

Single continuous erector spinae plane block for multiple rib, clavicle, and scapula fractures: A case report

ABSTRACT

The aim of this study is to describe the ability of a continuous erector spinae plane (ESP) block to provide analgesia in an extended territory (brachial plexus and thoracic nerves) with a single catheter. A continuous ESP block at T4 was performed in a 74-year-old man, two days after trauma involving clavicle, scapula, and multiple posterior rib fractures (first to ninth). The technique was maintained for 12 days and provided effective analgesia not only to the thoracic region but also the scapula and clavicle area (C5–T12 dermatomes). Concomitant respiratory insufficiency was ameliorated, which helped to avoid mechanical ventilation and intensive care unit admission. Moreover, this analgesia technique promoted patient's ambulation. ESP block, as an alternative to a thoracic epidural, is a more straightforward and safer procedure than paravertebral block (PVB). To obtain an extensive dermatome block using PVB, more than one paravertebral catheter would be necessary. Extensive cephalad–caudad spread of the PVB is primarily related to analgesia due to the concomitant epidural spread. PVB frequently causes bilateral block and may produce significant motor or sympathetic block. Additionally, proximal extension of the block under the erector spinae muscle fascia can provide a significant extension of the block to the cervical region, which allows brachial plexus block (cervical plexus block was not observed clinically). This is a unique feature of ESP block, as there is no communication between adjacent paravertebral levels in the cervical region that could allow the same pattern of analgesia using PVB.

Key words: Clavicle fracture, erector of spinae plane block, multiple rib fractures, scapula fracture, thoracic trauma

Introduction

We describe the use of a single continuous ESP block administered at T4 and maintained for 12 days in the context of a patient with clavicle, scapula, and multiple rib fractures.

The patient provided written informed consent for treatment and publication of the anonymized case details.


Case Report

A 74-year-old man with comorbid high blood pressure and atrial fibrillation was admitted to an intermediate care unit after blunt thoracic trauma. Patient reported a numerical rating scale (NRS) pain score of 10/10 and experienced severe functional limitation associated with the scapula, clavicle, and multiple rib fractures. A computed tomography scan

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How to cite this article: Almeida C, Francisco E, Cunha P, Vieira L, Antunes P. Single continuous erector spinae plane block for multiple rib, clavicle, and scapula fractures: A case report. *Saudi J Anaesth* 2022;16:497-9.

Access this article online	
Website: www.saudija.org	Quick Response Code 
DOI: 10.4103/sja.sja_290_22	

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Submitted: 07-Apr-2022, **Revised:** 28-Apr-2022, **Accepted:** 01-May-2022, **Published:** 03-Sep-2022

revealed nine left posterior rib fractures (first to ninth) with comminuted clavicle and scapula fractures [Figure 1]. It also revealed a pulmonary contusion in the left upper lobe and an ipsilateral pneumothorax with pneumomediastinum. The pneumothorax was drained in the emergency room and we aimed to manage the fractures conservatively.

Two days after admittance, despite continuous intravenous analgesia with tramadol (300 mg/24 h) and intermittent boli of paracetamol (1000 mg three times/day [tid]), metamizole (2000 mg two times/day), ketorolac (30 mg tid), and pethidine (25 mg tid), the patient maintained an NRS pain score of 8/10 and reported significant respiratory distress. Blood gas analysis with oxygen at 6 L/min indicated respiratory failure type 1 with metabolic acidosis: pH of 7.33, partial pressure of oxygen of 56 mmHg, partial pressure of carbon dioxide of 40 mmHg, HCO_3^- of 21 mEq/dL, and lactate of 2.4 mmol/L.

After evaluating and explaining the possible risks and benefits of unilateral ESP block, the patient consented to the intervention. The premedication consisted of intravenous midazolam 1 mg and intravenous fentanyl 0.05 mg. He was placed in a sitting position under standard American Society of Anesthesiologists monitoring. Using an aseptic technique, a high frequency (12 MHz) linear-array transducer (Sonosite, M-turbo, FujiFilmSonosite, Seoul, Korea) was placed in a longitudinal parasagittal orientation, approximately 3 cm from the midline, to identify the plane between the T3–T4 transverse process (TP) and the overlying erector spinae muscle (ESM).

After local anesthesia (LA) with 2% lidocaine, a continuous ESP block was performed via insertion of a 100-mm needle (Contiplex C, B. Braun Medical Inc., Bethlehem, PA, USA) in-plane to the ultrasound beam, in the caudal-to-cranial direction to contact the posterior aspect of the T4 TP.

Correct needle tip position was confirmed by hydrodissection with 3 mL of LA and visualization of the linear fluid spread,

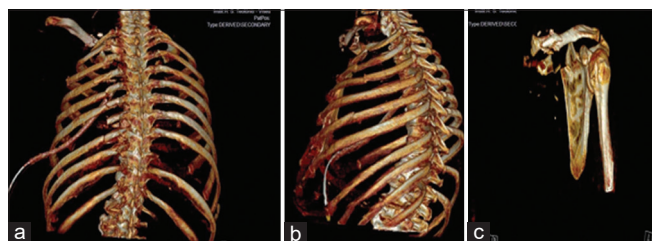


Figure 1: Thoracic computed tomography image with three-dimensional reconstruction of the nine left posterior rib fractures with comminuted clavicle and scapula fractures after thoracic drain placement. (a) Posterior view, (b) left lateral view, and (c) anterior view of left clavicle and scapula

which lifted the ESM from the TP. Thereafter, 20 mL of 0.375% ropivacaine was injected and a perineural catheter was inserted 6 cm beyond the needle tip [Figure 2]. The catheter position was confirmed by hydrodissection with 5 mL of LA. The catheter was fixed in-plane with skin adhesive (Histoacryl, B. Braun, Melsungen, Germany) and a sterile dressing.

A continuous infusion of 0.2% ropivacaine was then started using a drug infusion balloon at a rate of 5 mL/h and was maintained for 12 days. Every 12 h, an additional bolus of 15 mL of 0.2% ropivacaine was administered during the first 5 days. Conventional intravenous analgesia was continued.

The NRS pain score decreased from 8/10 to 2/10 10 min after the ESP block. Neurological assessment after 30 min revealed diminished pinprick sensation in the posterior thorax (C6–T10 dermatomes) extending over the anterolateral thorax (T1–T12 dermatomes) and axilla [Figure 3]. There was also diminished pinprick and thermal sensation in the fourth (medial portion) to fifth digits (ulnar innervation) and medial area of the upper limb corresponding to the C8–T1 dermatomes (the innervation of the intercostobrachial, medial brachial cutaneous, and medial antebrachial nerves) after the initial bolus of 0.375% ropivacaine (this sensory block lasted 4–6 h). The patient also reported discrete diminished cold sensation in the region of the lateral antebrachial nerve (branch of the musculocutaneous nerve [the C5–C6 dermatomes]). There was no clinically apparent motor blockade of the left upper limb. The motion of the shoulder was not tested, owing to the clavicle and scapula fractures. After the initial bolus of ropivacaine, no further sensitive block was noted with 0.2% ropivacaine. The chest tube was withdrawn without significant pain 4 days after the ESP block. The NRS pain score in the scapula, thorax, and clavicle during rest and movement was consistently <3.

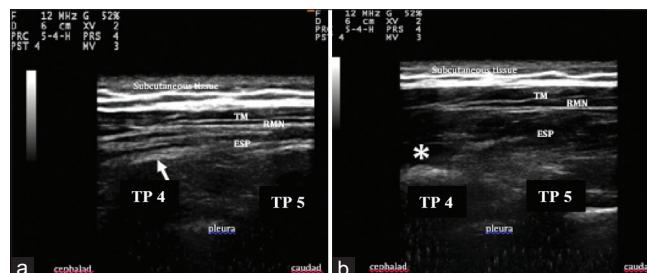


Figure 2: The continuous erector spinae plane block technique. (a) The probe is in a parasagittal orientation over the tip of the T4 transverse process (TP) and the block needle is advanced in a caudad-to-cephalad direction via the trapezius muscle (TM), rhomboid major muscle (RMM), and erector spinae muscle (ESM) to gently contact the TP (arrow). (b) Injection into the interfascial plane deep in the ESM produces a visible linear pattern of fluid spread (asterisk) beneath the ESM. Images revealing the placement of the catheter were not captured in this case

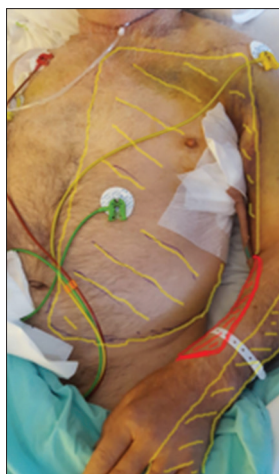


Figure 3: Approximate representation of the extent of cutaneous sensory loss over the left anterolateral thorax with the upper limb in adduction. A sensitive block was administered to the level of C5–C6. This sensitive block lasted 4–6 h after the initial bolus of 0.375% ropivacaine (20 mL) was administered at T4, deep in the erector spinae muscle. The yellow area represents diminished pinprick and thermal sensation. The red area represents a discrete area of diminished cold sensation in the region of the lateral antebrachial nerve

The catheter was removed 12 days after the initial bolus. After suspending regional analgesia, under the same conventional analgesia, he reported increased pain intensity corresponding to NRS pain scores of 3/10 at rest and 5/10 during movement, particularly in the clavicle during upper limb movements.

No side effects were noted, such as limitation of ambulation, weakness of respiratory muscles, or hemodynamic instability. He was discharged on the 18th day after the initial trauma.

Discussion

A paravertebral catheterization covers a maximum of six consecutive fractured ribs, which likely requires the placement of a second catheter when more than six ribs are involved,^[1] in opposition to the ESP block.

Forero *et al.*^[2] used ESP block at T2–T3 for the treatment of chronic shoulder pain and obtained promising results. They demonstrated that the extension of this block to the cervical region produced significant block of the brachial and cervical plexus nerves.^[2] The imaging evaluation of the injectate indicated that it has diffused anteriorly via the ESM and over its surface in the plane created by the adjacent elevator scapulae muscle to reach the vicinity of the cervical neural foramina and exiting nerve roots, where some amounts of LA presumably exert their effects for clavicle, scapulae, or shoulder analgesia.^[2] Of note, it demonstrated that the action

of ESP block at T3 does not rely primarily on the epidural spread of the LA.

The sensory innervation of the clavicle has not been fully elucidated. The supraclavicular, subclavian, and long thoracic/suprascapular nerves, alone or together, may be responsible for pain transmission after clavicle fracture.^[3] Peripheral nerve blocks that have been used to anesthetize the clavicle include superficial cervical plexus block, interscalene block (ISB), and combined superficial cervical plexus–ISB.^[3] Conversely, the sensory innervation of the scapulae has been shown to originate in the brachial plexus primarily via the suprascapular (C5, C6) and dorsal scapular (C5) nerves.^[4]

With the ESP infusion with 0.2% ropivacaine (5 mL/h), the analgesic coverage extended to at least C5 (covering the upper trunk of the brachial plexus), because the scapular pain, which is mainly transmitted by the suprascapular nerve, was controlled.

The ability to produce concomitant cervical and thoracic analgesic block via spreading below the ESM fascia after injection at a thoracic level seems to be an important feature of ESP block.^[2]

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.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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