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Case Report Continuous Errector Spina Plane Blockspinaeas An Alternative To Epidural Analgesia During Thoracotomy Surgery

Wahyu Prasetyo Andriyanto[1], Dedi Susila[2]

[1]Department of Anesthesiology and Reanimation, Airlangga University, Surabaya, Indonesia
Email ID: Prasetyo.wahy@gmail.com

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ABSTRACT

Thoracotomy is a major surgical procedure that often causes severe postoperative pain, thus requiring optimal analgesic management. *Erector Spinae Plane*(ESP) *Block has* emerged as a promising alternative to epidural analgesia, with a lower risk of complications and good efficacy. This report presents a case of a 43-year-old male patient diagnosed with a mediastinal abscess with a possible lung tumor and chronic empyema on the chest tube for four months. The patient underwent right pulmonary decortication thoracotomy under Continuous ESP Block anesthesia. This procedure was performed under ultrasound guidance using a pediatric epidural catheter at the T4 level. Ropivacaine 0.5% was given as a loading dose of 20 ml, followed by maintenance ropivacaine 0.2% at a 7 ml/hour rate throughout the operation. This technique involves injecting a local anesthetic into the tissue layer near the erector spinae muscles to block sensory nerves that carry pain signals from the surgical area. The results showed effective analgesia with adequate pain control during and after surgery, without complications such as infection, hematoma, or nerve damage. The use of ESP Block also reduced dependence on systemic opioids and improved the patient's oxygen saturation. Thus, ESP Block provides a better safety profile with a shallower technique compared to epidural analgesia. In this case, Continuous ESP Block proved to be a valuable alternative for post-thoracotomy pain management, making it a reliable option for patients with contraindications or high risk to epidural techniques.

Keywords: *Case report, thoracotomy, Erector Spinae Plane Block, analgesia, pain control.*

1. INTRODUCTION

Thoracotomy surgery is one of the major surgical procedures that is often associated with severe postoperative pain. Pain that occurs after thoracotomy has a serious impact on the respiratory system, potentially causing complications such as hypoxia, atelectasis, and lung infection (Ding et al., 2014; Marchetti-Filho et al., 2014). Not only that, inadequate pain control after surgery can trigger the development of post-thoracotomy pain syndrome. This chronic condition can last for years and affect the patient's quality of life (Sarridou et al., 2023). Therefore, effective pain management is a very important aspect in post-thoracotomy care.

Although complications of anesthesia have been extensively studied over the past decades, the development of chronic pain after thoracotomy remains a significant challenge. This condition not only causes physical and emotional suffering for patients but also increases the burden on healthcare resource utilization. In addition, this problem is often accompanied by prolonged use of postoperative opioids (PPOU), which can cause side effects and the risk of dependence (Park et al., 2023). Therefore, continued efforts are needed to improve postoperative pain management approaches to prevent long-term complications.

Thoracic epidural analgesia technique has long been considered the gold standard in controlling postoperative pain in patients undergoing thoracotomy. This method is the main choice in pain management after chest surgery because of its proven effectiveness in reducing pain through adequate sensory blockade (Hamilton et al., 2022). Although thoracic epidural analgesia is very effective, this technique still has limitations, including certain contraindications and the risk of serious complications. This technique is invasive and often causes side effects. In addition, the failure rate of this technique has been reported to reach 12%, with the level of analgesia effectiveness varying between patients (Goto, 2018).

In response to the challenges of epidural analgesia, in recent years, the Erector Spinae Plane (ESP) Block technique has emerged as a promising alternative. This technique has gained widespread attention as a safer and more flexible method in post-thoracotomy pain management (Forero et al., 2016). ESP Block is an interfascial nerve block performed under

ultrasound guidance. Its mechanism involves the administration of local anesthetic in the fascial plane located deeper than the erector spinae muscles (ESM) at the tip of the transverse processes of the vertebrae (Tsui et al., 2019).

Local anesthesia administered in this plane spreads craniocaudally with an average distribution of one dermatome per 3.4 ml of injected anesthetic volume (De Cassai & Tonetti, 2018). This spread of local anesthesia not only covers the paravertebral and epidural areas anteriorly, but also reaches the intercostal spaces laterally. This helps in effective sensory blockade of the ventral and dorsal ramus of the spinal nerves, providing broad and functional analgesia. Through its lower risk of complications and its less invasive nature, ESP Block is now an attractive alternative in post-thoracotomy pain management.

The Erector Spinae Plane (ESP) Block technique has several advantages, including a lower risk of complications and ease of implementation. These advantages make ESP Block an attractive alternative in postoperative pain management, especially for patients who cannot undergo epidural analgesia. Previous studies have demonstrated the effectiveness of ESP Block in various clinical contexts. One example is the study by Mudarth et al. (2021), which reported the successful use of continuous ESP block in post-lung transplant patients receiving systemic anticoagulation therapy. This technique offers a better safety profile because the needle tract is more superficial and away from the neuraxis, while providing effective pain control. In addition, this technique reduces the dependence on systemic opioids and helps improve oxygen saturation in patients, making it a valuable alternative for analgesia in lung transplant cases.

Another study by Chaudhary et al. (2020) showed that the use of ESP Block was able to improve acute and chronic pain control, while preserving lung function. These findings suggest that this technique has the potential to accelerate the recovery of patients undergoing Video-Assisted Thoracoscopic Surgery (VATS) procedures as part of a multimodal analgesia regimen.

This case report will highlight the effectiveness of Continuous ESP Block Spinae which aims to provide an overview of the benefits of this technique as an alternative to epidural analgesia during thoracotomy procedures. In addition to providing effective pain control, this technique also reduces the risk of complications and provides better patient comfort. Identification and evaluation of safe and effective alternatives to epidural analgesia are important steps to improve postoperative pain management, especially in patients with contraindications to epidurals. The impact of its advantages, Continuous ESP Block can be a beneficial solution for patients, while improving their quality of life after surgery. Additional evidence from this report is expected to contribute to the development of clinical guidelines, helping medical personnel design safer, more effective, and more appropriate analgesia strategies for post-thoracotomy patients.

2. CASE REPORT

A male patient, Mr. BU, aged 43 years with a body weight of 50 kg and a height of 165 cm, was diagnosed with a mediastinal abscess accompanied by chronic empyema in the 4th month of chest tube use. Differential diagnoses include lung tumors, and the patient also has a history of pulmonary tuberculosis who is undergoing OAT therapy in the 5th month. Comorbid factors include hypoalbuminemia (3.47 g/dL) and prolonged hemostasis function (PPT 38.2 seconds and APTT 59.1 seconds). The planned operation is a thoracotomy with right pulmonary decortication, under general anesthesia with left DLT (Double Lumen Tube) intubation and continuous ESP block for pain management.

The patient had a respiratory rate of 20–22 breaths per minute with an asymmetric pattern, stable supine position, and oxygen saturation of 94% with nasal cannula 3 L/min. Breath sound examination showed vesicular with decreased breath sounds on the left side without rhonchi or wheezing. The cardiovascular system was stable with blood pressure of 124/74 mmHg, regular pulse rate of 67–71 beats/min, and CRT less than 2 seconds. Neurological function was good with GCS 15, isocor pupils, and no lateralization signs. The gastrointestinal and genitourinary systems showed normal function.

Preoperative labs showed hemoglobin 12 g/dL, WBC 5.35 × 10^9/L, platelets 242,000/µL, normal renal function (BUN 10 mg/dL, creatinine 0.6 mg/dL), and low albumin 3.47 g/dL. Blood gas analysis showed pH 7.46, PCO_2 38 mmHg, and SaO_2 100%.

During the operation, the patient received general anesthesia with 2% sevoflurane and ESP block with ropivacaine through an epidural catheter. Intravenous fluids included 1400 mL of crystalloid and 408 mL of whole blood, with output of 600 mL of blood and 200 mL of urine. Hemodynamic stability was maintained with a blood pressure of MAP 67–94 mmHg and a heart rate of 83–96 beats/min.

The patient showed moderate pain response with initial NRS 2–6 in the first 8 hours and decreased to NRS 2 on day 3. Oxygen saturation was stable in the range of 95–100% with the use of nasal cannula from the first postoperative day. Pain management used continuous pump ropivacaine (0.2%, 5 mL/hour), plus oral paracetamol and intravenous ibuprofen every 8 hours.

The patient showed progressive clinical recovery during the first 72 hours postoperatively with respiratory stabilization (respiratory rate 20–22 breaths/min) and improvement in oxygen saturation. Multimodal analgesia strategy involving ESP block provided adequate pain control and supported patient mobilization. Hemodynamic stability and other organ functions were maintained.

Postoperatively, continuous ESP block was continued for pain management, with a 0.2% ropivacaine pump (5 mL/h). Pain control was evaluated using the Numerical Rating Scale (NRS). In the first 72 hours, the patient's pain score decreased from 6 to 2, indicating the effectiveness of analgesic therapy. Oxygen saturation was maintained above 95% using a simple mask and nasal cannula. Respiratory rate gradually stabilized from 28 to 20 breaths per minute. Postoperative analgesic therapy included:

a. First day: Paracetamol IV 750 mg every 8 hours, Ibuprofen IV 400 mg every 8 hours, and ropivacaine 0.2% pump 5 mL/hour.

b. Second and third days: Paracetamol PO 500 mg every 8 hours, Ibuprofen IV 400 mg every 8 hours, with the ropivacaine pump maintained.

The successful combination of ESP block anesthesia and multimodal therapy showed improved patient comfort and recovery of postoperative respiratory function. The patient was in stable condition without major complications during the postoperative hospitalization period.

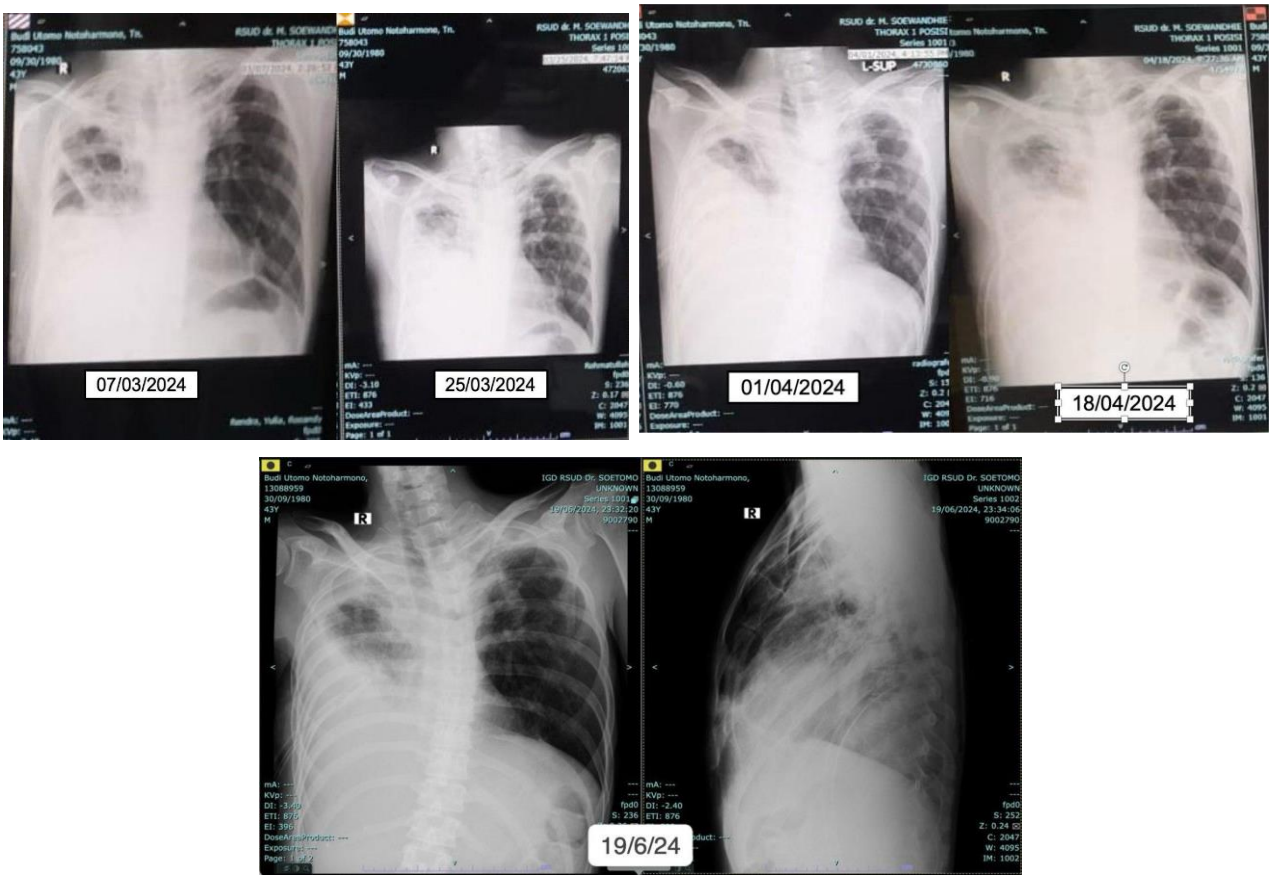

Figure 1. X-ray of Mr. BU's lungs.

3. DISCUSSION

Thoracotomy surgery is a major procedure involving a chest wall incision to access the lungs or mediastinal organs. In anesthesia and postoperative pain management, effective analgesia is essential to reduce intense postoperative pain and accelerate patient recovery (Vinogradsky et al., 2024). One commonly used method is epidural analgesia, which provides good pain control, but also has potential side effects such as decreased blood pressure and risk of infection (Isnaini et al., 2024). However, in recent years, Erector Spinae Plane (ESP) block has emerged as a safer and more effective alternative for postoperative pain management in thoracotomy procedures. ESP block offers the advantage of pain relief without the serious complications that can arise from epidural techniques, such as excessive blood pressure decrease or epidural catheter-related problems (Cavaleri et al., 2021).

ESP block works by infiltrating local anesthetic around the erector spinae muscles, which provides analgesic effects on the intercostal and subcostal nerve branches leading to pain blockade in the thoracic and abdominal areas, making it an excellent choice for thoracotomy procedures, where post-operative pain is generally very intense (Devarajan et al., 2021). In Mr. BU's

case, the thoracotomy procedure performed with ESP block allowed for more effective pain management without the need for an epidural. In addition, the use of ESP block can reduce the risk of anesthesia-related complications, such as hypotension or impaired mobility that often occur after an epidural, as well as improve post-operative patient comfort (Kang et al., 2021).

In Mr. BU's case, the use of ESP block using 0.5% ropivacaine with loading and maintenance doses can significantly reduce opioid use and allow the patient to recover faster. Effective pain reduction, as reported in Mr. BU with a decrease in pain score from 6 to 2 in 3 days, suggests that ESP block has the potential to be the primary choice in post-thoracotomy pain management, providing a safer and more comfortable solution for patients with complex comorbidities.

In Mr. BU's procedure, the use of ESP block with 0.5% ropivacaine given in loading and maintenance doses has been shown to significantly reduce opioid use. Ropivacaine, as a local anesthetic, provides effective anesthesia with a lower potential for side effects compared to other drugs commonly used in postoperative pain management (Shadaque et al., 2024). By reducing dependence on opioids, patients can avoid the associated risks such as excessive sedation, nausea, and constipation, which often occur after long-term opioid use (Paul et al., 2021).

The results obtained in Mr. BU's case, with a decrease in pain score from 6 to 2 within three days, demonstrate the effectiveness of ESP block in managing post-thoracotomy pain. This significant pain reduction contributed to faster recovery and improved quality of life for the patient. It also indicates that ESP block can be a primary choice in managing post-operative pain in patients with complex comorbidities, considering that this technique is not only safe but also improves patient comfort during the recovery process.

Erector Spinae Plane (ESP) block as a regional anesthesia technique that targets somatic and autonomic nerve fibers along the spine. This block is performed by injecting local anesthetic into the periosteal space of the erector spinae muscles, leading to reduced thoracic, abdominal, and lower extremity pain (Ferero, 2021). The main advantages of ESP block compared to other anesthesia techniques such as epidural are ease of implementation, lower risk of infection, and the ability to provide adequate pain control without affecting motor skills. Several previous studies have shown that ESP block provides equivalent pain control to epidural, but with fewer complications, such as in patients with thoracotomy and other major surgeries (Silva et al., 2022).

Previous relevant studies, such as those conducted by Ninyonkuru et al., (2024), showed that ESP blockade is effective in reducing opioid requirements in postoperative patients, which is very important considering its side effects. In the study, patients who received ESP blockade showed a significant reduction in opioid consumption, compared to the control group who were only given conventional therapy. In addition, a study by Singh et al., (2023) revealed that ESP blockade can reduce the duration of recovery and accelerate postoperative mobilization. This supports the idea that ESP blockade not only reduces pain but also provides clinical benefits in terms of a faster and more comfortable patient recovery process, especially in patients with complex comorbidities.

In the case of Mr. BU, who underwent thoracotomy, the use of ESP block was shown to be effective in significantly reducing pain. The decrease in pain score from 6 to 2 in the first three days after surgery indicated that this technique can provide adequate pain control. Previous studies have also shown that the use of ropivacaine as a local anesthetic in ESP block has the advantage of reducing side effects compared to other local anesthetics, such as bupivacaine. Ropivacaine is known to have a lower toxicity profile, making it safer to use in patients with complex comorbidities (Tsai et al., 2024). By reducing opioid use and increasing patient comfort, ESP block is a very promising option in post-thoracotomy pain management.

Thus, this case report shows that Erector Spinae Plane (ESP) block can be an effective and safer alternative compared to epidural analgesia for postoperative pain management in thoracotomy procedures. ESP block, which works by infiltrating local anesthetic around the erector spinae muscles, provides significant pain relief in the thoracic and abdominal areas without causing serious complications such as hypotension or impaired mobility that often occur with epidurals. In the case of Mr. BU, the use of ESP block with 0.5% ropivacaine was shown to significantly reduce opioid use, accelerate recovery, and reduce pain scores from 6 to 2 in three days. These results indicate that ESP block is a primary choice in post-thoracotomy pain management, providing a safer, more comfortable, and more effective solution, especially for patients with complex comorbidities.

4. CONCLUSION

Continuous Erector Spinae Plane (ESP) *Block* is an attractive alternative to epidural analgesia in thoracotomy surgery. Based on this case report, the technique showed effectiveness in improving postoperative pain control, as evidenced by a gradual decrease in the Numerical Rating Score (NRS) after surgery. Although the patient experienced increased pain in the early hours after surgery, with a peak NRS of 6 in the first 4 hours, the pain was well managed and stabilized at NRS 2 from 48 to 72 hours after surgery. In addition, the patient's breathing returned to normal levels at 48 to 72 hours, with oxygen saturation (SpO2) consistently in the good range of 95%-100%. This suggests that the interventions performed, including pain control with Continuous ESP Block, supported adequate breathing and oxygenation during recovery. This immediate recovery after thoracotomy surgery was facilitated by optimal pain management, providing an opportunity for increased healing mechanisms. Thus, with a shallower technique than epidural analgesia, ESP Block offers a better safety profile, reducing the

risk of complications such as infection, hematoma, or nerve damage. In this case report, Continuous ESP Block was shown to be a valuable alternative for postoperative thoracotomy pain management. This technique is a reliable option, especially for patients with contraindications or high risk for epidural analgesia.

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