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CASE REPORT

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Hemorrhagic stroke following elective cesarean delivery

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ABSTRACT
We present a case of hemorrhagic stroke after cesarean delivery under combined spinal-epidural anesthesia in an 35-year-old Hispanic patient treated with anticoagulants for protein C deficiency. She required vasopressor therapy for intraoperative hypotension and developed severe headache immediately after administration. To our knowledge, this is the first case of stroke occurring in a pregnant woman following vasopressor therapy for spinal anesthesia-induced hypotension. Although the exact cause of her hemorrhagic stroke is uncertain, the hypertensive response that may have led to the hemorrhagic stroke occurred following administration of commonly used doses of vasopressor agents. We discuss the possible causes of stroke.
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Keywords: Hemorrhagic stroke; Pregnancy; Vasopressors; Ephedrine; Phenylephrine

Introduction

Hemorrhagic strokes are rare during pregnancy, but may be caused by preeclampsia and rupture of cerebral vascular malformations.[1,2] Other conditions that have been recognized as significant risk factors for pregnancy-related stroke include heart disease, smoking, non-white ethnic origin, age 35 years and older, sickle cell disease, thrombophilias, substance abuse (particularly cocaine), lupus anticoagulant, migraine headaches, anemia, and blood transfusion.[3] We describe a case of hemorrhagic stroke in a parturient following elective cesarean delivery at term under regional anesthesia.

Case report

A 35-year-old, (G4 P0) ASA 2 Hispanic female was admitted for elective cesarean delivery at 37 weeks of gestation. She was 152 cm tall and weighed 61.4 kg (BMI 26.6 kg/m^2). Three previous pregnancies had all resulted in spontaneous abortion, thought to be secondary to protein C deficiency. Her medical history was also significant for diet controlled gestational diabetes and panic disorders, which she described as anxiety attacks, with fear, palpitations and sweating. She was receiving subcutaneous unfractionated heparin 5000 units twice daily as thromboprophylaxis; she had received her last dose 24 h before this admission. She was not taking other medications or dietary supplements. Her blood pressure was 100/70 mmHg, and heart rate 92 beats/min. Blood tests showed a preoperative hematocrit of 40% and glucose 4.2 mmol/L. Clotting studies were within normal limits.

Preoperatively she received aspiration prophylaxis with 30 mL of oral sodium citrate. In the operating room, 1 L of lactated Ringer's solution was given as preload and combined spinal-epidural (CSE) anesthesia was performed in the sitting position under aseptic conditions. A 7.5-mg intrathecal injection of hyperbaric bupivacaine with fentanyl 20 μg and preservative-free morphine 250 μg was made through a 27-gauge Whitacre needle. The dose of bupivacaine was selected because of her short stature. The CSE technique was chosen to provide a back-up catheter for extending the block if necessary. Immediately after initiation of the CSE anesthetic, she was placed in the supine position with left uterine displacement and the blood pressure was recorded every 2.5 min. Within 5 min the sensory level to pin prick was at the 4th thoracic dermatome and her blood pressure decreased to 80/60 mmHg with a heart rate of 65 beats/min. A total of 15 mg of ephedrine (10 mg + 5 mg) was administered i.v. along with 500 mL of lactated Ringer's solution. The blood pressure returned to baseline levels over the next few minutes. The infant was delivered with Apgar scores of 9/9 at 1 and 5 min respectively. An infusion of oxytocin 40 units in 1 L of lactated Ringer's was started following delivery and initially she remained hemodynamically stable.

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The patient was very anxious during the procedure and intermittently complained of pressure at the surgical site. Therefore, following delivery, she received intermittent i.v. doses of midazolam (total 2 mg), morphine (total 5 mg) and fentanyl 25 μg, with good sedative effect. Estimated blood loss was 500 mL, her urine output 300 mL, and she received a total of 2200 mL of lactated Ringer's solutions during surgery.

During skin closure, the patient complained of increased discomfort at the surgical site and 3 mL of 2% lidocaine with epinephrine was administered via the epidural catheter. The epidural route was selected because 1 h 15 min had elapsed since administration of low-dose spinal anesthesia. We also planned to maintain a T10 level with the epidural medication to provide early postoperative pain relief until the onset of intrathecal morphine. Five minutes after the administration of the epidural medications, her systolic blood pressure decreased to 60 mmHg with a heart rate of 95 to 105 beats/min. Immediate repeat blood pressure measurement was unchanged. The patient was alert and did not complain of nausea, dizziness or difficulty in breathing. In addition, she had no weakness of her upper limbs, thus excluding a high spinal block. After the second low blood pressure reading intravenous ephedrine 10 mg and phenylephrine 50 μg were administered. When the blood pressure did not respond, the patient received two more doses of phenylephrine 50 μg. Within 2 min of the phenylephrine, her blood pressure increased to 180/110 mmHg with a heart rate of 75 beats/min, and she began to complain of severe headache. She was given 400 μg of sublingual nitroglycerine spray and her blood pressure decreased to 150/105 mmHg but the headache did not subside. Because of the severity of her headache, an urgent computed tomographic (CT) scan was organized.

In the post anesthesia care unit (PACU), the patient continued to complain of severe headache with blood pressures of 160/110 mmHg, and was given incremental i.v. doses of labetalol (total 20 mg) and nicardipine (total 0.5 mg) after which the blood pressure decreased to 130/85 mmHg. She remained pain-free from surgery and had a urine output of 70 mL/h.

Forty-five minutes after arrival in the PACU, while awaiting the CT scan, she exhibited altered mental status, slurred speech, left hemiplegia and facial weakness. The CT scan was performed immediately and showed a hemorrhagic stroke with an extensive external capsular bleed. The neurology service was consulted and suggested that this was a hypertensive stroke secondary to overly aggressive treatment of intraoperative hypotension. The patient was transferred to the stroke unit. An arterial line was placed for continuous monitoring of blood pressure to facilitate antihypertensive therapy, if required. She remained conscious with adequate protective airway reflexes, ventilation and arterial blood gases. She did not require antihypertensive therapy. The neurology team decided to wait six weeks before initiating anticoagulation therapy. Intermittent pneumatic compression (IPC) was applied to her calves as prophylaxis for DVT. A few months later she continues rehabilitation, with slow recovery. Subsequent CT and MRI studies were negative for cerebral vascular abnormalities or tumor.

Discussion

Risk of stroke is greater among pregnant than among non-pregnant women. Webers et al.[4] found the increase to be 13-fold. This is not surprising since oral contraceptives containing estrogen increase the risk of stroke two-fold.[5] Pregnancy is also associated with elevated levels of estrogen, as well as altered hemodynamics. Thrombotic strokes are more likely in pregnancy, but pathological states such as preeclampsia may predispose to hemorrhagic stroke.

Although the exact cause of this patient's hemorrhagic stroke is uncertain, it is unlikely to be due to her protein C deficiency. She received thromboprophylaxis with standard heparin but her last dose was 24 h before surgery and her coagulation screen was within normal limits at the time of surgery. Within a few minutes of receiving relatively modest doses of ephedrine and phenylephrine to treat profound hypotension her blood pressure dramatically increased and she started complaining of severe headache. Because of this timeline, the possibility that her stroke was related to the use of vasopressors and the ensuing period of hypertension must be considered. Her blood pressure returned to normal within several hours and she never developed signs and symptoms of preeclampsia.

There is one published case report of hemorrhagic stroke in association with 10 mg of i.v. ephedrine during surgery and anesthesia.[6] There are also case reports of intracerebral hemorrhage and acute cerebral arteritis associated with ephedrine abuse,[7] and after consuming dietary supplements containing ephedra alkaloids.[8] Excessive quantities of ephedrine (150 mg daily), as seen in drug abuse, may predispose to both hemorrhagic and ischemic strokes.[9] Subarachnoid hemorrhage can be caused by either the hypertensive action of ephedrine or by vasculitis seen with many sympathomimetic drugs although the latter is unlikely in this case.[10]

The reason for the dramatic drop in blood pressure after the epidural dose is not clear. Accidental intrathecal injection of local anesthetic was excluded by the lack of an upper extremity block. Intravascular injection of 60 mg of lidocaine is unlikely to have caused such a dramatic drop in blood pressure and examination of the partially used syringes ruled out a drug error. The patient was adequately hydrated and had a good urine