

ANESTHESIOLOGY™ 2014

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Placenta Percreta: Preparation and Management

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Stem Case and Key Questions Content

A 35 year old female, G5 P4004, with 27 week intrauterine pregnancy presents for admission from clinic due to vaginal bleeding. She has a history of four previous cesarean deliveries. This pregnancy is complicated by placenta previa diagnosed by ultrasound, as well as placenta percreta with invasion into her urinary bladder based on a Magnetic Resonance Imaging (MRI).
Physical Exam

Vitals:

Blood Pressure 125/72 mmHg Pulse 87 bpm

Past Surgical History: cesarean delivery x 4 (failure to progress; elective repeat x 3) - all neuraxial anesthetics without complications

Labs and studies

Hematocrit 35%

Platelets 122,000

Prothrombin time (PT) and Partial Thromboplastin Time (PTT) - within normal limits

Type & Screen - blood type A+ (antibody negative)

Ultrasound - placenta previa, placenta accreta

MRI - placenta percreta with invasion of the urinary bladder

Her vaginal bleeding is now minimal and she is admitted to the antepartum service for antepartum steroids and expectant management. The obstetric plan is to deliver by elective cesarean delivery at 35 weeks gestational age (8 weeks from now).

While on the antepartum service...

What type of intravenous (IV) access will you maintain while she is on the antepartum service?

How many peripheral IVs? Minimum size(s)? What are the pros/cons of this decision?

How many units of blood will you have typed and crossed (T&C), if any? Why? How often will you repeat her T&S? Why? What are the pros/cons of this decision? How would your management differ if her hematocrit were 22%?

How frequently, if at all, will you recheck her hematocrit? Coagulation studies? What other labs, if any, would you check?

A multidisciplinary conference is convened. Who should be invited? What are the goals of this conference?

The final plan for an elective delivery is to have the interventional radiologist place catheters in

ANESTHESIOLOGY™ 2014

OCTOBER 11-15 | NEW ORLEANS, LA

the anterior division of the iliac arteries, bilaterally, immediately prior to surgery. If necessary, the balloons will be inflated intraoperatively to occlude the uterine or hypogastric arteries. Following the cesarean delivery, the patient will return to interventional radiology for arterial embolization via these catheters.

The interventional radiologist says he can place the arterial catheters with infiltration of local anesthetic and IV sedation. What are your concerns with this plan, if any? Will you monitor the patient during this procedure? If not an anesthesiologist, then who will sedate and monitor the mother during the procedure in interventional radiology? Who will monitor the fetus? Your exam at this time is remarkable for:

Airway: Mallampati 3, Neck - full range of motion, > 4 finger breadth (FB) thyromental distance, >3 FB mouth opening, normal dentition.

Height 163cm (5'4") Weight 79 kg (175 pounds) BMI = 30 kg/m²

How will you plan to anesthetize this patient for an elective delivery? General? Neuraxial? Why? What are your concerns with alternative techniques?

If you decide to avoid neuraxial anesthesia, when will you induce general anesthesia? ...in vascular radiology prior to arterial catheter placement? ...in the OR immediately prior to delivery? What are the advantages and disadvantages of the different times?

If you plan on a neuraxial technique, what will you choose? Spinal, epidural, combined spinal-epidural (CSE)? Why? Will you place the neuraxial block prior to or following the placement of the arterial catheters by the interventional radiologist?

The interventional radiologist says that he needs to give 5,000 units IV heparin after catheter placement, just prior to going to the operating room (OR) for delivery, to keep the arterial catheters patent.

How will this information change your anesthetic plan for the interventional radiology procedure?

How will it change your anesthetic plan for the cesarean delivery?

In addition to ASA standard monitors, what monitors, if any, would you use? Arterial-line?

Central venous catheter (CVC)? Fetal heart rate monitoring? Any special equipment?

Your junior colleague is scheduled to be in the OR the day this case is planned to happen. She wants your advice on how to decrease the need for a blood transfusion.

What do you tell her about the pros/cons of hemodilution for this patient?

She wants to use cell salvage.

What do you tell her about the pros/cons of cell saver for this patient? What blood products, if any, will you have in the OR? How many units of each product? Why? What coagulation adjuncts would you have in the OR? Recombinant Factor VIIa? Antifibrinolytic (e.g. tranexamic acid or aminocaproic acid)?

Suddenly at 0100 on Saturday, when the fetal gestational age is 32 weeks, you are told that the patient is in preterm labor that is unresponsive to tocolytics. Vaginal bleeding is moderate. The obstetrician calls for an urgent delivery.

The interventional radiologist has been called from home, but the obstetrician wants to proceed promptly with cesarean delivery. Would you demand to wait for the radiologist for preoperative placement of the arterial catheters?

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OCTOBER 11-15 | NEW ORLEANS, LA

How does the urgency of the situation affect your anesthetic plan? How does it differ from your elective plan (neuraxial vs general)?

If you had planned for a neuraxial, what labs, if any, will you recheck (e.g. coagulation studies, platelets) prior to placing a spinal, epidural, or CSE? How long will you wait for results? What else will you prepare prior to going to the operating room (monitors, personnel, supplies)? How will you decide whether or not it is necessary to transfuse blood prior to induction?

You proceed with your anesthetic plan (neuraxial or general); the patient is comfortable on incision.

You decide to use a cell saver. What special instructions do you give the obstetrician? What criteria would you use to decide to transfuse the salvaged blood? What are your concerns, if any?

Following the delivery of the fetus, there is 2 liter blood loss within 5 minutes. What will you do first? Next? What will you transfuse while waiting for lab results? What blood products will you give?

During the resuscitation how will you guide your transfusion? What labs will you follow? How often will you check labs? What derangements would you anticipate?

The interventional radiologist decides to inflate the arterial balloon catheters to occlude regional blood flow. What are the risks to inflating the arterial balloon catheters?

The hemorrhage resolves. The obstetrician decides to leave the placenta intact and proceed with arterial embolization as originally planned. What are the risks of embolization? What are other risks of leaving the placenta in place?

What other options does the obstetrician have for managing this placenta percreta?

If you proceeded with a general anesthetic, will you plan to extubate immediately after delivery or delay until after arterial embolization in the vascular radiology suite? How would your anesthetic management change if you cared for the patient in a hybrid OR (interventional radiology procedure equipped OR)?

Will you accompany her for the embolization? Why or why not?

Where will you send her post-operatively? Why? If no intra-operative hemorrhage had occurred, would your decision be different?

Model Discussion Content

Incidence and Diagnosis

Abnormal, invasive placental implantation has reportedly increased by 50% in the US over the past 10 years, and up to 10-fold over the past 50 years, presumably due to the increased rate of cesarean delivery.^{1,2} The rate of defective placental implantation at the deciduas basalis may actually be as high as 1:530 deliveries.^{1,3} The extent of invasion of the myometrium distinguishes placenta accreta (focal invasion), from placenta increta (penetration into the myometrium), and placenta percreta (perforation of the myometrium and possible penetration of nearby organs including bladder and bowel). Risk factors for placenta accreta include uterine scar or mass, advanced maternal age, and smoking. However, placenta previa is most highly

associated. For instance the risk of placenta accreta with the fourth cesarean delivery rises from 0.8% to 61% in the presence of placenta previa.³ The greatest risk of abnormal placentation is hemorrhage, making it a leading cause of maternal hemorrhage and death.

The diagnosis of abnormal, invasive placental implantation can be made with ultrasound. Ultrasound is reported to have a 93% sensitivity and 79% specificity for the diagnosis of placenta accreta/percreta even in early pregnancy.⁴ MRI can be used to more precisely define the invasion of other organs. There is emerging evidence that biomarkers in maternal blood may be useful in the diagnosis and monitoring of patients with abnormal, invasive placentation.⁵

Obstetric Management

There is no consensus on the optimal obstetric management of placenta percreta, however elective delivery is frequently performed by 36 - 38 weeks gestation.² Treatment options for placenta percreta ranges from everything (immediate hysterectomy) to nothing (conservative treatment if the placenta is left intact). Due to the demonstrated decrease in maternal mortality and morbidity, hysterectomy immediately following cesarean delivery has been the recommended treatment since 1972.¹ In 1986, methotrexate was described as a therapy for placenta percreta in cases where preservation of fertility was desired. However, methotrexate is less likely to be effective at term gestation, since trophoblasts are no longer dividing rapidly, and thus are no longer good targets for this agent. The use of arterial embolization to manage obstetric hemorrhage was introduced in 1979.⁶ In 1997, DuBois, et al., described the application of this technique as an alternative for the management of placenta percreta.⁷ For postpartum hemorrhage, in general, the success rate of this intervention is 85-95%. Some combine these two options (arterial embolization and methotrexate), even in cases where hysterectomy is eventually planned, as an attempt to minimize hemorrhage during each surgery. There are several case reports of conservative management when the placenta is left intact - no hysterectomy, no methotrexate, no embolization - that have resulted in successful outcomes eighty percent of the time.¹ A recent report recommends that placenta percreta invading the urinary bladder be treated with prophylactic arterial occlusion combined with subtotal hysterectomy.⁸ For now, the current data on the management of placenta percreta support hysterectomy or leaving the placenta intact, as opposed to partial removal.¹ Women treated conservatively, without hysterectomy, are at risk for post-operative vaginal bleeding even several weeks postpartum, disseminated intravascular coagulation (DIC) and endomyometritis.¹ Other complications of placental invasion of the urinary bladder include ureteral transection, urinary fistula or laceration of the bladder requiring cystectomy.⁹ A recently published retrospective multicenter study of 167 women treated conservatively demonstrates a low rate of serious complications when delivery is performed in a tertiary care center.¹⁰

Team Approach

Most would agree that a parturient with placenta percreta is best cared for in a facility capable of managing acute, high-risk situations for the mother and the fetus. A recent case series of 141 cases comparing outcomes between standard care to utilization of a multidisciplinary care team demonstrate that coordinated, specialized care results in 50% reduction in complications for all patients with accreta and 80% decrease in those with a preoperative diagnosis allowing for proper preparation.¹¹

The recommendation to appropriately plan for care is to assemble a multidisciplinary team. The team should consist of specialists in maternal fetal medicine, obstetric anesthesiology, and neonatology, at a minimum. Other specialists who may be involved include an interventional

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OCTOBER 11-15 | NEW ORLEANS, LA

radiologist, and surgical specialists such as a gynecologic oncologist and depending on the extent of organ invasion a vascular surgeon and urologist. Other consultants may be included based on other clinical indications. The meeting(s) should allow each consultant to present their plan so that conflicting goals can be addressed early and a final plan developed. An example is the interventional radiologist discussing the desire to administer IV heparin after arterial catheter placement, as this will influence the decision to use neuraxial anesthesia, or at least the timing of placement.

Anesthetic Management

The intra-operative anesthetic management of parturients with known placenta percreta depends on several factors. There is no single optimal anesthetic plan for all patients with placenta percreta; both general anesthesia and neuraxial techniques have been used successfully.^{12,13,14} One of the primary anesthetic considerations is the potential for significant blood loss necessitating preparation for volume resuscitation. Appropriate preparations may include arterial occlusion techniques, arterial embolization, skilled surgical personnel, cell salvage, as well as availability of blood products. In addition, adjuncts to transfusion such as recombinant Factor VIIa and anti-fibrinolytics should be considered in cases of massive hemorrhage. To be useful, these items need to be considered preoperatively. Maternal and fetal condition will factor into obstetric and anesthetic plan.

These cases are optimally managed under elective conditions, but that is not always possible. Preparations for care of high-risk antepartum patients must include an emergency plan. For example, preoperative preparations would include consideration of:

- monitoring supplies and equipment (a-line, central venous catheter, fluid warmer)
- transfusion (T&S/T&C, cell saver, rapid infusion device, recombinant Factor VII)
- contact information for key personnel (e.g. radiologist, vascular surgeon, anesthesia technician)
- location of procedure - OB OR? Main OR?
- arrangements for fetal monitoring in radiology; availability of hybrid OR
- transport monitoring
- coverage of other patients on labor and delivery

Hemorrhage: Preparation and Treatment

Given the risk of hemorrhage, the parturient should be evaluated early during the admission to determine the likely ease of obtaining IV access in an emergency. A decision should be made with anesthesia colleagues and the obstetricians regarding the number of IVs to be maintained during the prolonged antepartum admission. The decision should weigh factors such as the risk of bleeding and the risk of depleting the limited number of easily accessible peripheral veins prior to the time of true need for resuscitation.

Intra-operative blood loss has the potential to be massive, especially with hysterectomy or partial removal of the placenta. Blood loss may be reduced if arterial embolization is performed prior to hysterectomy or if the placenta is left in situ. Options to minimize, but not eliminate the need for allogenic blood transfusions include acute normovolemic hemodilution and intraoperative blood salvage (cell saver). Hemodilution requires phlebotomizing the patient immediately prior to the procedure and replacing the volume with balanced salt solution resulting in a goal hematocrit of 25%. The principle is that the surgical blood loss is less concentrated. Then, when indicated during the procedure, or at the conclusion, the patient's own filtered, whole blood is returned. The special equipment requirements are minimal and this

technique has been used successfully in obstetric patients.¹⁵ Limitations of this technique include time required which can limit its practicality in urgent or emergent conditions, as well as prevalence of anemia in parturients.

Intraoperative blood salvage is used widely for other surgical procedures as a means to avoid allogenic blood transfusions. However, in obstetric surgery the inherent concern is contamination with fetal products that could result in maternal immunoreactivity. Waters, et al., report that leukocyte depletion filtering prior to transfusion reduces the level of particulate fetal contaminants to a level normally found in maternal circulation.¹⁶ Case reports and series document the safe use of intraoperative blood salvage in obstetric surgery.^{17,18} When used, the obstetrician should be sure to avoid gross collection of the amniotic fluid by avoiding collection of blood for salvage until after the delivery of the placenta.

Details regarding these and other techniques for blood conservation and optimization prior to surgery are described in the ASA Committee on Transfusion Medicine 2006-2007 report - Questions and Answers about Blood Management, Fourth edition.¹⁹

There is no set right amount of blood product to be readily available. That is a judgment by the clinician at the time. Given massive hemorrhage is possible, transfusion with a 1:1 ratio of packed red blood cells (PRBCs) to fresh frozen plasma (FFP) would be indicated. Also, cryoprecipitate (to provide fibrinogen) or fibrinogen concentrate and platelets would likely be needed due to the consumptive process. If massive transfusion is required then it is critical to manage electrolyte abnormalities that can occur, namely hypocalcemia and hypomagnesemia.¹⁵ Additionally, active warming is important for hemostasis.

Internal Iliac Artery - Balloon Occlusion and Embolization

Increasingly obstetric hemorrhage is being managed by acute arterial occlusion and/or embolization of uterine blood supply via placement of catheters placed in the bilateral internal iliac arteries. This procedure is performed under fluoroscopy by interventional radiologists. In a case of placenta percreta diagnosed preoperatively, arterial cannulation can occur prior to the procedure to allow for intraoperative balloon occlusion with postoperative embolization. When anticipated, use of a hybrid OR should be considered. In the case of an undiagnosed percreta or emergent delivery, postoperative embolization remains an option. One case series of 13 women demonstrated a reduction in blood loss and need for transfusion, but not a reduction in rate of cesarean hysterectomy.²⁰ However, other case series utilizing this technique report a reduction in the rate of hysterectomy as well.^{21,22}

Of course, this procedure requires availability of an interventional radiologist. In addition, utilization of this technique may necessitate transport of the patient to a distant site within the institution, thus requiring hemodynamic stability to allow for safe transport and thoughtful coordination with yet another team.

Postoperative management

Immediate postoperative care will depend on the clinical condition of the patient; the specific procedure performed will not influence this as much as the degree of hemorrhage. Postoperative monitoring in the ICU may be necessary. If a hysterectomy is not performed then the risk of hemorrhage, while decreased relative to prior to delivery, may extend into the post-

operative period for even weeks. However, the risk is thought to be low enough that these patients are typically treated as outpatients.

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OCTOBER 11-15 | NEW ORLEANS, LA

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