Continuous spinal anesthesia for Cesarean hysterectomy and massive hemorrhage in a parturient with placenta increta

Anesthésie rachidienne continue pour hystérectomie lors d'une césarienne et hémorragie massive chez une parturiente ayant un placenta increta

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Abstract

Purpose We present anesthetic management using a continuous spinal anesthesia (CSA) technique in a patient with placenta increta who underwent elective Cesarean hysterectomy with massive postpartum hemorrhage.

Clinical features A 34-yr-old parturient (G3P2) was scheduled for Cesarean delivery and possible hysterectomy at 35⁺ weeks due to suspected placenta accreta. Her body mass index was 21 kg·m⁻² and she had a reassuring airway. Inadvertent dural puncture occurred during combined spinal-epidural (CSE) placement, and a decision was made to thread the epidural catheter and utilize a CSA technique. Following delivery of a healthy infant, morbid adherence of the placenta to the myometrium was confirmed, and a supracervical hysterectomy was performed. Eight litres of blood loss occurred postpartum requiring resuscitation with crystalloid 3,800 mL, colloid 1,500 mL, red blood cells 16 units, fresh frozen plasma 16 units, platelets 4 units, and cryoprecipitate 1 unit. The patient developed pulmonary edema requiring conversion to general anesthesia. The patient's cardiovascular status was stable throughout surgery, and her lungs were mechanically

ventilated for 18 hr postoperatively in the intensive care unit. The intrathecal catheter was removed 24 hr after placement. She developed no adverse neurological sequelae and reported no postdural puncture headache. The pathology report confirmed placenta increta.

Conclusion A CSA technique may be a viable option in the event of inadvertent dural puncture during planned CSE or epidural placement in patients with a reassuring airway undergoing Cesarean delivery. Although a catheter-based neuraxial technique is appropriate for Cesarean hysterectomy for abnormal placentation, conversion to general anesthesia may be required in the event of massive perioperative hemorrhage and fluid resuscitation.

Résumé

Objectif Nous présentons la prise en charge de l'anesthésie à l'aide d'une technique d'anesthésie rachidienne continue (CSA) chez une patiente porteuse d'un placenta increta ayant subi une césarienne avec hystérectomie élective et hémorragie massive du postpartum.

Caractéristiques cliniques Une parturiente de 34 ans (G3P2) devait subir un accouchement par césarienne avec hystérectomie possible à 35⁺ semaines en raison de la suspicion d'un placenta accreta. Son indice de masse corporelle était de 21 kg·m⁻² et ses voies aériennes ne soulevaient pas d'inquiétudes. Une ponction dure-mérienne accidentelle a eu lieu au cours de la mise en place d'une anesthésie combinée rachidienne-péridurale (CSE) et la décision a été prise d'enfiler le cathéter péridural et d'utiliser une technique de CSA. Après la naissance d'un enfant vivant en bonne santé, la présence d'adhérences morbides du placenta sur le muscle utérin a été confirmée et une hystérectomie supracervicale a été réalisée. Des pertes de huit litres de sang sont survenues au cours du

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postpartum nécessitant une réanimation avec 3 800 mL de cristalloïdes, 1 500 mL de colloïdes, 16 culots globulaires, 16 unités de plasma frais congelé, 4 unités de plaquettes et 1 unité de cryoprécipité. La patiente a développé un œdème pulmonaire nécessitant le passage à une anesthésie générale. L'état cardiovasculaire de la patiente est resté stable tout au long de la chirurgie et elle est restée sous ventilation mécanique pendant 18 heures en unité de soins intensifs après l'intervention. Le cathéter intrathécal a été retiré 24 heures après sa mise en place. Elle n'a développé aucune séquelle neurologique et n'a signalé aucune céphalée postponction de la dure-mère. Le compte rendu pathologique a confirmé le placenta increta.

Conclusion Une technique de CSA peut être une option viable en cas de ponction dure-mérienne accidentelle au cours d'une CSE planifiée ou de la mise en place d'un cathéter épidural chez des patientes ayant des voies aériennes rassurantes et devant subir un accouchement par césarienne. Même si une technique neuraxiale au moyen d'un cathéter est appropriée en cas d'hystérectomie par césarienne pour emplacement anormal du placenta, le passage à une anesthésie générale peut être nécessaire en cas d'hémorragie périopératoire massive et de réanimation avec remplissage liquidien.

Abnormal placental attachment (placenta accreta, increta, or percreta) can result in severe postpartum hemorrhage and is associated with significant morbidity and mortality.¹ The incidence of abnormal placentation has increased from approximately 0.8 per 1,000 deliveries in the 1980s to 3 per 1,000 deliveries in the past decade,²⁻⁴ which is partly related to a rise in the rates of Cesarean delivery.⁵

We present anesthetic management using a continuous spinal anesthesia (CSA) technique in a patient with placenta increta who underwent an elective Cesarean hysterectomy with massive postpartum hemorrhage. In this case, the decision to use CSA as the primary anesthetic technique was due to inadvertent dural puncture during an attempted combined spinal-epidural technique. The patient gave written informed consent for publication of this article.

Case report

A 34-yr-old parturient (G3P2) with a singleton pregnancy was diagnosed by ultrasound at 35 weeks and found to have a complete placenta previa and a potential focal accreta with vascularity within the uterine wall and poor differentiation at the uterine-bladder interface. She had two prior uncomplicated Cesarean deliveries under spinal anesthesia. A Cesarean delivery with possible hysterectomy was

planned for 35⁺₃ weeks. Her body mass index, measured in the third trimester, was 21 (weight 51 kg, height 1.47 m) and her airway examination was reassuring (Mallampati class 1, normal mouth opening, thyromental distance > 6.5 cm). Admission hematologic indices were: hemoglobin (Hb) = 12.1 g·dL⁻¹, platelet count (PLT) = 132 × 10⁹·L⁻¹, international normalized ratio (INR) = 1.0.

On the day of surgery, intravenous access was obtained (peripheral intravenous cannulae, 2 × 14G and 1 × 18G). The patient received metoclopramide 10 mg *iv*, ranitidine 50 mg *iv*, cefazolin 1 g *iv* preoperatively, and a fluid preload with Hespan 500 mL (6% hetastarch in 0.9% sodium chloride; B. Braun Medical Inc., Bethlehem, PA, USA). Electrocardiography, noninvasive blood pressure, and pulse oximetry were monitored, and a radial arterial line was sited prior to anesthesia. Combined spinal-epidural anesthesia (CSE) was attempted with a 17G Tuohy needle at the L3/4 interspace. An inadvertent dural puncture occurred at a Tuohy needle depth of 4 cm. A decision was then made to introduce the 19G springwound open-tip polyurethane epidural catheter (B. Braun Medical Inc., Bethlehem, PA, USA) 4 cm into the intrathecal (IT) space, with the aim to use a CSA anesthetic technique for the case.

Intrathecal aliquots of 0.75% hyperbaric bupivacaine 1.5 mg were administered based on the patient's hemodynamic status and neuraxial block assessment. Bupivacaine 6 mg, fentanyl 10 µg, and preservative-free morphine 200 µg administered intrathecally produced a T4 sensory block to cold and sharp sensation bilaterally.

Cesarean delivery was performed through a midline skin incision followed by a classical uterine incision with delivery of a healthy infant (Apgar scores 8 and 9 at one and five minutes, respectively). Following delivery of the infant, an intravenous bolus of oxytocin 2 units was administered followed by an infusion of oxytocin 30 units in lactated Ringer's solution 1,000 mL. The surgical team confirmed placenta previa and morbid adherence of the placenta to the myometrium, and no attempt was made to remove the placenta manually. The hysterotomy was closed and a supracervical hysterectomy was performed with the adherent placenta *in situ*. After the hysterectomy, a 2-cm defect requiring surgical closure was revealed in the posterior bladder wall. Extensive pelvic bleeding occurred from the anterior and posterior vaginal walls and right utero-ovarian ligament pedicle despite no abnormal anatomic variations or intraoperative surgical complications. The volumes of intraoperative fluids infused were: lactated Ringer's solution 3,800 mL, Hespan 1,500 mL, red blood cells (RBC) 16 units, fresh frozen plasma (FFP) 16 units, adult apheresis platelets 4 units, and cryoprecipitate 1 unit (167 mL as recommended by hematology). Estimated blood loss was 8 L during the four-hour surgical procedure.

The massive transfusion was guided by hematological parameters and the surgical team's clinical observations of oozing in the operative field during the case. Hematological parameters after RBC 9 units, FFP 5 units, and platelets 1 unit (approximately one hour following delivery) were: Hb = 8.8 g·dL⁻¹, PLT = $73 \times 10^9 \cdot \text{L}^{-1}$, PT = 17.8 sec, and activated partial thromboplastin time (APTT) = 77 sec. The fibrinogen level measured at the end of surgery was 246 mg·dL⁻¹.

Surgical anesthesia was maintained with IT bupivacaine (a dose of 4.5 mg given in 1.5 mg boluses over two hours, in addition to the initial 6 mg dose to establish the block). However, 2.5 hr after the onset of surgery and following massive resuscitation, the patient developed pulmonary edema unresponsive to furosemide 40 mg *iv* (bilateral inspiratory crepitations on auscultation, elevated jugular venous pressure, respiratory rate 30 breaths·min⁻¹, SpO₂ 96–100% on oxygen 10 L·min⁻¹ via a non-rebreather face mask, heart rate 110 beats·min⁻¹, and blood pressure 145/90). Therefore, the decision was made to convert to general anesthesia. Following modified rapid sequence induction (fentanyl 100 µg, propofol 70 mg, succinylcholine 100 mg *iv*) with cricoid pressure, a Cormack-Lehane grade 1 laryngoscopic view was observed, and a 7-mm internal diameter endotracheal tube was placed. The patient remained cardiovascularly stable throughout surgery (Figure) and required no vasoactive medication. The patient remained normothermic throughout the case, and one hour following delivery, she showed signs of a compensated metabolic

acidosis on arterial blood gas analysis (pH = 7.39, PCO₂ = 30 mmHg, PO₂ = 178 mmHg, HCO₃ = 17.6 mmol·L⁻¹, base excess = -6.5), which improved with further transfusion. While the patient remained sedated with her lungs ventilated, she was transferred to the intensive care unit (ICU) where she received a further dose of furosemide 20 mg resulting in diuresis. A postoperative chest *x-ray* showed mild interstitial prominence.

The patient's trachea was extubated 18 hr after admission to the ICU. No further medications were administered intrathecally in the ICU, and analgesia was adequate with hydrocodone patient-controlled analgesia. The IT catheter was removed 24 hr after placement following confirmation of adequate coagulation status (PLT = $94 \times 10^9 \cdot \text{L}^{-1}$, INR 1.1, APTT 13.6 sec, fibrinogen 302 mg·dL⁻¹). She was transferred to the postpartum ward on day one and showed no abnormal neurological symptoms or signs following removal of the IT catheter. She reported no postdural puncture headache (PDPH) throughout her hospital admission. On day eight, the patient required a repeat cystotomy repair and adhesiolysis, and she was discharged home 16 days after her Cesarean hysterectomy. The postoperative pathology report confirmed placenta increta extending into the uterine wall.

Discussion

We describe the management of a patient with placenta increta requiring Cesarean hysterectomy using a CSA technique. Following inadvertent dural puncture and careful risk-benefit evaluation, a CSA technique was employed. This is a novel case of the utilization of a CSA technique in an obstetric patient with placenta increta who is experiencing massive hemorrhage and transfusion. In addition, this case highlights the difficulties in predicting the severity and acuity of intraoperative massive hemorrhage in patients with abnormal placentation and in selecting the preferred mode of anesthesia (neuraxial *vs* general) for managing these cases.

At our institution, CSE is the preferred anesthetic technique for cases of abnormal placentation for Cesarean delivery. Neuraxial anesthesia has a number of advantages over general anesthesia for Cesarean delivery, including avoidance of potential risks associated with airway instrumentation in a pregnant patient, reduction in blood loss,^{6,7} decreased incidence of uterine atony,⁸ participation in the childbirth experience, and improved postoperative pain control.⁹

The CSA technique has been well described in the setting of patients with cardiac disease undergoing Cesarean delivery.^{10–13} Compared with a single-shot spinal, CSA dosing facilitates slow titration of local anesthetic solution and allows maintenance of maternal cardiovascular

Figure Maternal mean arterial pressure and heart rate values during the perioperative period. bpm = beats·min⁻¹; MAP = mean arterial pressure; IT = intrathecal; GA = general anesthesia

stability. CSA provides the option for additional intraoperative dosing to maintain dense surgical anesthesia during prolonged procedures. We also considered that CSA would eliminate the uncertainty of the untested epidural catheter associated with a CSE technique. IT anesthesia is generally more reliable than epidural anesthesia and with enhanced anesthetic quality.¹⁴ Epidural anesthesia may also be associated with late block failures during prolonged surgical procedures, possibly as a consequence of tachyphylaxis to local anesthetic solution.¹⁵ However, we appreciate that block failures may also occur with IT dosing using a CSA technique.¹⁶

A potential advantage of converting an inadvertent dural puncture to a CSA technique may be the possible reduction in incidence of PDPH. Despite an expected incidence of 55–80%, our patient did not report a PDPH secondary to dural puncture with the 17G Tuohy needle.¹⁷ Intrathecal catheters left *in situ* for 24 hr following dural puncture (as in our case) may decrease the incidence of PDPH.¹⁸ The immediate effect of inserting an IT catheter following accidental dural puncture is believed to be partial occlusion of the dural tear by the catheter, which consequently decreases cerebrospinal fluid (CSF) leak. It has been suggested that the delayed effect of leaving the catheter *in situ* for 24 hr may be related to an inflammatory process that facilitates closure of the dural puncture after catheter removal. One observational study showed a statistically significant decrease in the incidence of PDPH following accidental dural puncture as a result of retaining the IT catheter *in situ* for 24 hr after delivery *vs* removing the IT catheter following delivery (6% *vs* 51%, respectively).¹⁸ However, other investigators have reported no difference in headache rate between early *vs* late removal of the IT catheter after delivery.¹⁹ The efficacy and safety of a blood patch in postpartum patients whose coagulation function may not be optimal are unknown.

Many clinicians are reluctant to utilize the CSA technique in the event of accidental dural puncture. A survey of 160 members of the Society of Obstetric Anesthesia and Perinatology²⁰ and a survey of 471 Australian anesthesiologists²¹ reported that only 25% and 35% of respondents, respectively, would place the epidural catheter intrathecally following accidental dural puncture during labour epidural placement. The results of the Australian survey suggest that the majority of members would prefer to re-site the epidural catheter due to potential risks of misuse, high block, and infection. To minimize the risk of infection, the catheter was removed as soon as it was deemed safe in terms of coagulation and platelet parameters (24 hr after placement) to obviate the potential risk of hematoma formation. Close neurologic monitoring was instituted postoperatively to help identify development of epidural hematoma on the background of massive hemorrhage and coagulopathy.

Our case highlights the dilemma that obstetric anesthesiologists face in selecting general or neuraxial anesthesia for patients with abnormal placentation undergoing Cesarean delivery.²² A catheter-based neuraxial technique can provide successful surgical anesthesia for patients with abnormal placentation. Lilker *et al.*²³ described the use of a catheter-based neuraxial technique for surgical anesthesia in 17 patients undergoing Cesarean delivery for placenta accreta. However, five patients (29%) required perioperative conversion to general anesthesia for major perioperative obstetric hemorrhage (>2 L blood loss). As shown in our case, intraoperative conversion to general anesthesia may be necessary depending on the rate and magnitude of blood loss and the hemodynamic status of the patient. Further work is necessary to compare peri- and postoperative anesthetic outcomes according to the type of suspected abnormal placentation (accreta/increta/percreta) and the respective *planned* anesthetic modality (general *vs* neuraxial anesthesia).

Massive hemorrhage can cause hypotension and organ hypoperfusion, which may result in confusion, nausea, and respiratory distress in patients undergoing procedures under regional anesthesia. In our case, intubation and ventilation were necessary during the period of major blood loss as the patient developed symptomatic pulmonary edema secondary to aggressive fluid resuscitation and transfusion therapy. In this case, the pulmonary edema was likely caused by either transfusion-associated circulatory overload (TACO) or transfusion-related acute lung injury (TRALI). Differentiating these two conditions can be difficult. The occurrence of TACO has been linked specifically with the rate and volume of plasma transfused,²⁴ whereas TRALI has been defined as acute lung injury occurring within six hours of transfusion (or up to 72 hr if delayed TRALI), which is not related to other risk factors for acute lung injury or adult respiratory distress syndrome (ARDS).²⁵ Transfusion-related acute lung injury is a phenomenon of increased permeability, whereas TACO is hydrostatic pulmonary edema, a pressure-related phenomenon. Compared with the treatment of TACO, which may be improved by diuretic administration, treatment of TRALI is supportive with the use of lung-protective strategies for mechanically ventilated patients and restricting fluid administration to decrease the amount of fluid crossing damaged pulmonary endothelia.

In conclusion, CSA for Cesarean hysterectomy may be a viable option in the event of inadvertent dural puncture during planned CSE or during epidural anesthesia in patients with a reassuring airway undergoing Cesarean hysterectomy. Although a catheter-based neuraxial technique is an appropriate primary mode of anesthesia for patients with abnormal placentation undergoing Cesarean delivery, conversion to general anesthesia may be required

in patients in the event of massive perioperative hemorrhage and fluid resuscitation. Future work is required to assess the efficacy and safety of CSA following inadvertent dural puncture as well as to use CSA as a *de novo* technique in patients with abnormal placentation.

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Competing interests None declared.

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