CERVICAL EPIDURAL ANESTHESIA FOR TREATMENT OF BILATERAL HUMERAL FRACTURE IN BEACH CHAIR POSITION. CASE REPORT

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ABSTRACT
Fractures of the proximal humerus are uncommon in young patients. We found some cases of bilateral humerus fracture due to trauma, including an 18-month-old child. However, in none of these cases was reported the type of anesthesia used when operated. Choosing the safe anesthetic technique is an essential prerogative of the anesthesiologist. Depends on age, pre-existing systemic diseases and type of surgery. Administration of local anesthetic into the cervical epidural space results in anesthesia of cervical plexus, brachial plexus and superior thoracic dermatomes. We report a rare case of bilateral traumatic displaced proximal humerus fractures in a 34 years old male, conducted with epidural cervical anesthesia. In this case cervical epidural anesthesia performed with a catheter providing high-quality anesthesia and postoperative analgesia for more than 24 hours and no need for blood replacement.

KEYWORDS: Anesthesia, epidural; Anesthetics, local; Analgesia, epidural; Pain, postoperative; Orthopedic, bilateral humeral fracture.
INTRODUCTION
In a recent systematic review of cervical epidural anesthesia (CEA), was used for various types of surgeries involving head and neck, airway, oral-pharyngeal-hypopharyngeal, thyroid, breast, shoulder, upper limb, hand and thoracic surgeries.\textsuperscript{[1]} The ECA results from superficial cervical plexus block (C1-C4) and brachial plexus block (C5-T1/T2), being indicated for surgery, treatment of postoperative pain or chronic pain treatment.\textsuperscript{[1]} The approach to the epidural space at the C7-T1 interspace is not technically difficult. Patients are placed in the sitting position, increasing the negative pressure in the epidural space, with the head flexed on the thorax, in order to open the lowest cervical interspace. Administration of local anesthetic into the cervical epidural space results in anesthesia of cervical plexus, brachial plexus and superior thoracic dermatomes. Additional advantages are lower cost, reduced intraoperative blood loss, stable cardiovascular status, reduced stress response, post-operative analgesia and early ambulation of the patient.\textsuperscript{[2]} We selected this technique of CEA for correction of bilateral humeral fracture in order to avoid bilateral brachial plexus block which would require a large volume of local anesthetic.

CASE REPORT
A 34-year-old man (height 1.70m, weight 70kg, ASA I) was admitted with bilateral humeral fracture. Upon physical examination of the both upper limb, there was no lesion of the radial nerve. Chest X-ray, ECG, and all routine investigation results were within normal limit. We obtained informed consent and discussed throughout the anesthetic technique with the patient and family. As part of the program Acerto, the patient took a single 200 mL carbohydrate drink orally (12.5% dextrinomaltose) two hours before surgery.

On arrival to the operation theatre, intravenous line was secured with 18G cannula and Lactated Ringer solution and 500 ml 500 mL of 6% hydroxyethyl starch 130/0.4 in 0.9% sodium chloride solution (Voluven®) was started. Before induction of ECA, electrocardiogram (ECG), oxygen saturation (SpO\textsubscript{2}), noninvasive blood pressure (NIBP) and heart rate (HR) were monitored continuously throughout the intraoperative period.

After sedation with fentanyl (100 µg) and midazolam (1 mg) intravenously the patient was placed in the sitting position. The spine of the C7 vertebra is identified, and cleaning the skin with chlorhexidine and removal of excess. The skin and subcutaneous tissue in C7 and T1 intervertebral space is infiltrated with 1% lidocaine. An 18G Tuohy needle (Perifix® B.Braun Melsungen) is inserted in the C7-T1 interspace perpendicular to the skin, identified using
hanging drop technique. After negative aspiration of blood, 7.5 mL of 0.5% bupivacaine and 7.5 mL of 2% lidocaine plus epinephrine 1:200,000 were injected through the extension connector of the needle. An epidural catheter is guided through the Tuohy needle and advanced. Four centimeter of the catheter is left inside the space. The patient is placed in supine position and oxygen was given by nasal cannula at the rate of 3 L/min and monitored continuously and evaluated the parameters every 5 minutes. The level of sensory block was tested bilaterally (defined as loss of sensation to pinprick) in an ascending fashion starting from the T12 dermatome. A sensory block from C2 to T7 is obtained after 20 minutes.

Due to the sitting position (beach chair) and the surgery in the two humerus, it was decided with the surgeon to perform the left upper limb first, with venipuncture in the right hand. After the end of this side, surgery of the right upper limb was performed, with the replacement of the venous puncture to the left hand. In reason with the beach chair position, was associated general anesthesia using laryngeal mask, after propofol (200 mg) and fentanyl (150 μg) and placed in mechanical ventilation and 1% sevoflurane. At the end of the procedure (3:30 hours), both the fractures were treated with internal fixation with a metal plate and screws.

No significant decrease was observed in systolic and diastolic blood pressure from the baseline values. At the end of the procedure, the laryngeal mask was removed, the patient remained without complaints and was referred to PACU. Volume replacement was performed with Lactated Ringer (1,000 mL) and 6% hydroxyethyl starch (500 mL). The patient received 200 mL 12.5% dextrinomaltose before discharge from the PACU. First analgesic dose was performed at end of surgery in the operating room, tenoxicam (20 mg) and dipyrrone (3 g) were administered intravenously.

Six hours after the CEA, the first dose of 10 mL solution 0.1% bupivacaine is given by catheter, followed by a new injection with the same dose every 6 hours on the 1st day postoperative. The catheter was removed on the 2nd postoperative day. Patient did not have any complication either during surgery or in postoperative period. Post-anesthetic visits the patient did not report any painful complaint.

**DISCUSSION**
We have demonstrated a case of bilateral humeral fracture undergoing surgical treatment under cervical epidural anesthesia. Therefore, the ideal anesthetic technique must provide a
differential sensory blockade during the rehabilitation period. For secondary tendon surgery, CEA obtained with either 0.25% or 0.375% bupivacaine provides both intra- and postoperative differential sensory blockade.\cite{3} In the present case we performed the CEA with 2% lidocaine associated with 0.5% bupivacaine, without occurrence of hypotension and bradycardia. The association with general anesthesia under laryngeal mask is justified by the position of the patient and the possibility of long-term surgery.

Bilateral proximal humerus fractures are rare and usually associated with dislocation. Seizures account for most of the bilateral fractures. Electrocution and extreme trauma are the other causes of bilateral fracture dislocations described as the triple “E” syndrome (epilepsy, electrocution and extreme trauma).\cite{4} We found some cases of bilateral humerus fracture due to trauma\cite{5-7}, including an 18-month-old child.\cite{8} However, in none of these cases was reported the type of anesthesia used when operated. However, in a patient with predicted difficulty in intubation, CEA was performed for surgical clavicle treatment.\cite{9}

CEA blocks the cervical plexus (C1-C4), phrenic nerve (C3-C5), brachial plexus C5-T1) and upper thoracic dermatomes along with sympathetic fibers that are responsible for the stress induced neuro-hormonal reactions. At the cervical level, two methods are commonly used to confirm entry into the epidural space. The hanging drop technique relies on the subatmospheric epidural pressure to draw solution into the needle hub. In contrast, the loss-of-resistance method relies on detection of the ability to inject solution as the needle tip penetrates the ligamentum flavum.\cite{10} For access to the lumbar and thoracic epidural space we prefer the loss-of-resistance method, however to access the cervical epidural space we prefer the hanging drop technique.

Major concerns with CEA are the hemodynamic and respiratory complications. CEA produced high-quality anesthesia and excellent postoperative analgesia in dermatomes from C2 to T8 and has a favorable effect on hemodynamic parameters due to cardiac sympathetic blockade resulting in a prolonged coronary perfusion time and reduced left-heart afterload.\cite{3} This effect favors coronary circulation in patients operated on a beach chair.

Studying the effects of 0.25% and 0.375% of bupivacaine on pulmonary function in ten healthy conscious patients and concluded that both concentrations impaired the diaphragmatic function but SpO2 decreased by 2% after administration of 0.375% of bupivacaine.\cite{11} Ultrasonography, a sensitive method for diagnosing diaphragmatic
dysfunction\textsuperscript{[12]}, was applied in a controlled and repetitive manner on all patients and showed a limitation of diaphragmatic excursion.\textsuperscript{[11]} Due to this reduction in the limitation of both diaphragms, general anesthesia with laryngeal mask and 1\% sevoflurane was performed. The effects on the circulatory system result from the sympathetic blockade along with changes to baroreflex sensitivity. Heart rate decreases from the blockade of cardio-acceleratory fibres, and also reflexively from diminished venous return through intracardiac stretch fibres.\textsuperscript{[13]} In the present case no decrease in heart rate or hypotension were observed. Dural punctures were reported in two patients and respiratory difficulties to paralysis were reported in three patients in a study with 394 patients.\textsuperscript{[14]}

Bilateral proximal humeral fractures in a young adult is a very rare injury. CEA involves the administration of local anesthetics into the epidural space resulting in the blockade of cervical nerve roots. CEA allows one to reduce the dose of local anesthetic considerably compared to other regional techniques such as brachial plexus block. In this case CEA performed with a catheter providing high-quality anesthesia and postoperative analgesia for more than 24 hours and no need for blood replacement.

REFERENCES


