



Case Report

Ultrasound-Guided Thoracic Paravertebral Block for Uniportal VATS Sublobar Resection: A Case Report

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Abstract

Background: Lung cancer remains one of the leading causes of cancer-related mortality worldwide. Despite the numerous advantages of video-assisted thoracoscopic surgery (VATS) in thoracic surgery, postoperative pain continues to pose a significant challenge, contributing to pulmonary complications and delayed recovery. Given the limited efficacy and notable adverse effects of systemic opioids, opioid-sparing multimodal analgesic strategies—including regional nerve block techniques such as the paravertebral block—have gained increasing attention for optimizing postoperative pain management and enhancing recovery. **Objective:** This case report aims to illustrate the clinical application and analgesic efficacy of an ultrasound-guided single-injection TPVB, combined with a preoperative nonsteroidal anti-inflammatory drug (NSAID), as a component of an opioid-sparing multimodal regimen in a patient undergoing VATS sublobar resection. **Methods:** A 36-year-old female underwent VATS sublobar resection of a right upper lobe nodule. To achieve opioid-sparing multimodal analgesia, the anesthesiologist implemented a regimen consisting of an intravenous NSAID (flurbiprofen axetil 50 mg) administered 30 minutes before the end of surgery, followed by an ultrasound-guided thoracic paravertebral block (TPVB) with 25 mL of 0.25% ropivacaine injected as a single shot postoperatively. **Conclusions:** A single-injection thoracic paravertebral block (TPVB) represents a highly effective component of a multimodal analgesic strategy, offering profound and opioid-sparing analgesia for thoracic surgical procedures.

Keywords

Video-assisted Thoracoscopic Surgery (VATS), Thoracic Paravertebral Block (TPVB)

1. Introduction

Lung cancer remains one of the leading causes of cancer-related mortality among both men and women worldwide. According to the American Cancer Society (ACS), an estimated 127,070 deaths from lung cancer are expected in 2023, representing approximately 20% of all cancer-related fatalities. Non-small cell lung cancer (NSCLC) accounts for 84% of these cases, and thoracic surgery, including lobectomy, remains the cornerstone of curative treatment. [1] However, this surgical approach is associated with substantial postoperative

risks, including dyspnea, hemorrhage, and pain. Notably, postoperative pain contributes to pulmonary complications in approximately 40.8% of patients, which may delay recovery and adversely impact quality of life. [2] Video-assisted thoracoscopic surgery (VATS) has gained widespread application in the management of various thoracic malignancies, including esophageal and lung cancers, due to its advantages of smaller incisions, attenuated postoperative pain and inflammatory response, and accelerated recovery [3, 4]. Systemic

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opioids have limited efficacy in this setting, often resulting in inadequate pain control and significant adverse effects. Therefore, opioid-sparing multimodal analgesic strategies—such as regional nerve blocks—have gained increasing attention for optimizing postoperative pain management and enhancing recovery [5-7].

2. Case Presentation

A 36-year-old woman presented with a space-occupying lesion in the right lung detected on routine physical examination. Outpatient imaging follow-up failed to exclude the possibility of malignancy. The patient was then admitted to our hospital for surgical intervention. Preoperative imaging, including non-contrast and contrast-enhanced thin-section computed tomography of the chest, demonstrated a ground-glass nodule in the posterior segment of the right upper lobe, with dimensions of approximately 0.6 cm × 0.7 cm. The nodule showed irregular morphology, multiple short spiculations along its border,

and mild retraction of the adjacent oblique fissure. These radiographic features were highly suggestive of a small malignant lesion. The surgical plan was to perform a video-assisted thoracoscopic surgery (VATS) sublobar resection of the nodule in the right upper lobe under general anesthesia. A uniportal incision was made at the fifth intercostal space on the midaxillary line. During the procedure, the patient underwent partial resection of the right upper lobe and lymph node sampling. One chest tube was inserted for closed drainage, after which the incision was closed layer by layer. Thirty minutes prior to the completion of surgery, 50 mg of flurbiprofen axetil was given intravenously. Following surgery, the patient was positioned in the left lateral decubitus position. Under aseptic technique, ultrasound guidance was employed by the anesthesiologist using a curved-array probe. Using an in-plane approach with lateral-to-medial needle trajectory, the needle was advanced until its tip pierced the superior border of the costotransverse ligament and reached the paravertebral space (Figure 1).

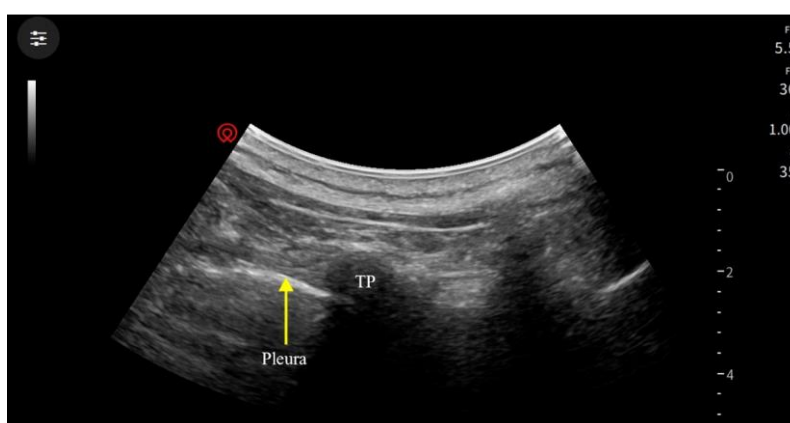


Figure 1. Using an in-plane approach with lateral-to-medial needle trajectory, the needle was advanced until its tip pierced the superior border of the costotransverse ligament and reached the paravertebral space. Transverse process (TP).

After the pleura was gently displaced, 25 mL of 0.25% ropivacaine was injected into the paravertebral space (Figure 2).

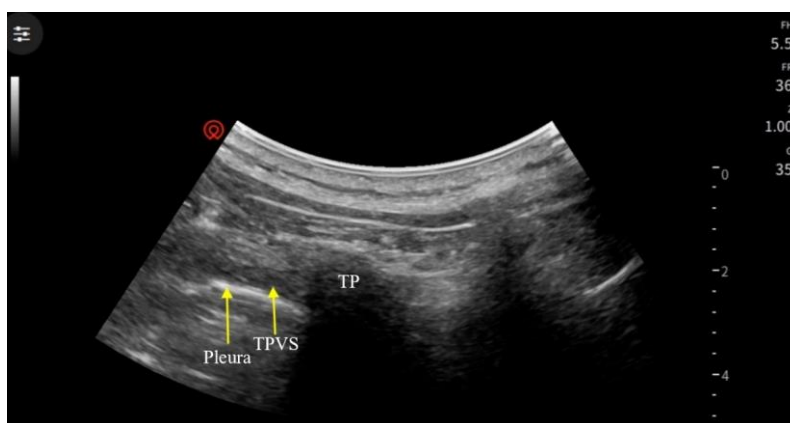


Figure 2. After the pleura was gently displaced, 25 mL of 0.25% ropivacaine was injected into the paravertebral space. TPVS: Thoracic paravertebral space.

Upon arrival in the post-anesthesia care unit (PACU), the patient rated her pain as 1 on a 10-point Visual Analog Scale (VAS) and did not require any rescue analgesic intervention. Oxygen saturation was maintained at 100% with 2 L/min of oxygen via nasal cannula, and her hemodynamic status remained stable throughout the PACU stay. On the first postoperative day, the patient reported no pain at rest (VAS 0) and mild pain during movement (VAS 3). She demonstrated good respiratory effort and effective coughing. By postoperative day 2, the patient was completely pain-free both at rest and during routine activities; however, she noted pain at the chest tube insertion site when assuming certain positions. The patient was highly satisfied with her postoperative pain control, giving a satisfaction score of 9 out of 10.

3. Discussion

This case report describes a 36-year-old female patient who underwent video-assisted thoracoscopic surgery (VATS) in which a nonsteroidal anti-inflammatory drug (NSAID) combined with a regional nerve block effectively controlled postoperative pain. The regional anesthetic technique employed was an ultrasound-guided thoracic paravertebral block (TPVB). This technique provided excellent perioperative analgesia, as evidenced by low Visual Analog Scale (VAS) pain scores in the post-anesthesia care unit (PACU) and on the first postoperative day, without the need for rescue analgesia. The patient reported high satisfaction with her pain management, rating it 9 out of 10, and experienced an uneventful postoperative recovery characterized by effective coughing and stable hemodynamics.

Currently, multimodal analgesic regimens—including both pharmacological and regional interventions—are increasingly recognized as essential for optimal postoperative pain management. The paravertebral block is an ideal technique for thoracic and abdominal surgeries, providing segmental anesthesia at the level of the surgical site. [8, 9] The ultrasound probe is positioned at the target vertebral level. The needle is then advanced using a lateral-to-medial in-plane approach until its tip penetrates the internal intercostal membrane. Intermittent injection of normal saline may be used to confirm needle tip positioning. After negative aspiration, local anesthetic is injected into the paravertebral space. This technique also achieves adequate muscle relaxation and prolongs the duration of postoperative analgesia. Compared with systemic opioids, the thoracic paravertebral block offers superior analgesic efficacy with fewer complications. [10, 11] Video-assisted thoracoscopic surgery (VATS) is associated with substantial postoperative pain, which consequently requires a multimodal approach to analgesia. In this context, many working groups have recommended the thoracic paravertebral block (TPVB) as the preferred regional

anesthetic technique for patients undergoing VATS, favoring it over other nerve block modalities.

4. Conclusion

This case report from an anesthesiologist details the complete clinical course of postoperative pain control in VATS using an NSAID combined with a regional nerve block. The case demonstrates that a single-injection TPVB under precise ultrasound guidance with appropriate local anesthetic volume and concentration is a highly effective component of multimodal analgesia. This technique provides profound opioid-sparing analgesia for thoracic surgery, which may facilitate early mobilization, enhance postoperative pulmonary rehabilitation, reduce opioid-related side effects, and shorten hospital stay.

Abbreviations

VATS	Video-assisted Thoracoscopic Surgery
NSAIDS	Nonsteroidal Anti-inflammatory Drug
ACS	American Cancer Society
TPVB	Thoracic Paravertebral Block
TPVS	Thoracic Paravertebral Space
NSCLC	Non-small Cell Lung Cancer
TP	Transverse Process
PACU	The Post-anesthesia Care Unit
VAS	Visual Analog Scale

Author Contributions

Shizhu Lin: Formal Analysis, Methodology, Writing – original draft, Writing – review & editing

Conflicts of Interest

The authors declare no conflicts of interest.

References

- [1] Sun L, Mu J, Gao B, et al. Comparison of the efficacy of ultrasound-guided erector spinae plane block and thoracic paravertebral block combined with intercostal nerve block for pain management in video-assisted thoracoscopic surgery: a prospective, randomized, controlled clinical trial [J]. *BMC Anesthesiol*, 2022, 22(1): 283. <http://10.1186/s12871-022-01823-1>
- [2] Zhu J, Wei B, Wu L, et al. Effect of Thoracic Paravertebral Block on Postoperative Pulmonary Complications After Video-Assisted Thoracoscopic Surgery: A Dual-Center Randomized Clinical Trial [J]. *Ther Clin Risk Manag*, 2025, 21: 691-703. <http://10.2147/tcrn.S515093>

- [3] Murakawa T, Sato H, Okumura S, et al. Thoracoscopic surgery versus open surgery for lung metastases of colorectal cancer: a multi-institutional retrospective analysis using propensity score adjustment† [J]. *Eur J Cardiothorac Surg*, 2017, 51(6): 1157-1163. <http://10.1093/ejcts/ezx020>
- [4] Kinjo Y, Kurita N, Nakamura F, et al. Effectiveness of combined thoracoscopic-laparoscopic esophagectomy: comparison of postoperative complications and midterm oncological outcomes in patients with esophageal cancer [J]. *Surg Endosc*, 2012, 26(2): 381-90. <http://10.1007/s00464-011-1883-y>
- [5] Karnik P P, Dave N M, Garasia M. Comparison of analgesic efficacy and safety of continuous epidural infusion versus local infiltration and systemic opioids in video-assisted thoracoscopic surgery decortication in pediatric empyema patients [J]. *Saudi J Anaesth*, 2018, 12(2): 240-244. http://10.4103/sja.SJA_659_17
- [6] Beltran R, Veneziano G, Bhalla T, et al. Postoperative pain management in patients undergoing thoracoscopic repair of pectus excavatum: A retrospective analysis of opioid consumption and adverse effects in adolescents [J]. *Saudi J Anaesth*, 2017, 11(4): 427-431. http://10.4103/sja.SJA_339_17
- [7] Rahman N M, Pepperell J, Rehal S, et al. Effect of Opioids vs NSAIDs and Larger vs Smaller Chest Tube Size on Pain Control and Pleurodesis Efficacy Among Patients With Malignant Pleural Effusion: The TIME1 Randomized Clinical Trial [J]. *Jama*, 2015, 314(24): 2641-53. <http://10.1001/jama.2015.16840>
- [8] Sung C S, Wei T J, Hung J J, et al. Comparisons in analgesic effects between ultrasound-guided erector spinae plane block and surgical intercostal nerve block after video-assisted thoracoscopic surgery: A randomized controlled trial [J]. *J Clin Anesth*, 2024, 95: 111448. <http://10.1016/j.jclinane.2024.111448>
- [9] Turhan Ö, Sivrikoz N, Sungur Z, et al. Thoracic Paravertebral Block Achieves Better Pain Control Than Erector Spinae Plane Block and Intercostal Nerve Block in Thoracoscopic Surgery: A Randomized Study [J]. *J Cardiothorac Vasc Anesth*, 2021, 35(10): 2920-2927. <http://10.1053/j.jvca.2020.11.034>
- [10] Hu Z, Liu D, Wang Z Z, et al. The efficacy of thoracic paravertebral block for thoracoscopic surgery: A meta-analysis of randomized controlled trials [J]. *Medicine (Baltimore)*, 2018, 97(51): e13771. <http://10.1097/md.00000000000013771>
- [11] Sandeep B, Huang X, Li Y, et al. A comparison of regional anesthesia techniques in patients undergoing video-assisted thoracic surgery: A network meta-analysis [J]. *Int J Surg*, 2022, 105: 106840. <http://10.1016/j.ijvsu.2022.106840>