

Accidental injection of succinylcholine into epidural space as a test dose

ABSTRACT

Inadvertent injection of nonepidural drugs into the epidural space is a rare situation, which is under-reported, and can lead to serious complications, such as cardiovascular and respiratory complications, paraplegia, or quadriplegia, and can worsen the patients' outcome from surgery. Succinylcholine administered epidurally leads to the appearance of fasciculation and shortness of breath and can prolong neuromuscular blockade. We report a case of accidental administration of 100 mg of succinylcholine via an epidural catheter as a test dose instead of 2 ml 0.5% bupivacaine in a patient planned for major abdominal surgery. After 2 min, the patient complained of shortness of breath; dysarthria; and fasciculation in the trunk, upper limbs, and face. This was managed with induction to general anesthesia (GA). In the postoperative period, no neurological or cardiovascular complications were observed. There is no adequate drug as an antidote of accidentally given nonepidural drugs via an epidural catheter. Succinylcholine given via epidural catheter has been shown to prolong neuromuscular blockade. Proper labeling and storage of syringes are of utmost importance for avoiding these unpleasant situations.

Key words: Accidental administration; epidural catheter; succinylcholine

Background

Epidural anesthesia involves injecting a small amount of anesthetic into the epidural space of the spine. The anesthetic numbs the spinal nerves and blocks the pain signals. Accidental injection of muscle relaxants into the epidural space as a test dose is very rare and an under-reported complication, and it can be associated with serious complications.^[1] We report a case of inadvertent injection of 100 mg succinylcholine into the epidural catheter as a test dose. This was characterized by the presence of spasms initially located at the trunk and then expanded in the upper limbs and face.

Case Report

A 61-year-old male patient, weighing 65 kg, was scheduled for removing carcinoma of the gastric cardia with history of type 2 diabetes mellitus (DM) and was American Society of Anesthesiologists (ASA) class II. Premedication of 5 mg diazepam was given 1 h before the surgery and the glucose level was 9.5 mmol/L. We placed one large intravenous (IV) catheter with a 500 ml crystalloid solution, and 2 mg of midazolam was given intravenously. In left lateral position, we performed thoracic epidural anesthesia at the level Th7–Th8.

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The patient was in supine position when a test dose of 2 ml 0.5% bupivacaine was given epidurally. After 2 min, the patient started to complain of shortness of breath, dysarthria, and muscle spasms, which looked like fasciculation and showed in the thoracic part of the trunk, upper extremities, and face. We immediately proceeded to induction to general anesthesia (GA) with additional 1 mg midazolam, lidocaine 1 mg/kg, fentanyl 0.002 mg/kg, propofol 2 mg/kg, and succinylcholine 75 mg for rapid sequence induction. After tracheal intubation rocuronium, bromide 0.8 mg/kg was given intravenously and anesthesia was maintained with continuous IV infusion with propofol 0.2 mg/kg/min combined with additional boluses of rocuronium bromide and fentanyl as required. We checked the 2 ml syringe which had the test dose of 2 ml 0.5% bupivacaine. It was labeled only with empty patch for epidurals and placed where we usually put epidural test dose syringes. However, in the table where we keep the syringes, we found two empty ampoules of succinylcholine. We assumed that we gave 100 mg of succinylcholine as a test dose via epidural catheter and after that, we intravenously gave 75 mg succinylcholine. The epidural analgesia was continued with bolus doses of bupivacaine. After the extubation, the patient stayed for 3 h in the recovery room. He was hemodynamic stable, without any persistence of muscle weakness, pain, or sensory or motor blockade. After 3 h, a neurological assessment was done by the specialist and the patient showed no signs of neurological alterations.

Discussion

Local anesthetics,^[2] opioids (morphine^[3] and fentanyl^[4]), and corticosteroids can be injected via the epidural catheter.^[5] Accidental injection of non-epidural drugs into the epidural space has been associated with severe hypotension, burning pain on injection, respiratory insufficiency requiring intubation, prolonged neuromuscular blockade, tachycardia and hypertension, motor and sensory block, bladder and bowel incontinence, generalized convulsion, severe pruritus and hyperalgesia, headache, and vomiting.^[2] Sometimes, it can be associated with serious morbidities, such as paraplegia or quadriplegia and sensory change.^[6]

Succinylcholine is the only depolarizing muscle relaxant and works via the stimulation of nicotinic receptors in parasympathetic and sympathetic ganglia.^[7] Paralysis proceeds from the small, distal rapidly moving muscles to the proximal, slowly moving muscles. The diaphragm is one of the last muscles to relax. Given intravenously, muscle relaxation occurs in just 30 sec with total paralysis in 45 sec, and the duration of action lasts 7–10 min. Succinylcholine

given as an intramuscular injection had adequate intubation conditions at 3–4 min.

In this case report, our patient complained of shortness of breath, dysarthria, and muscle spasms, which looked like fasciculation, 2 min after epidural administration of 100 mg of succinylcholine in the thoracic part of the trunk, upper extremities, and face. In addition, 75 mg of succinylcholine was given intravenously for rapid sequence induction, without knowing that accidentally we gave 100 mg succinylcholine via epidural catheter. The total amount of rocuronium given intravenously during surgery was 70 mg, which indicates the prolonged neuromuscular blockade from succinylcholine given via epidural catheter. The rate of absorption of succinylcholine from the epidural space is unknown. The onset time may be estimated to be between that of an IV and intramuscular bolus, supposing the fact that the epidural space is rich in venous plexuses and with that are important routes for the uptake of drugs that are administered via epidural catheter into the plasma.^[1] The treatment of this unpleasant situation depends on the complaints of the patient, the type of drug, and the dose of the drug that is given via the epidural catheter.^[2] An inadvertent epidural injection can be managed by aspiration of the epidural catheter, flushing with saline or distilled water, or insertion of a second epidural catheter for the lavage of the epidural space.^[6] It has been shown that local anesthetic via the epidural space and corticosteroids given intravenously or via epidural catheters cannot minimize the risk of an adverse outcome and sometimes they can worsen the situation.^[6]

Also, in our case, the main problem was an unlabeled syringe that was stored in the usual place where we kept epidural test dose syringes. In our hospital, epidural test dose and succinylcholine are prepared in a 2 ml syringe, and now the standard of practice include double-checking while preparing the drugs.

There are a few cases in the literature reporting inadvertent giving of succinylcholine into the epidural space. Sofianou *et al.* in their case reported a prolonged onset and a longer duration of neuromuscular blockade compared with IV administration of succinylcholine.^[7] Pourzitaki *et al.* reported the administration of 125 mg of succinylcholine during combined spinal and epidural anesthesia without any neurological or cardiovascular complications during the postoperative period.^[8] They reported that diazepam taken orally can lessen the adverse effects of accidental epidural administration of succinylcholine.

In conclusion, of utmost importance is proper labeling of syringes, placing them in the right place, and unlabeled syringes must be discarded and double-checked with a nurse or another anesthetist. Inadvertent administration of succinylcholine through the epidural catheter can be without complications and prolong neuromuscular blockade; however, sometimes, serious morbidity can occur and worsen the outcome for the patient.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his 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

All authors disclose all conflicts of interest they may have with the publication of the manuscript or an institution or product that is mentioned in the manuscript and/or is important to

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