain relief

during her labor and asks what options are available.

8. What type of labor analgesia would you recommend to this parturient? Why?

9. What are the advantages and disadvantages of epidural analgesia, combined spinal-epidural analgesia, and continuous spinal analgesia in this patient?
When you discuss neuraxial techniques of labor analgesia with the patient, she tells you that family members have told her that your back is never right again after a spinal or epidural anesthetic. Therefore, she refuses any such procedures.

10. How would you deal with the patient's refusal of neuraxial techniques?
After further discussion with the patient, she agrees to proceed with epidural analgesia. The results of her admission laboratory tests have just been received. All of her laboratory values are within normal limits except for her platelet count, which is 71,000/mm^3.

11. Will you still provide epidural labor analgesia? Do you want any additional laboratory data before making that decision?

12. If you decide not to provide epidural analgesia, what alternative technique would you recommend for labor analgesia?
You ultimately decide to proceed with epidural analgesia. The epidural is placed with some difficulty, but good analgesia is obtained. Three hours later, when the patient's cervix is dilated 6 cm, the nurse calls you to the patient's room. The patient's blood pressure is 110/63 mm Hg, and the fetal heart tracing shows late decelerations with moderate baseline fetal heart rate variability (ACOG Category 2 fetal heart tracing).

13. What will you do? What is the optimal blood pressure range for this patient?

14. What vasopressor would you use to treat hypotension in this patient?
Three hours later the patient's cervical dilation is still 6 cm despite documentation of adequate labor. The obstetrician decides to proceed with cesarean delivery for arrest of labor. The patient currently has good labor analgesia.

15. What is your anesthetic plan for cesarean delivery?
Due to the patient's size, you decide to delay any dosing of the epidural until she has been moved to the operating room table so she can assist with transfer to the table. As she is moving from her labor bed to the operating room table you note that the tape on the epidural catheter has become loose. Upon closer inspection, the epidural catheter is found to have become dislodged.

16. What will you do now?
The obstetrician enters the operating room and evaluates the fetal heart tracing. He informs you that the fetus is now having persistent late decelerations and he wants to proceed with urgent cesarean delivery.

17. Will the change in fetal status affect your anesthetic plan? What anesthetic technique will you use?

After conferring with the obstetrician, you decide to perform a continuous spinal technique for the surgery. A bilateral T5 sensory level to pinprick is quickly obtained. After the surgical prep and drape are completed, the obstetrician tests the patient for adequate surgical anesthesia and she reports feeling pain when he pinches the skin near the intended incision site with a surgical clamp. He also reports that by palpation the patient is having tetanic contractions and he is concerned that there may be a placental abruption. You decide that you must proceed with general anesthesia. The patient's blood pressure is currently 152/85 mm Hg and heart rate is 97 bpm.

18. How will you secure the patient's airway? What medications will you use to induce and maintain general anesthesia?
After carefully positioning the patient in the sniffing position using towels and blankets to elevate her shoulders and occiput, you perform a rapid sequence induction with propofol and succinylcholine. Successful intubation using a videolaryngoscope is confirmed and surgery commences immediately. After the infant and placenta are delivered, the obstetrician reports that there was an approximately 50% placental abruption. He notes uterine atony and increased uterine bleeding.

19. What pharmacologic treatments for uterine atony are indicated or contraindicated in this patient? Why?
Uterine massage, intravenous oxytocin and intramuscular 15-methyl prostaglandin $F_{2\text{-alpha}}$ produce normal uterine tone. Although the patient remains hemodynamically stable, the obstetrician informs you that the surgical field seems "oozy," and the estimated blood loss is 2000 mL.

20. Will you obtain any laboratory tests? What blood products would you ask the Blood Bank to make available?
You place another large-gauge peripheral IV. The obstetrician reports adequate surgical hemostasis after the patient receives 2 units of fresh frozen plasma and 2 units of packed red blood cells, and he is able to complete the surgery. The patient's blood pressure is 127/54 mm Hg and heart rate is 93 bpm. Once she is awake and following commands, she is extubated and transported to the PACU where she remains hemodynamically stable.

21. When will you remove the spinal catheter?

Model Discussion Content
Preeclampsia occurs in approximately 7% of all pregnancies and is, therefore, one of the most common complications that anesthesiologists will encounter in parturients. Several issues must be considered when planning the anesthetic management of preeclamptic patients (1). During physical examination, evaluation of the patient's airway is crucial. The incidence of difficult intubation is greater in all pregnant patients compared to nonpregnant patients. In the preeclamptic patient the risk may be increased even further because of additional airway edema resulting from the disease. Attention should also be paid to fluid balance of the patient. Many of these patients are relatively hypovolemic. However, preeclamptic patients are also at increased risk for developing pulmonary edema due to decreased colloid oncotic pressure and increased capillary membrane permeability. Therefore, maintaining appropriate fluid balance can be challenging. Rarely, patients with severe preeclampsia may benefit from invasive monitoring

with a pulmonary artery catheter to guide fluid management. Use of a central venous pressure catheter is generally not recommended in patients with preeclampsia because the correlation between pulmonary capillary wedge pressure and central venous pressure is poor. Pulmonary edema or persistent oliguria are conditions that may result in the decision to proceed with invasive monitoring in a preeclamptic patient. When the anesthesiologist is deciding whether treatment of hypertension is required and what drugs should be used, effects of the drug on mother, fetus, and uteroplacental perfusion must all be considered. Hydralazine and labetalol remain the drugs most commonly used to manage hypertension during labor and delivery. Occasionally, a continuous infusion of an antihypertensive drug, such as nitroglycerin, will be required to achieve adequate blood pressure control.

In the preeclamptic parturient, neuraxial labor analgesia is beneficial for many reasons. The pain of labor can worsen the patient's already existing hypertension. By providing excellent pain relief, neuraxial analgesia has been shown to reduce maternal catecholamine levels. Therefore, it can help facilitate blood pressure control during labor. Preeclampsia compromises uteroplacental perfusion but when patients with severe preeclampsia receive epidural analgesia, Doppler studies have documented improved uteroplacental perfusion (2). As a result, the fetus might also benefit from the administration of neuraxial labor analgesia. Patients with preeclampsia are at increased risk for cesarean delivery compared to healthy parturients. If an epidural catheter is already in place for labor, it is likely that the risks of general anesthesia can be avoided in emergency situations requiring cesarean delivery. These risks are significant in preeclamptic patients and include aspiration, difficult/failed intubation, and severe hypertension associated with laryngoscopy.

There are pitfalls associated with neuraxial analgesia in preeclamptic patients that should be considered. Hypotension associated with epidural analgesia could worsen the status of a fetus already affected by the compromised uteroplacental perfusion of preeclampsia. Therefore, diligent monitoring of maternal blood pressure and prompt treatment of hypotension is important. Although ephedrine had traditionally been considered the vasopressor of choice in obstetric anesthesia, data from studies performed over the past decade support the use of phenylephrine (3). It has been found that placental transfer of ephedrine is significantly greater than transfer of phenylephrine. Fetal effects of ephedrine include stimulation of beta-adrenergic receptors, leading to metabolic effects that increase the risk of developing fetal acidosis when maternal hypotension is treated with ephedrine compared to phenylephrine (4). A meta-analysis that compared ephedrine and phenylephrine for the treatment of hypotension in healthy parturients found that the risk of fetal acidosis was significantly decreased for mothers who received phenylephrine (5). It should be noted that the research supporting the use of phenylephrine rather than ephedrine has been performed in healthy women rather than patients with conditions in which uteroplacental insufficiency is likely to be present.
Thrombocytopenia occurs in at least 15% of women with preeclampsia, and patients with severe disease are at increased risk for having a platelet count less than 100,000/mm^3. When the platelet count is less than 100,000/mm^3, the risks and benefits of a neuraxial technique must be carefully weighed when deciding upon an anesthetic plan for the patient (6). Many obstetric anesthesiologists are comfortable proceeding with neuraxial techniques when the platelet count is 70-80,000 (7). Other coagulation studies, including prothombin time (PT), partial thromboplastin time (PTT), INR, and fibrinogen should be obtained before proceeding with epidural analgesia in preeclamptic parturients with clinically significant thrombocytopenia to rule out the presence of additional coagulation abnormalities. The anesthesiologist may also want to

evaluate platelet function in these patients. Thromboelastography and the platelet function analyzer (PFA) test have both been used to assess platelet function in preeclamptic patients and may provide additional information to aid the anesthesiologist in the decision-making process.

Morbid obesity introduces additional challenges to the anesthetic management of a preeclamptic parturient (8,9). Concerns about difficult airway management are increased. In addition, the respiratory changes associated with morbid obesity, when combined with the physiologic changes of pregnancy, put the morbidly obese parturient at higher risk for developing hypoxemia. Obtaining a baseline oxygen saturation reading in both the upright and supine positions is advisable. A baseline arterial blood gas might also be useful to determine $PaCO_2$. If the patient has signs of obesity hypoventilation syndrome, antepartum cardiac evaluation might be warranted to assess for pulmonary hypertension, which is associated with increased maternal mortality. Morbid obesity presents significant technical problems for the anesthesiologist and obstetrician. If accurate noninvasive blood pressure monitoring cannot be achieved, placement of an intraarterial catheter might be required. Performing successful neuraxial analgesia may be a challenge to the anesthesiologist, but the benefits are many. Morbidly obese parturients are more likely to require cesarean delivery. The maternal morbidity and mortality associated with cesarean delivery are increased in morbidly obese patients, and surgery is often of longer duration.

Options for neuraxial labor analgesia include continuous lumbar epidural analgesia, combined spinal-epidural analgesia, and continuous spinal analgesia. The advantages and disadvantages of each technique in the preeclamptic, morbidly obese patient should be considered. Lumbar epidural analgesia provides excellent pain relief, can facilitate blood pressure control, improves uteroplacental perfusion, and can quickly be converted to an anesthetic for cesarean delivery. However, the initial failure rate of epidural analgesia is increased in morbidly obese parturients, and the obese patient is more likely to require replacement of the epidural catheter during labor (10). Therefore, the reliability of an epidural catheter in the event of emergent delivery may be diminished compared to nonobese patients. Also, sympathectomy-induced hypotension resulting from epidural analgesia could jeopardize the fetus. The use of combined spinal-epidural analgesia will produce rapid and superior labor analgesia. The initial pain relief produced by an intrathecal opioid does not produce a sympathectomy so clinically significant hemodynamic changes may be less likely to occur. However, until the initial intrathecal analgesia has dissipated, the epidural catheter remains unproven. If emergency cesarean delivery was required during this time interval, the anesthesiologist could be faced with a nonfunctioning catheter, thus necessitating the induction of general anesthesia. Therefore, many obstetric anesthesiologists prefer to avoid this technique in scenarios where nonreassuring fetal status or increased maternal risk for general anesthesia exist, as may be the case for a morbidly obese, preeclamptic parturient. However, the actual risk of epidural analgesia failure has been reported to be less when using a combined spinal-epidural technique compared to an epidural technique (11).

Continuous spinal analgesia is the third option for labor analgesia (12). Superior labor analgesia can be achieved with this technique using intrathecal opioids during early labor and opioids plus small doses of local anesthetics during late labor and delivery. Since pain relief can be provided with minimal doses of local anesthetics, motor block can be minimized. This might facilitate vaginal delivery and will certainly make nursing care easier, especially in the morbidly obese

woman. Correct placement of the catheter can be confirmed by aspiration of cerebral spinal fluid (CSF) so initial failure rates should be less than with epidural analgesia. If the catheter becomes dislodged during labor, identification of the problem and replacement of the catheter might occur more promptly compared to epidural analgesia since the loss of ability to aspirate CSF would confirm the dislodgement. A large gauge epidural needle and catheter is often used to place a continuous spinal catheter although a catheter over needle system that allows the use of a smaller gauge needle and catheter is now available. Regardless of the equipment used, a dural puncture does intentionally occur with continuous spinal analgesia so the risk of developing a spinal headache is a disadvantage of the technique. Some data do suggest that the risk of postdural puncture headache is decreased in obese patients. Specifically in the setting of an unintended dural puncture during epidural placement, analgesia can be established more easily and quickly by placing an intrathecal catheter rather than repeating the epidural procedure (13). A recent meta-analysis also found that the need for an epidural blood patch was decreased when an intrathecal catheter was utilized after accidental dural puncture (14).

In some situations, such as severe thrombocytopenia, regional analgesia techniques cannot be safely used, and other analgesia techniques must be utilized during labor. Systemic opioids are most commonly administered to these patients. Opioid agonist/antagonists, such as butorphanol, have been commonly used. However, the administration of shorter-acting opioids, especially remifentanil patient-controlled analgesia (PCA), is gaining popularity because it appears more effective than intermittent dosing of other analgesics while potentially producing less neonatal depression (15). Similar maternal satisfaction despite a smaller decrease in pain scores compared to epidural analgesia has been reported for remifentanil PCA (16). The use of PCA rather than continuous infusion has been associated with better pain relief (17). Because the risk of maternal oxygen desaturation is increased with this technique compared to regional analgesia, continuous pulse oximetry and one-to-one nursing care should be used.

The anesthesiologist is presented with many challenges when providing anesthesia for cesarean delivery in the morbidly obese, preeclamptic patient. When an epidural or spinal catheter is already in place for labor analgesia, surgical anesthesia can be provided by using larger doses of local anesthetic. However, because the failure rate for neuraxial anesthesia is increased in the morbidly obese population and these patients are also at increased risk for a difficult airway, some anesthesiologists advocate for securing the airway while the patient is awake and then proceeding with general anesthesia. Awake fiberoptic intubation may be technically more difficult in a parturient because the mucous membranes are friable, which could lead to bleeding within the airway. Clinical decision-making becomes even more difficult when fetal heart rate changes suggest fetal compromise. Expeditious delivery of the fetus must be balanced with the need to minimize the risk of anesthetic complications in this high-risk mother. Replacement and dosing of an epidural catheter could significantly delay delivery of the fetus. Spinal anesthesia could provide surgical anesthesia more quickly than epidural anesthesia while avoiding the risks of general anesthesia. Some anesthesiologists and obstetricians had previously expressed concerns about precipitating severe hypotension and further jeopardizing the fetus when initiating spinal anesthesia in a severely preeclamptic patient who may be hypovolemic. Current data do not support the belief that these patients are at increased risk for developing hypotension. In fact, recent studies have found that patients with severe preeclampsia are less likely to develop hypotension during spinal anesthesia for cesarean delivery than normotensive women (18). Anesthesiologists should be cautious, however, about initiating spinal anesthesia in a patient who has residual blockade from

preexisting epidural analgesia because these patients are at increased risk for developing a high spinal block. In one case series, 11% of patients experienced this complication when they received single-shot spinal anesthesia following failed epidural blockade (19).

One option in this scenario of urgent cesarean delivery and failed epidural anesthesia is to perform a continuous spinal technique. Small doses of local anesthetic can be administered incrementally, thus avoiding the risk of high spinal, while achieving surgical anesthesia more quickly than with an epidural technique. The expertise and experience of each anesthesiologist will contribute to his/her decision as to which anesthetic technique to utilize in this situation. It is crucial that the anesthesiologist not allow other practitioners to pressure him/her to proceed with an anesthetic plan that could jeopardize maternal well-being. If general anesthesia is planned, a difficult intubation cart that includes alternative airway equipment, such as laryngeal mask airway, fiberoptic bronchoscope, and video laryngoscope should be readily available.

Women with preeclampsia are at increased risk for placental abruption with one case-control study reporting a threefold increase in risk compared to normotensive parturients (20). Classic signs and symptoms of an abruption include increased uterine tone (eg. tetanic contractions), abdominal pain, abnormal fetal heart rate pattern, and vaginal bleeding. In some patients vaginal bleeding may be minimal due to the development of a retroplacental hematoma; inadequate resuscitation is more likely in these patients. When choosing an induction agent for general anesthesia in a preeclamptic patient with possible abruption, the anesthesiologist must consider the risk of severe hypertension associated with laryngoscopy when drugs such as etomidate or ketamine are used versus the risk of hypotension when propofol is used in a hypovolemic patient. The patient's current vital signs and estimated blood loss should guide the decision-making process. Placental abruption is the most common cause of disseminated intravascular coagulation (DIC) in pregnant women, and the risk of this complication increases with the severity of the abruption. Volume resuscitation and transfusion of blood products, including packed red blood cells, fresh frozen plasma, and cryoprecipitate, are often key aspects of the anesthetic management of a parturient with placental abruption undergoing emergency cesarean delivery. Intraoperative laboratory values for prothrombin time, activated partial thromboplastin time, fibrinogen, hemoglobin, and platelet count will help guide transfusion management.

Patients with placental abruption also have an increased risk for uterine atony. In addition, magnesium sulfate administered for seizure prophylaxis in preeclampsia can contribute to uterine atony. When uterine atony requires pharmacologic treatment, the anesthesiologist must consider the maternal hemodynamic effects of each drug. The first-line agent for treatment of atony is oxytocin. When administered as a bolus of at least 5 units, hypotension can occur due to vasodilation. There are minimal hemodynamic effects when oxytoxin is administered in the more common manner as a continuous infusion. Although methylergonovine is often administered if oxytocin is ineffective, it would be relatively contraindicated in a patient with preeclampsia as it produces vasoconstriction, which could lead to severe hypertension in a preeclamptic patient. There are also reports of coronary artery vasospasm associated with methylergonovine administration. 15-methyl prostaglandin $F_{2\text{-alpha}}$ and misoprostol, an E prostaglandin, are other second-line drugs available for the treatment of uterine atony which are not associated with the adverse cardiovascular effects that have been reported with methylergonovine.

Trauma caused by the removal of an epidural or spinal catheter could result in an epidural hematoma in a coagulopathic patient. In preeclamptic women with thrombocytopenia, the platelet count sometimes continues to decrease into the postpartum period. Therefore, another platelet count should be measured before removal of the catheter. The catheter should not be removed until the platelet count has reached a level at which the anesthesiologist would feel comfortable placing an epidural.

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