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CASE REPORTS

Refractory status epilepticus after inadvertent intrathecal injection of tranexamic acid treated by magnesium sulfate

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ABSTRACT
We present a case of accidental injection of tranexamic acid during spinal anesthesia for an elective cesarean delivery. Immediately following intrathecal injection of 2 mL of solution, the patient complained of severe back pain, followed by muscle spasm and tetany. As there was no evidence of spinal block, the medications given were checked and a 'used' ampoule of tranexamic acid was found on the spinal tray. General anesthesia was induced but muscle spasm and tetany persisted despite administration of a non-depolarizing muscle relaxant. Hemodynamic instability, ventricular tachycardia, and status epilepticus developed, which were refractory to phenytoin, diazepam, and infusions of thiopental, midazolam and amiodarone. Magnesium sulfate was administered postoperatively in the intensive care unit, following which the frequency of seizures decreased, eventually stopping. Unfortunately, on postoperative day three the patient died from cardiopulmonary arrest after an oxygen supply failure that was not associated with the initial event. This report underlines the importance of double-checking medications before injection in order to avoid a drug error. As well, it suggests that magnesium sulfate may be useful in stopping seizures caused by the intrathecal injection of tranexamic acid.

Keywords: Cesarean section; Spinal anesthesia; Tranexamic acid; Magnesium; Medication error

Introduction

Several factors have been identified as contributing to medication errors in anesthesia, including similar appearance or location of vials, miscommunication, anesthesia provider inattention, and fatigue.[1–3] While the true frequency of anesthesia-related medication errors is unknown, these errors are an increasing global health problem.[1–3] We describe the accidental intrathecal tranexamic injection in a low-resource setting that resulted in seizures that were refractory to standard therapy. Subsequent management and use of magnesium sulfate is discussed along with the initiation of a new operating room protocol for drug administration in an attempt to minimize the risk of this complication.

Case report

A 31-year-old, G3P2 woman was admitted to a West African regional hospital at 33 weeks of gestation with premature rupture of membranes and pyelonephritis. She had no significant past medical, obstetric or anesthesia history other than two previous cesarean deliveries. She was treated with erythromycin and metronidazole. Two doses of steroids were administered for fetal lung maturity. Two days after admission, she developed abdominal tenderness and intravenous cefuroxime was started. The patient was scheduled for repeat cesarean delivery eight days after admission due to worsening pyelonephritis.

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She received intravenous lactated Ringer's solution 1 L before arriving in the operating room. An anesthesia technician was assisting the nurse anesthetist providing care for the case. The technician opened a glass vial of medication and held it away from the sterile field while the nurse anesthetist drew up 2 mL of solution. Lumbar puncture was performed with the patient in a sitting position, at the L4–5 interspace with a 25-gauge Whitacre needle. Shortly after injection, the patient complained of severe burning back pain, followed by lower extremity spasms and difficulty in lying supine due to tetany. After failure to achieve anesthesia, the team prepared to repeat the intrathecal injection at which point an opened vial of tranexamic acid was discovered (100 mg/mL) (Fig. 1). The consultant anesthesiologist was notified and a second spinal was not attempted. General anesthesia was induced with propofol 150 mg and suxamethonium 100 mg; the patient was intubated and anesthesia maintained with an uncharted dose of volatile anesthetic. Due to ongoing myoclonus and tetany, vecuronium 4 mg was administered shortly after induction. The patient remained tachycardic and hypertensive with heart rates of 120–150 beats/min and a blood pressure of 165/105 mmHg throughout the case with occasional short intervals of ventricular tachycardia. Treatment with amiodarone 150 mg, midazolam (dose unknown), diazepam 10 mg, and labetalol 20 mg were unsuccessful in treating the tachycardia and hypertension or terminating seizures.

A live, male infant was delivered weighing 1.6 kg with Apgar scores of 7 and 8 at 1- and 5 min, respectively. The case was completed within one hour of the initial intrathecal injection and the patient, who remained intubated and ventilated, was taken to the intensive care unit whilst receiving midazolam (2 mg/h), 10% mannitol 100 mL/h, amiodarone (unknown rate), and fentanyl 200 μg/h. Upon arrival, her heart rate was documented at 164 beats/min and blood pressure 225/164 mmHg. She continued "twitching" per handwritten charts and was treated with vecuronium 4 mg, thiopental 150 mg followed by phenytoin 100 mg eight hourly, dexamethasone 8 mg eight hourly, vecuronium 10 mg/h, thiopental 500 mg/h and pethidine 50 mg four hourly. Laboratory values obtained showed a hemoglobin value of 12.6 g/dL, white blood cell count of 21.1×10^9/L, and a platelet count of 356×10^9/L.

Fig. 1 Ampules of bupivacaine and tranexamic acid. The similar size of ampules led to a medication administration error during spinal anesthesia

Her vital signs remained unstable throughout the evening requiring placement of a radial arterial line and a central venous line. There were repeated bursts of ventricular tachycardia that spontaneously converted to sinus rhythm without medical intervention. Seizure activity continued despite intravenous boluses of diazepam, dexamethasone, and phenytoin and infusions of midazolam, fentanyl, mannitol, vecuronium, and thiopental. As she had ongoing seizure activity, despite antiepileptic or benzodiazepine boluses, the vecuronium and thiopental infusions were discontinued.

On postoperative day two, the anesthesiologist ordered magnesium sulfate (4 g bolus) followed by an infusion of 1 g/h. This had an immediate effect of reducing the seizure frequency. Within hours, the seizures terminated altogether and the patient was able to open her eyes and move all of her extremities as well as make independent respiratory effort while on the ventilator. Midazolam and fentanyl infusions were gradually decreased and boluses of these two drugs were only used as needed. A serum magnesium level was ordered but the result was never obtained.

While showing many signs of clinical improvement without seizure activity such as purposeful movement in her extremities, eye opening, and respiratory effort, the patient remained in the intensive care unit on mechanical ventilation due to need for continued respiratory support. Unfortunately, on day three the main oxygen supply of the hospital stopped working and the patient desaturated and went into cardiopulmonary arrest. As the oxygen issue was being resolved, and she was pronounced dead.

Discussion

In our case, an accidental injection of tranexamic acid, instead of bupivacaine, for spinal anesthesia led to refractory seizure activity. Factors thought to be responsible for the mistake were human error and the fact that the two vials were of similar size and color.

This case is an example of a mistake occurring in a low-resource setting due to human error and the lack