



Case report

Placenta percreta with invasion of the bladder wall: management with a multi-disciplinary approach

Mehdi Parva MD (Resident)^a, Dmitri Chamchad MD (Adjunct Assistant Professor)^{a,b,c},
Joan Keegan DO (Resident)^a,
Andrew Gerson MD (Attending Obstetrician/Gynecologist)^a,
Jay Horrow MD, MS (Professor)^{c,*}

^aLankenau Hospital, Wynnewood, PA 19096, USA

^bLankenau Institute of Medical Research, and United Anesthesia Services PC, Wynnewood, PA 19096, USA

^cDepartment of Anesthesiology, Drexel University College of Medicine, Philadelphia, PA 19102, USA

Received 8 June 2008; revised 6 March 2009; accepted 18 March 2009

Keywords:

Anesthesia;
Obstetrical;
Cesarean hysterectomy;
Cesarean section;
Placenta percreta

Abstract Placenta percreta with pelvic organ invasion carries a high mortality for mother and fetus. Appropriate multidisciplinary consultation, strategy, and preoperative planning for Cesarean hysterectomy permitted caregivers to provide a maternal-infant bonding experience, surgical hemostasis, preservation of bladder function, and a healthy, vigorous neonate.

© 2010 Elsevier Inc. All rights reserved.

1. Introduction

In placenta percreta, a rare disorder of placental implantation, placental villi penetrate through the decidua and myometrium, even through the serosa of the uterus and into surrounding organs [1–4]. The increased prevalence of Cesarean section, uterine surgery, and increasing parturient age and parity [2,3,5,6] have led to an increased incidence of abnormal placentation, from one in 2,500 [7] a quarter century ago, to one in 533 deliveries currently [8].

Placenta percreta significantly increases risk for both maternal and fetal morbidity and mortality. Placental invasion of the bladder carries a maternal morbidity of 9.5% and perinatal mortality of 24% [3,7]. Placenta percreta with bladder invasion may cause massive maternal bleeding, leading to complications of coagulopathy and infection.

Therefore, a safe maternal outcome requires antepartum recognition and a multidisciplinary team approach.

2. Case report

An otherwise healthy 38 year-old, G2P1001 woman with a previous Cesarean section underwent routine ultrasound examination at 20 weeks' gestation. The results showed placenta previa. At 31 weeks' gestation, repeat ultrasound examination showed a complete placenta previa, with loss of the hypoechoic retroplacental zone, suggesting placenta accreta. The next day, magnetic resonance imaging of the abdomen and pelvis without contrast strongly suggested placenta percreta. The placenta implanted along the lower anterior uterine wall where it invaded beyond the uterus and involved portions of the bladder dome. Extensive uterine wall involvement also was found posterior to the cervical aspect and along the right posterolateral aspect of the lower uterine body (Fig. 1).

* Corresponding author.

E-mail address: jhorrow@drexelmed.edu (J. Horrow).

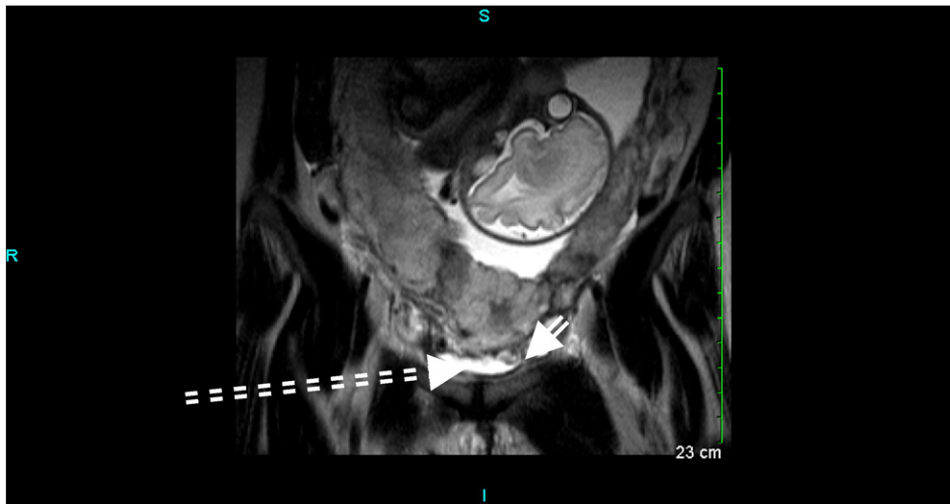


Fig. 1 Magnetic resonance image demonstrating intrauterine pregnancy, placenta percreta invading the bladder wall (short arrow), and urine within the bladder (long arrow).

Preoperative anesthesia assessment showed a healthy parturient with a Mallampati class 1 airway. The patient's obstetrical history included one previous Cesarean section with low transverse incision. The patient had no other significant medical history. She denied bowel or urinary dysfunction. Laboratory studies did not show any abnormalities. Of note, hematuria was absent.

At 31 weeks plus two days' gestation, the patient received betamethasone to encourage fetal lung maturity. Multidisciplinary consultation prior to surgical intervention included evaluations by a general obstetrician-gynecologist, urologist, gynecologic oncologist, obstetric anesthesiologist, hematologist, neonatologist, and interventional radiologist. After intensive discussion among this consultation team regarding all perinatal management aspects, with attention to the possibility of massive bleeding during the delivery, the team placed bilateral percutaneous nephrostomy catheters prior to surgery. In the event of massive hemorrhage, these catheters would facilitate identification of the ureters. They would provide for urinary drainage in the event of ureteral damage, if cystectomy were necessary, or staged reconstruction of the urinary system were preferable. The team planned also to insert bilateral internal iliac artery balloon catheters to decrease arterial perfusion to the uterus and bladder so as to decrease surgical blood loss.

The hematologist prescribed iron dextran infusion twice weekly and erythropoietin injection three times weekly to increase the parturient's red cell mass, bearing in mind the risk of potential complications from erythropoietin, such as hypertension and thrombosis. Cell salvage was discussed preoperatively, but the team decided against it so as to avoid potential intravenous (IV) infusion of amniotic fluid.

At 34 weeks' gestation, the patient had multiple episodes of vaginal bleeding of increasing volume and frequency. Following full discussion of the associated risks and benefits, the patient agreed to a Cesarean

hysterectomy. She requested an anesthetic that would allow her to hold and bond with her newborn child immediately after delivery.

Bilateral percutaneous nephrostomy catheters were placed with local anesthesia on the evening prior to surgery. On the morning of surgery, she received an epidural catheter. Interventional radiologists then placed the bilateral iliac artery balloons. In the operating room, she had a T4 anesthetic level. We placed a central venous catheter via the right internal jugular vein, an arterial catheter in the right radial artery, and a 14-gauge peripheral IV catheter in the left forearm with local anesthetic. All IV fluids were warmed prior to infusion. A urinary drainage catheter had been previously placed. The husband joined the patient just prior to incision. Surgery commenced with a vertical midline incision. The uterus appeared normal except for the lower uterine segment, where many enlarged, dilated vessels extended toward the bladder reflection. A healthy female infant in the breech position was delivered via a classical incision high into the uterine corpus. Apgar scores were 8 at one minute and 9 at 5 minutes. After double clamping and transection of the umbilical cord, the hypogastric artery balloons were inflated. This action precluded the need for oxytocin.

After delivery, the patient and her husband had time to bond with the infant and to celebrate her delivery. The couple indicated that, although brief, this time was of great importance to them.

Sixteen minutes after delivery, the surgeon indicated a need for muscular relaxation beyond that which was provided by the epidural block. The patient underwent general anesthesia with IV fentanyl 100 µg, propofol 200 mg, and succinylcholine 100 mg, followed by rocuronium 30 mg 15 minutes later. The gynecologic oncologist performed a supracervical hysterectomy using the previously placed nephrostomy catheters to identify the ureters upon

opening of the retroperitoneum. This retroperitoneal approach minimized the possibility of ureteral injury. After thorough inspection and attempts at dissecting the bladder, surgeons performed a cystotomy at the dome of the bladder. No placental tissue protruded through the bladder mucosa. They removed the fundus of the uterus and repaired the bladder. Only then did the surgical team deflate the hypogastric artery balloons.

During the procedure, blood loss approached 1,500 mL accompanied by a 20% decrease in systolic blood pressure. The operative team decided to transfuse two units of packed red cells and 500 mL of 5% albumin in addition to clear IV fluids. The parturient required no vasoactive medication. Surprisingly, the estimated blood loss was only 1,800 mL at the end of the procedure, yielding a hemoglobin concentration of 9.3 g/dL. Surgical closure, reversal of neuromuscular block with neostigmine and glycopyrrolate, and extubation proceeded without incident. She recovered for one day in the intensive care unit; after an uneventful postoperative course, the patient was discharged home on the 7th postoperative day. The urinary drainage catheter remained in place for one week after discharge.

3. Discussion

Successful management of placenta percreta requires a multi-disciplinary team approach extending beyond obstetrics, nursing, and anesthesiology to include specialists in hematology, surgical oncology, and interventional radiology. In placenta percreta, a rare variant of abnormal placentation with an incidence of 0.03 per 1,000 [3], placenta villi grow into the myometrium, reaching or penetrating the uterine serosa, possibly extending beyond to the intraabdominal or pelvic organs. Risk factors for abnormal placentation include advanced maternal age, placenta previa, previous uterine surgery, and increased parity, all of which occurred in the case presented [3,5].

Findings on ultrasound that are suggestive of placenta accreta and percreta are: placenta previa; placental lacunae with turbulent flow; irregular bladder wall with extensive associated vascularity; loss of retroplacental clear space; myometrial thickness < one mm or loss of visualization of the myometrium; and a gap in the retroplacental blood flow [9]. Treatment for placenta percreta consists of Cesarean hysterectomy and resection of invaded tissues.

Conservative management involves leaving the placenta *in situ* at the time of Cesarean section without further hysterectomy. However, this approach risks sepsis and hemorrhage. Furthermore, the optimal strategy for subsequent management of these patients is not clear [10,11]. The extirpative approach to placenta percreta consists of Cesarean hysterectomy and resection of invaded tissues while avoiding removal of the invasive placenta from adherent tissues during the operation.

Localization of bladder involvement to its upper posterior wall is associated with less bleeding during surgery. Preoperatively placed bilateral iliac artery balloon catheters, when inflated during surgery, limit perfusion to the pregnant uterus and the invasive placenta sufficiently to allow surgical control without massive hemorrhage [12]. To prevent massive blood loss, following delivery of the infant the obstetrician completes the Cesarean hysterectomy with the placenta *in situ*.

Prevention of and preparation for massive bleeding constitutes the primary anesthetic goal [1,3,13]. Measures include optimizing preoperative red cell mass, perioperative invasive hemodynamic monitoring, use of equipment for rapid administration of warmed fluids, and ready availability of a full range of banked blood products. Regional anesthesia and general anesthesia each have advantages and disadvantages. Regional anesthesia provides better postoperative pain control, decreased risk of aspiration, minimal fetal exposure to anesthetic medications, and an interactive maternal-child experience at birth [3,13,14]. Compared with regional anesthesia, general anesthesia provides control of ventilation in the event that massive hemorrhage leads to cardiovascular collapse and respiratory arrest [3]. General anesthesia also is associated with decreased incidence of transient cardiac arrhythmia and hypotension [15].

Frederiksen and colleagues reported increased blood loss with general versus regional anesthesia in a retrospective study of 514 women with placenta previa [2]. Those observational data, collected over 22 years, are confounded by changes in surgical and anesthetic management over time. Indeed, regional anesthesia use strongly increased with time in that series ($r = 0.84$; $P < 0.0001$), rendering any direct association of anesthetic technique with bleeding highly suspect. Observational data collected over 15 years by Parekh et al., similarly confounded, showed less bleeding and fewer transfusions with regional versus general anesthesia patients undergoing Cesarean section for placenta previa [13]. Chestnut and colleagues reported equivalent blood loss in patients receiving regional rather than general anesthesia (not randomized) among 46 cases of obstetric hysterectomy over three years at 5 institutions [16].

Hunter and Kleiman first described the anesthetic management of Cesarean hysterectomy for placenta percreta with bladder invasion [3]. They employed general anesthesia alone, using fentanyl, nitrous oxide, and isoflurane. Their patient underwent initial cystoscopy and ureteral stent placement, followed in sequence by Cesarean delivery, bilateral internal iliac artery ligation, and then hysterectomy and resection of the urinary bladder dome. The patient experienced massive hemorrhage through the vagina, transfusions totaling 29 donor exposures, dilutional coagulopathy, multiple periods of uncontrolled hypotension despite multiple vasopressor infusions, and severe metabolic acidosis (arterial pH 7.11, even with bicarbonate administration). Despite these problems, her trachea was extubated at the end of the 260-minute procedure and she was discharged from the

hospital 10 days later. Suboptimal preparation resulted in massive hemorrhage, shock, and postoperative complications in a more recent case reported by Sasaoka and colleagues [6].

In the case presented here, the team preempted massive hemorrhage and the need for vascular surgical intervention by using percutaneously placed internal iliac artery balloons. Arterial catheterization provides both prophylactic and therapeutic control of obstetrical hemorrhage [17]. Prophylactic use in the current case may have contributed significantly to the hemostasis.

Regional anesthesia for placement of the nephrostomy tubes and the iliac arterial balloons avoided a prolonged period of general anesthesia that risked fetal lethargy upon delivery. Hunter and Kleiman report Apgar scores of 7 and 7 for the neonate born after a maternal general anesthetic of considerable duration, scores descriptively inferior to those achieved in the current case, which employed regional anesthesia for those portions of the complex procedure up to and including delivery.

This patient desired an interactive childbirth experience. Multidisciplinary discussion yielded common ownership of a plan for regional anesthesia for all procedures up to and including Cesarean delivery of the infant and a period of maternal-child bonding. The subsequent Cesarean hysterectomy and surgical repair could then occur during either regional or general anesthesia.

In summary, multidisciplinary teamwork, including consultation with hematologists and invasive radiologists, preoperative discussion and prospective planning among the team, sensitivity to the patient's desires, and a flexible approach to anesthetic management, may lead to optimal perioperative management of placenta percreta with bladder invasion.

References

- [1] Chung CL, Cheng PJ, Liang CC, Chang FH, Lee JD, Soong YK. Obstetrical hysterectomy and placenta previa/accreta: three bladder injury case reports. *Changeng Yi Xue Za Zhi* 1997;20:44-51.
- [2] Frederiksen MC, Glassenberg R, Stika CS. Placenta previa: a 22-year analysis. *Am J Obstet Gynecol* 1999;180(6 Pt 1):1432-7.
- [3] Hunter T, Kleiman S. Anaesthesia for caesarean hysterectomy in a patient with a preoperative diagnosis of placenta percreta with invasion of the urinary bladder. *Can J Anaesth* 1996;43:246-8.
- [4] Ota Y, Watanabe H, Fukasawa I, et al. Placenta accreta/increta. Review of 10 cases and a case report. *Arch Gynecol Obstet* 1999;263:69-72.
- [5] Palacios Jaraquemada JM, Pesaresi M, Nassif JC, Hermosid S. Anterior placenta percreta: surgical approach, hemostasis and uterine repair. *Acta Obstet Gynecol Scand* 2004;83:738-44.
- [6] Sasaoka N, Kitamura S, Kinouchi K, Fukumitsu K, Taniguchi A, Tachibana K. Cesarean section in a pregnant patient with placenta percreta involving the urinary bladder. *Masui* 2000;49:755-8.
- [7] Iyasu S, Saftlas AK, Rowley DL, Koonin LM, Lawson HW, Atrash HK. The epidemiology of placenta previa in the United States, 1979 through 1987. *Am J Obstet Gynecol* 1993;168:1424-9.
- [8] Wu S, Kocherginsky M, Hibbard JU. Abnormal placentation: twenty-year analysis. *Am J Obstet Gynecol* 2005;192:1458-61.
- [9] Baughman WC, Corteville JE, Shah RR. Placenta accreta: spectrum of US and MR imaging findings. *Radiographics* 2008;28:1905-16.
- [10] Hays AM, Worley KC, Roberts SR. Conservative management of placenta percreta: experiences in two cases. *Obstet Gynecol* 2008;112(2 Pt 2):425-6.
- [11] Lee PS, Bakelaar R, Fitzpatrick CB, Ellestad SC, Havrilesky LJ, Alvarez Secord A. Medical and surgical treatment of placenta percreta to optimize bladder preservation. *Obstet Gynecol* 2008;112(2 Pt 2):421-4.
- [12] Bodner LJ, Noshier JL, Gribbin C, Siegel RL, Beale S, Scorza W. Balloon-assisted occlusion of the internal iliac arteries in patients with placenta accreta/percreta. *Cardiovasc Intervent Radiol* 2006;29:354-61.
- [13] Parekh N, Husaini SW, Russell IF. Cesarean section for placenta praevia: a retrospective study of anaesthetic management. *Br J Anaesth* 2000;84:725-30.
- [14] Sun MS, Hseu SS, Chang DS, et al. Anesthetic management in parturients with uterine rupture preoperatively—report of two cases. *Acta Anaesthesiol Sin* 1997;35:167-70.
- [15] Shen CL, Ho YY, Hung YC, Chen PL. Arrhythmias during spinal anesthesia for Cesarean section. *Can J Anaesth* 2000;47:393-7.
- [16] Chestnut DH, Dewan DM, Redick LF, Caton D, Spielman FJ. Anesthetic management for obstetric hysterectomy: a multi-institutional study. *Anesthesiology* 1989;70:607-10.
- [17] Mitty HA, Sterling KM, Alvarez M, Gendler R. Obstetric hemorrhage: prophylactic and emergency arterial catheterization and embolotherapy. *Radiology* 1993;188:183-7.