

# Multidisciplinary Approach to Placenta Percreta: An Observational Case Study

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*Abnormal placental implantations can result in postpartum hemorrhage and poor outcomes. With proper diagnosis and preplanning, complications can be minimized and aligned with maternal wishes of abstaining from blood and blood product transfusions.*

**Keywords:** placenta percreta, Jehovah's Witness, hemodilution.

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**OBJECTIVES—1. DESCRIBE RISK** factors for placenta percreta. 2. List methods to decrease blood loss during obstetrical surgery. 3. Identify three pharmacological agents that can be used to minimize blood loss in obstetrical surgery.

Placenta percreta is an obstetrical surgical emergency.<sup>1</sup> Percreta is part of abnormal placental implantations known as accretas. The occurrence of placenta accretas in pregnancy is 1 in 2,500, with 5% actually being placenta percreta.<sup>2</sup> The incident of abnormal placental implantation is rising because of sequelae of cesarean section scarring.<sup>3</sup> Risk factors for developing placenta percreta are previous cesarean delivery, and in 75% of cases, a placenta previa.<sup>4</sup>

In placenta percreta, the chorionic villi invade the myometrium through the serosa and often attach to adjacent organs like the bladder or rectum. Prenatal diagnosis can be made via ultrasonography (US) and magnetic resonance imaging. When the diagnosis of placenta percreta is made, delivery is usually associated with cesarean hysterectomy.<sup>5</sup>

We present the case of 29-year-old (SR), gravida 4, para 3, with history of three previous cesarean deliveries. She is a Jehovah's Witness (JW) and wishes to adhere to the doctrines of no blood transfusions. Diagnosis of placental abnormality made after a fetal US at 29 weeks found an anterior, low-lying placenta previa. SR sought prenatal care late into the third trimester for unknown reasons. SR was referred to a perinatologist and diagnosed with placenta accreta, with a strong indication of placenta percreta. US report stated SR has a low implantation of the placenta, placenta previa, loss of placenta-myometrium interface, and visualization of blood vessels into the dome of the bladder. This report demonstrates classic signs of placenta accreta because the placental tissue completely penetrates the uterine muscle.<sup>6</sup>

A multidisciplinary meeting commenced to consider the best management of SR and included the disciplines of obstetrics, anesthesia, interventional radiology, perinatology, neonatology, gynecologic oncological surgery, and perianesthesia nursing.<sup>7</sup>

## Plan of Action

A plan was made to conduct the surgery and procedure in the hybrid operating room with full operating equipment and staff, along with interventional radiology equipment and fluoroscopy.<sup>8</sup> After the cesarean section, the abdomen was to be left open in case of operational need.<sup>9</sup> The interventional radiologist (IR) and team were to perform uterine artery embolization.<sup>9</sup> Inserting femoral arterial sheaths before cesarean section

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Conflict of interest: none to report.

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was entertained; however, the perinatologist was emphatic that the blood vessels supplying the uterus should not be accessed until after the fetus was delivered. Finally, the gynecology oncological surgeon was to continue on with total abdominal hysterectomy, bilateral salpingectomy, and dissection of the bladder vasculature. The elective cesarean section at 35 weeks was chosen for fetal viability, diminished growth of placental tissue to adjacent organs, and less uterine stretching that would increase bleeding.<sup>10</sup>

General anesthesia was the preferred method because of a high vertical incision and an expectation of large fluid shifts.<sup>8</sup> SR was admitted in the early morning through the labor and delivery unit. She had fetal monitoring performed. SR was then transferred to the surgical preparation unit for standard preoperative routine nursing care. Informed consent from all physicians involved in her care was obtained after the risks and benefits of the procedures were discussed fully with SR, and all questions answered. SR signed the blood product administration consent as “declined,” although her physicians recommended blood and blood product administration for the likely occurrence of massive blood loss for the anticipated surgical procedures. Placenta percreta has as high of mortality of 80% and increases dramatically to 130 times higher when no blood products are administered.<sup>8</sup> The average blood loss for a cesarean section with an adherent placenta is 1.4 L.<sup>11</sup> The anesthesiologist had previously made phone contact with SR regarding blood product administration and minimal blood loss techniques. The IR met with the patient for consent of radial artery access, uterine artery embolization, and possible embolization of other feeder arteries. The gynecologic surgeon was present in the preoperative area as well. Gynecologic-oncological surgeons have expertise in pelvic dissections with substantial vascularity and are often consulted for difficult cases such as this.<sup>12</sup>

Her spouse, brother, and niece accompanied SR in the preoperative area for familial support. Rapport was gained by introductions and discussions among SR and her significant family members. Blood fraction documents that SR brought with her were reviewed between her and her family. She agreed to albumin infusions, cryoprecipitate,

and recombinant clotting products as well as bovine and porcine products. Nursing confirmed to relay her wishes to the nurse assuming her care in verbal and written report. SR also agreed to cell salvage and hemodilution. Although SR agreed to heme (iron containing compound of the hemoglobin molecule) use, she declined any red blood cell transfusions, fresh frozen plasma, and platelet transfusions. After explaining the technology to separate hemoglobin from the red blood cell does not exist, and that no artificial oxygen-carrying components are available in the United States at this time, she confirmed her declination of any red blood cell transfusions.

### Procedural Events

The 29-member team comprising physicians, nurses, and technicians headed to the hybrid room. SR was transferred to the operating table, positioned, and a second 16-gauge intravenous peripheral line was started. An arterial line was placed in the right radial artery by anesthesia and connected to pressure line tubing with a good waveform. To initiate hemodilution, a prefilled, blood collection bag with anticoagulant was connected via tubing to the arterial line for retrograde removal of autologous blood in a closed system by the anesthesiologist. As long as the autologous blood stays in a closed system with the patient, JW usually agree to this technique.<sup>13</sup> The blood removed will be returned later during the procedure. An albumin 5% infusion was started along with 1 g of tranexamic acid infusing via piggyback.<sup>14</sup> The antibiotic cefotetan was administered per surgeon request. The obstetrical team did preparation and positioning for the cesarean section. The neonatologist and resuscitation team also arrived and prepared their equipment in a designated corner of the hybrid operating room. Simultaneously, IR was using US to identify the left radial artery and discussing the best techniques to gain access of the uterine arteries for embolization immediately after delivery of fetus.<sup>6</sup>

The gynecology oncological surgeon performed a time out and all questions were answered. Rapid induction of general anesthesia was used to minimize fetal exposure to anesthetics, a vertical incision made in the abdomen, and sterile tubes from the cell salvage machine were placed. The

obstetrician made a high fundal uterine incision, and delivered a healthy newborn.<sup>5</sup> After routine newborn interventions, the infant was transferred to the newborn nursery in stable condition with Apgar scores of 8 and 8. The obstetrician closed the uterus with large sutures to create surgical compression to tamponade placental and uterine blood vessels.<sup>15</sup> The 150-mL blood loss was recovered by cell saver to be reinfused later. The blood loss was significantly lower than average for a cesarean section, which averages around 500 to 800 mL.<sup>16</sup>

In routine cesarean sections, oxytocic medications are usually administered after delivery of the fetus to augment placenta separation from the uterus, increase strength of uterine contractions, and decrease postpartum bleeding. However, under these special circumstances, the gynecology oncological surgeon specifically requested not to administer oxytocin because separation of the abnormal placenta implantation uterus would cause hemorrhage of 3 to 5 L of blood.<sup>7</sup> The placenta does not need to be removed before a planned cesarean hysterectomy.

Next, the abdomen was left open, packed with warm sponges, and an iodine impregnated clear dressing was placed over the skin.<sup>17</sup> IR cannulated the left radial artery and accessed both uterine arteries. After flush pelvic aortography, embolization of both the left and right vesicular artery and bilateral uterine arteries was accomplished using Gel-foam, beads, and Onyx. The decision to use Onyx was based on a fast track record of embolizing vessels. A transradial band was applied over the left radial site after sheath removal. Perfusion and site were checked every 15 minutes. After 90 minutes, the protocol for balloon deflation was initiated. The left hand remained well perfused without hematoma or bleeding at the site. The radial artery site was advantageous to nursing being able to assess the extremity. If the groin sites have been used, the surgical drapes would have obscured the groin site hindering assessment and management.

Before resection of the uterus, cryoprecipitate was started and a tranexamic infusion of 1 mg/kg/h was maintained throughout the case.<sup>14</sup> Cryoprecipitate is a blood fraction prepared from plasma and consists of fibrinogen, factor VIII, factor XIII, and

fibronectin. The precipitate does not contain cells, and is acceptable to JWs. During the hysterectomy surgery, the autologous blood collected at the beginning of the case was infused antegrade via the closed system. In the beginning of the hysterectomy surgery, the surgical team noted a higher than usual amount of exhaust expelled from the cautery during resection of the uterus. The Onyx representative was called by the IR director for immediate consultation. Onyx is made from a compound of ethylene and alcohol, which is combustible. Recommendations to use a minimal amount of electrical cautery and irrigation were made. There was relatively little bleeding.

Careful dissection from the placenta invasion into the bladder serosa was tedious. At the end of dissection, a bladder instillation of 250 mL normal saline diluted with methylene blue 1% was performed. No cystotomy or leaks were noted in the surgical field. Abnormal placental invasion involves the bladder in most cases and often requires intraoperative consult of a urologist for surgical exploration of the urinary tract.<sup>7</sup> The surgeon requested the topical hemostatic agent Arista for use on the surgical site before closing the fascia. Topical hemostatic agents can significantly reduce bleeding from surgical sites and other bleeding orifices.<sup>15</sup> Careful consideration should be used when determining the best hemostatic compound so that agents that contain human blood and blood products are not used inadvertently for JW patients. Many products contain combinations of synthetic, plant, animal, and human-based proteins<sup>18</sup> (Table 1).

The estimated blood loss for the 5-hour surgery was 400 mL and 150 mL for the cesarean section. Similar cases without the additional IR procedures can result in massive hemorrhage of liters of blood requiring fluid resuscitation.<sup>7</sup> Cell saver infusion was given at the completion of case with 135 mL infused. During the case, an arterial blood gas specimen obtained and showed a mild metabolic acidosis that was treated with two ampules of sodium bicarbonate, and hypocalcemia was corrected with 1 g of calcium chloride.<sup>19</sup> Normovolemic hemodilution resulting in acidosis, coupled with large volumes of saline infusions, places SR at risk of developing the adverse effects of acidosis.<sup>20</sup> Acute metabolic acidosis causes decreased cardiac output, hypotension, altered

**Table 1. Synthetic and Nonhuman Agents That Aid in Hemostasis**

Name	Formulation	Mechanism of Action	Application
Arista	100% Plant based	Concentrates blood solids to form a gelled matrix	Topical powder, absorbable
Gelatins (gel-foam)	Animal based, porcine/ bovine Cellulose	Stimulates clot formation at site	Placed directly in wound/ blood vessel Absorbable
Factor VII (Novo 7) Factor VIII (Novo 8)	Recombinant DNA- genetically engineered cell line	Part of the clotting cascade	Given intravenous
Flowable hemostat (Surgiflo)	Contains porcine or bovine gelatin matrix, can combine with recombinant thrombin	Initiates clot formation	Apply directly to wound
Topical thrombins (Recothrom)	Recombinant DNA- genetically engineered cell line	Minimizes bleeding at surgical site and other bleeding orifices by the clotting cascade	Topical to wounds/ bleeding sites
Tranexamic acid (TXA) Aminocaproic acid (Amicar)	Synthetic drug	Inhibit plasma-mediated fibrinolysis by preventing plasminogen from activating plasmin	Given intravenous infusion
Cyanoacrylates (Derma bond)	Polymers	Mechanical sealant	Topical
Desmopressin (DDAVP)	Synthetic drug	Stimulates release of Factor VIII and von Willebrand factor, increase platelet aggregation	Given intravenous, subcutaneous, or intranasal

oxygen delivery from shifting on the oxyhemoglobin dissociation curve, and impairment of the immune response.<sup>21</sup> Because SR refused any red blood cell transfusions that have oxygen-carrying capabilities and citrate buffers, acidosis needed to be treated aggressively. In addition, the albumin and gelatin that SR received during the procedure contained acids.<sup>21</sup> Bicarbonate therapy for metabolic acidosis is recommended at an arterial pH varying from as low as 6.9 to as high as 7.2.<sup>22</sup>

After the procedure, the anesthesiologist administered bilateral transabdominal plane (TAP) blocks with local anesthetic for postoperative pain relief. The postanesthesia nurse should be aware that a TAP block can take up to 20 minutes to take effect, and needs to be judicious when administering opioid analgesia to avoid hypoventilation.<sup>23</sup> Because large volumes of local anesthetic are used to deliver a TAP block, the postanesthesia nurse needs to be alert to the signs and symptoms of local anesthetic toxicity and intervene appropriately.<sup>24</sup>

SR received 2,000 mL of the crystalloids lactated Ringer's solution and normal saline, 2,750 mL of albumin 5%, two units of cryoprecipitate, and one unit of autologous blood. Urine output was 1,700 mL without evidence of hematuria. After the 5-hour surgery and procedures, SR was fully reversed, extubated, and transported to the postanesthesia care unit in stable condition. Vital signs remained stable throughout the procedures and surgery.

In an effort to optimize her hemoglobin level, SR was given supplemental iron, vitamin B12, and folate prenatally.<sup>8</sup> As a result, SR's preoperative hemoglobin level reached 14 g/dL. Hemodilution artificially decreased the hemoglobin to 10 g/dL mid-case. Metabolic acidosis and hypocalcemia resolved as evidenced by repeat, postsurgery arterial blood gas results in the postanesthesia care unit. Hydromorphone 2 mg was titrated for postoperative pain. Dressings remained dry with no evidence of bleeding at the incision site. Urine remained clear, yellow, and greater than 30 mL/h.

SR was transferred to the mother baby unit after meeting Phase I discharge criteria. As promised, SR's plan of care in regards to blood products and fractions was discussed with the receiving nurse.

### Religious Perspective

Members of the JW faith have literal interpretations of biblical verses condemning the use of human blood by man. Therefore, JW abstain from blood and blood product administration, even in the face of imminent mortality. This creates a challenge with the health care team, especially in obstetrics where massive blood loss can occur in minutes.<sup>16</sup> Each JW has individual conscientious views on blood and blood products, and which fractions of blood they are willing to accept. A thorough discussion related to risk and benefits should be performed well in advance of the scheduled procedure with the health care team and patient. Hemodilution, cell salvage, and autologous blood reinfusion is acceptable to JW as long as it is maintained in continuity with the circulatory system at all times.<sup>25</sup>

### Blood Recovery

Hemodilution is a technique used to minimize blood loss.<sup>25</sup> Before an incision is made, the patient's own blood is harvested via a large bore vascular access device, connected to tubing, and stored in a bag with anticoagulant. An arterial line for the dual purpose of closely monitoring intraoperative blood pressure and procuring blood from the patient was used in this case. The blood contains the patient's own cells, plasma, and clotting factors undiluted. It never leaves the patient's circuit. After hemodilution is begun with isotonic intravenous fluids, or if the patient agrees, albumin 5%, the patient's blood becomes dilute, so less cells and clotting factors are lost. Acute normovolemic hemodilution reduces blood viscosity, decreases systemic vascular resistance, and allows for the patient's own reinfusion of platelets and coagulation factors.<sup>25</sup> Cell saver is an intraoperative technique for salvaging blood during a surgical procedure.<sup>26</sup>

During cell salvage, shed blood is suctioned from the surgical field; centrifuged, washed, and reinfused using a leukocyte removal filter.<sup>26</sup> Cell saver is a closed circuit used during surgery. When cell saver is used for a cesarean section, care must be taken not to use blood contaminated with amniotic fluid because of risk of embolism.<sup>26</sup> As with any blood transfusion, the patient must be continually monitored for adverse reactions, including dilution of clotting factors and thrombocytopenia.<sup>27</sup>

### Pharmacologic Agents

Surgical blood loss can be minimized using hemostatic medications.<sup>28</sup> Table 1 summarizes static agents that do not contain blood or blood products for use during surgical procedures.<sup>29</sup>

### Special Considerations

Onyx is an elastic polymer dissolved in dimethyl sulfoxide used as an embolic agent.<sup>30</sup> The black liquid system is easy to use by an experienced IR and team. Onyx has been used in neurovasculature embolization for years, but its use in peripheral vessels is a newer technology.<sup>31</sup> Onyx is nonabsorbable, permanent, and must be shaken for 20 minutes before application. This specification is a disadvantage in emergency events. Patients emit an aroma similar to "creamed corn" for 1 to 3 days after instillation. Onyx is combustible and precautions need to be taken when used with electrocautery.<sup>32</sup>

### Conclusions

Patients that decline blood transfusions and blood products based on religious beliefs present particular limitations to their health care team when managing complex, high-risk conditions.<sup>33</sup> Preplanning and coordination of an excellent multidisciplinary team led to quality outcomes of both a healthy mother and infant, while adhering to the wishes of the patient.<sup>34</sup> After her surgical procedures, SR was discharged home on postoperative day 4 without complications and a hemoglobin concentration of 12 g/dL.

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To enable the nurse to increase knowledge on care of the patient with placenta percreta.

**Target Audience**

All perianesthesia nurses.

**Article Objectives**

1. Describe the risk factors for placenta percreta.
2. List methods to decrease blood loss during obstetrical surgery.
3. Identify three pharmacological agents that can be used to minimize blood loss in obstetrical surgery.

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