Baser et al. BMC Anesthesiology (2025) 25:368
https://doi.org/10.1186/s12871-025-03237-1

BMC Anesthesiology

RESEARCH

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Optimizing post-thoracotomy pain management: comparing erector spinae vs. paravertebral block in thoracotomy patients: a prospective randomized study

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Abstract

Background Postoperative pain can lead to serious complications in the short and medium term. It may also increase the risk of converting acute pain into chronic pain, leading to the development of postthoracotomy pain syndrome (PTPS). The aim of this study was to demonstrate the effectiveness of erector spinae plane block (ESPB) and paravertebral block (PVB) in managing acute postoperative pain and preventing the development of PTPS in patients undergoing thoracotomy and lobectomy.

Methods This prospective, randomized study included American Society of Anesthesiologists (ASA) class II-III patients aged 18–70 years who underwent elective unilateral lobectomy via a thoracotomy. The study was conducted at Başakşehir Çam and Sakura City Hospital, following approval from the hospital's ethics committee on May 20, 2022 (protocol number: KAEK.2022.05.155). Patients were randomly assigned into ESPB ($n = 30$) and PVB ($n = 30$) groups using a computer-generated randomization sequence prior to surgery. Intravenous patient-controlled analgesia (PCA) was provided for 24 h postoperatively. Resting numerical rating scala (NRS) and Prince Henry Hospital Pain Scale (PHHPS) scores were evaluated at 0, 2, 6, 12, and 24 h after surgery. Pain levels were further assessed via telephone interviews using the NRS at 2 weeks and 2 months postoperatively.

Results The baseline NRS score was significantly lower in the PVB group (3.97 ± 0.61) compared to the ESPB group (4.37 ± 0.85) ($p = 0.044$). The mean number of PCA requests, mean opioid consumption and number of patients receiving rescue analgesics were significantly lower in the PVB group than in the ESPB group ($p < 0.05$). No significant differences were observed between the groups in hemodynamic parameters ($p > 0.05$). PTPS developed in 3 patients (1 in PVB, 2 in ESPB), with no significant intergroup difference ($p = 0.561$).

Conclusions PVB and ESPB provided effective acute pain control after thoracotomy, with PVB showing superior outcomes in analgesic use and pain scores. Early management of postoperative pain may improve short-term recovery and potentially reduce PTPS incidence, which was 5% in our study—lower than reported in the literature.

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Trial registration ClinicalTrials.gov (ID NCT06964698). The clinical trial was retrospectively registered on April 02, 2025.

Keywords Post-operative pain syndrome, Paravertebral block, Erector spinae plane block, Thoracotomy

Introduction

Postthoracotomy pain is a significant clinical challenge, with approximately 75% of patients experiencing moderate to severe pain following the procedure [1]. If not managed adequately, acute postoperative pain can lead to serious complications, such as impaired respiratory function, increased hospital stay, and the development of chronic pain syndromes. One of the most concerning complications is postthoracotomy pain syndrome (PTPS), a condition characterized by persistent or recurrent pain lasting at least two months after thoracotomy [2, 3]. According to the International Association for the Study of Pain, PTPS has a prevalence ranging from 33 to 91% following thoracic surgery [4, 5]. It is typically neuropathic in nature and manifests as burning sensations, dysesthesia, and localized pain [6]. The exact mechanisms contributing to PTPS remain unclear, but factors such as genetic predisposition, psychosocial influences, preexisting neuropathic conditions, and, notably, insufficient acute pain management have all been implicated [7, 8].

Given the debilitating impact of PTPS on patient quality of life and the risk of treatment failure, preventing acute pain effectively is crucial. Various regional and central analgesia techniques, including thoracic epidural analgesia (TEA), paravertebral block (PVB), and erector spinae plane block (ESPB), are utilized in a multimodal strategy. While TEA has long been considered the gold standard for thoracotomy pain management, its side effect profile has led to recommendations for alternative approaches. The European Society for Regional Anaesthesia (ESRA) now suggests that PVB should be the first-line option for thoracic surgery because of its comparable efficacy and improved safety [9].

ESPB, a more recently developed fascial plane block, has also gained recognition for its analgesic effectiveness and lower risk of complications than PVB [10]. Both blocks have been used successfully in the management of acute postthoracotomy pain, but studies that directly compare their efficacy for preventing both acute pain and the development of PTPS are lacking. To address this gap, our study aimed to evaluate and compare the impact of preoperative ESPB and PVB on postoperative pain management and the development of PTPS in patients undergoing thoracotomy for lobectomy. By analysing the short- and long-term outcomes of these two techniques, we hope to provide valuable insights into optimizing pain management strategies for thoracic surgery.

Materials and methods

Study design and ethics approval

It was conducted as a prospective, randomized trial at the Basaksehir Cam and Sakura City Hospital, after approval had been obtained from the ethics committee of the Basaksehir Cam and Sakura City Hospital on May 20,2022, (protocol number: KAEK.2022.05.155). Our study recognises the Declaration of Helsinki as a statement of ethical principles for medical research involving human participants.

Patient population and randomization

Adult patients aged 18–70 years who underwent unilateral lobectomy via a thoracotomy approach under elective conditions between June 1, 2022, and December 1, 2022, were included in the study. Informed consent was obtained from all patients prior to enrollment. The inclusion criteria were as follows: patients classified as American Society of Anesthesiologists (ASA) II-III, no history of previous thoracotomy, no chronic pain or analgesic dependence, and adequate preoperative cooperation. The exclusion criteria included patients with known drug allergies, chronic analgesic use, or preexisting neuropathic conditions.

Randomization was performed via a computer-generated sequence to ensure the true random allocation of patients into either the ESPB or the PVB group. The sequence was concealed via sealed opaque envelopes, which were opened by the attending anesthesiologist just before block administration. No stratification was applied; however, group assignment was conducted to ensure an equal distribution of patients by sex, age, and ASA status. The anesthesiologist monitoring postoperative pain was blinded to the type of block administered.

Preoperative anaesthesia preparation and block protocols

All patients received standard ASA monitoring, including invasive blood pressure measurement. All blocks were performed by the same anesthesiologist (O.A.), who had more than 7 years of experience in ultrasound-guided regional anesthesia.

Erector spinae plane block (ESPB) protocol

For ESPB, the patient was positioned in a seated posture, and under sterile conditions, a 22G, 80 mm Stimuplex® D block needle (B. Braun, Melsungen, Germany) was inserted between the T6 and T7 transverse processes and the erector spinae muscle via ultrasound guidance (Fujifilm Arietta 65, Tokyo, Japan). The T6-T7 level was chosen on the basis of its proximity to the thoracic surgical site, allowing for optimal coverage of the thoracic dermatomes. Following negative aspiration, 1 mL of saline was injected via hydrodissection to confirm correct needle placement, and 20 mL of 0.375% bupivacaine was administered.

Paravertebral block (PVB) protocol

For the PVB, the patient was seated, and a 22G block needle was inserted into the paravertebral space at the T5 level under ultrasound guidance. The T5 level was selected to provide direct analgesia to the thoracic paravertebral space, which is known to block multiple thoracic nerves. After negative aspiration, 1 mL of saline was injected to confirm correct needle placement, and 20 mL of 0.375% bupivacaine was administered following hydrodissection.

Anaesthesia protocol

Premedication was achieved with 2 mg intravenous midazolam, which was administered prior to the block performance. General anaesthesia induction was achieved with 2 mcg/kg fentanyl and 1.5–3 mg/kg propofol, with a target bispectral index (BIS) between 40 and 60. Neuromuscular blockade was induced via 0.6 mg/kg rocuronium, and maintenance of anaesthesia was achieved via sevoflurane (1-2%) and remifentanil (0.05–0.2 mcg/kg/min) in a 50% oxygen/air mixture. All patients underwent orotracheal intubation with a double-lumen tube appropriate for their body height and surgical side, and mechanical ventilation parameters were standardized across all patients. A standard posterolateral thoracotomy was performed through the fifth intercostal space to provide surgical access. For optimal postoperative drainage and lung re-expansion, a 28 Fr chest tube was inserted through the sixth intercostal space, one level below the thoracotomy incision. All operations were carried out by the same team. At the conclusion of the surgery, patients were administered 1 g of paracetamol and 100 mg of tramadol intravenously, followed by reversal of neuromuscular blockade with 2–4 mg/kg sugammadex. A patient-controlled analgesia (PCA) device (BodyGuard 595) with a basal infusion of 2.5 mL/h of tramadol (500 mg tramadol in 125 mL of 0.9% NaCl) was used for postoperative analgesia (intermittent bolus dose of 5 mL - lock time 30 min). Morphine (0.1 mg/kg) was used as a rescue analgesic if the numerical rating scala (NRS) score exceeded 4 out of 10.

Outcome measurements

The primary outcome was postoperative pain, which was assessed via the NRS and the Prince Henry Hospital Pain Scale (PHHPS) at 0, 2, 6, 12, and 24 h postoperatively. Pain levels were also assessed at 2 weeks and 2 months postoperatively, with phone calls for follow-up. Although phone assessments may introduce bias due to the subjective nature of self-reported pain levels, this method was chosen to maintain follow-up consistency across all patients. To mitigate this limitation, the same standardized questionnaire was used for all phone assessments, and patients were instructed to report their pain levels accurately.

The secondary outcomes included the incidence of PTPS at 2 months; the total consumption of opioids via the PCA device at 24 h postoperatively; the number of requests for rescue analgesia within the first 24 h postoperatively; and the incidence of complications such as hematoma, pneumothorax, or nerve damage. Hemodynamic variables were assessed with measurements taken at the following predefined times: preoperatively, end of induction, time of skin incision, 30th, 60th, 90th and 120th minute of block and end of surgery. Additionally, demographic characteristics, intraoperative hemodynamic data, and surgical duration were recorded.

Statistical analysis

A power analysis was conducted to determine the required sample size, with an alpha of 0.05 and beta of 0.1, expecting a minimum 3 mg morphine consumption difference in 24-hour opioid consumption between the groups [11]. Based on an estimated effect size of Cohen's $d \approx 0.9$, a minimum of 60 patients (30 per group) were included to achieve a power of 90%. A total of 64 patients were enrolled to account for potential attrition. The minimal clinically important difference (MCID) was considered as ≥ 1.0 for the NRS and ≥ 0.3 for the PHHPS, in accordance with previously published literature [12]. These thresholds were used to interpret the clinical relevance of the observed differences.

The data were analysed via SPSS (Mac OS, version 27.0). The normality of the data was assessed with the Kolmogorov−Smirnov test. Normally distributed data were analyzed using independent t-tests, while non-normally distributed data were analyzed with the Mann-Whitney U test. Categorical variables were compared using chi-square or Fisher's exact tests. Continuous variables are presented as the means ± standard deviations, and categorical variables are presented as frequencies and percentages. Statistical significance was determined by p values < 0.05.

Results

Our study included 64 patients. Four patients, two from each group, were excluded (two due to a change in the operation decision and two due to data loss). We analysed the data of 60 patients, with equal numbers of patients in both the PVB group ($n = 30$) and the ESPB group ($n = 30$) (Fig. 1) (Table 1).

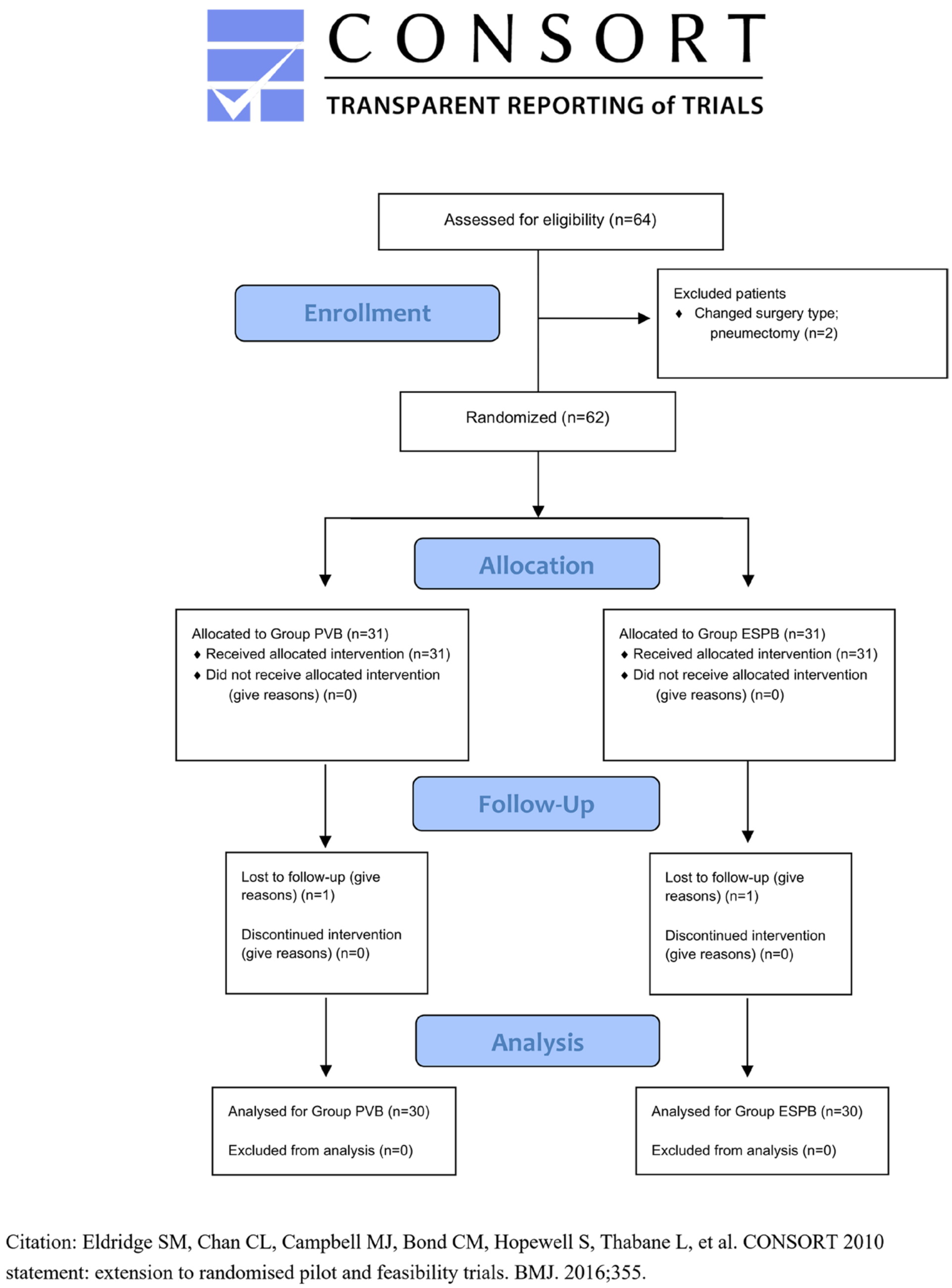

Fig. 1 Flow diagram

The demographic characteristics of the patients in the PVB and ESPB groups were similar ($p > 0.05$) (Table 1). The PVB group had a greater percentage of left lobectomies (67.7%), whereas the ESPB group had a greater percentage of right lobectomies (63.3%) ($p = 0.021$). No significant difference was found between the groups in terms of other intraoperative features ($p > 0.05$) (Table 2).

The measurement values of the mean arterial pressure (MAP) and heart rate (HR) parameters of patients at different times and procedure steps. No significant difference in hemodynamic data was found between the two groups ($p > 0.05$) (Fig. 2A-B).

Table 3 displays the results of the NRS scores measured at different postoperative time points for the PVB and ESPB groups. The initial NRS score at postoperative hour 0 was significantly lower in the PVB group than in the ESPB group ($p = 0.042$). There was no statistically significant difference between the groups in the NRS scores at 2, 6, 12, and 24 h; 2 weeks; and 2 months, excluding the baseline time period ($p > 0.05$). PTPS developed in a total of three patients at 2 months, with one (3.3%) in the PVB

Table 1 Demographic characteristics of the patients

	Group PVB (*n* = 30)	Group ESPB (*n* = 30)	*p* value
Gender$^{\chi 2}$			
Female	8(27%)	11(37%)	0.409
Male	22(73%)	19(63%)	
Age *(years)*$^{\Psi}$	57.3 ± 13.4	59.2 ± 10.4	0.541
Length *(cm)*$^{\Psi}$	170.3 ± 9.2	169.4 ± 7.4	0.691
Weight *(kg)*$^{\Psi}$	73.7 ± 11.0	74.0 ± 10.6	0.915
BMI *(kg/m^2)*$^{\Psi}$	25.5 ± 3.7	25.7 ± 3.1	0.741
ASA score $^{\chi 2}$			
II	14(%47)	9(% 30)	0.220
III	16(%53)	21(%70)	

Data presented as Mean ± SD and n (%)

BMI Body mass index, *ASA* American Society of Anesthesiologists

$^{\Psi}$Independent samples t tests, χ^2 Chi-square test

Table 3 Postoperative numeric rating scale (NRS) scores

	Group PVB (*n* = 30)	Group ESPB (*n* = 30)	*p* value
0. hour$^{\mu}$	4.0 ± 0.6	4.4 ± 0.8	*0.044**
2. hour$^{\mu}$	3.0 ± 0.5	3.2 ± 0.6	0.223
6. hour$^{\mu}$	2.4 ± 0.5	2.6 ± 0.6	0.260
12. hour$^{\mu}$	1.7 ± 0.6	1.9 ± 0.5	0.217
24. hour$^{\mu}$	1.0 ± 0.5	1.1 ± 0.4	0.298
2. week$^{\mu}$	0.4 ± 0.6	0.4 ± 0.5	0.792
2. month$^{\mu}$	0.1 ± 0.2	0.0 ± 0.2	0.557

Data presented as Mean ± SD

$^{\mu}$ Mann–Whitney U test

Table 2 Perioperative follow-up

	Group PVB (*n* = 30)	Group ESPB (*n* = 30)	*p* value
Duration of anaesthesia *(min)*$^{\Psi}$	238.7 ± 59.7	241.8 ± 53.0	0.829
Surgical time *(min)*$^{\Psi}$	212.2 ± 56.5	213.0 ± 51.4	0.953
Intraoperative bleeding amount$^{\mu}$	161.7 ± 75.1	158.3 ± 54.3	0.845
Fluid given *(mL)*$^{\mu}$	793.3 ± 127.8	865.0 ± 150.9	0.052
Surgery side			
Right$^{\chi 2}$	10(%33)	19(%63)	*0.021**
Left$^{\chi 2}$	20(%67)	11(%37)	
Length of stay-ICU *(days)*$^{\mu}$	1.1 ± 0.4	1.17 ± 0.25	0.703
Length of stay-Hospital *(days)*$^{\mu}$	9.3 ± 3.1	10.40 ± 2.91	0.175
Incidences of PTPS$^{\chi 2}$	1(%3)	2(%7)	0.561

Data presented as Mean ± SD and n (%)

ICU Intensive care unit, *PTPS* Postthoracotomy pain syndrome

$^{\Psi}$Independent samples t tests

$^{\mu}$Mann–Whitney U test

χ^2chi-square test

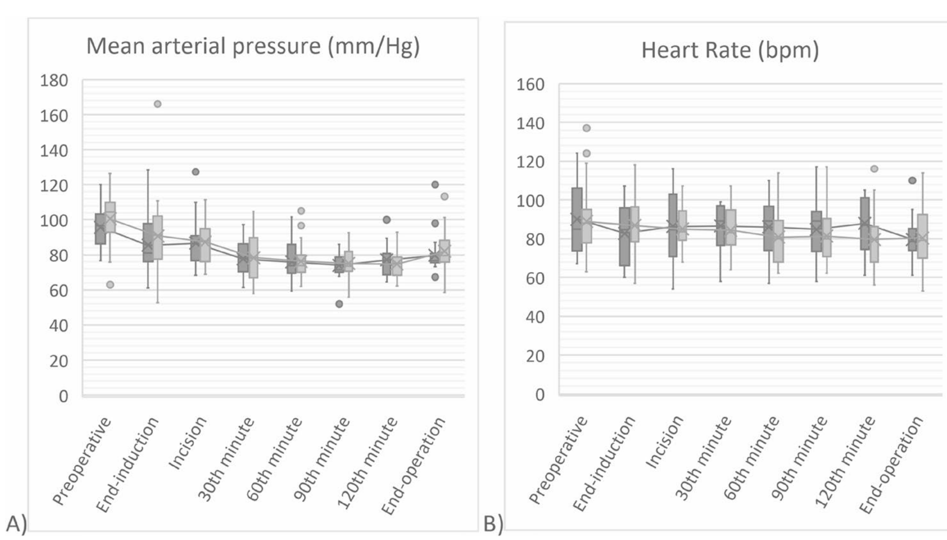

Fig. 2 Comparison of mean arterial pressure **A** and Heart Rate **B** between the PVB group and the ESPB group

group and two (6.6%) in the ESPB group. Although PTPS was observed at a lower rate in the PVB group than in the ESPB group, there was no statistically significant difference between the groups ($p = 0.561$).

The PHHPS score was significantly lower in the PVB group than in the ESPB group at 0, 2, 6, and 12 h postoperatively ($p < 0.05$) (Table 4).

Compared with the ESPB group, the PVB group had significantly lower mean numbers of requests and analgesic demand met from the PCA device, mean amounts of opioid use, and number of patients receiving rescue analgesics ($p < 0.05$) (Table 5).

No block-related complications, such as hematoma, nerve damage, pneumothorax, or local anaesthetic toxicity, were observed in either group, and neither group experienced nausea or vomiting.

Table 4 Prince Henry hospital pain scale (PHHPS) comparisons

Postoperatively	Group PVB ($n = 30$)	Group ESPB ($n = 30$)	*p* value
0. hour$^{\mu}$	1.1 ± 0.3	1.4 ± 0.5	*0.008**
2. hour$^{\mu}$	1.1 ± 0.3	1.4 ± 0.5	*0.004**
6. hour$^{\mu}$	1.1 ± 0.3	1.4 ± 0.5	*0.004**
12. hour$^{\mu}$	1.1 ± 0.3	1.4 ± 0.5	*0.004**
24. hour $^{\mu}$	1.1 ± 0.3	1.3 ± 0.4	0.098
2. week$^{\mu}$	0.1 ± 0.3	0.3 ± 0.4	0.098
2. month$^{\mu}$	0.0 ± 0.0	0.0 ± 0.2	0.317

Data presented as Mean ± SD

$^{\mu}$Mann–Whitney U test

Table 5 Patient-controlled analgesia (PCA) usage

	Group PVB ($n = 30$)	Group ESPB ($n = 30$)	*p* value
Analgesic demand met$^{\mu}$	3.8 ± 1.8	7.0 ± 2.0	< 0.001*
Number of analgesic demands$^{\mu}$	9.7 ± 3.8	16.4 ± 4.1	< 0.001*
Total amount used *(mg)*$^{\Psi}$	304.5 ± 22.9	352.1 ± 17.5	< 0.001*
Rescue analgesia$^{\chi^2}$			
Yes	3(10)	10(33)	0.024*
No	27(90)	20(67)	

Data presented as Mean ± SD and n (%)

$^{\mu}$Mann–Whitney U test

$^{\Psi}$Independent samples t tests

$^{\chi^2}$chi-square test

Discussion

Our findings showed that both PVB and ESPB provided effective analgesia, but PVB was superior in early postoperative pain control and opioid sparing. These results align with prior research and emphasize the role of PVB as a preferred technique in thoracic surgery analgesia.

Although minimally invasive surgery is becoming more common, there are still many problems with postoperative pain after thoracotomy. In the review by Miyazaki et al., the development of PTPS could not be effectively prevented even after minimally invasive surgery [13]. Currently, the most effective approach to pain management after thoracotomy is multimodal analgesic treatment via regional anaesthesia techniques in combination with intravenous analgesics [14–16]. PVB and ESPB are both effective regional analgesic techniques for postoperative pain management after thoracotomy. In line with literature recommendations [9, 17], both blocks are routinely used in our clinic under ultrasound guidance due to their favorable safety profiles.

Regional anaesthesia techniques such as PVB and ESPB have been shown to reduce the incidence of chronic pain, including PTPS. By blocking nociceptive input early, these techniques help prevent central sensitization and limit inflammatory responses that contribute to chronic pain. This early intervention is especially valuable in modulating the transition from acute to chronic pain. Studies indicate that patients receiving PVB or ESPB report lower PTPS rates and reduced opioid use compared to systemic analgesia alone. Incorporating these blocks into multimodal analgesia protocols not only improves acute pain control but also enhances long-term outcomes by decreasing the risk of chronic pain development [18, 19].

Importantly, in our study, both blocks were performed before anesthesia induction, allowing a preemptive analgesic effect, which likely contributed to the low incidence of PTPS observed.

In the study by Fusco et al. [20], drug-related factors were highlighted as crucial determinants in the success of fascial plane blocks. While volume is a key factor, the authors emphasized that rapid systemic reabsorption, local anesthetic toxicity risk, and motor-sparing effects also influence both the efficacy and safety of these blocks. They noted that varying concentrations and volumes may lead to different reabsorption patterns. Similarly, Zengin et al. [21] demonstrated that a higher volume (30 mL vs. 20 mL) of local anesthetic improved analgesic efficacy. To ensure methodological consistency and avoid confounding due to drug volume, we standardized local anesthetic use: all patients received 20 mL of 0.375% bupivacaine. Each patient received 20 mL of 0.375% bupivacaine for both block techniques. This approach allowed for a more reliable comparison of block effectiveness independent of drug dose variability.

In the study by Zengin et al. [22], ESPB with 20 mL of local anesthetic was reported to be superior to thoracic PVB in patients undergoing VATS, showing lower pain scores at rest and during coughing, as well as reduced opioid consumption and analgesic requirements. However, the type of surgical approach (uniport vs. multiport) was not specified, which may have influenced the outcomes due to variations in surgical and block techniques. In contrast, Chu et al. [23] found lower pain scores and opioid consumption with single-shot PVB compared to control. Although PVB is widely used, ESPB has been associated with fewer complications such as pneumothorax, hematoma, and subarachnoid spread [24]. Fang et al. [25], compared ESPB and PVB in thoracotomy patients and found no significant differences in pain scores or PCA usage, suggesting both blocks provide effective analgesia. These findings support the use of ESPB as a safer alternative when PVB is contraindicated. However, several studies, including those by Swisher et al. [26] and Chen et al. [27] reported superior analgesic efficacy with PVB compared to ESPB. A meta-analysis of 503 trials further reinforced this, showing that while both blocks are effective, PVB offered significantly lower rest and dynamic pain scores and reduced opioid use in thoracic surgery [28]. Consistent with these findings, our study demonstrated that the PVB group had significantly lower resting NRS scores in the first two postoperative hours and reduced dynamic NRS scores during the first 12 h, along with decreased opioid consumption, fewer PCA demands, and less need for rescue analgesia. These results highlight the superior efficacy of PVB in acute pain control following thoracotomy. Although the differences in pain scores (NRS and PHHPS) were statistically significant, their magnitude was relatively small. When assessed against the established MCID thresholds (≥ 1.0 for NRS and ≥ 0.3 for PHHPS), the clinical significance of these findings appears to be marginal [12]. Therefore, while the analgesic technique demonstrated statistical superiority, its impact on patient-reported outcomes and functional recovery may be limited.

In the literature, the incidence of PTPS varies between 11% and 80%, depending on several factors such as surgical technique, follow-up duration, and assessment methods [29–31]. Although these studies refer to the administration of regional blocks after surgery, most involve perioperative or preemptive strategies or are general reviews. In our study, however, the PTPS rate was lower than those reported in the aforementioned studies (5%). We attribute this to the implementation of regional blocks as the main intervention in the perioperative period, in combination with a multimodal analgesic strategy. Similarly, our findings can be compared with existing studies investigating the positive effects of regional techniques on PTPS. In the case-based evaluation by Viderman et al. [32], ESPB was applied multiple times with volumes of 20 mL or more for the treatment of PTPS. However, the lack of controlled data limits the strength of their conclusions. De Cassai et al. [33] also investigated the role of ESPB in chronic pain management but emphasized that inconsistencies in both the mechanism of action and clinical outcomes prevent definitive conclusions. These studies help to contextualize the potential role of ESPB in PTPS.

A study by Khoronenko et al. [18] evaluated the PTPS incidence in patients who underwent lobectomy via thoracotomy. The results revealed that the incidence of PTPS at 6 months was lower in the TEA group (23%) compared to PVB (34%) and INB (40%). These results support the importance of regional techniques in chronic pain prevention. To reduce the incidence of PTPS, it is recommended that preemptive analgesia be used and that acute pain be managed with aggressive postoperative analgesia. This can be achieved by using intravenous PCA methods in combination with regional analgesia methods. Additionally, the importance of block timing was supported by Sentürk et al. [19], who showed that early initiation of TEA reduced both acute pain and the incidence of PTPS. Early initiation of TEA, particularly before surgical incision, was associated with reduced incidence of chronic pain. Our study revealed a relatively low incidence of PTPS (only 5%), demonstrating the efficacy of our approach compared with that reported in the literature. The multimodal analgesia approach would have been more effective and efficient if we had used PVB and ESPB preoperatively, initiated the analgesia process before surgery, increased the accuracy and efficacy of USG-guided blocks, and used the PCA system. Similarly, our blocks were administered before anesthesia induction, suggesting a preemptive effect that may have reduced central sensitization and PTPS development. These findings reinforce the need for early intervention in multimodal analgesia protocols to limit chronic pain risk. Further well-designed, long-term studies are needed to confirm the preventive role of ESPB and PVB against PTPS.

Limitations

Follow-up pain assessments conducted via phone calls may have introduced bias, as self-reported scores are subjective and may not accurately reflect the severity of pain. In-person evaluations could have provided more objective and standardized measurements. Additionally, the lack of a control group without regional block limits the ability to compare these techniques directly with standard systemic analgesia. As a single-center study, our findings may have limited generalizability. Multicenter trials would enhance external validity and allow for broader clinical application. The chronic pain assessment endpoint at two months may not capture the full course of PTPS, which often extends beyond this period such as 3 and 6 months. Future research should incorporate longer-term follow-up and in-person assessments to strengthen data reliability and capture chronic pain trajectories more accurately. Although the incidence of PTPS was numerically lower in the PVB group, the difference was not statistically significant, likely due to the small number of events and limited sample size. Future studies with larger cohorts and longer follow-up periods are needed to more conclusively determine the effect of regional blocks on PTPS prevention.

Conclusion

Both PVB and ESPB were effective components of multimodal analgesia in managing acute postthoracotomy pain. However, PVB demonstrated superior analgesic efficacy, with lower opioid requirements and fewer rescue interventions. Both techniques also appeared effective in reducing chronic pain incidence, with a lower PTPS rate compared to values commonly reported in the literature. Given their ease of application and favorable safety profiles, PVB and ESPB represent viable alternatives to thoracic epidural analgesia in thoracic surgery analgesia protocols.

Abbreviations

PTPS	Postthoracotomy pain syndrome
TEA	Thoracic epidural analgesia
PVB	Paravertebral block
ESPB	Erector spinae plane block
ESRA	The European society for regional anaesthesia
ASA	American society of anesthesiologists
BIS	Bispectral index
PCA	Patient-controlled analgesia
NRS	Numerical rating score
PHHPS	Prince Henry hospital pain scale
MAP	Mean arterial pressure
HR	Heart rate

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12871-025-03237-1.

Supplementary Material 1.

Acknowledgements

None.

Authors' contributions

Coresponder author: O.A.Concept/Design: O.A., K.B., F.G.O.Analys/Interpretation: O.A., K.B., E.M.Data acqusition: O.A., K.B., E.M.Writing: O.A., K.B.Clinical Revision: O.A., K.B., F.G.O.Final Approval: O.A., K.B., E.M., F.G.O.

Funding

There is no financial support or funding for our work.

Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

Basaksehir Cam and Sakura City Hospital on May 20,2022, (protocol number: KAEK.2022.05.155). Written informed consent was obtained from all individual participants included in the study.

Consent for publication

Not Applicable.

Competing interests

The authors declare no competing interests.

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Received: 2 January 2025 / Accepted: 30 June 2025
Published online: 30 July 2025

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