The rate of cesarean delivery in the United States is at an all-time high. With the increased rate of primary and repeated cesarean delivery, a corresponding increase in the occurrence rate of placenta previa and placenta accreta has been observed.

The purpose of this case report is to discuss the obstetric disorder of placenta previa with the concurrent occurrence of placenta accreta. A review of the actual management and course of a patient undergoing elective cesarean delivery with the aforementioned concurrent disorders will be undertaken. This will be followed by a general discussion related to the management of an obstetric patient undergoing elective cesarean delivery with known placenta previa and placenta accreta.

**Keywords:** Anesthesia, cesarean delivery, hemorrhage, placenta accrete, placenta previa.

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Case Report: Management of Elective Cesarean Delivery in the Presence of Placenta Previa and Placenta Accreta

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Of every 100,000 live births in the United States, 3 result in maternal death. Some of these deaths occur following complications associated with placenta previa, which is present in approximately 1 in 200 pregnancies. Placenta previa occur when the placenta is positioned in the lower part of the uterus, close to or involving the cervical opening. Commonly associated with or suspected in the presence of placenta previa is the disorder of placenta accreta, which is a form of abnormal placentation and occurs when the placenta imbeds dysfunctionally into the wall of the myometrium. The occurrence rate of placenta accreta is approximately 1 in every 2,500 pregnancies. Placenta previa and placenta accreta are associated with increased maternal hemorrhage and resulting increased maternal mortality and morbidity. When the rate of cesarean delivery increases, a corresponding increase in the occurrence rate of placenta previa and placenta accreta has been observed. The rate of cesarean delivery in the United States is 31.1% and is at an all-time high. The increased rate of cesarean delivery is multifactorial. The number of primary cesarean deliveries being performed has increased. Meanwhile, the number of vaginal births after cesarean delivery has decreased. This decreased number has contributed to an increased rate of repeated cesarean delivery. The purpose of this case report is to review the management of a patient admitted for elective cesarean delivery with known placenta previa and suspected placenta accreta. The case report will be followed by a general discussion related to the management of obstetric patients with placenta previa and placenta accreta.

**Case Summary**

A gravida 2, para 1, 37-year-old woman was admitted at 36\% weeks' gestation to the obstetric preoperative area for an elective cesarean delivery. A diagnosis of known breech presentation, known total or complete (type IV) placenta previa, and suspicion of possible placenta accreta were noted on the patient's record. These findings were based on serial ultrasound reports. The patient had experienced abdominal cramping but no vaginal bleeding during the course of her pregnancy. The patient was carrying diamniotic, dichorionic twins with fetal demise of twin B at 12 weeks' gestation. Incidentally, both placentas exhibited subchorionic bleeding before the demise of twin B. At 38.5 weeks' gestation, followed failed induction of labor. This cesarean delivery was without incident, and no placental abnormality was noted.

In the preoperative area, 2 large-bore peripheral intravenous catheters were inserted. A complete blood cell count and a type and crossmatch for 4 U of blood were completed. The patient's preoperative hemoglobin and hematocrit were 12.7 g/dL and 37.4%, respectively. The platelet count was 223 × 10^9/L. A bedside ultrasound was performed. Findings of this ultrasound, the suspicion for placenta accreta, and the resulting impact on the anesthetic plan were discussed with the surgeon. The surgeon thought that the low-lying, posterior location of the placenta did not suggest a high risk for involvement of the placenta with the traditional anterior horizontal uterine incision commonly used for the performance of cesarean delivery. Also, the suspicion of placenta accreta was low and had not been diagnostically confirmed. Based on this discussion with the surgeon and the patient's stable hemodynamic state, regional anesthesia via subarachnoid...
block was chosen as the modality for anesthetic management. The patient was medicated with 30 mL of citric acid/sodium citrate for aspiration prophylaxis 15 minutes before the procedure. Two units of typed and cross-matched blood were transported along with the patient to the operating room.

On the patient’s arrival in the operating room, standard monitoring was initiated. At this time, the patient’s vital signs were as follows: blood pressure, 145/82 mm Hg; pulse, 100/min; and pulse oximetry reading, 100% with oxygen at 3 L via a nasal cannula. The patient was assisted into the sitting position for administration of a subarachnoid block. The patient’s back was prepped and draped in a sterile manner. A 25-gauge, pencil-point spinal needle was introduced through the L3-4 interspace, and 1.4 mL of 0.75% hyperbaric bupivacaine was administered into the intrathecal space. Fentanyl, 20 µg, and morphine, 0.1 mg, were also administered intrathecally. Regional spinal anesthesia was established without difficulty. The patient received a 1,000-mL bolus of crystalloid intravenous infusion before initiation of the spinal anesthetic. On induction of regional anesthesia, hypotension, as defined by a blood pressure of 100 mm Hg systolic or lower, was treated with vasopressors. Ephedrine, 10 mg, in 2 bolus doses and phenylephrine, 40 µg, in 2 bolus doses were administered intravenously during a 7-minute interval. During this 7-minute interval, the patient’s sequential blood pressure readings were 90/39, 81/40, and 82/38 mm Hg. The patient’s heart rate remained in normal sinus rhythm at a rate of 80 to 85/min. Following this 7-minute interval and the administration of vasopressors, the patient’s blood pressure was 110/60 mm Hg and the heart rate was 85/min.

The infant was delivered without difficulty. The time from uterine incision to delivery of the infant was 2 minutes. Immediately on delivery, an infusion of oxytocin, 20 U/L, was initiated. At this time, the total estimated blood loss was 800 mL. Subsequent delivery of the placenta was then undertaken. The obstetrician expressed to the anesthesia team and to the patient that placenta accreta was indeed present and, as such, there was some difficulty with prompt delivery of the placenta. Preoperatively, the patient was aware of the suspicion of placenta accreta. The complications and risks associated with this potential diagnosis, including hemorrhage, possible hysterectomy, and the need to convert to a general anesthetic had all been discussed with the patient before the procedure. Complete removal of the placenta, in fragmented segments, was successfully achieved 7 minutes after delivery of the infant. Estimated blood loss during delivery of the placenta was 1,200 mL; therefore, at this time, the total estimated blood loss was 2,000 mL. After delivery of the placenta, bedside measurement of the patient’s hemoglobin revealed a level of 10.3 g/dL, which was communicated to the surgical team.

The remaining surgical time of 1 hour and 15 minutes was devoted to controlling uterine bleeding and performing abdominal closure. As the surgical team worked to achieve hemostasis, a second liter of fluid containing oxytocin, 20 U/L, was initiated. The patient’s blood pressure during this time returned to a hypotensive state, at 80/35 mm Hg. Her heart rate was 90/min. Incremental intravenous doses of phenylephrine, 40 mg in 3 bolus doses, along with 1 bolus dose of ephedrine, 10 mg, were administered during this period. The patient’s blood pressure returned to 110/60 mm Hg, and the heart rate increased to 105/min. During the period of hypotension, the patient remained alert and oriented but started to exhibit anxiety and agitation. Verbal reassurance and emotional support were given. As surgical time progressed, the patient reported the sensation of abdominal pressure and a feeling of general malaise and requested additional medication to assist in tolerance of the procedure. During a 10-minute interval, fentanyl, 125 µg, followed by morphine, 4 mg, and midazolam, 2 mg, were administered intravenously. The patient reported increased comfort. Fifteen minutes after the initial fentanyl dosing, the patient requested additional pain medication and sedation. During a 5-minute interval, fentanyl, 125 µg; morphine, 6 mg; and midazolam, 2 mg, were administered intravenously. The patient’s level of consciousness changed from awake to arousable with physical stimulation following administration of these medications.

Ultimately, to achieve hemostasis, uterine artery ligation was required along with placement of a Bakri balloon (Cook Medical Inc, Bloomington, Indiana). A Bakri balloon is a type of intrauterine balloon that can be placed to tamponade uterine vessels. These measures were successful in achieving hemostasis. Fifteen minutes before case completion, a repeated bedside hemoglobin measurement revealed a level of 8.9 g/dL, which was communicated to the surgical team. The estimated blood loss from time of removal of the placenta to procedure end was 500 mL. The total estimated blood loss for the procedure was 2,500 mL. The total crystalloid infusion was 4,600 mL, and the total urine output equaled 200 mL. The time from removal of the placenta to case end was 1 hour and 15 minutes, and total intraoperative time was 2 hours and 10 minutes.

Before the patient was transferred to the postanesthesia recovery unit, she was alert and oriented and requesting additional pain medication. Hydromorphone, 0.5 mg, was administered intravenously. The patient’s vital signs before administration of the hydromorphone were as follows: blood pressure, 112/45 mm Hg; heart rate, 110/min; and pulse oximetry reading, 95% with oxygen at 3 L via nasal cannula. At this time, specimens for fibrinogen and prothrombin time were sent to the laboratory for analysis. All coagulation studies had results within the reference ranges: fibrinogen, 338 mg/dL; prothrom-
bin time, 10.7 seconds; and international normalized ratio, 1.0. Vital signs on assumption of care by the postanesthesia recovery room nurse were as follows: blood pressure, 147/84 mm Hg; heart rate, 126/min; respiratory rate, 16/min; and pulse oximetry reading, 98% with oxygen at 3 L via nasal cannula. The patient was observed in the anesthesia recovery unit for 2.5 hours and continued to exhibit hemodynamic stability. A formal complete blood cell count was performed and revealed the patient’s hemoglobin level to be 9.1 g/dL. On the day of surgery, no blood products were transfused. Based on the patient’s status, the patient was transferred to the general-care postpartum unit.

Discussion

Placenta previa occurs when the location of the placenta is low in the uterus, and, thus, the placenta involves or lies close to the cervical os. This area of the uterus has a comparatively rich blood supply and may account for the abnormal occurrence of placental implantation in the lower uterine segment. Multiple risk factors for the development of placenta previa exist, including multiparity, advanced age, previous cesarean delivery, prior uterine surgery, use of cocaine, and smoking. These risk factors are all associated with the generalized effect of endometrial atrophy. Classification of placenta previa is based on the degree of placental overlap into the cervical os and includes 4 subtypes: total, partial, marginal, and low-lying. The type or degree of placenta previa can be diagnosed by using ultrasound or magnetic resonance imaging (MRI).

Placenta previa is a known associated risk factor for the presence of placenta accreta. Therefore, when there is a diagnosis of placenta previa, there should also be a high suspicion for placenta accreta. Wu et al. (2010) stated that “the risk of placenta accreta with two or more prior cesarean scars is increased 8-fold. The odds for those with previa are increased 51-fold.” and “In the presence of multiple prior CDs [cesarean deliveries] plus previa, the odds of placenta accreta might increase up to 400-fold.” Additional risk factors for the development of placenta accreta include advanced maternal age, previous uterine surgery, and previous uterine curettage.

Placenta accreta is the dysfunctional attachment of the entire placenta or segments of the placenta into the uterine wall. This attachment results in increased placental embedment into the uterine wall and resulting impediment of placental detachment. The resulting impact on maternal-fetal risk is multifaceted and is compounded by the commonly co-occurring placenta previa. In general, maternal morbidity significantly increases in the presence of placenta accreta. Specifically, poor outcomes associated with the dual diagnosis of placenta previa and accreta are preterm birth, low birth weight, maternal-fetal hemorrhage, surgical damage involving the urinary tract, and cesarean hysterectomy.

The diagnosis of placenta accreta is accomplished through visualizing placental abnormalities by using ultrasound and MRI. In most cases, MRI has not been shown to be a superior diagnostic tool compared with ultrasound, and failure of MRI to successfully diagnose all cases of placenta accreta has been established. The use of MRI may aid in better identification of the placental segments involved and their corresponding location in the uterus. This information may prove helpful in determining the best surgical strategy. However for purely diagnostic purposes, the only time that MRI may be considered a modality of heightened sensitivity is when the location of the placenta accreta involves the posterior uterine wall. Laboratory tests, including maternal alpha-fetoprotein and creatine kinase, have also shown some usefulness without being exclusively diagnostic for placenta accreta. While placenta accreta is suspected in the presence of placenta previa, definitive diagnosis does not always occur before delivery. This is partly due to the limitations of the aforementioned radiologic scans and blood tests in confirming the diagnosis.

There is limited up-to-date literature examining the ideal anesthetic for a parturient with known placenta previa and suspected abnormal placentation. Regional or general anesthesia can be used for the anesthetic management of a patient with placenta previa and suspected placenta accreta. Both techniques have arguable pros and cons. However, there are some cases when regional anesthesia is contraindicated.

Ideally, management of a patient with placenta previa includes elective cesarean delivery. The type of previa, orientation of the placenta to the anterior uterine wall, and patient status are all factors that must be considered when choosing the anesthetic modality. For a patient without active bleeding, decision making is often case-specific. Regional anesthesia may be associated with decreased blood loss, decreased necessity for hysterectomy to control maternal hemorrhage, and improved fetal outcomes. This is understood to be secondary to the sympathectomy that occurs with the initiation of regional anesthesia. Due to impaired sympathetic tone, arterial blood pressure and, as a result, blood loss are decreased. The literature supports that there is increased blood loss for a patient with placenta previa during cesarean delivery with use of a general anesthetic. This is in part due to increased sympathetic tone and resulting increased arterial blood pressure under general anesthesia compared with regional anesthesia. However, in the presence of active maternal bleeding or absence of maternal hemodynamic stability, general anesthesia is the modality of choice.

As with placenta previa, ideal anesthetic management of placenta accreta includes elective cesarean delivery. Immediate availability of blood products for treatment of maternal hemorrhage is also required. Because the surgi-
cal time may be variably extended because of the process of removing the embedded placenta or for performance of a cesarean hysterectomy, a general anesthetic may be the method of choice for management of known placenta accreta. This is due in part to the time limitation that regional anesthesia and resulting patient tolerance can impose on ideal or prolonged operative time. One case study discusses time concerns as the specific rationale for the planned use of general anesthesia in a patient with known severe abnormal placenta. If regional anesthesia is chosen, adequate prior explanation and patient teaching must be done related to what to expect intraoperatively if the need to manage severe hemorrhage arises. The patient should also be advised that initiation of general anesthesia may be required intraoperatively. Whatever the chosen anesthetic technique, adequate anticipation and resulting preparation for management of severe maternal hemorrhage are necessary.

Anesthetic planning and care for the patient arriving at the hospital for elective cesarean delivery with placenta previa and known or suspected placenta accreta must begin preoperatively. Minimally, 2 large-bore intravenous catheters should be inserted. Based on patient assessment and the degree of placental overlap into the cervical os, an arterial line may be inserted. The arterial line can be used to assist in continuous blood pressure monitoring and frequent laboratory testing. A central line may also be inserted to facilitate fluid and blood administration. The presence of a central line also allows for central venous pressure monitoring, which can be used in ongoing assessment of the patient’s fluid and hemodynamic status. Before beginning the procedure, at least 2 L of crossmatched packed red blood cells must be available at the patient’s bedside. A complete blood cell count must be performed. Traditional preoperative preparation of the patient, including administration of an oral antacid for aspiration prophylaxis, should not be neglected.

As previously discussed, there are benefits to regional and general anesthesia. Intraoperatively, anesthetic management is based on maternal hemodynamic status. Patients with placenta previa may have low-lying placental placement. This area of the uterus may not contract as efficiently as the fundus of the uterus. Placenta accreta may further compound the inefficient uterine contractions. Immediately following delivery, it is vital that an infusion of oxytocin, 20 U/L, be initiated. Decreased morbidity is associated with immediate performance of a hysterectomy with no attempt to deliver the placenta. One study found that whether or not placental removal was attempted was the primary determinant of maternal morbidity factors. When placental delivery is attempted, ongoing communication between the surgeon and nurse anesthetist is vital. If difficulty is encountered in removing the placenta from the uterine wall, the nurse anesthetist should anticipate the potential need for cesarean hysterectomy and ongoing profound blood loss. For patients receiving a general anesthetic, if loss of hemostasis occurs, halogenated inhalation agents should be discontinued. The halogenated agents cause uterine relaxation and a subsequent increase in hemorrhage. The use of nitrous oxide and intravenous narcotics may be a necessary alternative anesthetic plan.

While surgical management can include cesarean hysterectomy, ligation of causative vessels and partial uterine segment removal are alternatives that may be used. In an effort to maintain fertility, vessel ligation and uterine segment removal may be preferentially attempted. In the literature, there are multiple case reports showing success when conservative techniques have been implemented. However, safety, secondary to increased maternal hemorrhage, and the ultimate ability of these techniques to preserve fertility are challenged by some.

Postoperatively, ongoing vigilance is necessitated. Obstetric patients are commonly young, healthy women and, therefore, may not exhibit hypotension until severe hypovolemia has occurred. Nurse anesthetists, therefore, must monitor closely for earlier indicators of hypovolemia such as narrow pulse pressure, skin pallor, decreased urine output, and sluggish capillary refill. Minimally, patients will require continuous electrocardiographic and pulse oximetry monitoring, with frequent noninvasive blood pressure and temperature monitoring. The patient is at risk for the development of upper airway and pulmonary edema when large volumes of crystalloid and blood products have been infused. Therefore, endotracheal intubation, mechanical ventilation, and admission to the intensive care unit may be appropriate. Hemodynamic status and organ system response to hemorrhage, including signs and symptoms of neurologic impairment, renal failure, and the development of Sheehan syndrome, must also continue to be closely observed for by nurse anesthetists. The development of disseminated intravascular coagulation is also a concern. This concern has even heightened relevance if conservative methods involving leaving the placenta in situ have been used.

Anesthetic and obstetric management of the patient discussed in this case report were within the recommendations currently available in the literature. The patient was in hemodynamically stable condition with no active bleeding, and, therefore, the decision to use regional anesthesia was well supported by the literature. Packed red blood cells were immediately available for transfusion before initiation of the procedure, and all disciplines involved in the procedure were well aware of the patient’s diagnosis and had agreed on the planned course of anesthetic and surgical management.

While coagulation studies were performed immediately postoperatively and results were within the reference ranges, obtaining baseline coagulation studies preopera-
tively would have provided a valuable baseline measurement. The threshold for transfusion of blood products is not concrete, but rather is a recognized range of hemoglobin concentrations of less than 10 g/dL and more than 6 g/dL.28 However, due to the increased physiologic demand and resulting increased oxygen consumption present in peripartum patients, aggressive management may be the ideal standard.23 Therefore, administration of blood products intraoperatively may have been beneficial in the management of this patient. Postoperatively, the patient was transferred to a general-care postpartum unit. Telemetry monitoring is not available on this unit. However, based on experience at this institution, it has proven beneficial to keep obstetric patients in stable condition who require close observation on this unit. This is due to the constant presence of trained obstetric and anesthesia providers on the unit, which allows for close observation and monitoring of the patient's status by a multispecialty team.

As demonstrated by this case study, the anesthetic plan for obstetric patients must always take into consideration the need to handle a diverse set of emergency scenarios. Care of a patient with known placenta previa and known or suspected placenta accreta raises even greater potential for emergency surgical and anesthetic complications. With proper planning, thorough communication, and constant vigilance, the care of a patient with a dual diagnosis of placenta previa and placenta accreta can be safely accomplished.

REFERENCES


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