

Combined paravertebral and erector spinae plane block in non-intubated video-assisted thoracoscopic wedge resection: a case report

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ABSTRACT

Thoracic surgery is often performed under general anesthesia, with intubation required. Less invasive surgical and anesthesiology approaches, such as a combination of video-assisted thoracic surgery (VATS) and regional nerve blocks, have been utilized to facilitate early recovery. In this case report, a patient undergoing VATS will be presented using thoracic paravertebral block (TPVB) and erector spinae plane blocks (ESPB) as the primary anesthesia approach. A twenty-eight-year-old male patient with no known comorbidity had been evaluated for VATS to undergo wedge resection of the right middle lobe due to non-resolving repeated pneumothorax. As the patient had bullous lung presence at the contralateral side as well, invasive ventilation was deemed risky, and, as an alternative approach, real-time ultrasound-guide TPV and ESPB block were performed with intravenous midazolam 2 mg and fentanyl 50 mcg utilized to prevent anxiety and pain control. A total of 20 ml bupivacaine and 10 mL 2% lidocaine were used for nerve blocks and for maintenance of sedation; 2 mg midazolam, 50 mg ketamine, 50 mcg fentanyl, and 150 mg propofol were used within 90 minutes of operation. After VATS, the patient was admitted to the surgical intensive care unit, and no complication was observed post-operatively, with a successful transfer to the ward afterward. Maintenance of an unproblematic perioperative period is as paramount as the surgery itself. A combination of protocols, with the limitation of post-operative opioid usage by sedation and less invasive surgical methods, such as non-intubated VATS being presented in this case report, allows an earlier recovery period and less complication by preserving lung function. TPV and ESPB, in this case, granted exclusion of intubation, less invasive to thoracic epidural anesthesia, and control of possible complications due to an already bullous lung.

Keywords: Thoracic paravertebral block, erector spinae plane block, video-assisted thoracic surgery, non-intubated video-assisted thoracoscopic surgery, NIVATS

INTRODUCTION

In thoracic surgery, many procedures are performed under general anesthesia and with a double-lumen tube (DLT) intubation. These requirements necessitate the use of neuromuscular blockage and maintenance of anesthesia with intravenous and/or volatile agents. Utilization of these agents, in turn, may cause complications such as a delay in post-operative recovery.¹ Enhanced recovery after surgery (ERAS) protocols have recently been widely accepted in thoracic surgeries.² Video-assisted thoracic surgery (VATS) procedures using regional or thoracic nerve blocks are increasingly used in non-intubated patients. These practices also significantly increase compliance with ERAS protocols. This approach allows the exclusion of neuromuscular blockage and the requirement for DLT while allowing an optimal surgical procedure and reducing any post-operative complication rate that may be related to these invasive modalities.³ This reduction in post-operative risk is significant in pulmonary complications, which, due to the nature of the procedure, is relatively higher than other non-thoracic operations.

Performing these blocks as the sole method of anesthesia is also a topic that has become increasingly accepted in recent years.

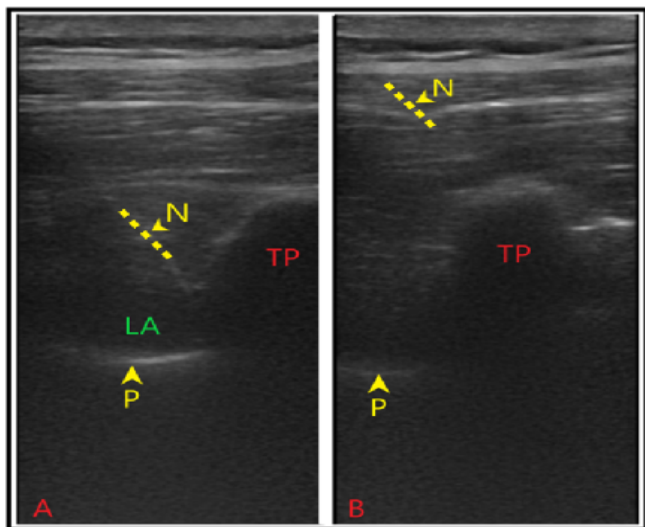
In thoracic surgery, thoracic paravertebral block (TPVB) and erector spinae plane blocks (ESPB) have been shown to provide analgesia and adequate anesthesia with minimal sedation.⁴⁻⁶ Among additional methods that could be utilized in thoracic wall blocks, which can be applied with a single needle insertion, are thoracic epidural anesthesia (TEA) and serratus anterior plane block (SAPB). The combination of ESPB and TPVB is a relatively new method that was validated in its safety and effectiveness.⁷ Similarly, the combination of both methods was found superior to either ESPB and TPVB alone, which varied within studies, as one study found the combination superior to ESPB but not TPVB, while the other stated the combination was superior to TPVB but similar to ESPB.^{8,9} In this case, we will discuss a patient who underwent VATS under TPVB and ESPB block as the primary anesthesia approach.

CASE

A twenty-eight-year-old male patient with no known comorbidity had been admitted to the thoracic surgery ward due to a right-side pneumothorax requiring a chest tube. Medical history revealed that he had a repeated right pneumothorax history; thus, further investigation was performed. Bullous lung formation was observed in the bilateral lungs in the requested computed chest tomography. During follow-up, the right lung was deemed non-expanding, and wedge resection for the right middle lobe by VATS was planned.

As the patient’s left lung was bullous as well, avoidance of invasive ventilation was considered, and a regional approach with sedo-analgesia was preferred, and the patient’s written and verbal approval was received. The procedure was performed by an experienced performer who was also certified in ultrasonography. After standard American Society Of Anesthesiologists (ASA) monitorization, real-time ultrasound-guided TPVB and ESPB block were utilized to visualize the fifth and sixth thoracic vertebral transverse processes. The hypothesis was that TPVB and ESPB would provide adequate analgesia, and the purpose would be to avoid invasive ventilation under this regimen. Midazolam 2 mg and fentanyl 50 mcg were administered intravenously prior to block application to prevent pain and anxiety. TPVB was then performed by injection of local anesthetic in the paravertebral space at T5 level (10 ml 0.5% bupivacaine, 5 ml 2% lidocaine), followed by ESPB performed between erector spinae muscle and thoracic transverse process at the same level (10 ml %0.5 bupivacaine, 5 ml 2% lidocaine) (Figure 1). Before local anesthesia injection, all block applications were initially checked in hydrodissection with saline. After 15 minutes of waiting for blocks to settle, a pin prick test was used to evaluate the dermatomal area examination and confirm an adequate block. The operation started after a Ramsay Sedation Score of 3 was reached. The surgeon and the operating team were experienced with the procedure and NIVATS application.

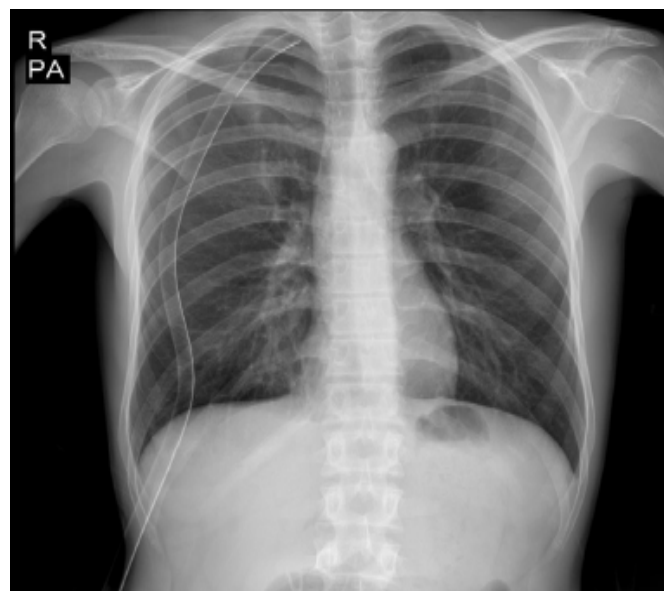
patient was uneventfully admitted to the surgical intensive care unit. A singular postoperative drain was inserted. (Figure 2-3) The total surgery duration was 90 minutes. Oral intake was resumed after four hours, and the patient did not report post-operative pain while under surveillance with Numerical Rating Scale (NRS). The postoperative NRS above four required additional analgesia, with analgesia performed under the guidance of an anesthesiologist by a pain management nurse. No post-operative complication was observed, and the patient was transferred to the ward. Total hospitalization duration was, including intensive care stay, with postoperative day being counted as 0, 4 days.



N: Needle (yellow dotted line), TP: Transverse process, LA: Local anesthesia, P: Pleural Line. Figure 1. Ultrasound-guided thoracic paravertebral and erector spinae block



*In the preoperative chest x-ray, an evident pneumothorax on the right side can be seen, with all structures relocated to the right hilum Figure 2. Preoperative chest X-ray



*After chest tube insertion, an adequate response to pneumothorax is present after the end of surgical intervention. Figure 3. Post-operative Chest X-ray

DISCUSSION

Maintaining an unproblematic perioperative period is as paramount as the surgery itself. Under ideal conditions, this practice may allow for earlier hospital discharge while reducing overall mortality and complications from underlying comorbidities. An increased preference for ERAS protocols

For maintenance sedation, 2 mg midazolam, 50 mg ketamine, 50 mcg fentanyl, and 150 mg propofol were used within 90 minutes. After VATS were performed with uniport, the

has been utilized to facilitate this benefit.² Combining all these approaches grants what may be called a golden key to a successful surgery. Limitation of post-operative opioid requirement after invasive procedures is essential, especially in thoracic surgeries, which often have a high incidence of pulmonary complications. Alternative anesthesia methods have been utilized, along with less invasive surgical techniques for this purpose, with non-intubated VATS being one option preferred.¹⁰

Such methods limit complications arising from general anesthesia usage, neuromuscular blockage requirement, and intubation-related issues, ranging from sore throat to possible esophageal intubation. The preference for VATS also does not require mandatory lung isolation methods, which limits possible physiological and mechanical issues caused by these methods.¹⁰

In this case, the patient was young and did not have any severe comorbidities; however, the presence of bilateral bullous lung and the requirement of positive pressure ventilation could have led to catastrophic consequences. Under TPVB and ESPB, VATS could be performed without intubation, and the mentioned complications were limited. Patient comfort was another parameter, as earlier hospital discharge reduced the need for sedation, and better overall pain management was provided. These benefits were also evident in intensive care unit requirements being less required in the mentioned patients, further supporting the claim of better overall care and patient comfort. Early oral intake was also allowed in these patients, which lessened possible post-operative nausea and vomiting. The minimally invasive nature of VATS also contributes to overall safety and allows regional anesthesia with sedation to be used as the sole method of anesthesia.^{11,12}

Another topic of interest was choosing the optimal block method. Thoracic epidural anesthesia (TEA) had been the preferred method for non-intubated patients; however, considering its invasive nature and possible risk of epidural hematoma, abscess, urinary retention, and similar complications, it was considered somewhat limited in terms of having a role in ERAS protocols.¹³ Additionally, current ERAS guidelines state that inadequate evidence is available to recommend a routine non-intubated approach for patients. However, it also states that the methods show promise and further studies are required. Combined approaches such as the one presented in this case are relatively more straightforward for the operator and patient while allowing better control of side effects. Considering both block procedures were performed under a single needle injection, failure to maintain a neural blockage was considered limited, as one failed block could have been compensated by the other. The combination of blocks, in general, provided a lower block failure and allowed more effective analgesia to be provided.

Control of pulmonary symptoms was another benefit of limited intervention to otherwise stable pulmonary systems. Preservation of lung function, along with the mentioned benefits of earlier hospital discharge and lower complication rates, have also been reported in thoracic surgery series.^{14,15} There have also been case reports stating that patients who

had otherwise been unfit for the thoracic intervention were able to undergo procedures with minimally invasive methods and non-intubation approaches. A study evaluated 16 patients going under NIVATS with a combination of ESPB and TPVB had similar results presented in our case report, with adequate safety profiles presented.¹⁶

CONCLUSION

It can be stated that VATS and non-intubated approaches reduce many complications, especially those that could be attributed to the pulmonary system. Further prospective studies, especially regarding thoracic ERAS protocols, would illuminate the safety of these approaches.

ETHICAL DECLARATIONS

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

REFERENCES

1. Moningi S, Patki A, Padhy N, Ramachandran G. Enhanced recovery after surgery: An anesthesiologist's perspective. *J Anaesthesiol Clin Pharmacol*. 2019;35(1):5-13.
2. Dinic VD, Stojanovic MD, Markovic D, et al. Enhanced recovery in thoracic surgery: a review. *Front Med*. 2018;5(1):5-14.
3. Pincus E. Regional anesthesia: an overview. *AORN J*. 2019;110(3):263-272.
4. Moorthy A, Eochagáin A, Dempsey E, et al. Postoperative recovery with continuous erector spinae plane block or video-assisted paravertebral block after minimally invasive thoracic surgery: a prospective, randomized controlled trial. *Br J Anaesth*. 2023;130(1):137-147. doi: 10.1016/j.bja.2022.07.051
5. Komatsu T, Kino A, Inoue M, et al. Paravertebral block for video-assisted thoracoscopic surgery: analgesic effectiveness and role in fast-track surgery. *Int J Surg*. 2014;12(9):936-939. doi: 10.1016/j.ijsu.2014.07.272
6. Liu L, Xin N, Zhang L, et al. Effects of ultrasound-guided erector spinae plane block on postoperative analgesia and plasma cytokine levels after uniportal VATS: a prospective randomized controlled trial. *J Anesth*. 2021;35(1):3-9. doi: 10.1007/s00540-020-02848-x
7. Zengin M, Alagöz A, Sazak H, et al. Comparison of efficacy of erector spinae plane block, thoracic paravertebral block, and erector spinae plane block and thoracic paravertebral block combination for acute pain after video-assisted thoracoscopic surgery: a randomized controlled study. *Minerva Anesthesiol*. 2023;89(3):138-148.
8. Zengin M, Baldemir R, Ulger G, Sazak H, Alagoz A. Postoperative analgesic efficacy of thoracic paravertebral and erectors plane block combination in video-assisted thoracic surgery. *Cureus*. 2021;13(6):15614.

9. Fu Z, Zhang Y, Zhou Y, et al. A comparison of paravertebral block, erector spinae plane block and the combination of erector spinae plane block and paravertebral block for post-operative analgesia after video-assisted thoracoscopic surgery: a randomised controlled trial. *J Minim Access Surg.* 2022;18(2):241.
10. Wen Y, Liang H, Qiu G, et al. Non-intubated spontaneous ventilation in video-assisted thoracoscopic surgery: ameta-analysis *Eur J Cardiothorac Surg.* 2020;57(3):428-437. doi.org/10.1093/ejcts/ezz279
11. Kao MC, Lan CH, Huang CJ. Anesthesia for awake video-assisted thoracic surgery. *Acta Anaesthesiol Taiwan.* 2012;50(3):126-130.
12. Lin J, Liao Y, Gong C, et al. Regional analgesia in video-assisted thoracic surgery: a bayesian network meta-analysis. *Front Med.* 2022; 9(6):842332.
13. Freise H, Van Aken HK. Risks and benefits of thoracic epidural anesthesia. *Br J Anaesth.* 2011;107(6):859-868. doi.org/10.1093/bja/aer339
14. Mudannayake R, Martinez G, Bello I, Gimenez-Milà M. Non-intubated thoracic surgery: a physiological approach. *Arch Bronconeumol.* 2023;59(11):699-701.
15. Tacconi F, Pompeo E. Non-intubated video-assisted thoracic surgery: does evidence stand? *J Thorac Dis.* 2016;8(4):364-375.
16. Alagoz A, Findik G, Sazak H, et al. Non-intubated video-assisted thoracoscopic surgery under combination of erector spinae plane block and thoracic paravertebral block. *BMC Anesthesiol.* 2022;22(1):99.