CASE REPORT

Erector Spinae Plane Block in Thoracotomy Surgery

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ABSTRACT

Background: Post-thoracotomy pain management remains a major challenge in anesthesia. Thoracic epidural and paravertebral blocks are effective but technically demanding. The erector spinae plane (ESP) block offers a simpler and safer alternative for postoperative analgesia. This case report presents the anesthetic and analgesic management using ESP block in a patient undergoing thoracotomy decortication.

Case: A 60-year-old male with spontaneous right pneumothorax and pulmonary atelectasis underwent thoracotomy decortication under general anesthesia. An ultrasound-guided ESP block was performed at T5–T6 using 0.25% levobupivacaine (20 mL). Intraoperative hemodynamics were stable, and the patient was extubated 14 hours postoperatively. Pain scores remained low without additional opioids. No complications were observed during postoperative monitoring.

Discussion: Spontaneous pneumothorax and pulmonary atelectasis frequently necessitate surgical intervention, demanding complex anesthetic management. This patient presented with a right-sided pneumothorax, compounded by atelectasis resulting from prior trauma. After the surgery, the patient underwent an ESP block at T5-T6 under general anesthesia for postoperative analgesia. Postoperatively, the patient exhibited satisfactory oxygenation, low pain scores, and no complications associated with the ESP block, indicating effective pain control.

Conclusion: This case report illustrates that an ESP block administered postoperatively can offer effective analgesia management for patients with spontaneous pneumothorax and pulmonary atelectasis undergoing decortication thoracotomy. This strategy not only ensures adequate pain relief but also facilitates early mobilization and reduces postoperative opioid use. These findings endorse the integration of the ESP block into a multimodal anesthetic approach for thoracic surgery.

Keywords: anesthesia; erector spinae plane (ESP); ICU; pneumothorax; thoracotomy

INTRODUCTION

The prevalence of post-thoracotomy pain syndrome (PTPS) ranges from 33% to 91%. The exact pathogenic mechanism causing chronic pain after thoracotomy is unknown. In addition to intraoperative nerve damage and subsequent postoperative neuropathic pain, surgical techniques, age, gender, pre-existing pain, genetic and psychosocial factors, severe postoperative pain, and analgesic management are believed to influence the development of PTPS.[1]

Anaesthesia for thoracotomy surgery presents unique challenges compared to other subspecialties. It requires specialized knowledge of managing single-lung ventilation with a double-lumen endotracheal tube (ETT) to ensure adequate oxygenation and provide effective postoperative pain relief to maintain patient safety and surgical outcomes. Pain relief enables early tracheal extubation, rapid return to spontaneous ventilation, and early mobilization. Adequate analgesia allows for coughing and deep breathing, vigorous physiotherapy, and incentive spirometry to prevent atelectasis and secretion retention. Inadequate analgesia can lead to an increased incidence of pulmonary complications such as hypoxemia, hypercapnia, atelectasis, pneumonia, and respiratory failure.[2,3]

The ESP block was first described in 2016 as a regional block for the treatment of thoracic neuropathic pain. Since then, this interfascial plane block has shown promising results as an alternative to neuraxial blockade for various surgeries with good effects. Additionally, this block carries a lower risk of spinal cord injury, epidural haematoma, and central infection.[4]

Ultrasound-guided ESP block is a promising new technique for thoracic analgesia as a relatively simple and safe alternative to more complex and invasive nerve block techniques. The authors have applied the ESP block in the management of PTPS and present patient outcomes illustrating its therapeutic potential.[5] This case report aims to describe the anesthetic management and postoperative analgesia using the ESP block in a patient undergoing thoracotomy decortication.

CASE

A 60-year-old male patient presented with complaints of shortness of breath for four days prior. The patient felt more comfortable in a semi-sitting position and complained of productive coughing that was difficult to expel over the past month. The patient had a history of blunt trauma due to a wooden object striking the right side of the chest. The patient was referred from the previous hospital with a diagnosis of right pneumothorax (Figure 1) and had undergone needle decompression and the placement of a water seal drainage (WSD). The preoperative laboratory findings are summarized in Table 1.

The patient's preoperative diagnosis included spontaneous right pneumothorax, right pulmonary atelectasis, and grade 1 hypertension, with an American Society of Anesthesiologists (ASA) classification of III.

Anaesthesia management involved general anaesthesia, with the patient positioned supine. General anaesthesia induction was performed with 10 micrograms of sufentanil, 40 mg of lidocaine, 100 mg of propofol, and 40 mg of rocuronium, with maintenance on sevoflurane and intubation with a double-lumen ETT size 35L. After the ETT was placed, the patient was positioned in the lateral decubitus position, and a unilateral

ESP block was performed under ultrasound guidance at T5, with an injection of 0.25% levobupivacaine (20 cc) on the right (Figure 2 and Figure 3). The thoracotomy decortication procedure was performed over 3 hours, with the ventilator set to volume control mode, tidal volume 360 ml, respiratory rate 12 breaths per minute, PEEP 5, FiO_2 50%, and during one-lung ventilation, volume control mode with a tidal volume of 240 ml, respiratory rate of 15 breaths per minute, PEEP 5, and FiO_2 70%. A total of 2000 ml of Ringer's lactate solution was administered intravenously, with blood loss of 300 ml and urine output of 300 ml.

Following surgery, the patient continued care in the intensive care unit (ICU). The patient was extubated 14 hours after admission to the ICU. Postoperatively, the patient's condition and hemodynamics were stable, fully conscious, with no complaints of shortness of breath, and SpO_2 at 100% using 3 litres of oxygen per minute. The patient received intravenous dexmedetomidine at 12 micrograms per hour during post-operative monitoring. Pain assessment using the visual analogue scale (VAS) yielded a score of 0, and no additional opioids were required. Post-operative arterial blood gas analysis indicated adequate oxygenation.

The patient mobilized more quickly, and no complications from the ESP block were observed (Figure 4). After 24 hours of post-operative monitoring, the patient was transferred to the ward and was discharged on the fifth day of treatment.

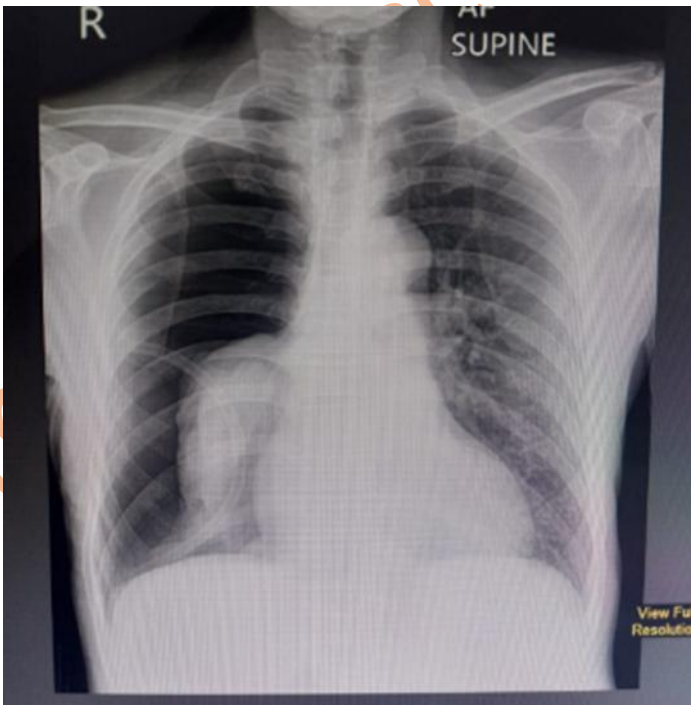

Figure 1. Preoperative chest X-ray

Table 1. Pre-operative laboratory test results

Laboratory test	Result	Normal value
Haemoglobin	13.5 g/dl	10.9 – 14.9
Hematocrit	41.4%	34 – 45
WBC	6980/mm	4790 – 451000
Platelets	224000/uL	216000 - 451000
Urea	20.3 mg/dl	15 - 40
Creatinine	0.63 mg/dl	0 – 0.9
PT	14.9 second	11.7 – 15.1
APTT	26.9 second	28.6 – 42.2
AST	20 U/L	< 31
ALT	14 U/L	< 31
Glucose	91.5 mg/dl	80 - 139
Sodium	138 mmol/L	136 - 145
Pottasium	4.29 mmol/L	3.5 – 5.1
Chloride	104 mmol/L	97 - 107
HbsAg	Non reactive	Non Reactive
Arterial Blood Gas		
pH 7	7.356	
PO2	59.9 mmHg	
PCO2	41.6 mmHg	
HCO3	22.7 mmol/L	
BE	-2.62 mmol/L	
O2 Sat	94 %	
A-aDO2	145.8 mmHG	

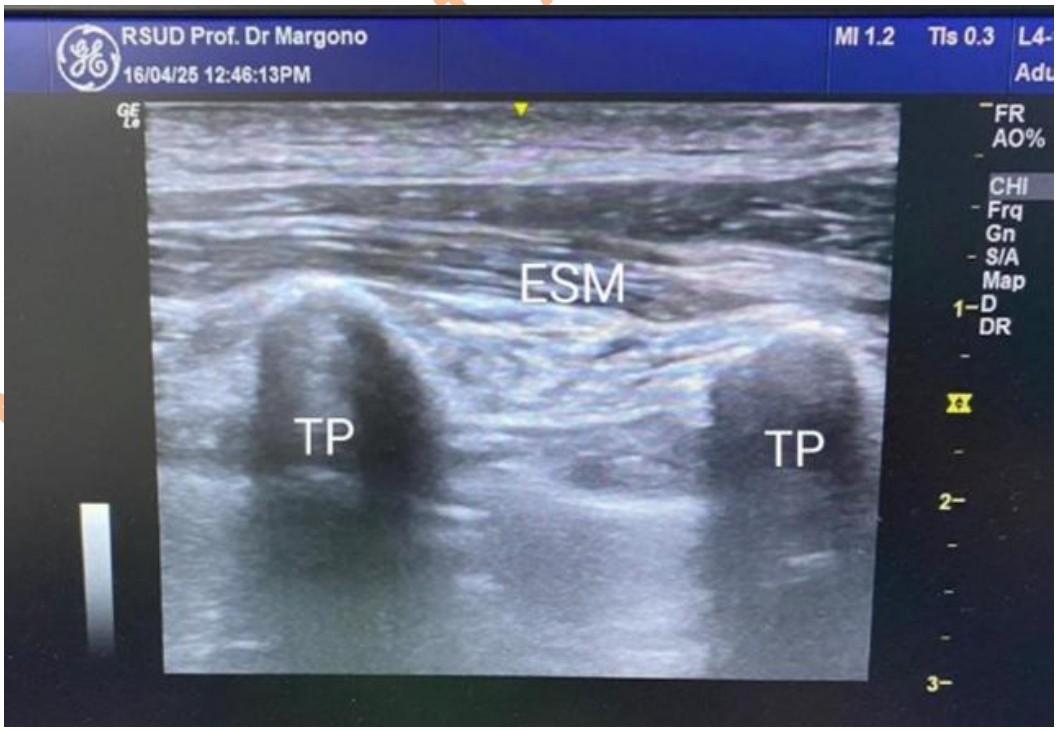

Figure 2. Evaluation before local anaesthetic infiltration in the ESP block

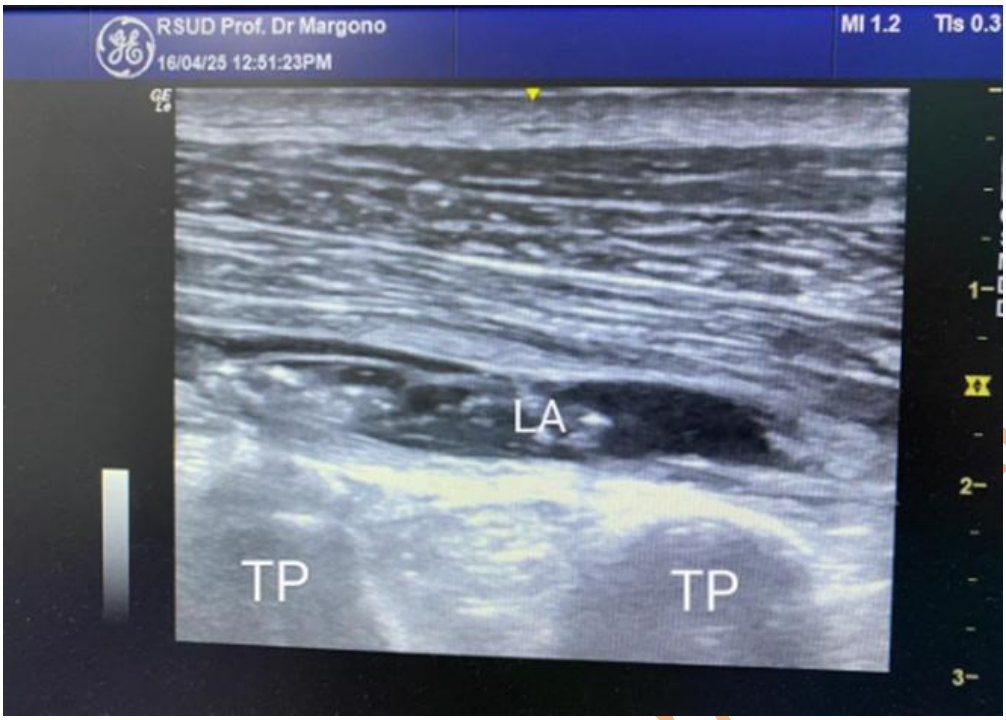

Figure 3. Local anaesthetic infiltration in the ESP block

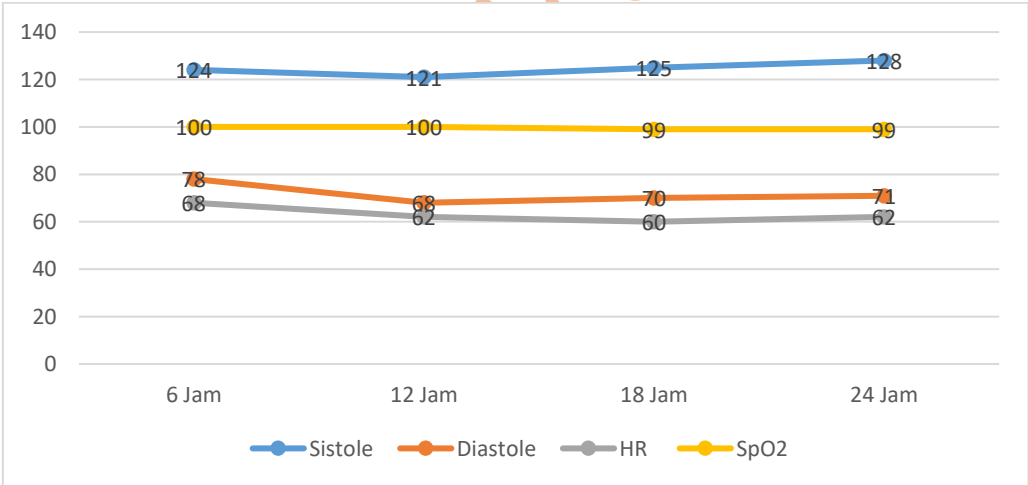

Figure 4. Postoperative hemodynamic monitoring

DISCUSSION

Spontaneous pneumothorax and pulmonary atelectasis are conditions that often require surgical intervention, with complex anaesthetic management. In this case, the patient had a history of blunt trauma that caused a right pneumothorax, which was exacerbated by pulmonary atelectasis. This combination of conditions requires a careful anaesthetic approach to ensure adequate ventilation and haemodynamic stability during surgery. A pneumothorax is a condition in which air enters the pleural cavity, causing lung collapse due to increased pleural pressure. Tension pneumothorax occurs when pleural pressure is transmitted to the mediastinum. This uncommon condition has a severe disease course and can be fatal if left untreated.[6,7]

Perioperative assessment of respiratory function, including lung mechanics, lung parenchymal function, and cardiopulmonary reserve, is essential for better management and outcomes.[8,9]

The ESP block is most commonly performed between levels T5 and T7, but can be performed at lower levels. The curved ultrasound transducer is placed in a cephalocaudal orientation over the midline of the back at the desired level. The probe is then slowly directed laterally until the transverse process is visible. The transverse process must be distinguished from the ribs at that level. The transverse process will appear more superficial and wider, while the ribs appear deeper and thinner. After the transverse process is verified, the trapezius muscle, the rhomboid major muscle (if performed at the T5 level or higher), and the erector spinae muscle should be identified superficial to the transverse process. Local anaesthesia can then be administered with a volume of 20–30 mL, with aspiration performed after every 5 mL to prevent intravascular injection. [15,16]

This patient underwent the ESP block technique as a peripheral block, performed by inserting a single needle far from the epidural space. Meanwhile, a higher concentration of local anaesthetic was administered to achieve adequate anaesthesia at the surgical site. Right-sided ESP block at T5-T6 was used as an adjunct to general anaesthesia to provide perioperative analgesia. The ESP block has been proven effective in reducing post-operative opioid requirements and facilitating early mobilisation, as reported in the literature. In this case, the use of the ESP block helped control post-operative pain without requiring additional opioids. This technique is relatively easy to perform, even with minimal sedation or without sedation. Unlike other regional blocks, which are limited to specific anatomical locations, the ESP block can be performed at multiple spinal levels and has been used in surgeries ranging from thoracotomy and Nuss procedures to lumbar fusion and ventral hernia repair.[10-14]

The ESP block is a technique that offers many advantages over conventional techniques performed near the neuroaxis. First, this technique is easy to perform because visualisation of the target using ultrasonography (USG) is very simple, and it is not difficult to guide the needle towards it. Second, this technique has a low risk of complications. Important structures (such as major blood vessels, the pleura, or the medulla) that could lead to serious complications if injured are located far from the target site of the block.[15,16]

Thoracotomy was performed under general anaesthesia with one lung ventilation (OLV) using a double lumen tube (DLT). Anaesthesia was induced with propofol and sufentanil, followed by endobronchial intubation. Sevoflurane was used for maintenance. Anaesthetic drug selection includes drugs for induction and maintenance. Anaesthetic induction can be achieved with opioids, hypnotic agents, and muscle relaxants. The choice of drugs for general anaesthetic maintenance should be based on the specific situation. Combining intravenous anaesthesia and inhaled sevoflurane may be an ideal, stable, and safe strategy in this case. During surgery, controlled ventilation with low tidal volume targets, low inspiratory pressure, and prolonged expiratory phase is used to prevent hypoxia and hypotension.[15] The selection of a 35L double-lumen ETT allows for effective lung isolation during thoracotomy, which is important for surgery on the chest cavity. Possible complications of DLT use include airway rupture during placement of the DLT.[16,17] DLT malposition can also have life-threatening consequences. Ventilation can be severely compromised, leading to hypoxia, pneumothorax, and complications during surgery.[18]

Position and mechanical ventilation are the main factors contributing to postoperative atelectasis in 90% of patients, leading to ventilation-perfusion (V/Q) mismatch, reduced lung compliance, and hypoxemia. Besides providing pain relief, inducing unconsciousness, maintaining stable hemodynamics, and applying single-lung ventilation when needed, anesthesiologists aim to minimize acute lung injury (ALI). [19,20,21,22]

Postoperatively, the patient showed good results with adequate oxygenation, stable haemodynamics, low pain scores, and no complications from the ESP block. It indicates that the anaesthetic approach used was effective in managing patients with complex respiratory conditions. Regional anaesthesia and pain management have advanced in recent years with the emergence of fascial pain receptor blockade. One of the latest techniques described in the literature is the ESP block. In the past two years, publications referencing the ESP block have increased significantly. Furthermore, most of the published articles are case reports; thus, it can be concluded that the ESP block is an effective analgesic technique in various thoracic surgical procedures. [23,24] Compared to thoracic epidural analgesia (TEA) and thoracic paravertebral block (TPVB), the ESP block provides comparable postoperative pain relief with fewer technical challenges and a lower risk of complications such as dural puncture or pneumothorax. Several studies have reported that ESP block results in faster recovery, reduced opioid consumption, and improved patient satisfaction in thoracic surgeries. Based on this case, we recommend considering the ESP block as part of a multimodal analgesia regimen for thoracotomy, particularly in patients where epidural analgesia is contraindicated or technically difficult.

CONCLUSION

This case report shows that the ESP block can provide effective anaesthesia management in patients with spontaneous pneumothorax and pulmonary atelectasis undergoing decortication thoracotomy. The ESP block is an effective and safe regional anaesthesia technique that provides good analgesia quality in patients post-thoracotomy.

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