Case Report

Segmental thoracic anesthesia for transabdominal colectomy with spontaneous ventilation through combined spinal-epidural block. Case Report with video

Abstract

Introduction: The combined spinal-epidural (CSE) technique offers advantages over the epidural or single injection spinal anesthesia alone. Assessing the distance between the dura mater and the spinal cord in the thoracic region with magnetic resonance imaging showed that there is a large space that allows the needle to enter without reaching the spinal cord. Segmental thoracic spinal anesthesia is being used in several types of surgery.

Case report: A woman aged 73 years, 64 kg, 163 cm, physical status ASA II, type II diabetic, with systemic arterial hypertension, was scheduled for resection of a tumor in the right colon. The CSE was placed at the T9-T10 interspace and 10mg 0.5% hyperbaric bupivacaine was injected into the subarachnoid space. The epidural catheter (20G) was then inserted four centimeters. Sedation was obtained with 1mg of midazolam as needed (total 5mg). Two hours after 0.5% bupivacaine had to be administered in a bolus of 25 mg through the catheter. There was no necessity for the use of vasopressor drugs or atropine.

Conclusion: This case has provided evidence that segmental spinal anesthesia can be an effective anesthetic technique for gastrointestinal surgery with spontaneous ventilation, and the infusion of 0.1% bupivacaine with an elastomeric pump provided 40 hours of analgesia.

Keywords: Thoracic spinal anesthesia, Combined epidural spinal block, Local anesthetic bupivacaine, Abdominal surgery, Elastomeric pump.

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Introduction

Studying the thoracic spine through magnetic resonance imaging (MRI) between the distance from the dura mater and spinal cord, at three levels (T2, T5, T10) in adults (in 2010) and children aged 1 to 13 years (2013) showed that there is a larger space in T5 compared to T2 and T10.[1,2] In adults, the mean posterior dural-spinal cord distance was at T2 equal to 3.9 mm, at T5 equal to 5.8 mm and at T10 equal to 4.1 mm.[1] The children's mean posterior dural-spinal cord distance at the three levels was T2 equal 4.52 mm, T5 equal 5.61 mm and T10 equal 4.68 mm.[2] Practically in children and adults there is an important space between the dura mater and the spinal cord to protect against causing injury during access to the subarachnoid space. These studies allowed the performance of thoracic spinal anesthesia for several procedures, without neurological sequelae studying 1,406 patients, at different puncture levels, with two puncture positions (lateral and sitting), and with two types of needles, pencil tip and cutting tip.[3]

Combined spinal-epidural technique (CSE) offers advantages over epidural or single injection spinal anesthesia alone. This technique consisted of inserting of a fine needle into the epidural space, and after injecting the local anaesthetic, pushing a needle into the subarachnoid space to administer further local anaesthetic. Spinal anesthesia provides fast and reliable segmental anesthesia with minimal risk of toxicity whereas epidural anesthesia provides perioperative anesthesia alone or in combination with general anesthesia, followed by excellent analgesia in the postoperative period, is widely used in orthopedic, urologic, gynecologic surgery, and obstetric.[4] The objective of this case report is to show that segmental thoracic anesthesia using the CES technique, with the thoracic injection of local anesthetic and the introduction of a catheter for supplementation and postoperative analgesia, with spontaneous breathing in colon surgery, and with a video confirming the safety of the technique (**Figure 1**).

Figure 1 Video showing this from the CSE puncture to the right colectomy.

(**Tap on the Video and it will open. OK.**)

Case report

A woman aged 73 years, 64 kg, 163 cm, physical status ASA II, with type II diabetes controlled with diet, systemic arterial hypertension controlled with medication (losartan 10 mg), smoker of a pack of cigarettes for more than 40 years, admitted for resection of a tumor in the right colon. The diagnosis made by colonoscopy revealed an infiltrative lesion in the hepatic angle of the colon, a sessile polyp of the transverse colon. The patient had a history of hysterectomy performed with spinal anesthesia, and appendectomy with general anesthesia, both without any complications.

Fasting was shortened with 300 ml of maltodextrin orally, 3 hours before being taken to the operating room. This case report is part of the protocol for the application of Accelerating total postoperative recovery (ACERTO) was approved by the Research Ethics Committee (No. 171,924) and registered on Platform Brazil (CAAE: 09061312.1.0000.5179). After signing the informed consent form and a detailed explanation of the anesthetic technique for the patient and her family, resection of the tumor under anesthesia using the CES technique was indicated. Laboratory tests revealed red blood cells 4,350,000/mm^3, hemoglobin 11.7 g/dL, hematocrit 38%, platelets 175,000/mm^3, prothrombin time 14 s, PTT 74%, and INR 1.3. ECG was within the normal range for the age, and chest radiological examination did not show any pathology. All other laboratory findings were within normal range.

After monitoring with continuous ECG in CM5, pulse oximetry and NIBP, a peripheral vein access with 18G extracath, started with 500 ml of lactate ringer solution was infused with the following medications ranitidine (50 mg), omeprazole (40 mg), dexamethasone (10 mg), ondansetron (8 mg), and metoclopramide (10 mg). After sedation with 50µg of fentanyl and 1mg of midazolam, the patient was placed in the left lateral decubitus position and antisepsis was performed with 70% alcohol. Local anesthesia was performed with 1% lidocaine, initially with a 1ml insulin needle and later with 3ml with a 27G needle of the T9-T10 interspace structures. The CES block was performed with a needle-in-a-needle set (Espocan®), with the epidural (18G Huber point) and spinal needles (27G Quincke type) were inserted without discomfort and a free flow of cerebrospinal fluid (CSF) obtained before injection of 10mg of 0.5% hyperbaric 0.5% bupivacaine and the 20G catheter was inserted into the epidural space. The permeability of the catheter was tested with 3ml of 2% lidocaine. Within 10 min a segmental sensory (pinprick) block, extending between the third thoracic and first lumbar dermatomes, was obtained and the motor block of legs was grade 1. The patient received oxygen 2 l/min in combination with the collector tube of the capnograph was placed at the nostril of the patient and exhibited the capnogram, and $EtCO_2$ all the time. Due to surgery under spinal anesthesia, a nasogastric tube was not placed, as the patient was only sedated. A bladder catheter was also not used to control diuresis.

Hemodynamic parameters were stable during all the time and the patient received and infusion of 1,200 ml of ringer lactate, 500 ml of voluven® (6% hydroxyethyl starch 130/0.4 in 0.9% sodium chloride injection). Two hours after the spinal injection of 0.5% hyperbaric bupivacaine, before any painful complaints, 25mg of 0.5% bupivacaine was injected through the epidural catheter, making a total of 35mg of 0.5% bupivacaine. The surgery lasted 3 hours and sedation was performed with fractionated doses of midazolam (total 5 mg). At the end of the surgery, tenoxicam 40mg and dipyrone 3g were administered in the last 100 ml of lactate ringer. SpO_2 assessment throughout the procedure was between 96% and 100% and $EtCO_2$ between 33 and 36 mmHg.

After the end of the surgery and before its discharge to the intensive care unit (ICU), a disposable elastomeric pump (Easypump®) containing 400mL of 0.1% bupivacaine was connected to the catheter, and the pump was programmed for infusion at a rate of 10 ml/h. The patient recovered in the ICU without any motor block, to control postoperative pain with the elastomeric pump. On the second day of surgery, after 40 hours with the end of the infusion of 0.1% bupivacaine through the elastomeric pump, the catheter was removed without any sign of infection.

In a previous study MRI, the distance between the dura mater and the spinal cord in a female patient was evaluated in the thoracic segments of T2, T5 and T10 (Figure 2).

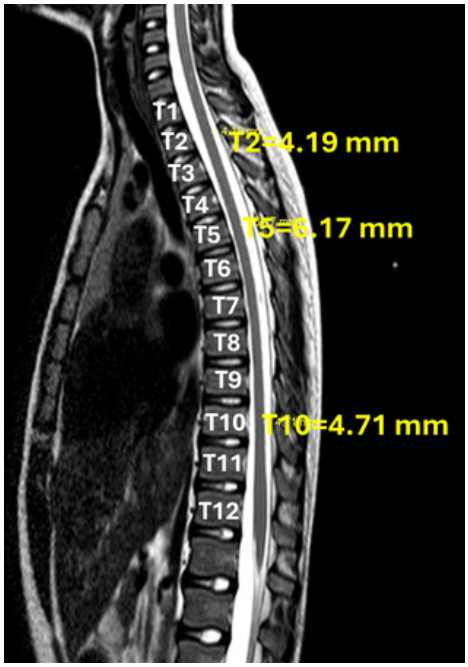

Figure 2 Distance between dura mater and spinal cord with MRI.

Discussion

CSE block provides advantages including rapid onset (spinal anesthesia), profound neuroaxial block, the ability to titrate or prolong blockade (epidural catheter), and lower total drug dosage (35mg 0.5% bupivacaine). All these advantages were observed in this case, with sufficient relaxation to perform transabdominal colectomy, sufficient levels of analgesia (T3 to L1), mild motor blockade of the lower limbs, and cardiocirculatory stability, without side effects. Both oxygen saturation and exhaled CO_2 analysis were within normal limits.

The spinal cord contains two anterior roots and two posterior roots, anteriorly presenting the anterior horn of a sensory nature and posteriorly presenting the posterior horn of a motor character.[5] The use of hyperbaric, isobaric, or hypobaric solutions in the subarachnoid space has shown that each solution has its own onset time, spread, sensitivity and motor block duration.[6] Hyperbaric local anesthetic solutions injected either in the sitting position or in the lateral decubitus position and immediately placed in the supine position, will privilege the posterior roots, providing a sensory block that lasts longer than the motor block.[6] In the present case, the use of 10mg of 0.5% hyperbaric bupivacaine at TSA provided a sensory block that allowed surgery to last 2 hours, with a mild degree of motor block of the lower limbs, confirming that there was a blockade mainly of the posterior roots to the detriment of the motor roots.

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Measurement of the space between the dura mater and the thoracic spinal cord in MRI scans in one woman out of 50 patients showed values of 4.19 mm in T2, 6.17 mm in T5 and 4.71 mm in T10, as shown in Figure 2. This space allows the entry of a cutting needle that has a terminal hole at its tip, whereas the orifice of the pencil needle starts at 1.25mm and corresponds to another 0.75mm until its end, thus requiring the needle to be inserted more than 2mm, within the subarachnoid space for CSF return.[3] In the case of the CSE technique, the set with a needle inside the needle was used, with a hole at the tip of the epidural needle (Huber) and the spinal anesthesia needle was the cutting tip, with no paresthesia occurring during its insertion. The insertion of the epidural catheter went without any problems. Recently, the Italian group introduced continuous thoracic spinal anesthesia without complications with the catheter and spinal cord.[7]

In a study comparing it with spinal anesthesia, the CES block offers flexibility because the duration of anesthesia can be extended with the help of the epidural catheter. This was demonstrated by injecting just one dose of 0.5% bupivacaine (25mg) through the catheter, approximately two hours after the start of the procedure. Subsequently, the epidural catheter was used to infuse 0.1% bupivacaine with the aid of an elastomeric pump, with 40 hours without pain, a result like another study with blockade of the femoral and sciatic nerves.[8] Portable pumps are increasingly being used in continuous regional anesthesia. If the elastomeric pump lies below the catheter tip, the delivery of the agent can be impaired by up to 15%. The pump was placed on the bed next to the patient and demonstrated that she received adequate analgesia through the epidural catheter. The elastomeric pump has several advantages over the electronic pump, including portability, ease of use, and a few technical problems, such as undesirable alarms.[9]

General anesthesia with or without neuromuscular blocker leads to decreased capacity functional residual. Residual neuromuscular blockade is a predictor of postoperative pulmonary complications, causing alveolar hypoventilation and gastric regurgitation with consequent broncho aspiration. Significant loss of muscle power and reduced pulse oximetric saturation are often present despite a TOF-Ratio > 0.9.[10] The advantage of segmental spinal anesthesia is it provides muscle relaxation, which allows surgery to be performed without the use of a neuromuscular blocker. This was shown in two studies with different types of surgical and laparoscopic cholecystectomy procedures.[3,11]

A systematic review of 37 trials showed that routine use of nasogastric tube decompression after abdominal operations, rather than speeding recovery, may slow recovery down and increase the risk of some postoperative complications.[12] In this case, the nasogastric tube was not used, and nausea and vomiting did not occur. Most patients find bladder catheterization invasive, undignified, and uncomfortable, in addition to posing risks of urinary tract infection and compromise several types of surgery.[13] The occurrence of urinary retention is believed to be secondary to the prolonged motor block seen with lumbar spinal anaesthesia. In this case, segmental thoracic spinal anesthesia provided a grade 1 motor block at the beginning of the surgery and no motor block at the end of the surgery. The procedure planned for this type of surgery included an abbreviation of fasting, restrictive hydration, and the use of 500 ml of colloid, with a final total of 1,700 ml of hydration, with no need for bladder catheterization.[14]

TSA was used at the beginning of the early 20th century to perform surgeries in the neck, mouth, and chest, showing that the middle thoracic region is more difficult to access concerning high and low thoracic levels.[15] Recently the narrative review well defined the role of thoracic spinal anesthesia in the 21st century, opening a wide range of possibilities for different surgeries to be performed using this type of anesthesia.[16] Spinal anesthesia has several advantages compared with general anesthesia.

Conclusion

In 1939, the authors began the article "*spinal anesthesia in abdominal surgery*", saying that spinal anesthesia has been developed to a degree has proven its usefulness.[17] TSA is already well established in the first quarter of this century, with different studies in different countries. In the same way delete that the CES block is indicated for different types of surgery and is the gold standard for labor analgesia. This case demonstrated that segmental thoracic anesthesia performed through the CES can be an effective technique for colorectal operation without upper airway handling, and without the need for a nasogastric tube and urinary catheter. Oxygen enrichment and CO_2 capture, in one way, allowed values to be kept within normal limits. There was no need to use vasopressors. The use of an elastomeric pump with a 0.1% bupivacaine solution through the epidural catheter provided pain relief for 40 hours.

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Conflict of interest

None.

Contribution

None.

IRB

None.

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