Narrative Review

# Efficacy and Clinical Utility of Pectoral Nerve Blocks in Thoracic Surgery: A Narrative Review

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## Abstract

Postoperative pain remains a major challenge after thoracic surgery, including video-assisted thoracoscopic surgery (VATS). Although thoracic epidural analgesia (TEA) and thoracic paravertebral block (TPVB) are established components of multimodal analgesia for thoracic surgery, both carry limitations and side effects. The pectoral nerve block II (PECS II) provides anterolateral chest wall analgesia, offering a potential alternative for selected thoracic procedures. However, most clinical data on PECS blocks derive from breast and cardiac surgery, while evidence in thoracic and pulmonary surgery remains limited. This narrative review summarizes the current efficacy, clinical utility, and limitations of PECS blocks in thoracic surgery.

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## Introduction

Thoracic surgery, particularly pulmonary resection, is associated with significant postoperative pain. Despite advances in minimally invasive approaches, including video-assisted thoracoscopic surgery (VATS) and robot-assisted thoracoscopic surgery (RATS), postoperative pain remains moderate to severe and adversely affects respiratory function, mobilization, and overall patient recovery. Inadequately controlled pain following thoracic procedures may lead to atelectasis, pneumonia, prolonged hospitalization, and chronic post-thoracotomy pain syndrome (1,2).

Thoracic epidural analgesia (TEA) and thoracic paravertebral block (TPVB), established components of multimodal analgesia for thoracic surgery, are associated with certain limitations and adverse effects, highlighting the need for alternative regional analgesic techniques for effective pain management in these patients (1,3).

Pectoral nerve blocks I and II (PECS I and PECS II) are ultrasound-guided fascial plane blocks used for analgesia of the thoracic wall. The PECS I block was first described in 2011 in the context of breast surgery as an interfascial block between the pectoralis major and pectoralis minor muscles. It provides blockade of the medial and lateral pectoral nerves, resulting in analgesia of the pectoral muscles (4,5).

The PECS II block was introduced one year later as an extension of the PECS I technique, with an additional injection of local anesthetic in the fascial plane between the pectoralis minor and serratus anterior muscles (6). This technique also targets the intercostal nerves 3–6, the intercostobrachial nerve, and the long thoracic nerve (4,6). The PECS II block provides analgesia to the anterolateral thoracic wall and axillary region, offering a potential alternative for pain management in various thoracic surgical procedures (3,4).

This narrative review summarizes the current evidence on the efficacy, clinical utility, and limitations of PECS blocks in thoracic surgery.

## Methods

This review is based on selected peer-reviewed literature addressing the efficacy, clinical utility, and safety of PECS blocks in thoracic and pulmonary surgery. The search used combinations of the terms PECS block, PECS II, thoracic surgery, pulmonary surgery, segmentectomy, lobectomy, VATS, thoracotomy, regional anesthesia, and postoperative analgesia. Relevant literature published from 2011 to 2026 was identified by searching the PubMed/MEDLINE and Scopus databases. The main reason for selecting this search period was the limited number of studies addressing the use of PECS blocks in thoracic and pulmonary surgery. For the same reason, relevant studies from breast and cardiac surgery were also included as indirect evidence.

## Discussion

*Clinical evidence for PECS II block in pulmonary surgery*

Direct evidence supporting the use of the PECS II block in pulmonary surgery remains limited. Luo et al. conducted a small randomized, double-blind, placebo-controlled trial involving 40 patients undergoing thoracoscopic lobectomy. Preoperative PECS II significantly reduced total fentanyl consumption within 24 hours after surgery, rescue analgesic requirements, and early postoperative pain scores compared with placebo. Significantly lower mean arterial pressure and heart rate at the time of chest entry in the PECS II group suggested improved intraoperative hemodynamic stability during surgical stimulation of the chest wall (7).

This was a small randomized trial involving only 40 patients, so the findings should be interpreted as preliminary evidence of the potential benefit of the PECS II block in thoracoscopic pulmonary surgery (7).

*Clinical evidence for PECS blocks in breast and cardiac surgery*

Versyck et al., in a systematic review and meta-analysis of 13 randomized controlled trials involving 815 patients, reported significantly reduced postoperative opioid consumption and lower pain intensity during the first 24 hours with PECS II compared with systemic analgesia alone. No statistically significant difference in postoperative opioid consumption or pain scores was demonstrated between PECS II and TPVB in breast surgery (8).

A subsequent scoping review also reported opioid-sparing effects and lower pain scores with PECS blocks compared with systemic analgesia in breast surgery (9).

Magoon et al., in a prospective, single-blind, randomized controlled study of 100 adult patients undergoing cardiac surgery via thoracotomy, reported that PECS II reduced postoperative pain scores at later time points and rescue opioid requirements compared with intercostal nerve block (ICNB), with analgesic efficacy comparable to serratus anterior plane block (SAPB). The authors concluded that PECS II is a simple, single-shot, effective alternative to ICNB with prolonged analgesia that may improve perioperative recovery in cardiac surgery via thoracotomy (10).

Similar results have been reported in pediatric cardiac surgery, where PECS II and SAPB demonstrated superior analgesic efficacy compared with ICNB in patients with congenital heart defects undergoing thoracotomy (11).

Jack et al. included 51 studies evaluating SAPB and PECS blocks in cardiac surgery, thoracic surgery, and trauma. Single-shot SAPB and PECS blocks reduced pain scores and opioid consumption compared with systemic analgesia alone for approximately 6–12 hours in cardiothoracic surgery and chest trauma. The analgesic effect appeared longer than with ICNB but potentially shorter than with TPVB. Continuous catheter techniques prolonged the effect, with results potentially comparable to TEA. No complications were noted, and the risk of hemodynamic instability was low (12).

Evidence from breast and cardiac surgery provides additional information regarding the analgesic efficacy of PECS blocks but should be considered indirect evidence for pulmonary surgery.

*PECS II block in VATS*

Pulmonary surgery via VATS requires port incisions placed in the lateral and anterolateral chest wall (1,3). The PECS II block predominantly provides anterolateral chest wall analgesia, although with variable dermatomal spread (4,6). This anatomical territory predominantly corresponds to the typical location of VATS port incisions, making the PECS II block a potentially suitable analgesic option for minimally invasive pulmonary surgery (3,7).

An important limitation of the PECS II block in thoracic surgery is its inadequate coverage of the posterior chest wall; consequently, the block may be particularly suitable for anterolateral and lateral approaches characteristic of VATS, but may be insufficient for procedures involving the posterior chest wall without additional regional techniques (3,4,6). For VATS lobectomy and segmentectomy, the PECS II block targets key sites of surgical stimulation, such as port incisions and lateral intercostal drain sites, but it fails to deliver comprehensive analgesia because visceral pain and posterior somatic pain components remain uncovered (7).

These limitations explain why the PROSPECT guidelines for VATS do not recommend pectoral nerve blocks, recommending instead TPVB and erector spinae plane block (ESPB) as the primary regional options due to the lack of direct evidence for PECS blocks at the time (13).

*Timing of administration and preoperative analgesic optimization*

Preoperative administration of the PECS II block reduces postoperative pain and stabilizes the hemodynamic response to surgical incision and entry into the thoracic cavity intraoperatively (7). This is particularly valuable in VATS, where

surgical manipulation of the chest wall and intercostal spaces may cause significant nociceptive stimulation and hemodynamic changes. Preoperative PECS II blockade may help suppress this response and reduce the need for intraoperative opioid analgesic supplementation (7).

A randomized controlled trial in cardiac surgery via thoracotomy demonstrates that the PECS II block can be successfully performed postoperatively, either immediately upon completion of the procedure or as a rescue analgesic option in patients with inadequately controlled pain (10). Flexibility in the timing of administration is one of the clinical advantages of the PECS II block compared with TEA and TPVB, which may require more extensive preparation and coordination with the surgical team (3,10).

*Duration of analgesia and catheter techniques*

A key limitation of single-shot PECS blocks is the relatively short duration of their analgesic effect. The systematic review by Jack et al. estimates this effect at 6–12 hours (12), which is insufficient for the entire postoperative period in pulmonary surgery, where clinically relevant pain often extends over 48–72 hours. Placing a catheter in the interfascial plane between the pectoralis minor and serratus anterior muscles offers a practical solution, allowing for continuous infusion or intermittent boluses of diluted local anesthetic. Current evidence suggests that this continuous chest wall technique can prolong analgesia and potentially match the efficacy of TEA without causing its typical hemodynamic adverse effects (12). However, data on continuous PECS techniques in pulmonary surgery remain sparse, meaning these methods should not yet be considered fully equivalent to TEA. Consequently, local anesthetic dosing should follow study-specific protocols rather than standard guidelines, given the high variability between published regimens (12).

*PECS II block compared with other regional analgesic techniques*

In contemporary thoracic anesthesia, the PECS II block is one of several available modalities. Selecting the optimal technique requires a clear understanding of their comparative advantages based on the surgical approach and patient profile.

TEA has long been regarded as the gold standard for thoracic analgesia, offering excellent coverage of both the anterior and posterior chest wall. This technique carries significant risks of hemodynamic instability from sympathetic blockade, urinary retention, and motor block that delays mobilization. Rare but serious complications include epidural hematoma and abscess, while its use may also require careful management of anticoagulation and urinary catheterization (1,3).

TPVB is an effective alternative to TEA with a favorable hemodynamic profile and a lower incidence of some complications. It provides ipsilateral chest wall analgesia across multiple dermatomal levels. Compared with the PECS II block, TPVB is technically more demanding and carries a greater risk of complications such as pneumothorax and vascular puncture (1,3).

ICNB is a straightforward technique that provides reliable segmental analgesia. Its main drawbacks are the short duration of a single injection and the necessity for multi-level punctures to achieve sufficient coverage (1,3).

SAPB is another fascial plane block that shares anatomical similarities with PECS II but focuses analgesia more laterally and posteriorly along the chest wall. While SAPB is highly effective for lateral port incisions and chest tube pain in VATS, it does not provide the same anterior coverage as the PECS II block, which targets the pectoral nerves directly (1,3).

The PECS II block offers a practical compromise between efficacy and safety. Data derived mostly from breast surgery show it provides comparable analgesia to TPVB and superior pain control over systemic opioids (8). Furthermore, performing the block in the supine position

makes it logistically easier to integrate into the perioperative workflow (3,4,6).

*Safety and contraindications of PECS blocks*

Complications of PECS blocks are rare, owing to ultrasound guidance that provides continuous visualization of the pleura and relevant blood vessels. Potential complications include pneumothorax (particularly with deep injection close to the pleura), infection at the insertion site, local anesthetic toxicity following inadvertent intravascular injection, and local vascular puncture with hematoma formation (4,12). Importantly, no serious block-related complications were reported in the cited clinical literature, further supporting the favorable safety profile of PECS blocks when performed by experienced practitioners under ultrasound guidance (7-12).

Absolute contraindications are patient refusal and infection at the planned injection site. Anticoagulation therapy represents a relative contraindication, meaning that bleeding risks should be assessed individually according to current regional anesthesia guidelines and institutional protocols (4,14).

## Conclusion

The PECS II block represents an effective, safe, and technically accessible option within a multimodal analgesic regimen for selected thoracic procedures, particularly VATS pulmonary surgery. However, its role remains complementary rather than a direct replacement for established regional techniques when extensive thoracic or visceral analgesia is required. The available literature remains heterogeneous, showing significant variations in patient populations, surgical approaches, local anesthetic regimens, and overall protocol design, which limits direct comparisons. Consequently, further prospective clinical studies are essential to fully define the clinical value of the PECS II block in thoracic and pulmonary surgery.

**Use Of Artificial Intelligence.**

AI tools (OpenAI, ChatGPT) were used solely to assist with grammar correction, English language quality improvements and reference formatting. They were not used to generate text, scientific content, clinical data, results, interpretations, or references. All authors have read and approved the final version of the manuscript and agree with its submission to SEEMEDJ.

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**Competing interests.** None to declare.

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# Učinkovitost i klinička primjena pektoralnih živčanih blokova u torakalnoj kirurgiji

**Sažetak**

Postoperativna bol ostaje velik izazov nakon torakalne kirurgije, uključujući videotorakoskopsku kirurgiju (VATS). Iako su torakalna epiduralna analgezija (TEA) i torakalni paravertebralni blok (TPVB) etablirani dijelovi multimodalne analgezije u torakalnoj kirurgiji, oba pristupa imaju određena ograničenja i nuspojave. Pektoralni živčani blok II (PECS II) pruža analgeziju anterolateralne stijenke prsnog koša, što predstavlja potencijalnu alternativu za odabrane torakalne zahvate. Međutim, većina kliničkih podataka o PECS blokovima potječe iz kirurgije dojke i kardiokirurgije, dok su dokazi u torakalnoj i plućnoj kirurgiji još uvijek ograničeni. Ovaj narativni pregled sažima trenutačne spoznaje o učinkovitosti, kliničkoj primjeni i ograničenjima PECS blokova u torakalnoj kirurgiji.

**Ključne riječi:** blokada živaca; torakokirurški zahvati; videoasistirana torakalna kirurgija; provodna anestezija; poslijeoperacijska bol