

Continuous erector spinae plane block: a simple, safe and effective technique for pain control in patients with rib fractures

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Abstract

Ribs are frequently affected after a blunt or penetrating thoracic trauma. Acute key complications associated with rib fractures include pain, hemo-pneumothorax, extrapleural hematoma, pulmonary contusion and laceration, and vascular injury. In high energy traumas, injuries to abdominal solid organs may also coexist. A later complication that can limit the weaning of patients from sedation and ventilation is neuropathic pain, which is frequently associated with rib fractures and that is often poorly

responsive to oral and topical medications. The benefit of interventional nerve block procedures is still controversial. Ultrasound-guided erector spinae plane (ESP) block is a relatively new technique for thoracic analgesia that can be both a simpler and safer alternative to more complex and invasive neural blocking techniques, especially in intensive care unit patients whereas major contraindications (*i.e.* coagulation alteration, infection etc.) might limit the feasibility of more invasive methods, such as central blocks.

Case Report

A 64-year old man, with a history of hypertension, diabetes mellitus II, chronic renal failure and pathological obesity, was admitted to our Level I Trauma Center for a major trauma, after being crushed under the heavy load of his own truck. During emergency room (ER) primary survey, he suffered from left chest pain (Numerical Rating Scale - NRS – 8), vitals were stable (GCS 14, BP 140/90 HR95 SatO₂ 94%) and blood gas analysis yielded no metabolic alteration.

Secondary survey total body CT scan showed bifocal fractures in VI, VII, VIII and IX left ribs with a flail chest, hemothorax and an intrathoracic extra pleural hematoma. The AIS (Abbreviated Injury Scale) thoracic calculated equal to 5; ISS (Injury Severity Score) equal to 29 (counting other injuries in other body districts). Due to the worsening of consciousness status and arousal of respiratory failure (mainly hypercarbia), patient was sedated and a nasotracheal intubation under fibro-bronchoscopic guidance was performed. Subsequently, a left 32Fr chest drainage was positioned and an esophageal balloon catheter was placed to monitor esophageal pressure (Pes). In intensive care unit (ICU), Pes monitoring let us set a true protective and patient-tailored ventilation to improve oxygenation, reduce ventilator induced injury and ease weaning from ventilator.

In the following days, attempts to discontinue invasive ventilation were unsuccessful: patient received a percutaneous tracheostomy, and multiple blood transfusions were needed due to the increase of both hemothorax and extra-pleural hematoma.

Therefore, a decision was made to take patient to the operating room (OR) to drain the extra pleural hematoma and stabilize left rib fractures with synthetic plates. After surgery, two pleural drainages were placed.

However, weaning from treatment was complicated by a cardiogenic shock (possibly triggered by the thoracic blunt trauma) and haemodynamic derangement, which required vasoactive drug support, advanced hemodynamic monitoring and a continuous renal replacement therapy.

A few days later, after cardiac recovery and stabilization of vitals were finally obtained, a trial of weaning from sedation was

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started, but acute left chest pain (NRS 7) made complete discontinuation of drugs extremely difficult.

After assessing the impossibility of placing a peridural catheter due to coagulation anomalies and low platelet count, we decided to perform an ESP block and position a peri-neural catheter deep into the erector spinae muscle for pain control (T4 level).¹

Ropivacaine (0.5% 20 mL bolus) was administered at the moment of catheter positioning and a continuous infusion was started (0.15% 10 mL/h) and maintained during the following 72 hours.

Thirty minutes after ropivacaine bolus administration, sedation drugs were reduced: upon awakening, patient reported an NRS pain of 2.

The good pain control allowed us to ease weaning from sedation and start active and passive mobilization of the patient, who presented many risk factors for venous thromboembolism and pulmonary embolism. Moreover, after flail chest surgery and ESP block, respiratory support was beneficially shifted to high flow O₂ delivered through tracheostomic cannula.

Eventually, six weeks after ICU admission, patient was successfully discharged to a sub-intensive care ward.

Discussion

Pain management plays a key role in patients with multiple rib fractures and it is traditionally managed with IV patient-controlled opioid administration, epidural and paravertebral blocks.^{2,3} These techniques, however, may be contraindicated or have limited application in certain patient populations, such as in ICU setting whereas other major lesions or contraindications may coexist.

Pain management in ICU is usually performed with IV continuous infusion drugs (mostly fentanyl, sufentanyl, remifentanyl, morphine, ketamine) but, if feasible, a multimodal approach is always recommended to decrease administration of opioids and side effects.

Recently, ultrasound-guided myofascial plane blocks such as the ESP block has emerged as a valid alternative, providing excellent analgesia with minimal side effects.⁴

Patients with a “flail chest” pattern of injury, defined as bifocal fractures in three (or more) consecutive ribs, present a segment of the chest wall (the flail) which may lose its mechanical continuity with the rest of the thorax. As a result, the flail segment moves paradoxically inward during spontaneous inspiration, causing a variable degree of acute respiratory failure, delaying weaning from mechanical ventilation if needed, and time to discharge. Controversy still exists as to whether surgical stabilization should be employed and

whether it has a better outcome over conservative management in the presence of a flail chest, and the issue has been a matter of debate.⁵ However a large number of studies demonstrate the potential short-term benefit with non-operative management of flail chest injuries, including decrease in the number of mean ventilator days, ICU and hospital days, as well as decreased odds for tracheostomy, pneumonia, ARDS, chest deformity, mortality, septicemia and a better pain control.⁶ When surgical treatment is indicated, general anesthesia is the gold standard, but we also reported in a case series a successful use of ESP block, obtaining a total anesthesiological level with patients being awake during surgery.⁷

Conclusions

Our experience suggests that continuous ESP block in patients with extensive rib fractures can have a positive impact on pain control and therefore on prognosis, without the risk and contraindications of other procedures or side effects of opioids.

That being said, we also realized that a catheter positioned deep into erector spinae muscle could be even more useful if used with a programmed intermittent bolus administration.

We also report an interesting synergic action between surgical and anesthesiological procedures.

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