Inadvertent administration of potassium chloride in the epidural space: How to prevent the inevitable

Madam,

We describe the successful management of a 71-year-old female, who had been accidently administered potassium chloride injection into the epidural space. The patient had a history of ovarian carcinoma and malignant ascites. She was scheduled to undergo exploratory laparotomy with total hysterectomy, omentectomy, and lymph node dissection. Significant medical history included hypertension, and routine preoperative laboratory investigations were grossly normal.

On the scheduled day of surgery, she was given general anesthesia, and an epidural catheter was placed in lumbar 1/2 space for postoperative analgesia. She was monitored in the surgical intensive care unit (ICU), postoperatively. On day 2, she had sudden onset of anxiety, profound sweating, and palpitations. She also complained of severe cramping pain in lower limbs and the perineal region accompanied by severe tachycardia and hypertension. Quick survey revealed that the nurse had attached potassium chloride infusion, ordered to be given intravenously to the epidural catheter. Approximately 15 mEq of KCl had gone into the epidural space. She complained of decreased sensations and weakness of lower limbs, followed by complete paraplegia. The cramping pain, however, remained in the perineal region.

Immediately, the epidural catheter was flushed with 20 mL of normal saline, in 5 mL boluses. Injections methylprednisolone 80 mg and hyaluronidase 1500 U were also injected into the epidural space to reduce nerve inflammation and damage. In addition, two boluses of injection ropivacaine 0.2%, 5 mL each, were given through epidural catheter, to reduce the pain, followed by a continuous epidural infusion of ropivacaine 0.2% at 5 mL/h.

The pain subsided after sometime, but hypertension and tachycardia persisted along with ventricular ectopics. Simultaneously, titrated boluses of injection labetalol were given to control heart rate and blood pressure, followed by labetalol infusion. Injections midazolam and fentanyl were also given intravenously for anxiolysis and sedation, followed by continuous infusion of injection dexmedetomidine. Injections pheniramine maleate and hydrocortisone were also administered intravenously to the patient an hour later. Gradually, she became calm and her vitals settled and her electrocardiography (ECG) also became normal. A couple of hours later, she regained sensations and motor power of lower limbs, and her cramping pain was gone. A day later, she did not reveal any signs of residual neurological deficit. The rest of the hospital stay of the patient was unremarkable and she was discharged on the sixth post-operative day.

Inadvertent administration of non-epidural medications into the epidural space has been associated with serious morbidity and mortality. Effects may be temporary or permanent, ranging from paraplegia to quadriplegia, bladder/bowel incontinence, paraparesis or sensory deficit of a region, severe pain and sympathetic stimulation which further may cause hemodynamic instability. In the present case, KCl in the epidural space initially caused severe pain in the lower limbs, which is caused due to the irritation of nerve roots because of hyperosmolar solution. Neurological deficit, which followed, might be caused by high extracellular concentration of K⁺ ions. In addition, K⁺ potentiates depolarization of sympathetic neurons, causing sympathetic stimulation leading to autonomic dysfunction (tachycardia and hypertension).

There is no proven effective treatment to reverse the harmful effects of epidural potassium chloride. Saline 0.9% used in case of accidental epidural injection of potassium actually raised the level of sensory blockade. However, many authors have successfully used saline or distilled water injection into the epidural space, which accelerates the systemic absorption of unwanted drug, by volume effect, limiting neural damage. Steroids have been used, both intravenously and epidurally, to reduce inflammatory response and suppress spinal cord irritation. Epidural hyaluronidase aids the dispersion of the solution and reduces local concentration of the available drug. Symptomatic treatment includes the use of antihypertensive drugs, benzodiazepines and opioids for anxiolysis, epidural local anaesthetic to reduce pain, and finally, resuscitative measures to support the airway and hemodynamics.

With no definitive treatment available and the potential for morbidity and mortality, prevention is paramount. Several steps can be taken to prevent epidural/intravenous line confusion, such as placement of intravenous pumps and epidural pumps on opposite sides of the patient’s bed, properly labelled epidural pumps and tubings, or the use of different make of pump and infusion tubing for epidural use.

Declaration of patient consent
The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients...
understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest
There are no conflicts of interest.

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