Ultrasound-Guided Serratus Plane Block and Fast-Track Tracheal Extubation in the Operating Room for Thoracic Trauma Patients: A Case Report

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Painful rib fractures may be a factor in trauma patients remaining intubated and being given postoperative mechanical ventilation after emergency surgery. Regional techniques could provide sufficient analgesia in these patients to enable weaning and extubation and thus prevent or minimize complications related to prolonged ventilatory support. We describe a trauma patient with multiple rib fractures requiring an emergency splenectomy for whom an ultrasound-guided serratus plane block provided good quality pain relief for his rib fractures and enabled fast-track extubation in the operating room. (A&A Case Reports. 2017;9:305–7.)

horacic trauma is a common cause of admission in emergency departments (EDs), and it is associated with significant morbidity and mortality. Coexisting injuries of other organs are often the most important lifethreatening events in thoracic trauma, and they should be identified and treated as soon as possible. Rib fractures are very painful and limit the patient's ability to breathe deeply. Shallow tidal breathing and lack of deep inspiratory sighs promote atelectasis, ventilation-perfusion mismatching, and hypoxemia, leading to pneumonia and respiratory failure.1 Rib fractures are present in up to 40% to 80% of blunt thoracic trauma patients who require admission to the intensive care unit for ventilatory support. In these patients, reintubation after weaning from mechanical ventilation is a common occurrence, and extubation failure is associated with increased morbidity and mortality. Effective pain relief could optimize pulmonary function in order to prevent complications related to mechanical ventilation and difficult weaning, such as pneumonia and respiratory failure.^{2,3}

In trauma patients with rib fractures undergoing exploratory or definitive abdominal surgery, there are different choices for postoperative pain management. Frequently, intubation and ventilation are continued postoperatively with analgesia provided intravenously, especially for clinically complex patients with poor cardiorespiratory reserve. Although fast-track extubation may be possible when analgesia is provided by a thoracic epidural, this option is often not recommended or contraindicated in trauma patients because of hemodynamic considerations. Another

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possibility to keep in mind to enable early extubation is to combine regional analgesia to treat the pain from the rib fractures and systemic analgesia to treat the pain from the abdominal incision. This choice represents a relatively new and novel approach that may be applicable or preferred in younger, healthier trauma victims.

The purpose of this case report is to describe the use of an ultrasound-guided serratus plane block (US-SPB) in a healthy trauma patient with rib fractures presenting for emergency splenectomy to enable fast-track extubation and early out-of-bed activity.

Written informed consent for treatment and patient's approval for the publication of results were obtained.

CASE DESCRIPTION

A 28-year-old man presented to the ED with a thoracic trauma after a fall. Computerized tomography revealed displaced fractures of the anterior arches of eighth, ninth, and tenth ribs, a left basal pneumothorax with maximum thickness of 5mm, and an ipsilateral pleural effusion. The abdomen computerized tomographic images showed a splenic laceration with serum-effusion in the perisplenic and perihepatic area. In the operating room (OR), the patient had difficulty breathing due to severe chest pain. Oxygen saturation (Spo₂) was 91%, Pao₂ 80 mm Hg, and Pco₂ 47 mm Hg without supplemental oxygen administration. He was unable to maintain supine position and to take deep breaths. He reported his rest and incidence pain scores on the numeric rating scale as 8 and 10 of 10, respectively. In the ED, intravenous (IV) ketorolac and paracetamol did not relieve his dynamic pain.

In the OR, we performed an ultrasound thoracic examination to confirm the presence of pneumothorax. It also revealed the absence of pleural sliding, the absence of **B** lines, and the presence of anterior lung points in the third intercostal space. Electrocardiogram, heart rate, arterial blood pressure, and Spo₂ were monitored. An IV induction of general anesthesia was performed with 100 μ g of fentanyl, 200 mg of propofol, and 0.6 mg/kg of rocuronium, and the patient was intubated and ventilated mechanically. Sevoflurane and remifentanil maintained anesthesia. A **20F** chest drain was inserted in the second intercostal space at the level of midclavicular line under ultrasound guidance.

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Figure 1. Patient on the operating table, after the surgery, during the execution of the serratus plane block at fifth rib level. We can observe the chest tube on the II intercostal space.

The surgeon performed an exploratory laparotomy and a splenectomy. Thirty minutes before the end of surgery, 6 mg of morphine and 1g of paracetamol were administered as systemic analgesia.

Before emergence, we performed a US-SPB followed by the insertion of a catheter for continuous infusion of local anesthetic (Figure 1). A high-frequency linear probe (12.5 MHz) was positioned at the level of the fifth rib along the midaxillary line. Two separate injections were performed under ultrasound guidance because we did not have an optimal visualization of the target plane due to the thoracic trauma. A 22-gauge 50-mm needle was introduced in-plane with a cranial-to-caudal direction. The plane between serratus anterior and fifth rib was identified. Once the tip of the needle was directed on the top of the rib underneath the serratus anterior muscle, 3 to 4mL of saline solution was injected to open this plane. Afterward, a total of 30 mL of 0.375% levobupivacaine was injected, and a 19-gauge epidural catheter (Teleflex) was inserted through a 17-gauge Tuohy needle, deep to the serratus anterior muscle. The correct spread of local anesthetic was confirmed by ultrasound guidance (Figure 2).

Postoperative analgesia also included the placement of an IV elastomeric pump containing 20 mg of morphine, 60 mg of ketorolac, 100 mg of ranitidine, and 20 mg of metoclopramide in 60 mL of normal saline, with a continuous flow of 2 mL/h. At the end of the procedure, the patient was extubated in the OR and was monitored in postanesthesia care unit. Spo_2 was 98%, Pao_2 95 mm Hg, and Pco_2 37 mm Hg without supplemental O₂ administration. He reported good quality postoperative analgesia with pain scores <3 on the numeric rating scale for both static and dynamic pain. Thereafter, the patient received a continuous flow of 0.25% ropivacaine as perineural analgesia connecting the catheter to an electronic patient-controlled analgesia pump with a basal flow of 8 mL/h, bolus of 5 mL, and a lockout time of 60 minutes. The infusion was stopped 72 hours after the intervention, and the catheter was removed on the fourth postoperative day. The patient spent the first night after surgery in the intensive care unit quietly and spontaneously breathing. No patient discomfort, infections, side effects of



Figure 2. Spread of local anesthetic confirmed by ultrasound guidance. S.a.m. indicates serratus anterior muscle.

local anesthetics, nor other complications were observed. The patient received 1g of paracetamol IV every 8 hours, with a rescue dose of 30 mg of ketorolac IV every 12 hours. No additional opioids were needed besides the 20 mg of morphine in the elastomeric pump.

DISCUSSION

Although opioids are considered the standard postoperative analgesic therapy, these drugs have significant drawbacks, including respiratory depression, suppression of the cough reflex, and delirium. Regional techniques such as epidural analgesia and paravertebral blocks are frequently used in thoracic pain.4 Unfortunately, contraindications such as coagulopathies or anticoagulant therapies, the difficulty in performing the block due to the immobilization of trauma patients, and the lack of time in the emergency setting may lead to the exclusion of these treatments.⁵ Given all these considerations, it is clear there is a need of alternative analgesic techniques. Recent literature evidences suggest that the US-SPB could be a technically simple, relatively safe, and clearly effective analgesic technique, providing pain relief for patients with traumatic rib fractures.6,7

In our patient, the US-SPB enabled early extubation in the OR. In the postoperative period, he reported a sensory block of T2-T9 dermatomes without signs of respiratory distress. Our experience seems to confirm that the use of US-SPB for analgesia in thoracic trauma patients could be a valid alternative to conventional regional techniques, such as epidural analgesia and paravertebral block. In the emergency setting, US-SPB may represent an easier and safer block than standard techniques, which can be technically more challenging and have a higher potential side-effect profile. This technique is also suitable for the insertion of an indwelling catheter to extend the duration of analgesia, as we reported in our experience.

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In conclusion, we demonstrated that the US-SPB provided complete anesthesia of hemithorax,⁷ facilitated a fast-track extubation in a patient with traumatic rib fractures, and perhaps avoided reintubation. Future studies are needed to confirm the real effectiveness of continuous US-SPB in thoracic trauma patients to determine the extent of sensory block and evaluate the duration of analgesia in the postoperative period.

DISCLOSURES

Name: Pierfrancesco Fusco, MD.

Contribution: This author helped conceive and design the study. **Name:** Paolo Scimia, MD.

Contribution: This author helped supervise the study.

Name: Stefano Di Carlo, MD.

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