Obstetric Forum

Anaesthesia for Caesarean hysterectomy in a patient with a preoperative diagnosis of placenta percreta with invasion of the urinary bladder

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Purpose: Placenta Percreta with invasion of the urinary bladder is a rare condition, which carries a high morbidity and mortality risk for mother and fetus. We present a case which illustrates some of the complexities of perioperative management.

Principal findings: Anaesthetic considerations include those of the pregnant patient and fetus, potential need for massive transfusion, and possible development of coagulopathy. Ideally, these cases should be diagnosed early enough in pregnancy to allow a multidisciplinary team approach to the management of mother and fetus.

Conclusion: The perioperative care of a patient with placenta previa is complicated but, with a multidisciplinary approach, may be successful.

Objectif: La placenta percreta avec envahissement de la vessie est une condition rare qui comporte un risque élevé de morbidité et de mortalité tant pour la mère que pour le fœtus. Les auteurs présentent un cas qui illustre les complexités de sa gestion périopératoire.

Principales constatations: L'anesthésiste doit tenir compte de la relation entre la parturiente et son enfant, du besoin potentiel de transfusions massives, et de l'apparition possible d'une coagulopathie. Idéalement, ces cas devraient être diagnostiqués assez précocement pendant la grossesse pour permettre une prise en charge pluridisciplinaire de la mère et de son fœtus.

Conclusion: La prise en charge d'une parturiente souffrant d'un placenta percreta est compliquée mais ne peut être couronnée de succès que si quand on adopte une approche multidisciplinaire.

Key words

ANAESTHESIA: obstetrical;

SURGERY: Caesarean hysterectomy;

OBSTETRICS: placenta previa, placenta percreta, haemorrhage.

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Accepted for publication 30th November, 1995.

Fortunately, placenta percreta with invasion of the urinary bladder is a very rare obstetrical condition. These patients are at considerably increased risk of intraoperative and postoperative maternal and fetal morbidity and mortality, secondary to haemorrhage, coagulopathy, and infection.^{1,2} We present a case in which preoperative recognition of the pathology allowed a carefully constructed multidisciplinary team approach to anaesthetic, surgical, and neonatal management.

Case report

Routine obstetrical ultrasound at 24 wk in a healthy, 65 kg, 38-yr-old caucasian woman G3 P2, revealed an anterior placenta previa. Repeat ultrasound at 29 wk showed a marginal placenta previa, placenta accreta,

and vascular changes suggestive of placenta percreta. Colour Doppler confirmed hypervascularity in the region of the anterior uterine wall and bladder, strongly suggesting placental invasion of the bladder.

Past obstetrical history included two previous Caesarean sections for cephalopelvic disproportion. There was no other significant past medical or surgical history. Other than a nine day hospitalization for hyperemesis gravidarum at 12 wk this pregnancy was uneventful. Routine laboratory investigations were normal, and no gross or microhaematuria was noted.

An elective Caesarean hysterectomy with partial bladder resection was discussed with the patient and planned for 34 wk gestation. B-methasone treatment was started at 31 wk to promote fetal lung maturation. The patient was admitted to hospital for preparation and observation at 32 wk. The Department of Anaesthesia as well as the Blood Bank, Vascular Surgery, Urology, Neonatology services and the Intensive Care Unit were all consulted for advice and assistance with management. Together, a multidisciplinary approach to operative management was developed. At 34 wk, the patient came to the operating room for an elective Caesarean hysterectomy. In anticipation of the possible need for massive transfusion, two blood infusion sets were prepared and equipped with a Level I Technologies Hotline blood warming system. A dopamine infusion was available in the event of severe hypotension. Blood products, including ten units of packed red blood cells, ten units of platelets and four units of fresh frozen plasma were immediately available in the operating room. The Hospital Blood Bank had been alerted to the case and was on standby to provide additional blood products on an urgent basis.

In the OR the patient was positioned supine, with a wedge under the right hip. Under local anaesthesia 14-ga intravenous catheters were placed in each arm. Pre-induction monitoring included ECK, indwelling arterial catheter for blood pressure and blood sampling, oxygen saturation, and end-tidal CO₂. General anaesthesia was induced with 300 mg of thiopentone, and 100 mg succinylcholine following three minutes pre-oxygenation. The trachea was intubated with a 7.5 mm tracheal tube with cricoid pressure applied until the tracheal tube cuff was inflated and tube position verified. Muscle relaxation was achieved with pancuronium. Anaesthesia was maintained with fentanyl *iv*, 50% nitrous oxide in oxygen and 0–1% isoflurane as needed. A #7 French introducer-type catheter was inserted in the right internal jugular vein following intubation. All fluids were infused via a blood warming device and a warming blanket covered the patient's arms and chest.

Cystoscopy revealed marked vascularity in the sub

mucosa of the dome of the bladder, with normal trigonal anatomy. Bilateral double J ureteral catheters were inserted. Following cystoscopy, the abdomen was opened via a midline incision. The placenta completely encircled the lower segment of the uterus, and invaded the dome of the bladder. A healthy male infant was delivered via a fundal incision in the sagittal plane. Apgar scores were 7 at both one and five minutes postpartum. The placenta was left *in situ*, and the uterine incision was closed in a single layer. An infusion of oxytocin, 20 U·L⁻¹ was given to aid in contraction of the uterus.

Although little bleeding was seen in the surgical field, considerable uterine bleeding continued vaginally. This was hidden by the drapes, and could not be measured directly. Arterial supply to the uterus was ligated by the vascular surgeon at the level of the hypogastric arteries prior to hysterectomy. During this period, blood loss was estimated clinically from haemodynamic variables, and serial haematocrit measurements. Despite rapid, multiple transfusions, periods of hypotension occurred, which were very difficult to control. Systemic blood pressure was at times as low as 70/40 mmHg in spite of infusions of dopamine 400 mg/D5W 250 ml, norepinephrine 8 mg/D5W 250 ml, and occasional boluses of neosynephrine. Serial arterial blood gas determinations during this period revealed metabolic acidosis with pH as low as 7.11. Acid base balance was restored with 100 mEq of sodium bicarbonate.

Intraoperative oozing was noted after eight units of packed cells were transfused. The INR, which was previously normal, increased to 1.5. After transfusion of four units of fresh frozen plasma and five units of platelets, the INR was 1.1 and oozing from raw surfaces stopped. It was not until the entire uterus and the dome of the urinary bladder were removed that bleeding stopped and haemodynamic stability was achieved. The bladder was then closed with the trigone and ureters intact. The total duration of surgery was 260 min.

When surgical drapes were removed approximately six litres of clotted blood was discovered between the patient's legs, accounting for nearly all the estimated blood loss. During surgery the patient received 13 units PRBC, six units FFP, ten units platelets, and 6500 ml of crystalloid. The preoperative haematocrit of 34% decreased to 29% postoperatively. At the conclusion of the procedure the patient's body temperature was 36°C. She was awake and responsive. The trachea was extubated in the operating room, then transferred to the Surgical Intensive Care Unit (SICU) for monitoring.

After spending the first night in the SICU the patient was transferred to the ward the following morning. Ureteral stents were removed on the second postopera-

tive day. On the tenth postoperative day, a urinary tract infection developed which was treated with antibiotics. The patient was discharged home 14 days after surgery with a suprapubic catheter to be removed at a later date.

Discussion

Placenta percreta, an extreme variant of placenta accreta, represents an abnormality of placentation, in which placental villi invade the decidua basalis of the uterus penetrating through the myometrium to the serosa. In severe cases, the placenta may invade intra-abdominal or pelvic structures.

While the incidence of placenta percreta is reported as 0.03 per 1000,² placenta percreta with invasion of the urinary bladder has only been reported 23 times in the English language literature.¹⁻⁵ To our knowledge this life-threatening entity and its anaesthetic management have never been reported in the anaesthesia literature.

The main risk factors for placental invasion of the myometrium include Placenta previa, Caesarean section, increasing age, Asherman's syndrome and increased parity.⁶ Clark reported a 67% incidence of placenta accreta in women with placenta previa who had undergone four previous Caesarean sections.⁷

The summation of the maternal mortality in the subgroup of patients with placental invasion of the urinary bladder has been reported as 9.5% with a perinatal mortality rate of 24%.²

In survivors, major morbidity has been reported. One patient required a total of 123 units of human blood products during the perioperative course.² Several have required prolonged hospitalization to deal with consequences of massive transfusion including adult respiratory distress syndrome and coagulopathy.^{1,2}

Early signs and symptoms of placenta percreta are non-specific and can range from antepartum hemorrhage in a patient with placenta previa, to spontaneous uterine rupture. If the urinary bladder is involved, gross or microscopic haematuria may be present.¹ Ultrasonic examination can indicate invasion of myometrium, while color Doppler flow studies can be strongly suggestive of hypervascularity associated with invasion of adjacent structures. Preoperative diagnosis allows a carefully planned team approach to surgery and delivery.

In this case, the early diagnosis of placenta percreta was instrumental in allowing the development of a surgical and anesthetic plan. Before surgery the patient was seen and assessed by all the involved specialties. The main goals were to deliver a healthy newborn and to devise a surgical approach which would minimize blood loss and provide a dry surgical field. The planned opera-

tive approach began with a cystoscopic examination of the urinary bladder by the urologist, to assess extent and depth of placental invasion. To allow ease of localization and to decrease the possibility of damage to the ureters during hysterectomy and partial bladder resection, ureteral stents were placed at the time of cystoscopy.

The Caesarean delivery was planned via a fundal incision in order to deliver the fetus quickly while avoiding laceration of the low-lying placenta. Leaving the placenta *in situ* and closing the uterus immediately would maintain a dry surgical field, making subsequent control of uterine feeding vessels easier. It was recognized in advance that almost all uterine bleeding would be per vaginum and thus difficult to quantify.

We chose to avoid a regional anaesthetic in this patient because of the uncertain duration of the procedure, as well as the possibility of massive haemorrhage and coagulopathy. The patient would thus be anaesthetized for some time prior to the Caesarean section to allow accurate diagnostic cystoscopy and passage of bilateral ureteral stents. We communicated this approach to the neonatologists who understood that they would receive a lethargic baby.

Intraoperative anaesthetic management focused primarily on replacement of blood loss. Determining the extent of haemorrhage was difficult as almost all bleeding occurred via the vagina.

Blood loss was estimated from haemodynamic variables and serial haematocrits. Despite rapid transfusion through large bore intravenous lines, as well as ligation of the hypogastric arteries, the patient did not become haemodynamically stable until the uterus and the dome of the bladder had been removed. This is most likely due to ongoing blood supply to the placenta from the superior haemorrhoidal veins on the surface of the bladder.

In summary, this case illustrates some of the complexities of perioperative management of patients with placenta percreta. Had the patient presented for an urgent Caesarean section without our foreknowledge of her condition, both the obstetrician and the anaesthetist would have faced a truly life threatening situation with extremely grave implications for mother and fetus. While the diagnosis of placenta accreta or percreta cannot always be made by ultrasound, in this case preoperative diagnosis and the coordination of a multidisciplinary team effort were determining factors in the successful outcome.

Acknowledgment

The authors gratefully acknowledge the secretarial assistance of Sarah Scholl.

COMMENTARY

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This excellent case report highlights many of the diagnostic and management challenges in the parturient with placenta percreta. It illustrates the benefits of a well-planned, appropriately timed, multidisciplinary approach to these cases.

Familiarity with the risk factors for placental invasion of the myometrium is of key importance in anticipating and diagnosing placenta accreta/percreta. In addition to those noted by Hunter and Kleiman one should include other conditions that produce uterine scarring such as endometritis, myomectomy, diagnostic or therapeutic curettage and previous retained placenta. Increased awareness of risk factors leads to closer scrutiny when following and interpreting ultrasound examinations. The suggestive, but not pathognomonic, ultrasound findings of placenta accreta (absence of the retroplacental clear space thought to represent decidua basalis and myometrium; and presence of sonolucent structures beneath the placenta and in the uterine wall) have a high false-positive rate. Color flow Doppler sonography of sonolucent structures which demonstrates blood flow through dilated blood vessels traversing the placenta and uterine wall, establishes a diagnosis of placenta accreta/percreta.⁸ Magnetic resonance imaging may prove useful.

A good strategy in this case was the decision to perform an elective Caesarean hysterectomy at 34 wk gestation. In our hospital, 31 of 70 (44%) women with placenta previa/accreta over a 12 month period (1993–1994) delivered prematurely on an *emergency* basis because of serious initial or recurrent antepartum haemorrhage. Planning an *elective* procedure with an informed and organized multidisciplinary team is obviously preferable, although not always possible.

Cystoscopy and placement of ureteral stents prior to the Caesarean hysterectomy lengthened anaesthetic induction to delivery time, but the information gained guided the surgical approach and protected the ureters which often are difficult to identify. Metabolic acidosis and hypothermia were recognized and well managed. It is important to monitor arterial blood gas acid-base status and to minimize heat loss (warming blanket, warm humidifier in the circuit, warm intravenous fluids and blood).

In addition to a team of experienced obstetricians, nurses, anesthetists, urologists and vascular surgeons we have benefitted from the active involvement of a gynaecological oncologist and a haematologist. The haematologist serves as a liaison between the operating room and blood bank; directing and coordinating haematological testing and blood product availability. In order to respond efficiently to the occasional, previously unrecognized, emergency placenta accreta/percreta there is an "on-call" list of the above specialists.

In our experience some planned Caesarean hysterectomies proceed uneventfully but in others, major intraoperative and postoperative haemorrhage is a problem. The source of bleeding may be obvious but often it is not apparent nor is it always possible to measure accurately ongoing blood loss. In our hospital autologous blood transfusion has proven efficacious and has avoided or decreased the need for homologous blood in these patients. Life-threatening haemorrhage and hypotension can occur even when the diagnosis is known preoperatively and the surgery carefully planned.

Hunter and Kleiman describe several strategies for achieving haemostasis. Other techniques to limit blood loss include the use of oxytocics (oxytocin, ergot and prostaglandin F_{2α}) until the uterus is removed and a continuous suture, rather than clamps, along the edges of the uterine incision. Leaving the uterus open with the latter manoeuvre allows direct visualization of intrauterine bleeding. Bilateral ligation of the uterine and/or hypogastric arteries and use of a transvaginal pelvic pressure pack for persistent bleeding from pelvic tissues after hysterectomy⁹ are described. When severe hypotension, secondary to haemorrhage, persists despite aggressive blood replacement and vasopressor therapy infrarenal manual compression and/or cross-clamping of the aorta may be life-saving.

Avoiding incision into the placenta and not disturbing the placental bed are important. Sanders described delivering the baby through the uterine fundus, remote from the placenta.¹⁰ Rather than risk uncomfortable hemorrhage the uterus was closed with the placenta *in situ* and hysterectomy deferred to two weeks postpartum. At the time "vessels extending from the uterus were mostly thrombosed and it was possible to remove the uterus, with its invading placenta, piecemeal from the bladder and to complete the procedure without injury to the bladder or the need for bladder resection."¹⁰ This option is only feasible with a preoperative diagnosis and no complications such as bleeding or sepsis.

Radiological strategies, underutilized in most centres, include prophylactic and emergency arterial catheterization and embolotherapy. Arterial embolization, which often follows failure of medical and surgical approach-

es, is successful in controlling haemorrhage in more than 95% of cases.¹¹ When used as a "third line" therapy there may be associated coagulopathy, greater blood loss, increased postpartum complications and longer procedure time.¹¹ The role of *prophylactic* arterial catheter placement is undetermined. Mitty reported its use in nine women; two who had preoperative embolization for antepartum haemorrhage and two who had embolization intraoperatively for severe bleeding during Caesarean section.¹² Fetal exposure to radiation and procedure-related complications (6.2%) have to be balanced against the risk of severe haemorrhage.

Successful management of the woman with placenta accreta/percreta remains one of the major obstetric challenges. Increased awareness of risk factors, ongoing advancements in ultrasound imaging and radiological technologies and a coordinated, multidisciplinary approach hold the best hope for successful maternal and fetal outcomes. The search for the best combination of medical, surgical and radiological strategies to achieve haemostasis will continue.

COMMENTARY

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This case supports previous reports of an association between abnormal placental implantation (placenta previa, accreta) and prior Caesarean delivery.^{7,13,14} The patient had two previous Caesarean deliveries and presented with placenta percreta. She was admitted at 32 wk gestation for observation and development of a management strategy for an elective caesarean hysterectomy.

Part of the planning process could have included having the patient admitted to a room in close proximity to the operating room (OR) where she could be closely followed. This would prevent delays in transport and management if unexpected haemorrhage necessitated emergency surgery. As well, it is important to give careful consideration to the best location for the surgery. This extensive, complicated surgery would create numerous logistic problems if undertaken in our obstetric OR. In our institution, the main operating room is better equipped to satisfy the requirements of the team.

In these cases it is important to have blood products readily available throughout the patient's admission which would prevent delays in the event of emergency surgery. When preparing for surgery with the potential

for massive blood loss, I insist that, at a minimum, the number of PRBCs present in the OR be equivalent to the patient's blood volume (usually six units). In this case, packed red blood cells [PRBCs], frozen plasma and platelets were located in the operating room prior to induction of anaesthesia. Although the majority of these were utilised, I would question the necessity of having frozen plasma and platelets in the operating room. As the blood bank was on "standby", I would assume that additional products would be readily available.

The choice of anaesthesia (regional vs general) for elective Caesarean hysterectomy is controversial. General anaesthesia is usually avoided for parturients due to the well documented risks of difficult/failed intubation, regurgitation/aspiration, hypoxaemia and the mother's desire to be awake. Elective, general anaesthesia establishes control of the parturient's airway prior to potential adverse intraoperative events (e.g., massive haemorrhage and hypotension) which may make manipulation of the airway more difficult. Massive haemorrhage, following the induction of regional anaesthesia with its resultant obligatory sympathectomy, is of concern to anaesthetists who advocate the use of general anaesthesia. However, a multicenter study demonstrated that blood loss was not excessive during elective caesarean hysterectomy under regional anaesthesia and therefore did not contraindicate its use.¹⁵

If consideration is given to regional anaesthesia for elective Caesarean hysterectomy there are four possible techniques. Single-shot subarachnoid blockade provides excellent anaesthesia but has the disadvantage of a finite duration. If the surgical procedure is prolonged it may be necessary to induce general anaesthesia, which is potentially hazardous. Therefore, I suggest avoiding single-shot spinal anaesthesia. Intrathecal microcatheters are no longer available for clinical use in North America and so the only option for continuous spinal anaesthesia is intrathecal placement of an epidural catheter. This increases the risk for postdural puncture headache, a relatively minor complication in contrast to the potential difficulties from lengthy surgery. Another technique is combined spinal-epidural (CSE) anaesthesia. Advocates suggest that following subarachnoid blockade, additional anaesthesia can be provided through the epidural catheter. In a recent report, 4.2% of epidural catheters placed for CSE labour analgesia required replacement due to ineffective analgesia.¹⁶ Therefore, I caution the use of this technique as the effectiveness of the epidural component can not be guaranteed. Instead, if there is concern that the intended procedure may be prolonged, I would use epidural rather than CSE anaesthesia. Lumbar epidural anaesthesia not only provides excellent surgical anaesthesia but the tested and proven epidural

catheter can be used should the surgical procedure be prolonged. It is my technique of choice under the circumstances. If an inadvertent dural puncture occurs during placement of the epidural catheter, I suggest placing the catheter intrathecally and using it to initiate and continue subarachnoid anaesthesia.

Unlike the cases described in the multicenter study¹⁵ the present case involved a more significant percreta. It was anticipated that surgery would be prolonged and that there would be massive haemorrhage. Rather than risk induction of general anaesthesia intraoperatively the choice was to administer it electively. The authors describe a well conceived plan for induction and maintenance of general anaesthesia. They established central venous monitoring, large bore intravenous access and attempted to prevent hypothermia. Was crystalloid haemodilution considered prior to the initiation of surgery? This would have ensured that the patient was well hydrated prior to surgery and may have reduced the haematocrit of the blood lost during the procedure.

Several aspects of the surgical plan require comment. The surgical team, in my opinion correctly, did not attempt to manipulate the placenta and left it *in utero*. This avoided excessive haemorrhage from the placental bed but, presumably in their attempt to achieve a "dry" surgical field, they "closed" the uterus. As a result ongoing blood loss was concealed. Did the anaesthetist notify the surgical team of the patient's haemodynamic instability? This type of communication is essential to ensure locating sites of ongoing haemorrhage. Would temporary abdominal aortic cross clamping performed by the vascular surgeon have provided the desired "dry" surgical field while avoiding concealed massive haemorrhage?

This case also illustrates that administration of oxytocics does not eliminate ongoing uterine bleeding. Oxytocin was administered to facilitate uterine contraction but was likely futile in preventing haemorrhage due to mechanical obstruction from the placenta intentionally left *in situ*.

In conclusion, this case underlines the importance of a well coordinated, multidisciplinary approach to the management of a potentially life-threatening complex problem. Once again we are reminded that we are all vital members of the healthcare "team" and must act accordingly.

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