

# The continuous erector spinae plane block can provide effective analgesia in polytrauma patients

## A case report

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**Abstract:** The choice of an effective analgesic and anesthetic technique usually poses a challenge in polytrauma patients requiring satisfactory pain control and emergency surgery. In this case report, we describe a patient under anticoagulant therapy who presented to the emergency department with multiple fractures of the thoracic and lumbar area and needed emergency splenectomy and thoracic drainage placement. The use of the bilateral continuous erector spinae plane block, a novel interfascial plane block, ensured satisfactory analgesic efficacy, without side effects and was helpful in avoiding the use of opioids.

**Keywords:** Erector spinae plane block; Polytrauma patient; Analgesia; Interfascial plane block

## Introduction

Motorcycle crashes and falls constitute a major proportion of severe injuries, especially in young adults. Motorcyclists are particularly vulnerable to head injury.<sup>1,2</sup> Chest and abdominal injuries commonly include fractures of the long bones.

Spinal “burst fracture”<sup>3</sup> is a type of compression fracture with failure in the middle and anterior spinal columns due to a high-energy axial loading, usually associated with motorcycle crashes. Burst fractures without neurological deficits are usually managed by conservative approaches.<sup>4</sup>

The erector spinae plane (ESP) block<sup>5</sup> is a novel interfascial plane block, described for providing thoracic analgesia and visceral abdominal analgesia.<sup>6–8</sup> A catheter inserted into this plane can extend the analgesic duration and can be an alternative to

epidural analgesia, especially when epidural analgesia cannot be performed.

Building upon existing literature and hereby demonstrate in this case report that the bilateral continuous erector spinae plane block (BC-ESPB) provides satisfactory analgesic efficacy with sparing use of opioids in a polytrauma patient, under anticoagulant therapy, in need of emergency splenectomy and drain- age placement.

## Case presentation

In the Emergency Department of Avezzano Hospital, a BC-ESPB under ultrasound guidance (USG) was performed on a 48-year-old female polytrauma patient (body mass index: 18.73, American Society of Anesthesiologists status 2), involved in a motorcycle accident. She was taking oral anticoagulants (warfarin 5 mg/day) for stroke prevention due to her chronic atrial fibrillation. computed tomography (CT) revealed that the victim suffered fractures of the transverse process from the sixth to ninth thoracic vertebrae and soma (T<sub>6</sub>, T<sub>7</sub>, T<sub>8</sub>, and T<sub>9</sub>), transverse process of the first and second lumbar vertebrae (L<sub>1</sub> and L<sub>2</sub>), fractures of anterior arches of fifth and sixth ribs, and posterior arches of seventh, eighth, and ninth ribs, as well as splenic laceration with serum-effusion in the perisplenic space and left basal hemothorax with maximum thickness of 40 mm. No immediate cardiovascular impairment was assessed. She remained conscious but showed respiratory distress because of severe thoracic, lumbar, and abdominal pain (numerical rating scale = 8) and hemothorax. She was placed on a backboard and a hard cervical collar was applied. The patient was a candidate for laparotomic splenectomy for splenic laceration and hemoperitoneum and left-side thoracic drainage for hemothorax. Written informed consent was obtained.

In the operating room, a peripheral venous access (16 G) was obtained. Regional analgesia was performed under USG, using a high-frequency linear ultrasound transducer placed in a longitudinal orientation 3 cm lateral to the T<sub>5</sub> spinous process. The patient was first placed in a left and then in a right lateral decubitus position, always maintaining neck and spinal immobilization. The in-plane approach was used; a 22-gauge, 100-mm atraumatic Sprotte-type needle for peripheral nerve blocks

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The procedure described in the case study was in line with Ospedale di Avezzano, Italy (Avezzano Hospital, Italy) Ethics Guidelines as per the Emergency Department's clinical procedures and with the 1964 Helsinki Declaration. The patient was informed her case might be subject to publication and signed an informed consent form.

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(SonoPlex Stim cannula, PAJUNK GmbH Medizintechnologie, Geisingen, Germany) was inserted in a medial-to-lateral direction, through the erector spinae muscles (ESM) and to gently contact the transverse process of T<sub>5</sub>. In addition, a 3–4 ml saline solution was injected into the interfascial plane deep to ESM, then a total of 20 ml of 0.5% levobupivacaine solution was bilaterally injected. Two 19-gauge epidural catheters (Arrow FlexTip Plus Epidural Catheters, Teleflex Medical S.r.l., Varedo, Italy) were placed into the plane through a 17-gauge Tuohy needle and were then connected to an electronic pump (ambIT PCA Pump, MOVI, Milan, Italy). The catheters were tunneled through the muscularis fasciae, sutured on the patient's skin, and covered by bandages. A bolus of 5 ml levobupivacaine 0.5% was injected through the catheter, followed by constant infusion of levobupivacaine 0.375% at a rate of 5–10 ml/hour (titrated to patient weight and clinical effect) using an infusion pump, before surgical incision. No complications from the blocks were recorded.

Cold tests and touch tests were bilaterally performed every 2 minutes. A complete loss of cold and touch sensation was observed for the T<sub>3</sub> to L<sub>3</sub> dermatomes from a line 3 cm lateral to the thoracic spine, along the abdominal wall. A 20 F chest drain was inserted in the fifth intercostal space at the level of the midclavicular line under USG. No supplemental opioids or local anesthetic (LA) were administered.

After 20 minutes from the end of the analgesic procedure, a complete pain relief was reached, with a significant decrease in visceral pain and respiratory distress.

General anesthesia was induced with propofol 2 mg/kg and fentanyl 1.5 µg/kg. Rocuronium 0.6 mg/kg was given to facilitate intubation with a cuffed tube. Anesthesia was maintained with sevoflurane 1.5%–2% in oxygen, with positive pressure ventilation in a circle system, and the main vital parameters were monitored.

Laparotomy confirms the presence of a splenic laceration and the need for a splenectomy. No supplemental opioids were administered during surgery, as the patient was hemodynamically stable requiring no pharmacological cardiovascular support.

At the end of the surgical procedure, the patient was extubated and admitted to the intensive care unit (ICU). Supplemental oxygen (2 l/minute) was administered by nasal prongs with continuous expired CO<sub>2</sub> monitoring. She received a continuous flow of 0.25% levobupivacaine as postoperative analgesia, with a basal flow of 8 ml/hour, bolus of 5 ml, and a lockout time of 60 minutes for the first 96 hours.

A full pain assessment was repeated 24, 36, 48, 72, and 96 hours after surgery; the patient referred thoracic, lumbar, and abdominal pain relief (numerical rating scale = 3) without neurological sequelae of the block, during postoperative follow-up in ICU.

After 72 hours, a second CT scan revealed a low-density mass close to thoracic paravertebral spaces (TPVS) from T<sub>5</sub> to T<sub>10</sub> (Figure 1), presumably suggesting LA spread.

The unbound plasma concentration of levobupivacaine was below 0.06 µg/ml throughout the 96-hour ICU staying period. No LA side effect was recorded.

In the first 96 hours after surgery, the patient did not request opioids or analgesic drugs.

The LA infusion was stopped 96 hours after surgery and then the catheters were removed upon patient's transfer to the hospital ward.

## Discussion

In our experience, the BC-ESP performed under USG has proven effective as sole analgesic therapy in pain control in patients with severe chest and abdominal trauma treated by urgent surgical procedures.

Actually, there is still a controversy about whether ESP block can provide anesthesia and analgesia for anterolateral and posterior chest wall and abdominal surgery.<sup>6</sup>

Epidural anesthesia and paravertebral thoracic block would not be recommended in this case because of spinal injuries, anticoagulants therapy, and the risk for iatrogenic respiratory complications.

It is still unclear whether the transmuscular quadratus lumborum block can ensure an efficacious anesthetic block of the abdomen's lateral wall with an effective visceral analgesia.<sup>9</sup>

Thoracic nerve blocks such as Pectoral (PECS) II block or Serratus plane block could not be performed due to respiratory distress and chest pain referred by the patient, as well as an unclear ultrasound reading due to bleeding by rib fractures.

It is possible to argue that the penetration of LA anteriorly occurs through the costotransverse foramen and into the vicinity of the origin of the dorsal and ventral rami when the drugs are injected into the deep (posterior) interfascial plane to ESM.<sup>5</sup>

Our second CT scan shadowed a low-density mass into paravertebral spaces from T<sub>3</sub> to T<sub>12</sub> (Figure 1) and this data presumably suggests the spread of LA from the deep (posterior) interfascial plane to ESM into the TPVS, as postulated by Forero et al, Chin et al, and Chin and El-Boghdadly.<sup>5,10,11</sup>

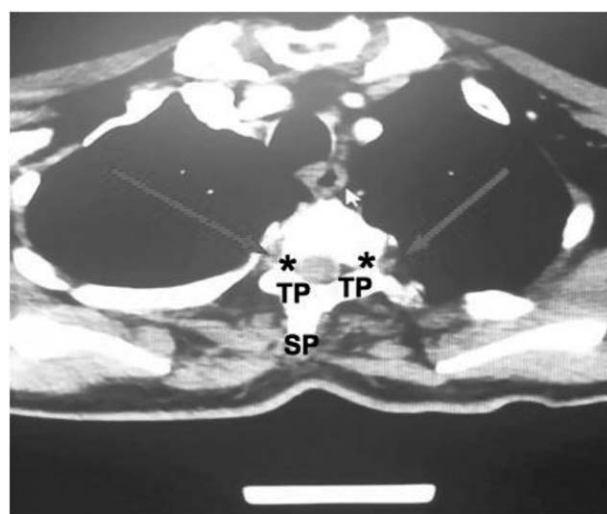
It is possible to explain anesthesia and analgesia of the T<sub>3</sub> to L<sub>3</sub> dermatomes by postulating that the LA from the lower TPVS posterior to the endothoracic fascia can spread inferiorly through the medial and lateral arcuate ligaments to the retroperitoneal space behind the fascia transversalis, where the lumbar spinal nerves lie. This forms the anatomic basis of the efficacy of injection into the deep (posterior) interfascial plane to ESM.<sup>12</sup>

It may also be possible to hypothesize an epidural spread from TPVS via the costotransverse foramina, through the intervertebral foramina.

These suggestions aim to show how it is possible to obtain a good sensory blockade and visceral analgesia with BC-ESP.

Our most relevant goal was also to ensure a long-lasting analgesia for the following postoperative pain, decreasing the need for opioids.

The deep ESP block could be considered quite safe, because the neuraxis is protected by T<sub>5</sub> spinous process that was just gently reached, and under USG single puncture for each side



**Figure 1.** Computed tomography scan. Low-density masses closely to T<sub>8</sub> (arrows), suggesting local anesthetic spread into the thoracic paravertebral space. Black asterisks: thoracic intervertebral foramina. SP indicates spinous process; TP, transverse process.

was performed, decreasing the risk of iatrogenic bleeding.<sup>12</sup> The cadaveric examination of the myofascial compartment of the erector spinae revealed that in this compartment there is no largely represented vessel network, compared to paravertebral space. The ESPB could also minimize the risk of LA systemic absorption,<sup>13</sup> especially when oral anticoagulant therapy is not stopped.

Furthermore, although opioids are considered the standard postoperative analgesic therapy, especially in ICU, these drugs have significant drawbacks, including respiratory depression, suppression of the cough reflex, delirium, and bowel dysfunction.

As per our case, the BC-ESPB enabled early extubation, providing satisfactory thoracolumbar, lumbar, and abdominal pain relief, with good hemodynamic stability and a significantly decreased use of opioids.

It can be argued that BC-ESPB is suitable for inserting an indwelling catheter so as to lengthen the duration of analgesia during the early postoperative period.

In conclusion, BC-ESPB under USG was performed to provide long-lasting analgesia for the thoracic wall and a sensitive cutaneous block of the abdominal wall, followed by effective postoperative analgesia based on a no-opioids strategy.

Therefore, further studies are needed to understand whether the choice of a peripheral myofascial block such as BC-ESPB could be a valid alternative to the common analgesic procedures, especially in polytrauma patients.

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