The European Society of Regional Anaesthesia & Pain Therapy
ESRA ITALIA

ESRA ITALIAN CHAPTER

30° NATIONAL MEETING

Presidents:
Giuseppe Servillo, Fabrizio Fattorini

13-15 NOV 2025

NAPOLI
HOTEL RAMADA

MZ EVENTS

Thoracic ESP block: one technique, multiple solutions

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Conflict of Interest

None

De Cassai *et al. J Anesth Analg Crit Care* (2024) 4:54
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Journal of Anesthesia, Analgesia and Critical Care

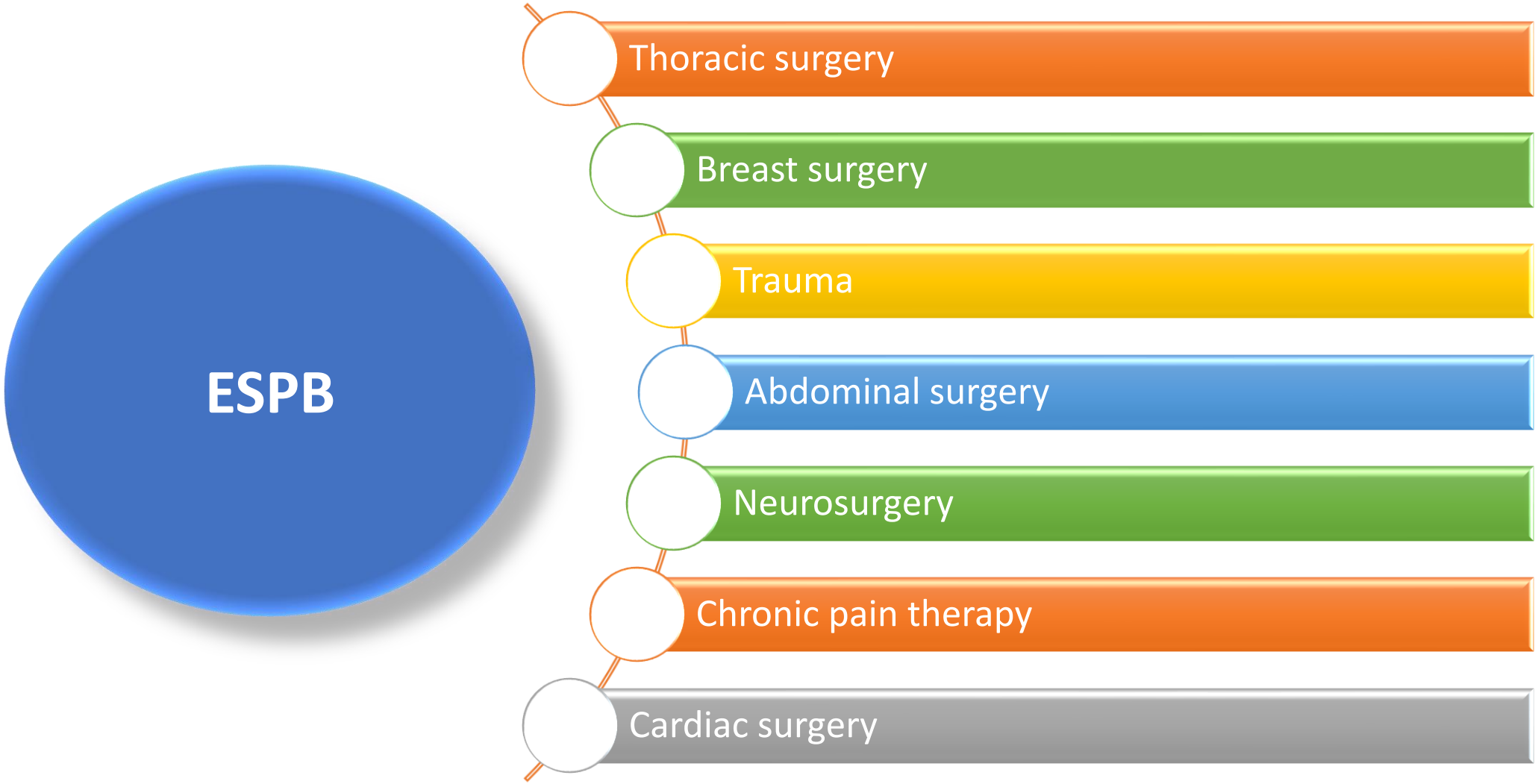
CONSENSUS ARTICLE Open Access

Anesthesiologists ultrasound-guided regional anesthesia core curriculum: a Delphi consensus from Italian regional anesthesia experts

Identified regional anesthesia techniques to be included in the anesthesiologists' core curriculum

Included

Strong consensus	Weak consensus
Upper limb	
1) Interscalene brachial plexus block	1) Superficial cervical plexus block
2) Supraclavicular brachial plexus block	
3) Infraclavicular brachial plexus block	
4) Axillary brachial plexus block	
5) Intermediate cervical plexus block	
Lower limb	
6) Femoral nerve block	2) Lumbar plexus block
7) Pericapsular nerve group block	3) Fascia iliaca block (suprainguinal approach)
8) Adductor canal block	
9) Sciatic nerve block (transgluteal approach)	
10) Sciatic nerve block (infragluteal approach)	
11) Sciatic nerve block at the popliteal fossa	
12) Ankle block	
Paraspinal and fascial plane blocks	
13) ESP block	4) Anterior QL
14) Deep SAP block	5) Lateral QLB
15) Superficial pectointercostal plane block	6) Paravertebral block
16) Interpectoral plane block	7) SAP block
17) Pectoserratus plane block	
18) Rectus sheath block	
19) Ilioinguinal iliohypogastric nerves block	
20) TAP block	
21) Subcostal TAP block	
22) Midaxillary TAP block	


ESPB
Thoracic surgery
Breast surgery
Trauma
Abdominal surgery
Neurosurgery
Chronic pain therapy
Cardiac surgery

Thoracic

- Thoracic surgery
- Breast surgery
- Trauma
- Abdominal surgery
- Neurosurgery
- Chronic pain therapy
- Cardiac surgery

Breast surgery

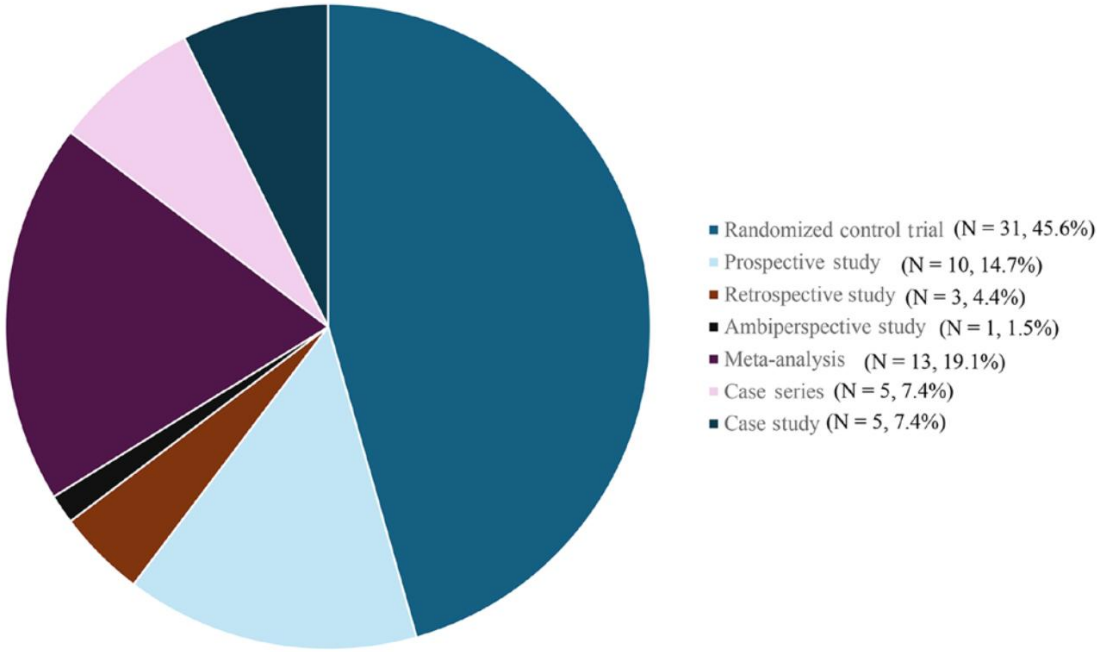
Recommendations	Minor breast surgery	Major breast surgery
Pre-operative and intra-operative interventions	1 Paracetamol (Grade B) and conventional NSAIDs (Grade A) or COX-2-selective inhibitors (Grade B) 2 Gabapentin (Grade A) 3 Dexamethasone (Grade B) 4 Local anaesthetic wound infiltration (Grade A)	1 Paracetamol (Grade B) and conventional NSAIDs (Grade A) or COX-2-selective inhibitors (Grade B) 2 Gabapentin (Grade A) 3 Dexamethasone (Grade B) 4 Paravertebral block (Grade A) 5 PECS block if no axillary node dissection or paravertebral block is contraindicated (Grade A) 6 Local anaesthetic wound infiltration may be added to regional analgesia techniques (Grade A)
Postoperative Interventions	1 Paracetamol (Grade B) and conventional NSAIDs (Grade A) or COX-2-selective inhibitors (Grade B) 2 Opioids as rescue (Grade B)	1 Paracetamol (Grade B) and conventional NSAIDs (Grade A) or COX-2-selective inhibitors (Grade B) 2 Opioids as rescue (Grade B) 3 Continuous paravertebral block if catheter in place (Grade B)

Paravertebral block is recommended as the first-choice regional analgesic technique in major breast surgery.

Pectoral nerves block may be used as an alternative to paravertebral block.

Local anaesthetic wound infiltration may be added to regional analgesia techniques.

Anaesthesia 2020 may 75:664-673



Takeaways

Question: What is the role of the erector spinae plane block (ESPB) in breast surgery and supporting evidence?

Findings: Sixty-eight publications were identified. ESPB showed safe and reliable outcomes, significantly decreasing pain and opioid requirements compared with non-blocked individuals. It performed similarly to other blocks including paravertebral blocks, but some evidence suggests pectoralis (PECS) nerve blocks outperform ESPB.

Meaning: ESPB demonstrates favorable outcomes in breast surgery; however, more research is needed to fully delineate if pectoral nerve block is a better choice.

Although its outcomes rival the previous gold standard, PVB, some evidence suggests that PECS shows improved pain scores, reduced opioid use and a longer duration of effect.

ESPB is a low-risk, reliable, easy-to-perform block when used **for breast surgery** as part of a **multimodal analgesia regimen**.

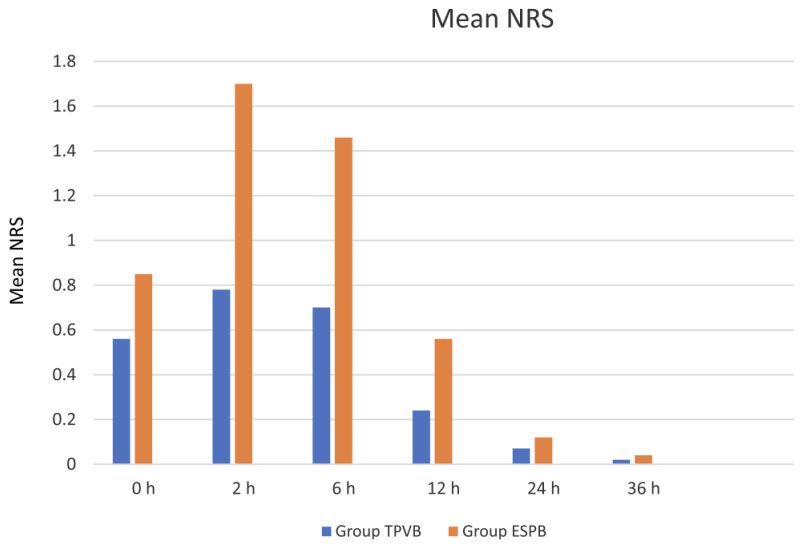
Macdonald RL et al. The Utility of Erector Spinae Plane Blocks in Breast Surgery: A Practical Review. Plast Reconstr Surg Glob Open 2025;13:e6667

RESEARCH Open Access

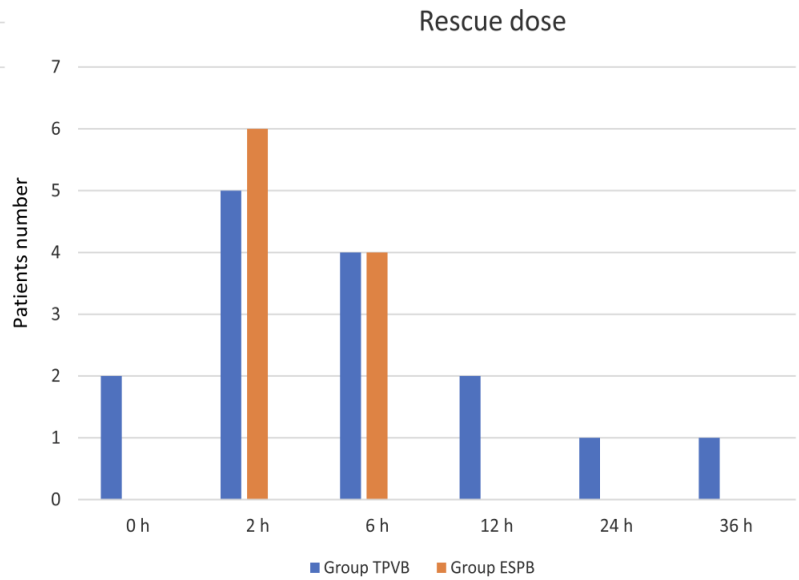
Efficacy of bi-level erector spinae plane block versus bi-level thoracic paravertebral block for postoperative analgesia in modified radical mastectomy: a prospective randomized comparative study

Table 2 Clinical outcomes of the studied groups

Variables	Group TPVB	Group ESPB	*P*-value
NRS on awakening			0.808
Median (IQR)	0.85 (1.47)	0 (2)	
NRS at 2 h			< 0.001
Median (IQR)	1.7 (1.5)	2 (2)	
NRS at 6 h			0.012
Median (IQR)	1.46 (1.3)	2 (2)	
NRS at 12 h			0.089
Median (IQR)	0.56 (0.8)	0 (1)	
NRS at 24 h			0.429
Median (IQR)	0.12 (0.3)	0 (0)	
NRS at 36 h			1.0
Median (IQR)	0 (0)	0 (0)	
Rescue dose on awaking [N (%)]	2 (4.88)	0 (0)	0.152
Rescue dose at 2 h [N (%)]	5 (12.2)	6 (14.6)	0.745
Rescue dose at 6 h [N (%)]	4 (9.76)	4 (9.76)	1.00
Rescue dose at 12 h [N (%)]	2 (4.88)	0 (0)	0.152
Rescue dose at 24 h [N (%)]	1 (2.44)	0 (0)	0.314
Rescue dose at 36 h [N (%)]	1 (2.44)	0 (0)	0.314
Intraoperative Fentanyl [N (%)]	13 (31.7)	19 (46.3)	0.174
PONV [N (%)]	2 (4.88)	0 (0)	0.157
Hypotension [N (%)]	0 (0)	2 (4.88)	0.152
Chronic pain [N (%)]	0 (0)	0 (0)	1.0
Length of stays			1.0
Mean (s.d.)	2.4 (±0,5)	2.3 (±0,6)	



At 2 and 6 postoperative hours, the NRS was significantly lower in Group TPVB than in Group ESPB; however, this difference did not lead to an increased request for rescue doses by patients.
The NRS at 12, 24, and 36 postoperative hours did not show significant differences.



The TPV and ESP blocks used for **radical mastectomy** were absolutely **effective and very similar** in the management of intra- and post-operative **pain**, in intra- and post-operative **opioid consumption** and length of stay.

Santonastaso *et al. BMC Anesthesiology (2023) 23:209*

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Regional analgesia techniques for postoperative pain after breast cancer surgery: a network meta-analysis

Pascal RD Clephas, Sharon Orbach-Zinger, Martina A Gosteli-Peter, Moshe Hoshen, Stephen Halpern, Nicole D Hilber, Cornelia Leo, Michael Heesen

Reducing postoperative pain

At 2h

- At rest: **PEC** is slightly more effective than **PVB** (high-certainty evidence), Compared with PVB, **ESPB** is similarly effective (high-certainty evidence), and SAPB probably has similar effectiveness (moderate-certainty evidence)
- During movement: PEC may be more effective than PVB (low-certainty evidence). ESPB compared with PVB may be similarly effective (low-certainty evidence).

At 24h

- At rest: **PEC** is slightly more effective than **PVB** (high-certainty evidence). Compared with PVB, **ESPB** is similarly effective (high-certainty evidence), and SAPB is similarly effective (high-certainty evidence).
- During movement: compared with PVB, **ESPB** probably has similar effectiveness (moderate-certainty evidence), PEC may be similarly effective (low-certainty evidence), and SAPB may be similarly effective (very low-certainty evidence).

At 48h

- A rest: little or no difference in effectiveness between PVB and ESPB, though the evidence is very uncertain (very low-certainty evidence).
- During movement: compared with PVB, ESPB may be similarly effective (very low-certainty evidence) and PEC may be similarly effective (very low-certainty evidence),

Cochrane Database Syst Rev 2025 Jun 4;6(6):CD014818.

Compared with PVTB, ESPB did not meet the noninferiority criteria and was less effective for complete analgesia.

Thoracic paravertebral block remains the preferred technique for major breast surgery.

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Raft J et al. Br J Anaesth 2025 Sep;135(3):772-778.

Original Article

Regional anesthesia in breast surgery: An Italian expert consensus – Part 1: Methodology and Delphi strategy

This **consensus project** establishes a transparent, multidisciplinary framework for guiding the use of regional anesthesia in breast surgery. The ultimate objective is to formulate a set of consensus statements, graded according to evidence strength, which will serve as a foundation **for future guidelines and standardized clinical decision-making.**

Santonastaso et al. Saudi Journal of Anesthesia ():10.4103/sja.sja_461_25, October 28, 2025.

Video Assisted Thoracoscopic Surgery

Paravertebreal Thoracic Block (PVTB)

- Single shot (Grade A)
- Continuous (Grade A)

Erector Spinae Plane Block (ESPB)

- Single shot (Grade A)
- Continous (Grade B)

Regional analgesic techniques such as **PVTB** and **ESPB** are **recommended**, using either a single shot or preferably a catheter with a continuous infusion of local anaesthetics.

- A PVB is recommended because of its efficacy on pain control and limited side effects compared to TEA. The use of a catheter instead of single-shot analgesia prolongs the analgesic effect.
- An ESPB is also recommended as several studies have shown efficacy of ropivacaine ESPB versus sham block. **Two studies have shown non-inferiority of ESPB compared with PVB**. ESPB should therefore be considered as an alternative.

Feray S. et al. Anaesthesia 2022,77,311-325

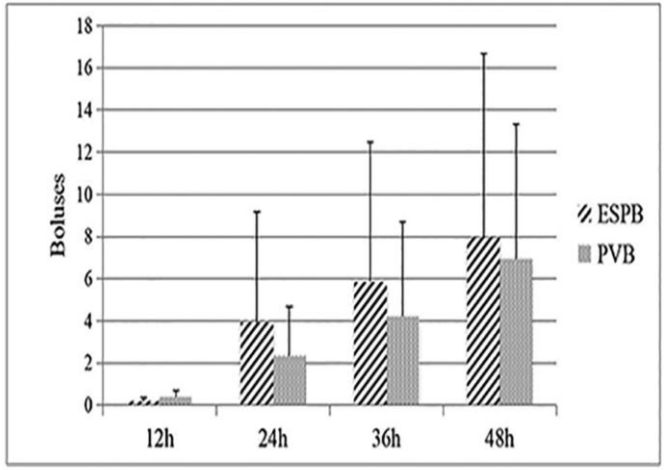
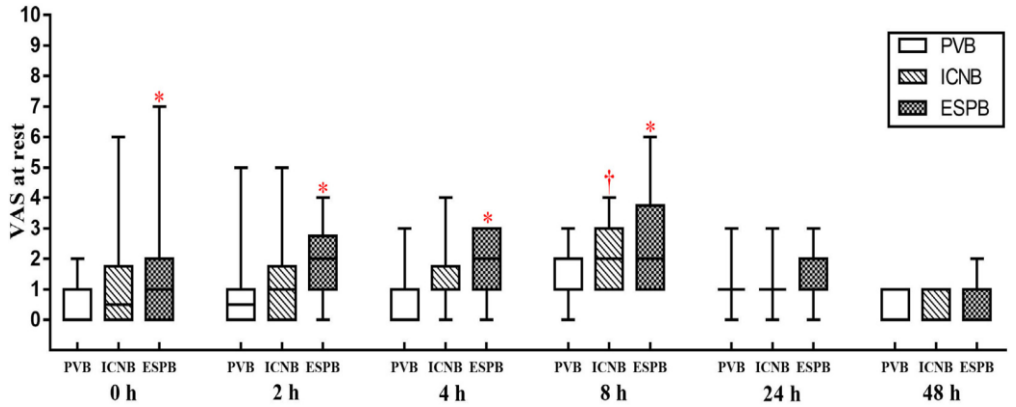


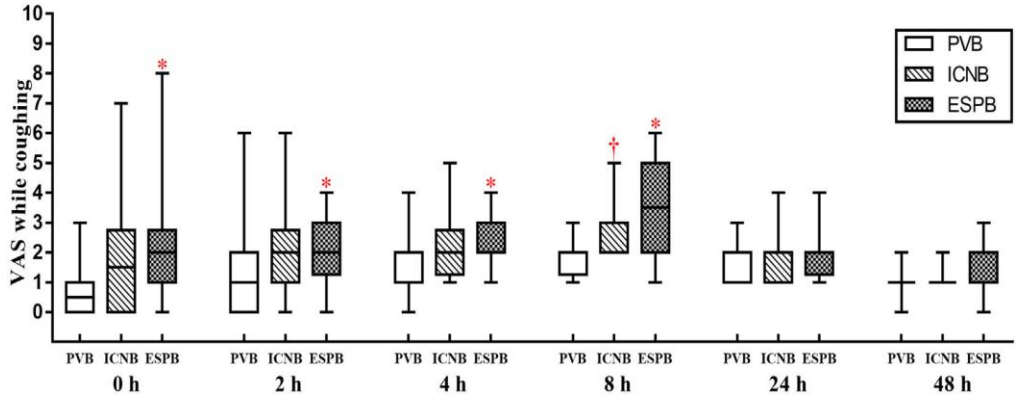
Fig. 3. Cumulative oxycodone rescue boluses after surgery.

Table 2
Surgical and anesthetic data.

	Group ESP (n = 33)	Group PVB (n = 33)	Statistical value	P value
Left lung surgery (n (%))	10 (30.3%)	15 (45.5%)	0.310	0.155
Surgical Procedure (n (%))			0.364	0.182
Wedge resection	9 (27.3%)	10 (48.5%)		
Segment	6 (18.2%)	6 (18.2%)		
Lobectomy	18 (54.4%)	17 (51.5%)		
Sufentanil Dose (ug)	31.1 ± 8.0	33.6 ± 6.3	1.910	0.172
Remifentanil Dose (ug)	562 ± 298	525 ± 172	0.618	0.539
Duration of surgery (min)	121 ± 58	107 ± 30	1.25	0.218
Duration of anesthesia (min)	152 ± 58	133 ± 30	1.608	0.115
Extubation time (min)	20.2 ± 13.6	21.8 ± 11.8	−0.53	0.598
Patients received > two doses of Vasopressors	5	10	2.157	0.142
Blood loss (mL)	30 (50, 300)	50 (50, 400)	480	0.399
Urine Output (mL)	300 (100, 500)	200 (100, 550)	460	0.307
Infusion volume (mL)	1200 (800,2000)	1100(900, 2000)	451	0.229
Resting pain score at 24 h	2.5 ± 0.7	2.2 ± 1.0	1.412	0.163
Coughing pain score at 24 h	2.8 ± 0.8	2.6 ± 0.8	1.016	0.323
Oxycodone rescue at 24 h	3.9 ± 5.2	2.3 ± 2.3	1.616	0.111
Resting pain score at 48 h	1.6 ± 1.0	1.8 ± 0.9	−0.854	0.396
Coughing pain score at 48 h	2.0 ± 0.7	2.4 ± 1.0	−1.882	0.065
Oxycodone rescue at 48 h	7.9 ± 8.7	6.9 ± 6.3	0.535	0.594
Time to first pain rescue (h)	16.1 ± 5.3	15.8 ± 8.7	0.169	0.866
Chest tube drainage (days)	2.6 ± 0.6	2.9 ± 1.1	−1.375	0.174
Hospital stay (days)	3.8 ± 0.8	4.1 ± 1.2	−1.195	0.236
QoR24h	111 ± 8	116 ± 6.8	−1.151	0.250
QoR48h	136 ± 7	132 ± 7	2.368	0.021

Group ESPB = Group Erector Spinae Plane block, Group PVB = Group Paravertebral Block. Data shown by mean ± SD or numbers (%).





Nan Chen et al. Journal fo Clinical Aneshtesia 59 (2020)106-111

Hong Zhao et al. Journal of Clinical Anesthesia 62 (2020) 109737

Author, year of publication	Characteristics of study participants(age, ASA)	Sample size (ESPB/PVB)	Location of block,	Local anesthetics(type, dose)	Surgery type	Duration of surgery (PVB & ESPB)	Outcome
Chen et al. (9), 2020	Patients aged 18–75 years, ASA I–II	24/24	PVB at T5-T7 ESPB at T5 level	20 mL of 0.375% ropivacaine for both blocks	VATS (Lobectomy, Segmentectomy, Wedge resection)	PVB = 128.4 (58.2), and 134.5 (43.1)	Cumulative morphine consumption, rescue analgesia, VAS pain scores at rest and while coughing at 0, 2, 4, 8, 24 and 48 h postoperatively.
Çiftçi et al. (25), 2020	Patients aged 18–65 years & ASA I-II	30/30	At the level of the T5 vertebra.	20 mL of 0.25% bupivacaine for both blocks	VATS (lobectomies/wedge resections)	PVB = 125.86 ± 17.67 min. & ESPB = 135.50 ± 29.13 min.	Total fentanyl consumption, rescue analgesia, VAS scores at 1, 2, 4, 8, 16, 24, 48 h at movement and at rest, Block procedure time, and side effects of the block (Nausea, Vomiting)
Duran et al. (26), 2022	Patients aged 18–75 years and ASA I-III	45/45	----------	----------	Thoracotomy	---------	Morphine consumption
Fang et al. (27), 2019	Patients aged 18–81 years and ASA I-II	46/45	----------	20 mL of 0.25% bupivacaine for either blocks	Thoracotomy (Wedge resection, Segmentectomy, Lobectomy)	72.61 ± 24.47 min and 78.33 ± 29.62 min.	VAS scores under the status of rest and cough at 1, 6, 12, and 24 h, puncture time and success rate of one puncture, and adverse effects (nausea and vomiting)
Jain et al. (28), 2022	Age ≥ 18 years, and ASA I-III	30/30	At T5/T6 level for PVB and T5 level for ESPB	20 mL 0.25% bupivacaine for either block	Thoracotomy, decortication, VATS, multiple open drainage system, and thoracomyoplasty	----------	Analgesic consumption, VAS scores at 0, 1, 3, 6, 12, and 24 h.
Taketa et al. (29), 2020	Patients aged 20–80 years, and ASA I-III	40/41	T4 or T5 intercostal level for both blocks	20 mL of 0.2% levobupivacaine for either block	VATS (radical lobectomy)	178.6 ± 28.2 and 179.3 ± 48.0	Rescue analgesia, NRS scores at rest and on movement at 0, 1, 3, 6, 12, and 24 h, and PONV.
Turhan et al. (30), 2021	Age ≥ 18 years, and ASA I-III	35/35	At the level of the T5 vertebra.	20 mL of 0.5% bupivacaine for either block	VATS	101.71 ± 24.55 min and 97.71 ± 43.05 min	Morphine consumption, VAS scores at rest and on movement, 0, 1, 4, 12, 24, 36 and 48.
Zengin et al. (31), 2022	Patients aged 18–80 years, and ASA I-III	30/30	At the level of the T5 vertebra.	20 mL 0.25% bupivacaine for either block	VATS (Wedge Resection, Segmenthectomy, Lobectomy)	175 (120–240) min and 150 (135–210) min.	Morphine consumption, rescue analgesia, Static and dynamic VAS resting and coughing scores at 1, 2, 4, 8, and 16 h, and PONV.
Zhang et al. (32), 2022	Patients aged 40–70 years, and ASA I-II	22/22	At T4 and T5 levels	30 mL of 0.5% ropiv-acaine	VATS lobectomy	126.05 ± 6.81 min and 126.82 ± 7.56 min.	VAS resting and coughing scores at 1, 6, 12, 24, and 48 h, PONV.
Zhao et al. (33), 2020	Patients aged 18–75 years, and ASA I-II	33/33	At T4 and T6 levels	30 mL 0.4% ropivacaine	VATS	107 ± 30 min and 121 ± 58 min.	Oxycodone consumption, VAS resting and coughing scores at 24 h, PONV.

- **PVB provides a superior postoperative analgesia** compared to ESPB as a part of multimodal analgesic regimen for patients undergoing thoracic surgeries.
- Additionally, by using significantly less opioids, PVB showed **superior opioid sparing.**

Fenta E. et al. The analgesic efficacy of erector spinae plane block versus paravertebral block in thoracic surgeries: a meta-analysis. Front. Med., 17 August 2023 Sec. Intensive Care Medicine and Anesthesiology

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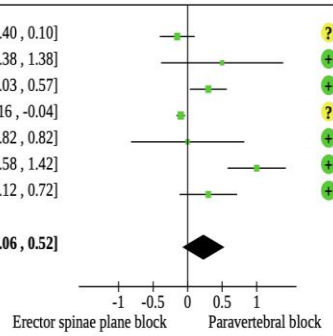
Erector spinae plane block for postoperative pain (Review)

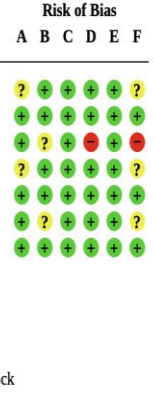
Schnabel A, Weibel S, Pogatzki-Zahn E, Meyer-Frießem CH, Oostvogels L

Analysis 3.1. Comparison 3: Erector spinae plane block vs paravertebral block, Outcome 1: Mean difference in postoperative pain intensity at rest (24 hours postoperatively) (VAS)

Study or Subgroup	Erector spinae plane block Mean	SD	Total	Paravertebral block Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
Ciftci 2020c	0.1	0.5	30	0.25	0.5	30	18.0%	-0.15 [-0.40 , 0.10]
El Ghamry 2019a	3.5	2.222	35	3	1.481	35	7.0%	0.50 [-0.38 , 1.38]
Fang 2019	2.2	0.6	45	1.9	0.7	46	17.7%	0.30 [0.03 , 0.57]
Guo 2019	2.8	0.1	20	2.9	0.1	20	20.7%	-0.10 [-0.16 , -0.04]
Taketa 2019	1	2.222	41	1	1.481	40	7.7%	0.00 [-0.82 , 0.82]
Turhan 2020	2	1.25	35	1	0.25	35	14.4%	1.00 [0.58 , 1.42]
Zhao 2020	2.5	0.7	33	2.2	1	33	14.5%	0.30 [-0.12 , 0.72]
Total (95% CI)			**239**			**239**	**100.0%**	**0.23 [-0.06 , 0.52]**

Heterogeneity: Tau² = 0.10; Chi² = 37.61, df = 6 (P < 0.00001); I² = 84%
Test for overall effect: Z = 1.55 (P = 0.12)
Test for subgroup differences: Not applicable





Compared to PVB, **ESPB may not have an effect on postoperative pain intensity at rest after 24 hours**, but there is probably a **reduced risk for block-related adverse events** compared to PVB.
There was no difference in pain intensity at rest after 2 and 48 hours, as well as no difference in postoperative pain during activity after two, 24 and 48 hours.
Cumulative oral morphine consumption was not different between the EPSB and PVB groups at 24 or 48 hours

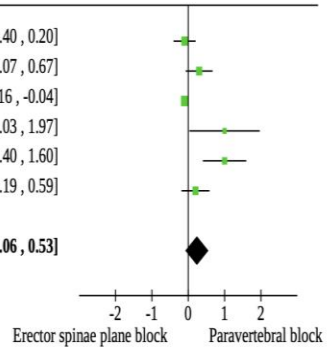
64 RCTs (3973 participants) in the meta-analysis

The primary outcomes: **postoperative pain at rest at 24 hours** and block-related adverse events.
Secondary outcomes: postoperative pain at rest (2h, 48 h) and during activity (2, 24 , 48 h), chronic pain after three and six months, cumulative oral morphine requirements at 2h, 24h , 48h, rates of opioid-related side effects.

Analysis 3.3. Comparison 3: Erector spinae plane block vs paravertebral block, Outcome 3: Mean difference in postoperative pain intensity during activity (24 hours postoperatively) (VAS)

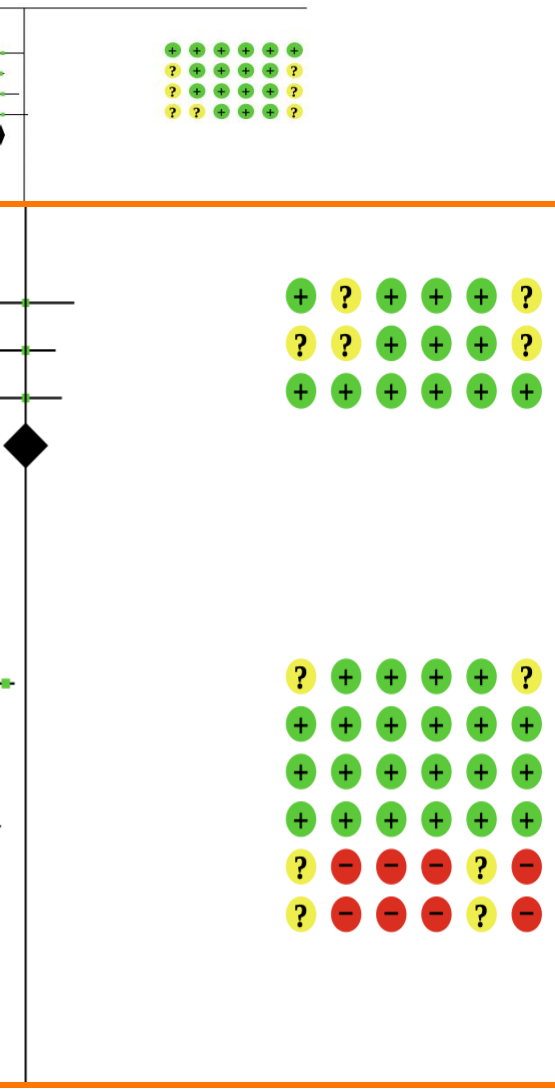
Study or Subgroup	Erector spinae plane block Mean	SD	Total	Paravertebral block Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
Ciftci 2020c	0.4	0.6	30	0.5	0.6	30	20.0%	-0.10 [-0.40 , 0.20]
Fang 2019	4.2	0.9	45	3.9	0.9	46	18.1%	0.30 [-0.07 , 0.67]
Guo 2019	2.9	0.1	20	3	0.1	20	25.0%	-0.10 [-0.16 , -0.04]
Taketa 2019	4	2.222	41	3	2.222	40	6.8%	1.00 [0.03 , 1.97]
Turhan 2020	3	1.5	35	2	1	35	12.5%	1.00 [0.40 , 1.60]
Zhao 2020	2.8	0.8	33	2.6	0.8	33	17.7%	0.20 [-0.19 , 0.59]
Total (95% CI)			**204**			**204**	**100.0%**	**0.24 [-0.06 , 0.53]**

Heterogeneity: Tau² = 0.09; Chi² = 23.68, df = 5 (P = 0.0002); I² = 79%
Test for overall effect: Z = 1.57 (P = 0.12)
Test for subgroup differences: Not applicable



Analysis 10.1. Comparison 10: Subgroup analysis: erector spinae plane block vs no block, Outcome 1: Mean difference in postoperative pain intensity at rest (24 hours postoperatively) (VAS) - Type of surgery

Study or Subgroup	Erector spinae plane block Mean	SD	Total	No block Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
10.1.1 Abdominal surgery								
Abdelhamid 2020	2	0.741	22	3	2.222	22	4.0%	-1.00 [-1.98 , -0.02]
Fu 2020	1.4	0.3	30	2.5	0.4	30	7.3%	-1.10 [-1.28 , -0.92]
Gultekin 2020	1.87	1.69	30	2.87	1.333	30	4.9%	-1.00 [-1.77 , -0.23]
Prasad 2020	2	1.481	31	3	2.963	30	3.3%	-1.00 [-2.18 , 0.18]
Subtotal (95% CI)			**113**			**112**	**19.4%**	**-1.09 [-1.26 , -0.92]**
Heterogeneity: Tau² = 0.00; Chi² = 0.12, df = 3 (P = 0.99); I² = 0%								
Test for overall effect: Z = 12.58 (P < 0.00001)								
10.1.2 Breast surgery								
Elsabeeny 2020	1	2.222	25	1	2.222	25	3.1%	0.00 [-1.23 , 1.23]
Park 2021	2	1.481	29	2	1.481	29	4.9%	0.00 [-0.76 , 0.76]
Singh 2019	2	1.481	20	2	1.481	20	4.2%	0.00 [-0.92 , 0.92]
Subtotal (95% CI)			**74**			**74**	**12.3%**	**0.00 [-0.53 , 0.53]**
Heterogeneity: Tau² = 0.00; Chi² = 0.00, df = 2 (P = 1.00); I² = 0%								
Test for overall effect: Z = 0.00 (P = 1.00)								
10.1.3 Thoracic surgery								
Ciftci 2020c	0.1	0.5	30	0.6	0.5	55	7.2%	-0.50 [-0.72 , -0.28]
Ciftci 2020d	0.27	0.52	30	1.77	0.72	30	6.8%	-1.50 [-1.82 , -1.18]
Liu 2021	2	0.741	40	3	0.556	40	7.0%	-1.00 [-1.29 , -0.71]
Sobhy 2020	2.5	0.741	30	3.5	0.741	30	6.6%	-1.00 [-1.37 , -0.63]
Yaoping 2019	2.4	0.9	30	4.2	1	30	6.2%	-1.80 [-2.28 , -1.32]
Zheng 2019	3.2	0.5	20	4.8	1.2	20	5.8%	-1.60 [-2.17 , -1.03]
Subtotal (95% CI)			**180**			**205**	**39.5%**	**-1.20 [-1.62 , -0.79]**
Heterogeneity: Tau² = 0.23; Chi² = 43.79, df = 5 (P < 0.00001); I² = 89%								
Test for overall effect: Z = 5.69 (P < 0.00001)								



(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

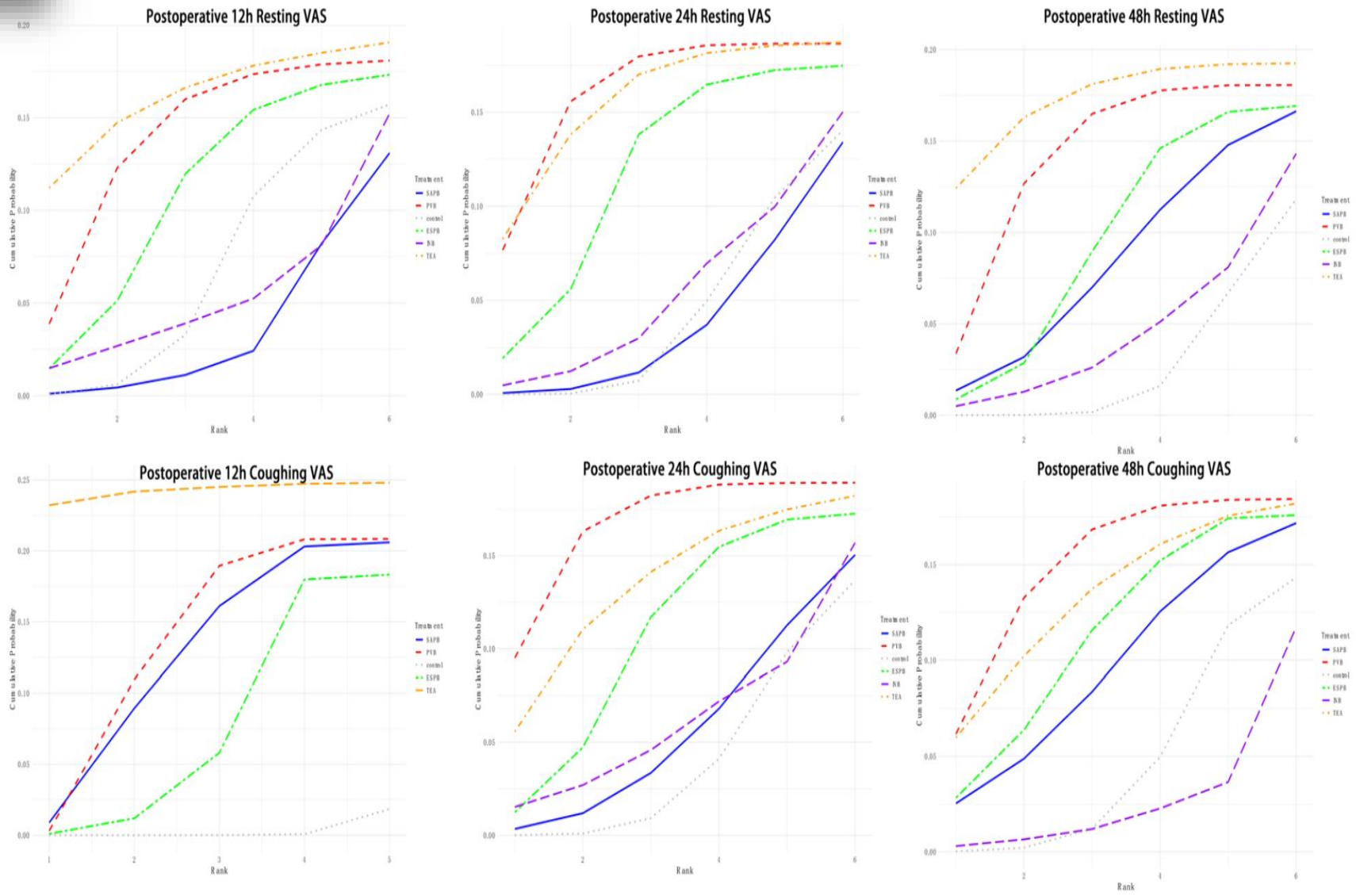
Bayesian Network Meta-Analysis of Postoperative Analgesic Techniques in Thoracoscopic Lung Resection Patients

Fang Yue · Yongye Xie · Xiangdong Chen · Ruifen Xu · Hui Wang · Ning Bai · Minna Hou · Jiao Guo

28 RCTs
2185 pz

PVB provides superior analgesic efficacy compared to ESPB, whereas TEA is less favorable due to its significant side effects.

PVB is recommended as the **first-line choice** for postoperative analgesia in patients requiring strong pain relief.



Pain Ther (2025) 14:617–637

Review

Loco-Regional Anesthesia for Pain Management in Robotic Thoracic Surgery

Luigi La Via [1,*], Marco Cavaleri [1], Alberto Terminella [2], Massimiliano Sorbello [3] and Giacomo Cusumano [2,4]

Loco-Regional Technique	Advantages	Limitations
Local Wound Infiltration	• Easy to perform • No advanced equipment or extensive training required • Low risk of LAST	• Limited duration of analgesic effect • No deeper surgical field or visceral pain coverage • Risk of local bleeding
Thoracic Epidural Analgesia	• Provide effective segmental analgesia and can be tailored to the surgical field • Continuous infusion over the surgery.	• Hemodynamic instability • Possible respiratory compromise, infections, neuraxial hematoma.
	• Effective analgesic option (similar to thoracic epidural)	• Technically difficult to perform
Erector Spinae Plane Block	• Simple and safe • Extended segmental analgesia provided with proper LA volume • US guidance • Continuous infusion	• Limited duration of analgesic effect • Variable level of visceral analgesia • Low-moderate risk of LAST
Serratus Anterior Plane Block	• Simple and safe • Extended duration of analgesia with single bolus • Continuous infusion • US guidance.	• Potential limited coverage of surgical field in thoracic robotic surgery • No visceral analgesic effects • Low-moderate risk of LAST

Robotic surgery has **revolutionized** the field of minimally invasive surgery.

This approach typically results in **less postoperative pain, reduced blood loss, shorter hospital stays, and quicker recovery**, but effective most effective approach for managing perioperative pain in robotic thoracic surgery.

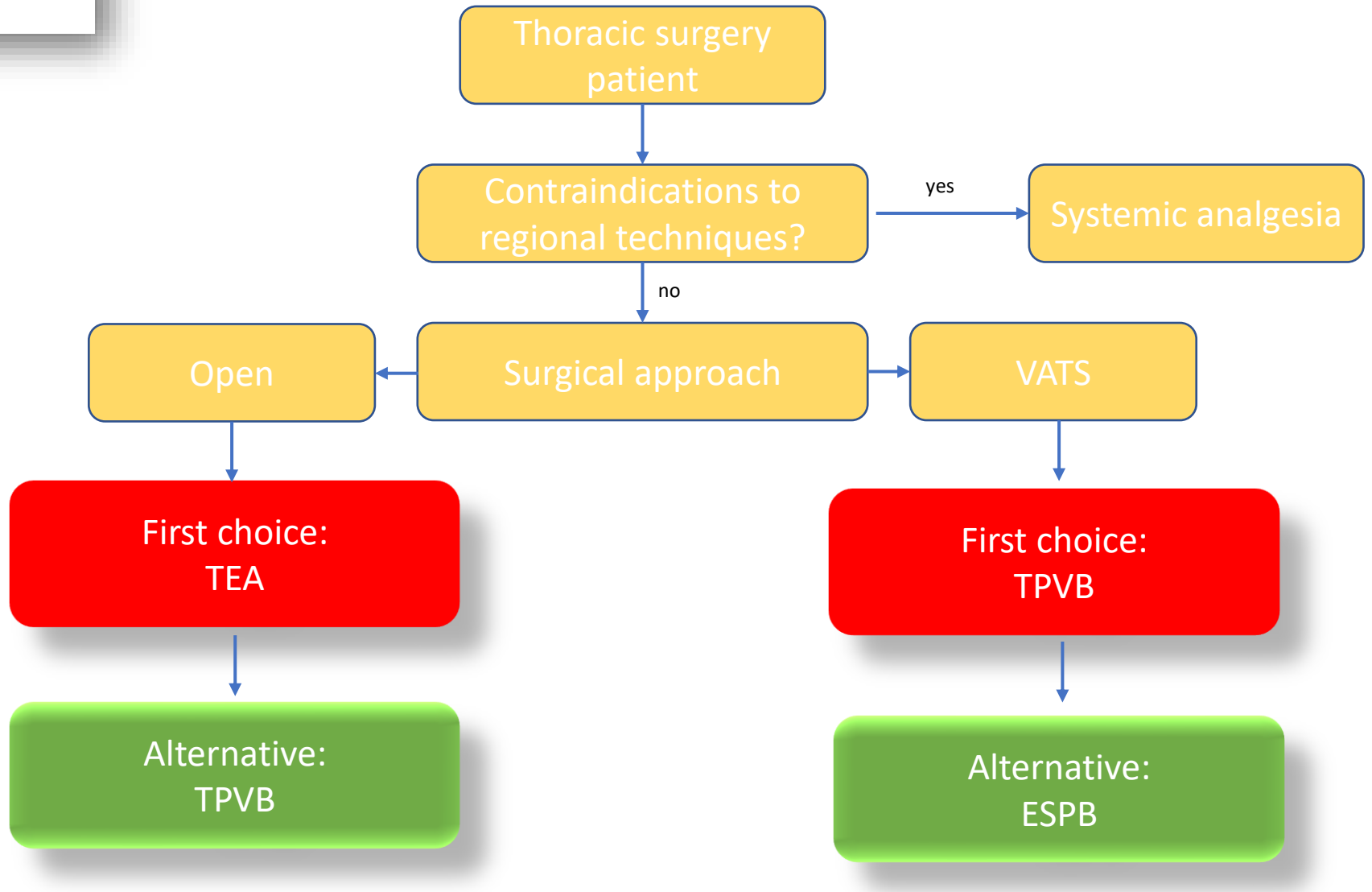
J. Clin. Med. 2024, 13, 3141

Systematic Review

Comparative Analysis of Perioperative Analgesia Methods in Thoracic Surgery: A Literature Systemic Review

Fahim Kanani [1], Rijini Nugzar [2], Mordechai Shimonov [1] and Firas Abu Akar [3,*]

Thoracic surgery pain management algorithm

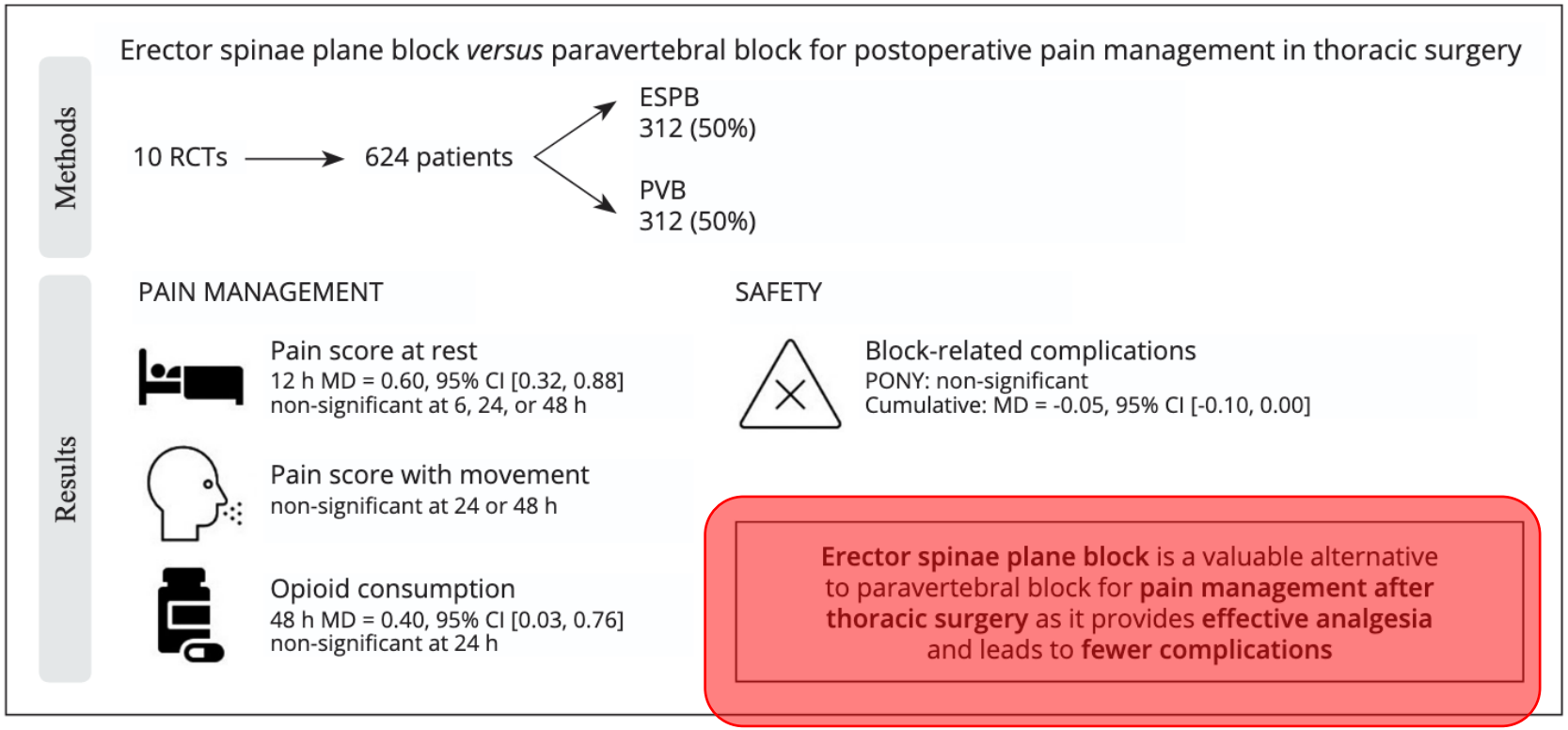


Consider multimodal approaches in all cases: regional + NSAIDS + acetaminophen

J. Clin. Med. 2025, 14, 2484

Erector spinae plane block *versus* paravertebral block for postoperative pain management in thoracic surgery: a systematic review and meta-analysis

Paolo CAPUANO [1] *, Bethany A. HILEMAN [2], Gennaro MARTUCCI [1], Giuseppe M. RAFFA [3], Antonio TOSCANO [4], Gaetano BURGIO [1], Antonio ARCADIPANE [1], Mariusz KOWALEWSKI [5, 6, 7, 8]



ESPB provides effective analgesia after thoracic surgery compared with PVB, it is a safer method, **without clinically important differences** in terms of **postoperative pain control**.

Therefore, **ESPB can be considered a valuable option** for postoperative pain management after thoracic surgery, **especially in high risk patients and in those with coagulation disorders**.

Minerva anestesiol 2023 Sep 05.

ESPB

may be a **safer** and **more appropriate** alternative.

- Patients with **coagulation disorders**
- Patients at **high risk for complications** from nerve blocks
- **When the anesthesiologist has limited experience** with nerve block techniques

Table 2 Categorisation of nerve blocks

	Deep nerve blocks / neuraxial blocks	Superficial nerve blocks
General considerations	Consequence of block-induced bleeding is clinically significant, and may be catastrophic. Management of bleeding complications is difficult because site may be deep and/or noncompressible. Invasive intervention (surgical control) may be required. Clinical consequence: Withdrawal of antithrombotic drugs for block-dependent bleeding risk reduction is recommended (Table 3).	Consequence of block-induced bleeding with superficial haematoma is of less clinical significance. Management of bleeding complications is easy, at compressible location, less likely to require invasive intervention to correct. Clinical consequence: Withdrawal of antithrombotic drugs for block-dependent bleeding risk reduction is not compulsory (Table 4).
Examples for blocks		
Head, neck	Stellate ganglion Deep cervical plexus Cervical paravertebral	Occipital Peribulbar Sub-Tenon's Superficial cervical plexus
Upper limb	Infraclavicular	Interscalene Supraclavicular Axillary Suprascapular Ulnar, radial, medial (forearm or wrist level)
Thorax	Epidural Thoracic paravertebral	Parasternal intercostal plane (deep, superficial) Serratus anterior (deep, superficial) Erector spinae plane Intercostal Interpectoral plane and pecto-serratus plane
Abdomen, pelvic		Ilioinguinal Iliohypogastric Transversus abdominis plane (TAP) Rectus sheath Genital branch of genitofemoral nerve Pudendal nerve
Lower limb, back	Lumbar plexus Psoas compartment Lumbar sympathectomy Lumbar paravertebral Quadratus lumborum Fascia transversalis Sacral plexus Pericapsular nerve group (PENG) Sciatic (proximal approaches) Spinal Epidural Lumbar paravertebral	Femoral Femoral triangle Adductor canal Sciatic (subgluteal, popliteal level) Fascia iliaca Lateral cutaneous nerve of the thigh Femoral branch of genitofemoral nerve Sural, saphenous, tibial, peroneal (deep, superficial)

Table 4 Management in low risk of bleeding blocks (superficial nerve blocks)

	Block with low risk of bleeding (Superficial nerve blocks)[a]		
Drug and dose	Time from last drug intake to intervention	Time from intervention to next drug dose	Target laboratory value at intervention
DXA DTI LMWH low ≤ 50 IU anti-Xa kg^{-1} day^{-1} Enoxaparin ≤40 mg day^{-1} UFH low ≤200 IU kg^{-1} day^{-1} SC ≤100 IU kg^{-1} day^{-1} i.v. Fondaparinux low Aspirin low ≤200 mg day^{-1}	Zero	At routinely next prescribed time point	No testing (consider specific laboratory test if anticoagulant drug accumulation is suspected, e.g. in renal insufficiency)
VKA LMWH high UFH high Aspirin high $P2Y_{12}$ inhibitor Drug combinations	Zero (If within or below the patient's individual therapeutic range)		

Recommendation 37

Superficial nerve blocks may be performed in the presence of anticoagulant or antiplatelet drugs. 1C
Deep nerve blocks should be performed according to the recommendations for neuraxial procedures (R3, R6, R9, R12, R16, R18). 1C

Recommendation 38

Consequences of local bleeding caused by blocks should be considered and monitored.1C
The lowest bleeding risk technique should be chosen and performed by an operator with experience in ultrasound guidance. 1C

EJA
PODCAST
Eur J Anaesthesiol 2022; **39**:100–132
GUIDELINES
Regional anaesthesia in patients on antithrombotic drugs
Joint ESAIC/ESRA guidelines

Regional anesthesia in the patient receiving antithrombotic or thrombolytic therapy: American Society of Regional Anesthesia and Pain Medicine Evidence-Based Guidelines (fifth edition)

Sandra L Kopp [1], Erik Vandermeulen,[2] Robert D McBane,[3] Anahi Perlas [4], Lisa Leffert [5], Terese Horlocker[1]

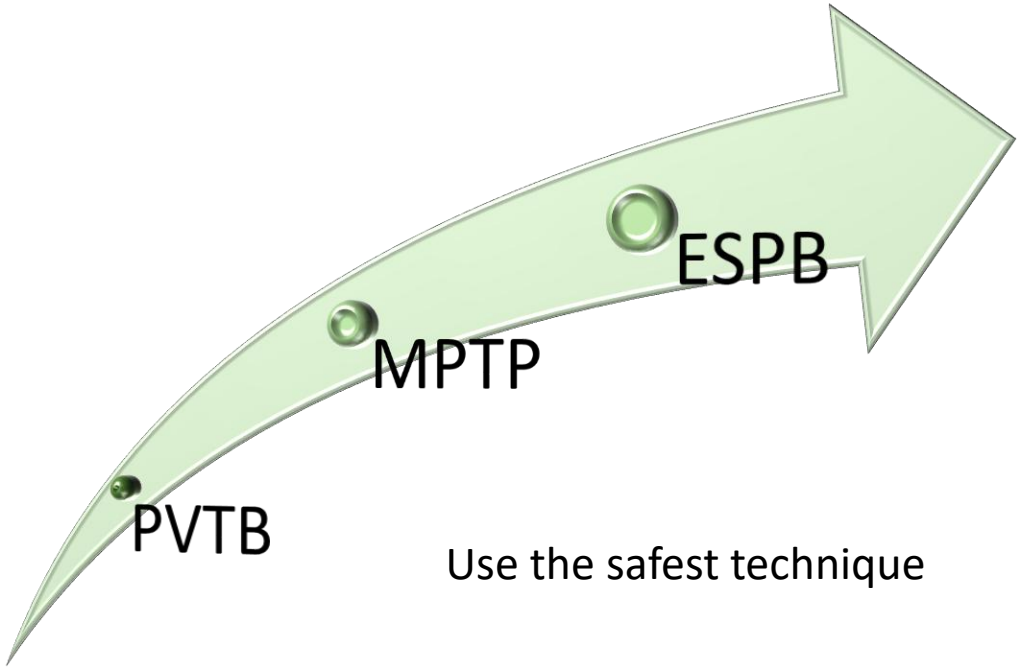
Like ASRA, **superficial nerve blocks** can be performed **without any therapy-free time interval** and irrespective of the dose of the antithrombotic drug used.

In contrast, deep nerve blocks should be performed according to the more stringent recommendations for neuraxial procedures.

Reg Anesth Pain Med 2025;**0**:1–29.

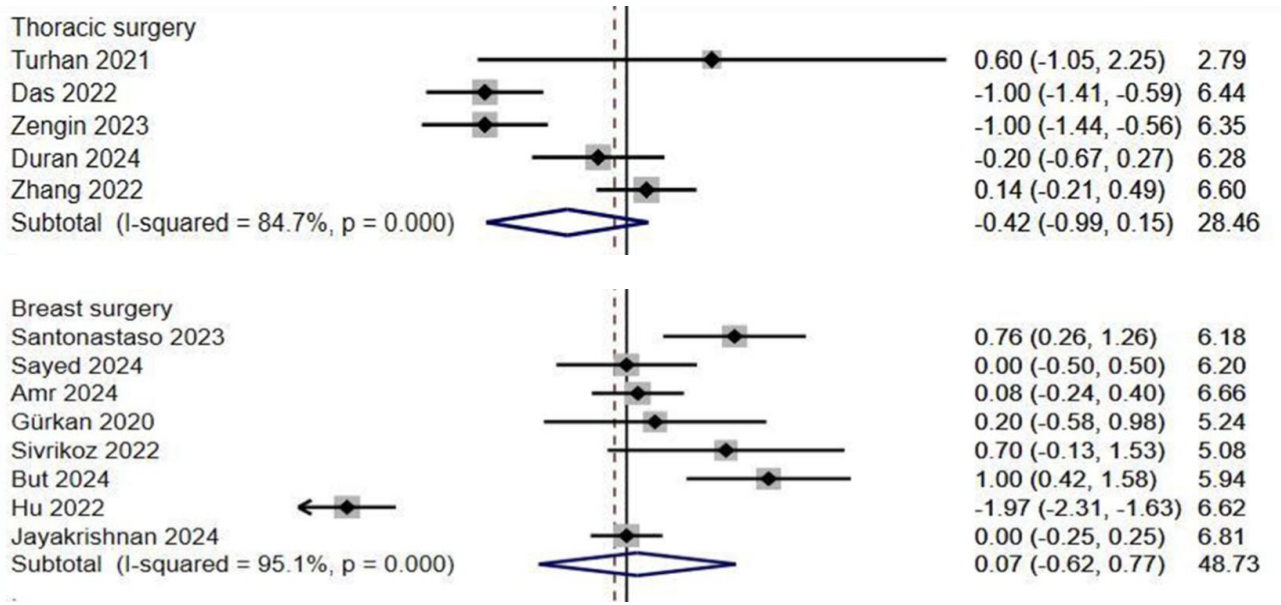
Patients at **high risk for complications** from nerve blocks

- Complex sonoanatomy
- Urgent surgery
- Neoplastic or infectious pathologies of the pleura
- Technical failure



Use the safest technique

Paravertebral Block versus Erector Spinae Plane Block for Postoperative Analgesia and Recovery: A Systematic Review and Meta-Analysis



33 RCTs with 2256 patients

Our systematic review and meta-analysis suggested that ESPB and PVB provided similar effectiveness for analgesia and recovery.

The ESPB was favored for its **quicker execution** time and **greater ease** of using, **particularly for those less experienced in regional anesthesia.**

Ren D. Journal of Pain Research 2025:18 4509–4526

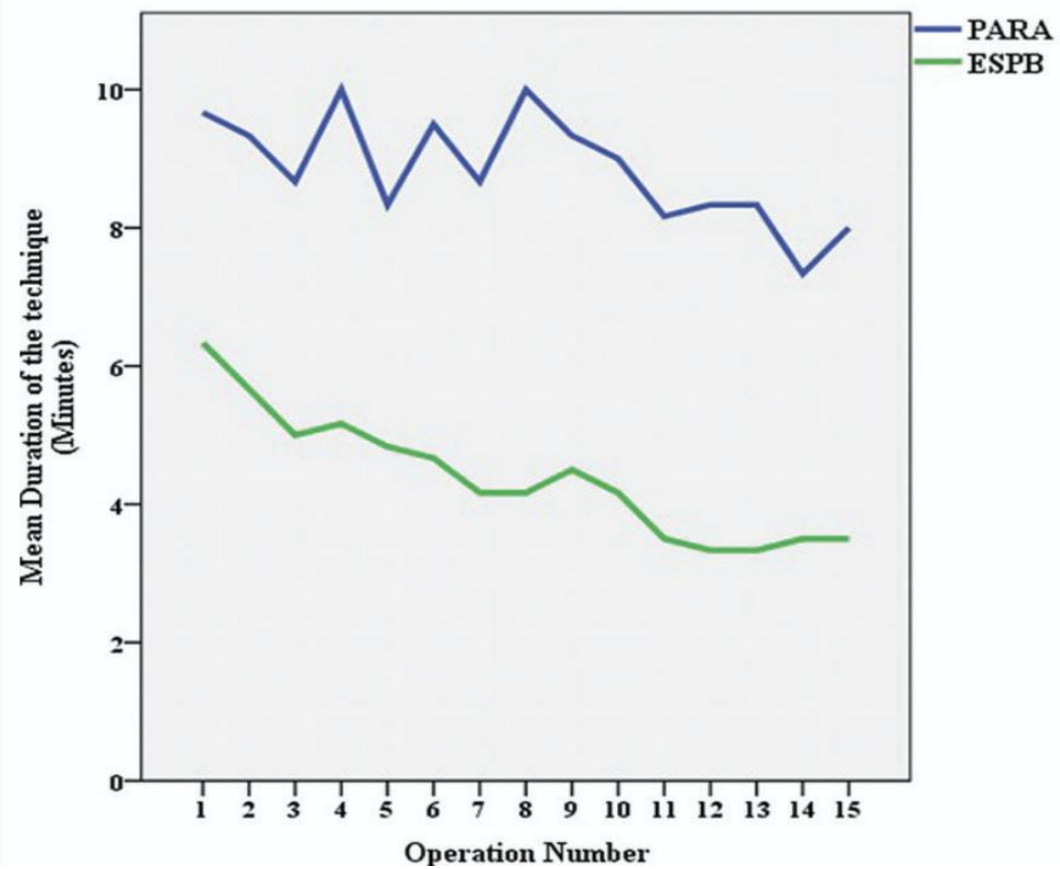
The greatest strength of the ESPB is its **simplicity**.

The **sonoanatomy is easily appreciated** with few structures to learn and identify, particularly in comparison with some other blocks.

Table 4: Assessment of technique mastering among residents

	ESPB (*n*=45)	PARA (*n*=45)	Test of significance (*P*)
Duration of the technique (min)			
Mean±SD	4.39±1.2	8.18±2.42	(*t*=-9.39, *P*<0.0001*)
Frequency of guidance to interventions			
Median (Min-Max)	0 (0-2)	2 (0-3)	(U=1.637, *P*<0.001*)
Success Rate among residents (%)	100	77.8	(χ^2=9.11, *P*=002*)

t; independent *t*-test, U; Mann-Whitney test, χ^2: Chi-square test, *;statistically significant



Learning curve of ESPB and PVTB

The ESPB may be a simple and safe alternative to the paravertebral block to provide postoperative analgesia in cases of modified radical mastectomy especially in novice practitioners.

It provides an equivalent profile of postoperative analgesia with **less time consumption to perform the bloc**k.

Moustafa MA, Alabd AS, Ahmed AM, Deghidy EA. Erector spinae versus paravertebral plane blocks in modified radical mastectomy: Randomised comparative study of the technique success rate among novice anaesthesiologists. Indian J Anaesth 2020;64:49-54.

Comparing erector spinae plane (ESP) and thoracic paravertebral (TPV) block analgesic effect after elective video-assisted thoracic surgery: a randomized, multiple-blinded, non-inferiority trial

Roberto Dossi[1#^], Miriam Patella[2#^], Barbara Barozzi[1], Gaston Dellaferrera[2], Adele Tessitore[2], Isabella Gimigliano[1], Stefano Cafarotti[2,3], Andrea Saporito[1,3^]

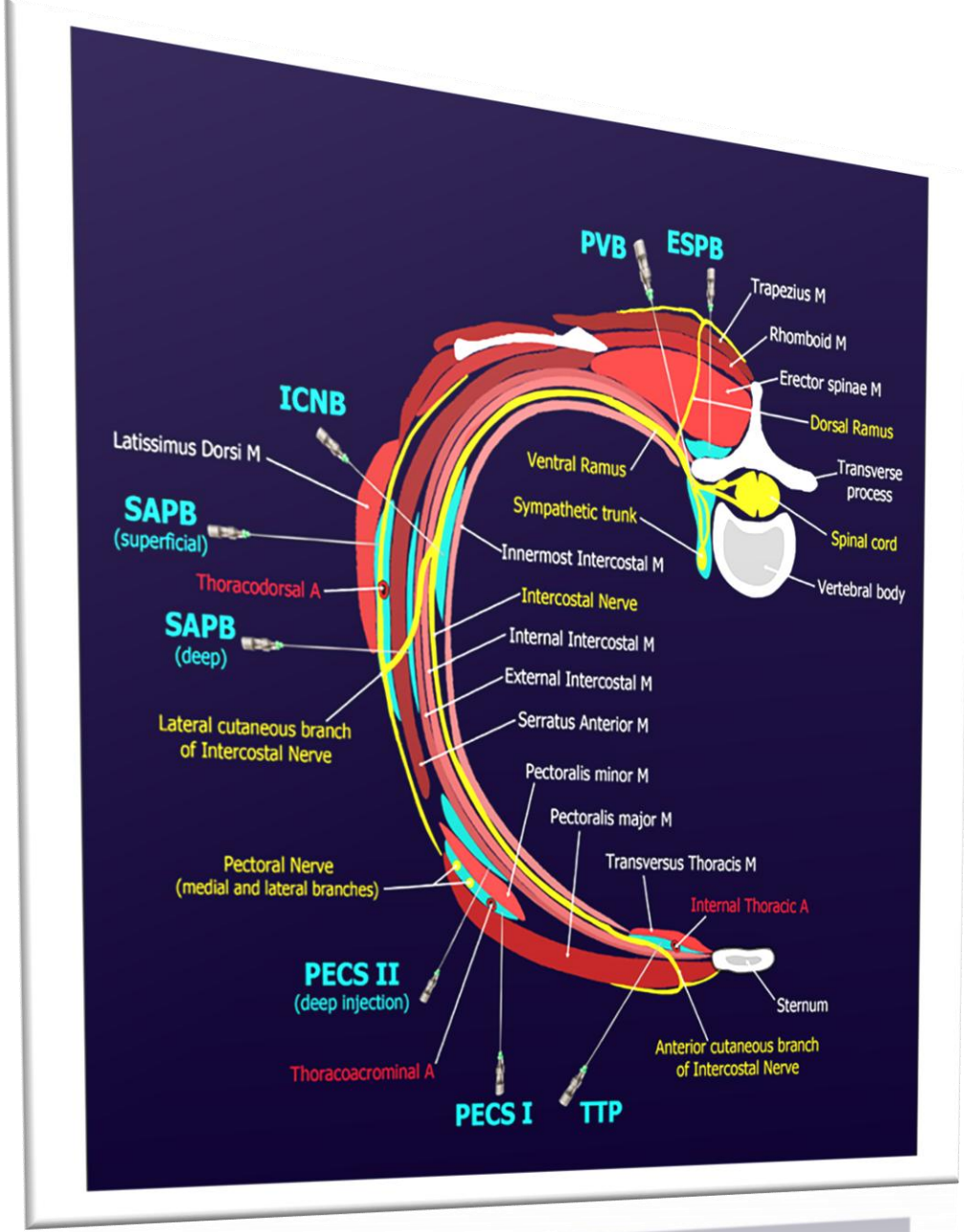
Patients (50) were randomly assigned to two groups:
Sham ESP group: received an ESP block with saline and a TPV block with local anesthetic (ropivacaine 0.375%);
Anest ESP group: received an ESP block with local anesthetic (ropivacaine 0.375%) and a TPV block with saline.
Analysis of **morphine usage in the first 48 hours** revealed no statistically significant differences between groups (Anest ESP 24 hours 17.9 mg, Sham ESP 24 hours 10.7 mg; Anest ESP 48 hours 19.8 mg; Sham ESP 48 hours 12.6 mg).

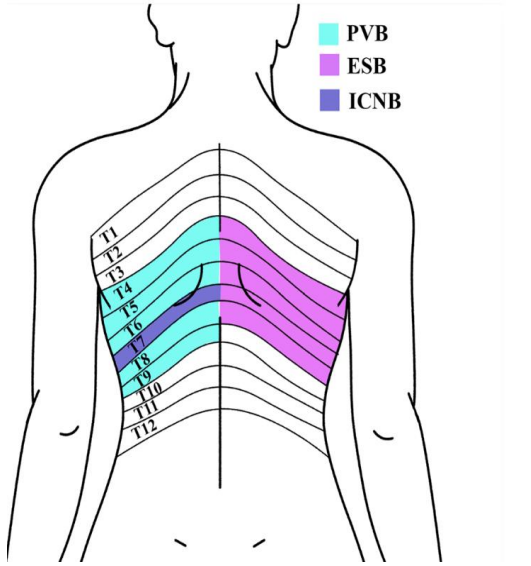
The study did not demonstrate the non-inferiority of the ESP block compared to the TPV block for postoperative analgesia following VATS.

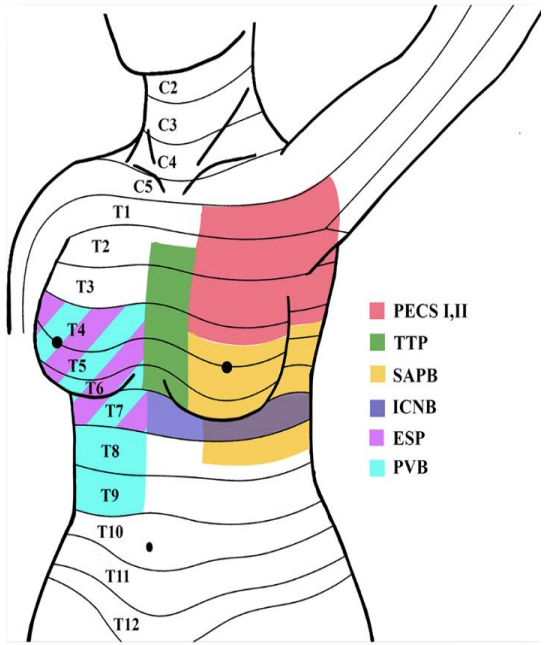
What is the implication, and what should change now?

- The findings suggest that both ESP and TPV could serve as viable alternatives to TEA, particularly in less invasive thoracic surgeries. This study underscores the importance of patient selection and tailored analgesic protocols based on surgery type, with single-shot analgesia being effective for non-anatomical resections.

J Thorac Dis 2025;17(3):1531-1540

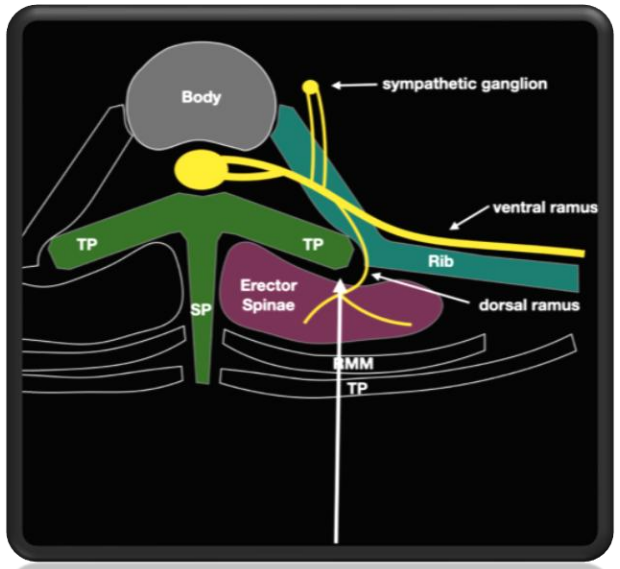


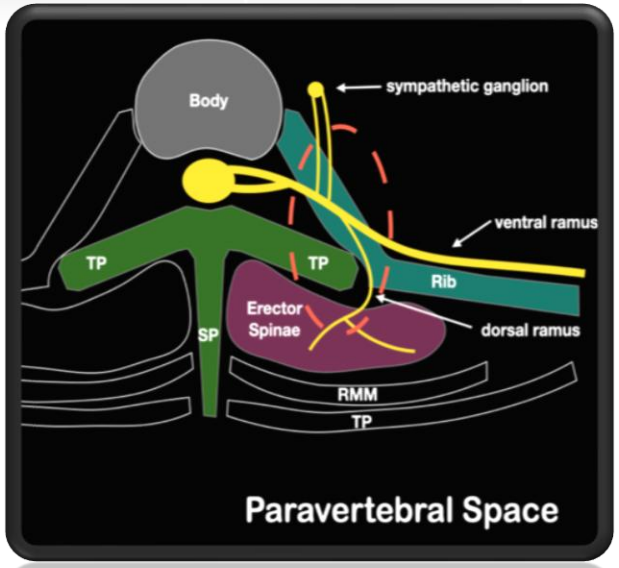




The **anterolateral blocks** are supplementary blocks in an opiate sparing, multimodal anaesthesia concept, whereas the **dorsal procedures**, as they include **visceral anaesthesia**, are an alternative to neuraxial anaesthesia, as they have a comparable analgetic potency.

Sharma R. et al. Chest Wall Nerve Blocks for Cardiothoracic, Breast Surgery, and Rib-Related Pain Current Pain and Headache Reports 2022

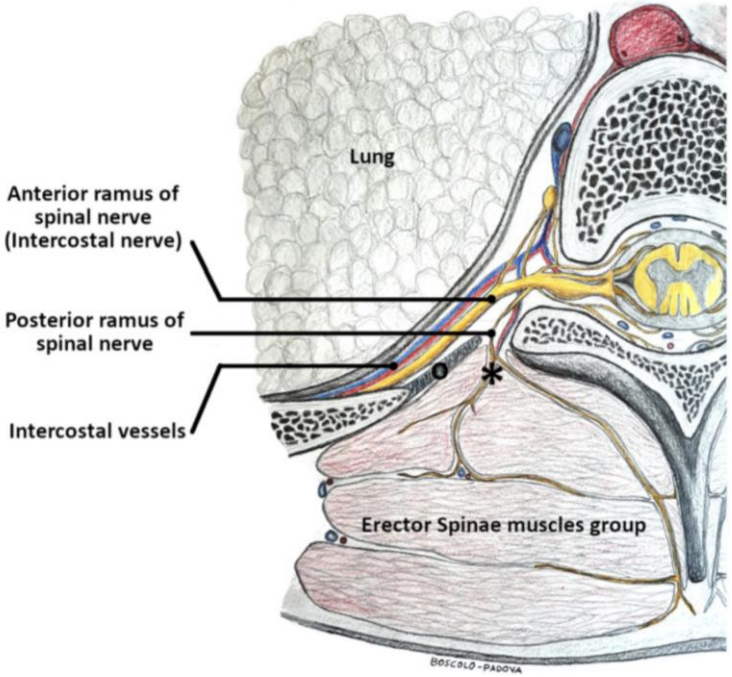




Paraspinal paravertebral by proxy techniques

Block	Erector spinae plane block (ESPB)	Mild point transverse process to pleura (MTP)	Retro lamina block (RLB)	Intercostal paraspinal block
Transducer position	Linear ultrasound probe placed on the transverse process. Paramedian plane	Linear ultrasound probe is placed on the transverse process. Paramedian plane	Linear/curvilinear probe is placed on the vertebral laminae. Paramedian plane	Linear ultrasound probe is placed more laterally at the ribs. Paramedian plane
Sono-anatomical landmarks	Identify trapezius, rhomboid major and erector spinae muscle groups superficial to the transverse process	Identify the top of the transverse process and pleura	Scan lateral to medial visualizing ribs, then transverse processes and the vertebral laminae. Identify the vertebral laminae and the erector spinae muscles	Identify rhomboid major and intercostal muscles
Needle trajectory	In-plane, cephalad to caudad direction (or vice-versa), towards the transverse process	In-plane, caudad to cephalad direction towards the paravertebral space	In-plane, cephalad or caudad direction	In-plane, cephalad to caudad direction
Point of injection	Contact the transverse process with the needle and inject deep to the erector spinae muscles	Mid-point between the posterior border of transverse process and the pleura	Contact the lamina and inject in the plane between the lamina of the thoracic vertebra and the erector spinae muscles. Injection is more medial than an ESPB	Fascial plane between the rhomboid and the intercostal muscles
Indications	Use described for thoracics, breast surgery, rib fractures, ventral hernia repair, abdominal surgery, and spinal surgery	Use described for breast surgery and video-assisted thoracoscopic surgery	Use described for breast surgery and rib fractures	Use described in rib fractures and thoracic surgery

Current Anesthesiology Reports (2019) 9:263–270



Region	Name	Anatomical description
Paraspinal	Erector Spinae Plane Block (ESPB)	Injection in the plane between the erector spinae muscles and the transverse process

El-Boghdadly K. Et al. Standardizing nomenclature in regional anesthesia: an ASRA-ESRA Delphi consensus study of abdominal wall, paraspinal, and chest wall blocks. Reg Anesth Pain Med. 2021 Jul;46(7):571-580.

- Is it possible to identify ultrasound signs attesting to the correct execution of these different blocks, where the local anesthetic is not properly injected between two fascial layers?
- Thus, the ESPB provides for the injection of local anesthetic between erector spinae muscles and the bone surface of the vertebral transverse process.

Defining the fascial blocks: lights and shadows

Sepolvere et al. Minerva anestesiologica 2024 January-February;90(1-2):101-3

Trapezius muscle

Rhomboideus muscle

Erector Spinae muscle

Superior costotransverse ligament

Superior costotransverse ligament

PVS

PVS

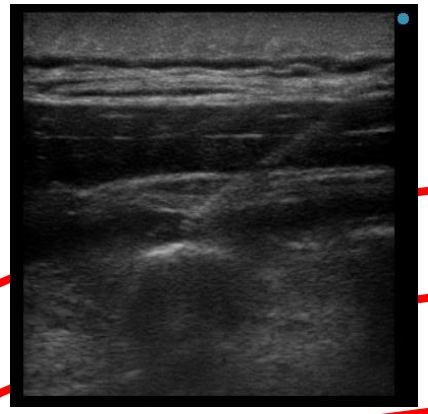
Transverse process

Pleura

Transverse process T4

Pleura

Transverse process



Trapezius muscle

Rhomboideus muscle

Erector Spinae muscle

Superior costotransverse ligament

Superior costotransverse ligament

PVS

PVS

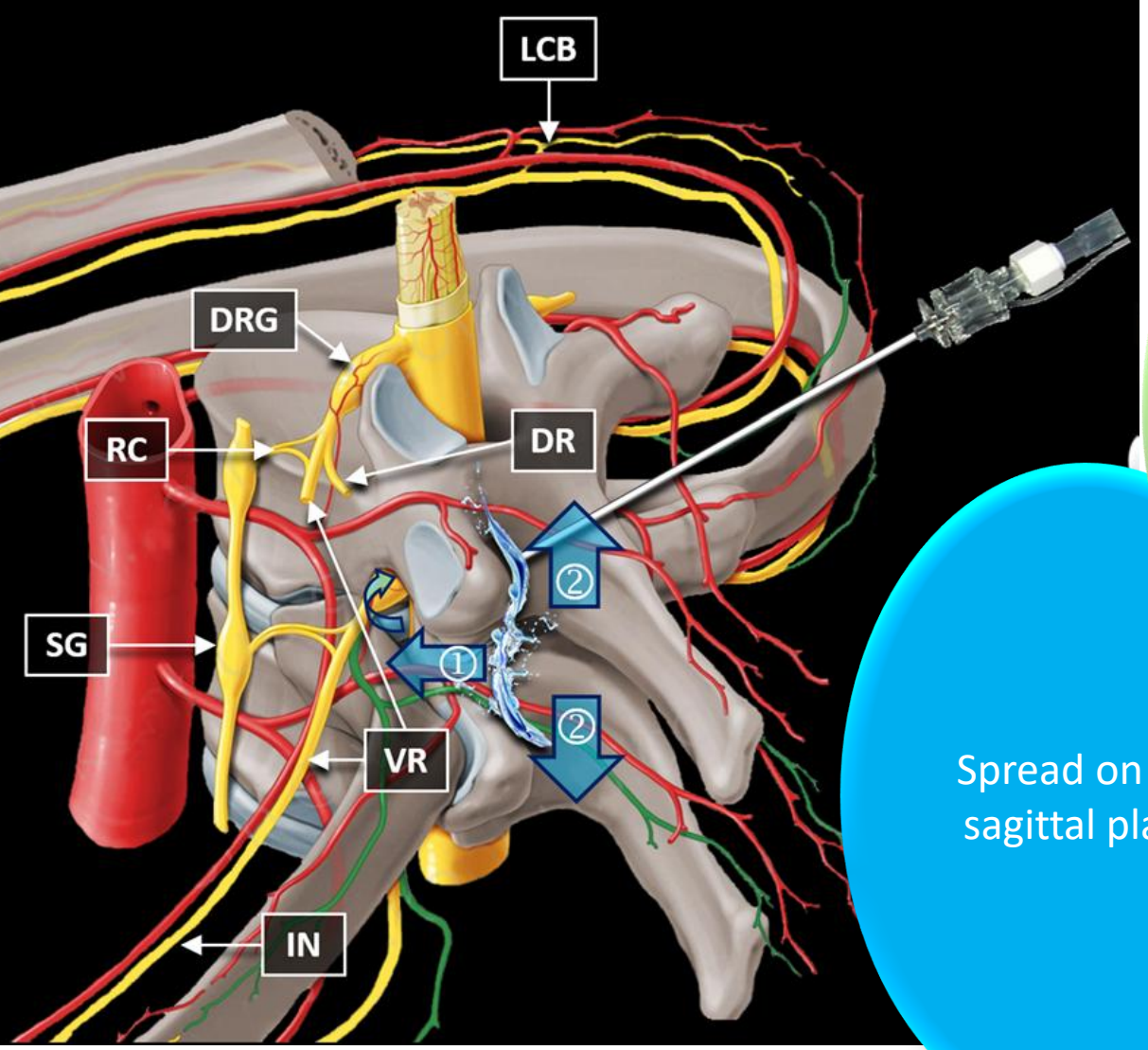
Transverse process

Pleura

Transverse process T4

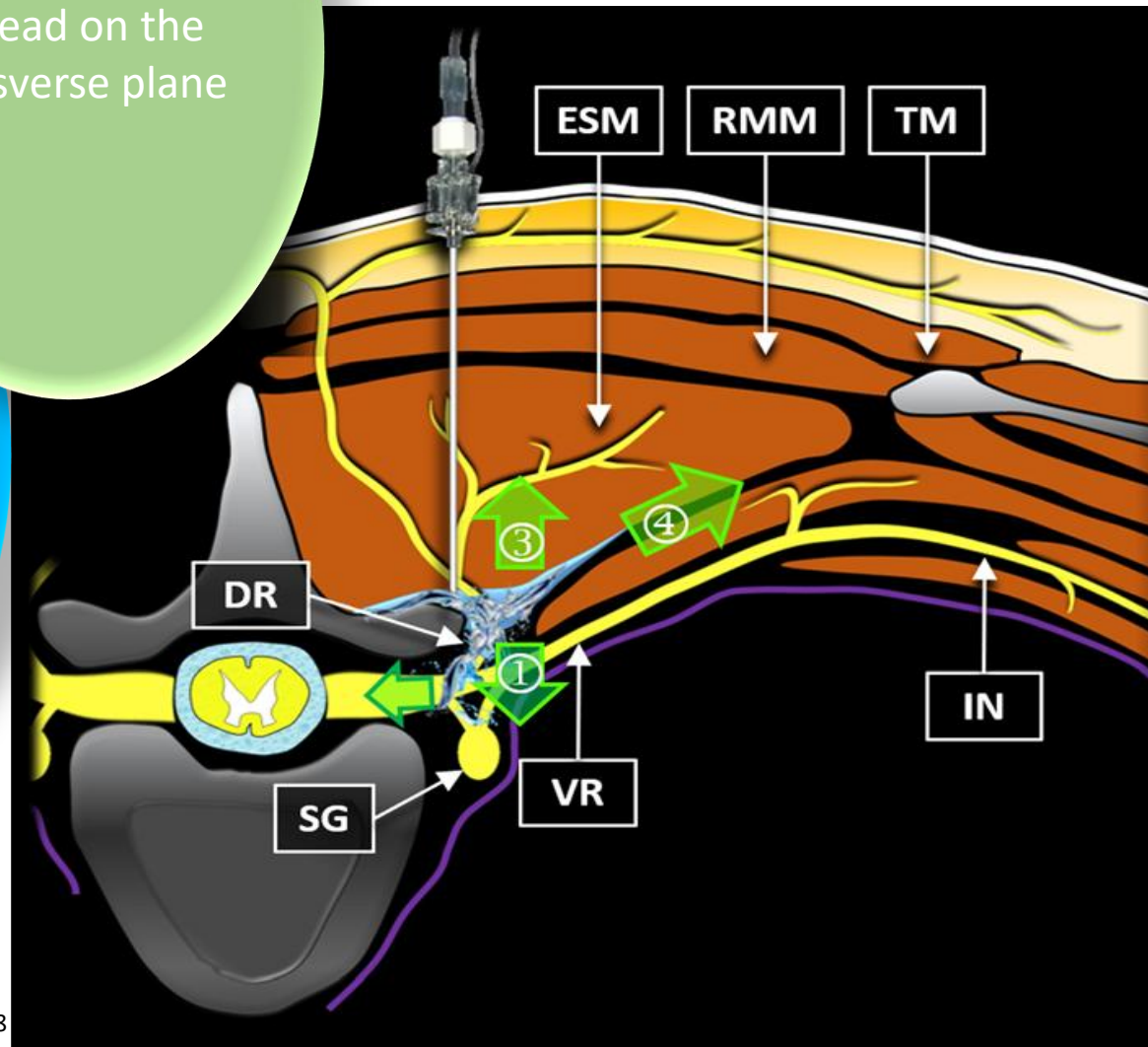
Pleura

Transverse process

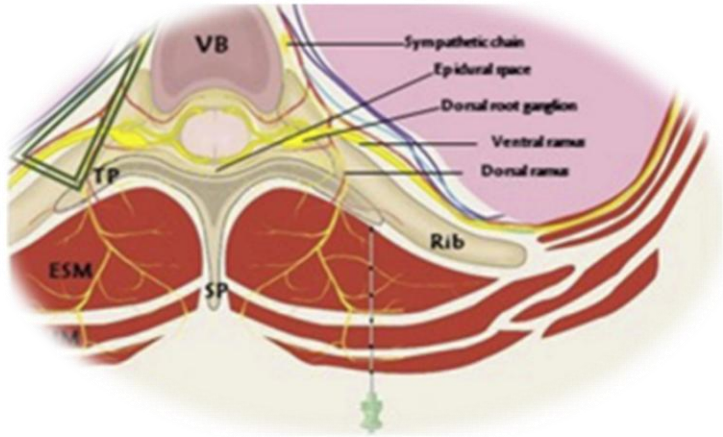


Spread on the transverse plane

Spread on the sagittal plane



Chin KJ. Et. Al. Mechanisms of action of the erector spinae plane (ESP) block: a narrative review. Can J Anesth (2021) 68:387-408

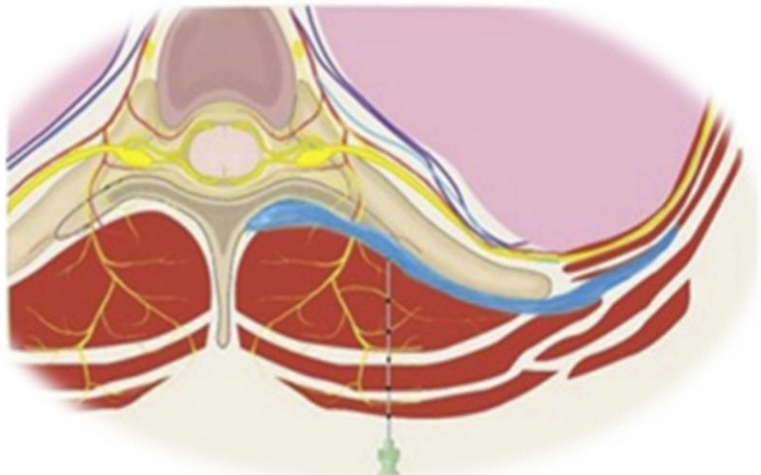


ESPB

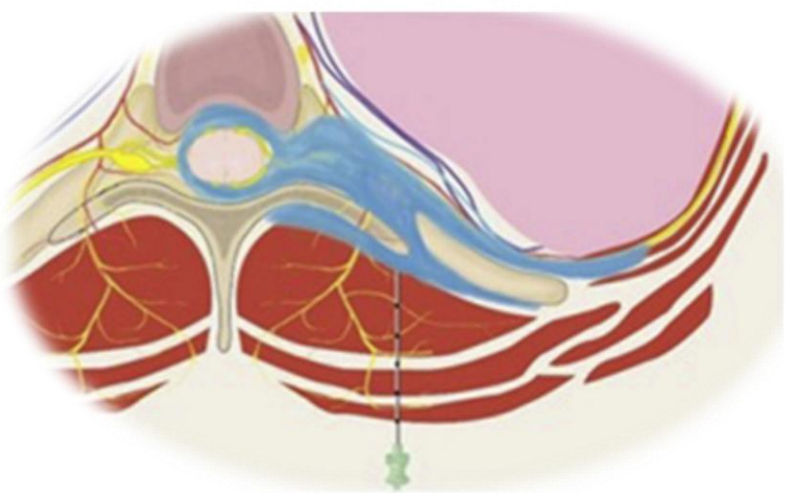
Does it provide effective analgesia?

How does it provide effective analgesia?

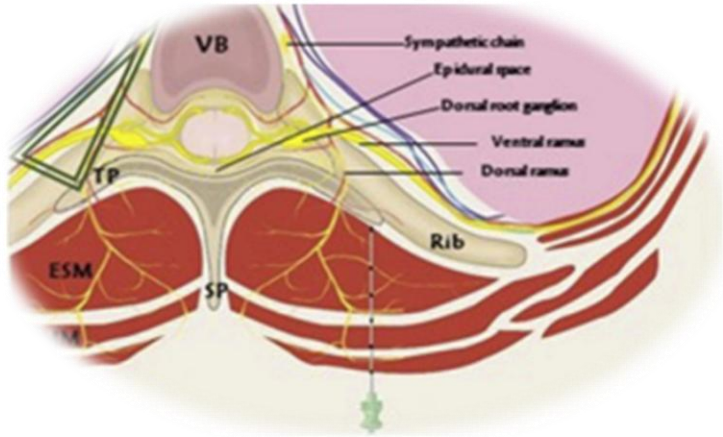
Journal of Pain Research 2019:12 2597–2613

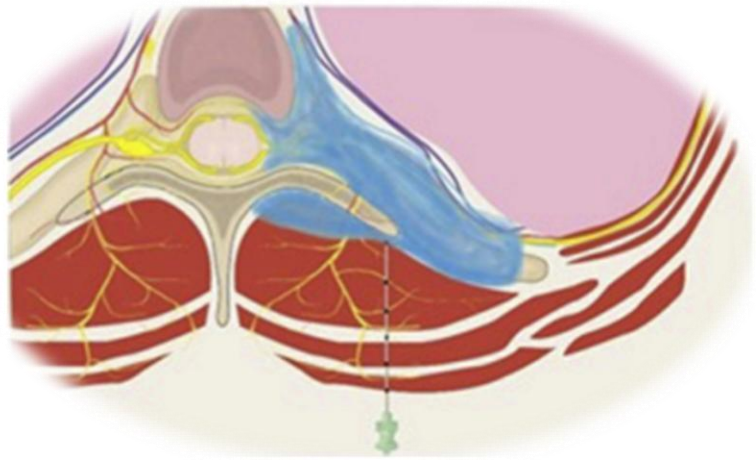


Spread widely in the **craniocaudal, posterior, and lateral planes**, with spread of local anesthetic to the dorsal ramus posterior of the costotransverse ligament in all cases (Ivanusic et al)

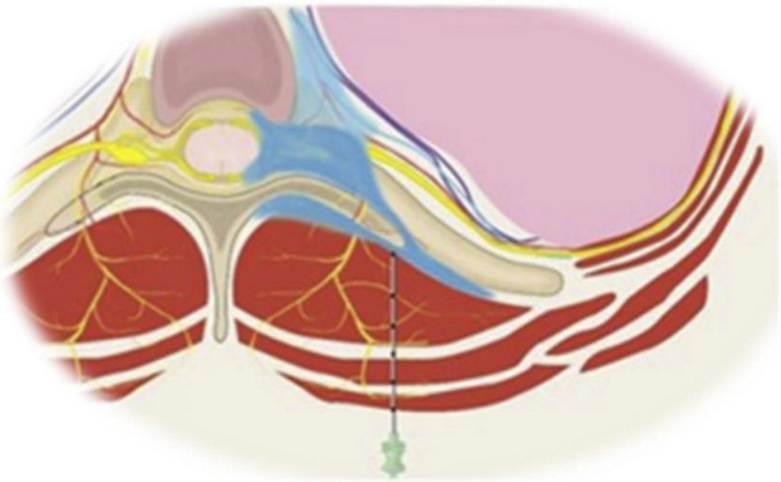


Local anesthetic was also shown to pass **anteriorly** and circumferential spread of the **epidural space** was observed. (Schwartzman et al)

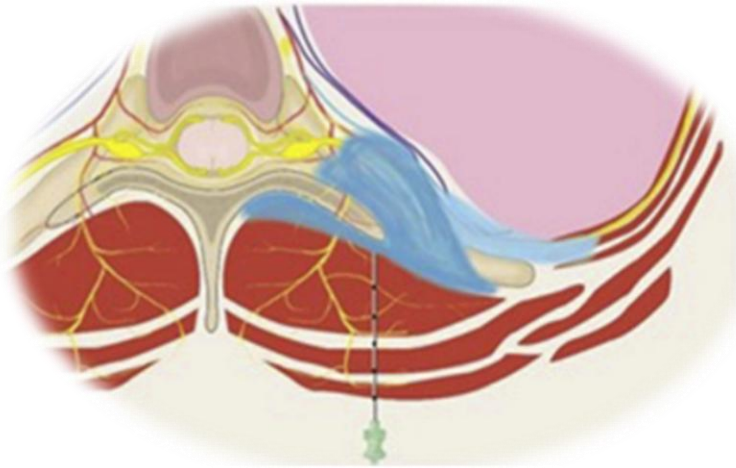




Profound spread anterior to the transverse process encompassing the **paravertebral space, neural foramina, ipsilateral epidural space, and ipsilateral sympathetic chain**. (Adhikary et al)



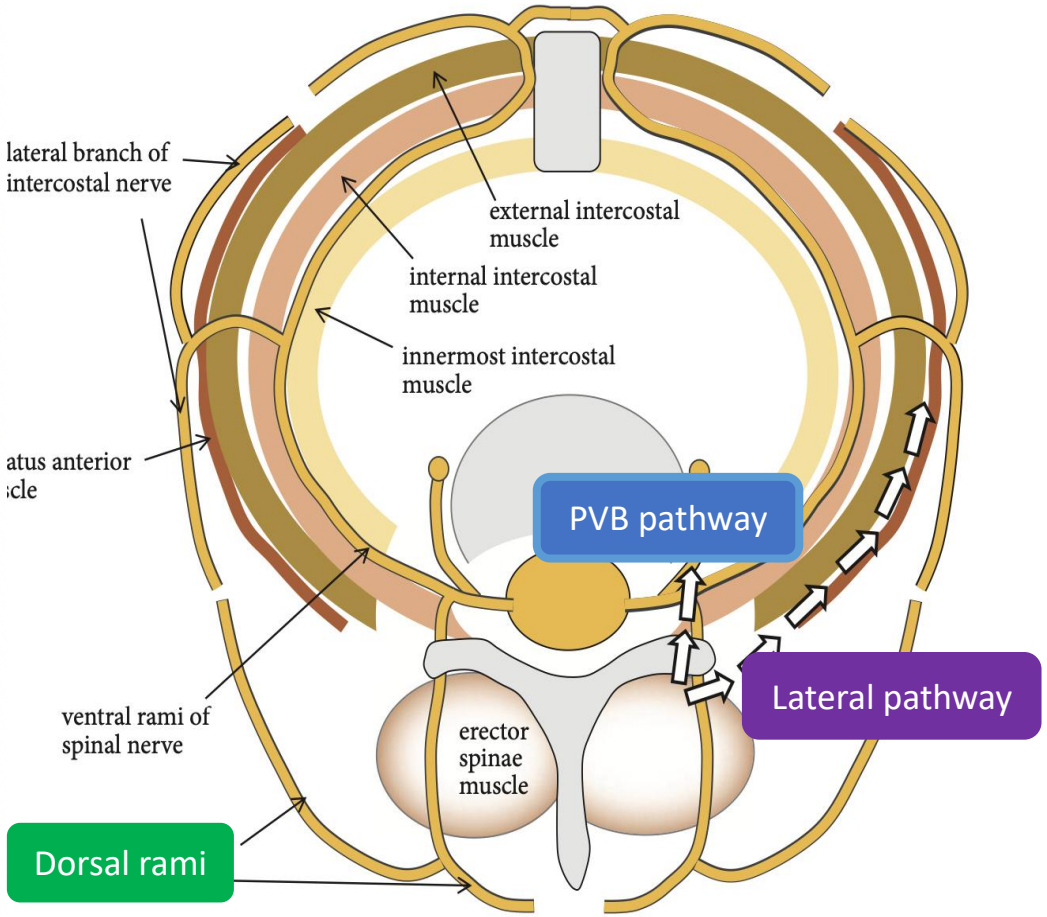
Local anesthetic spread to the **sympathetic chain**. (Yang et al.)

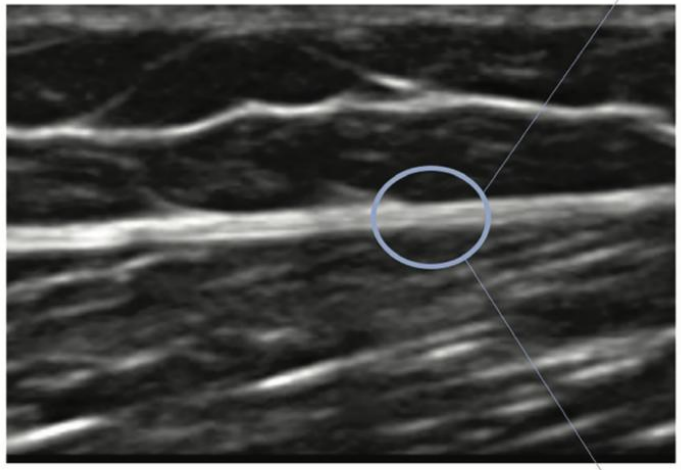


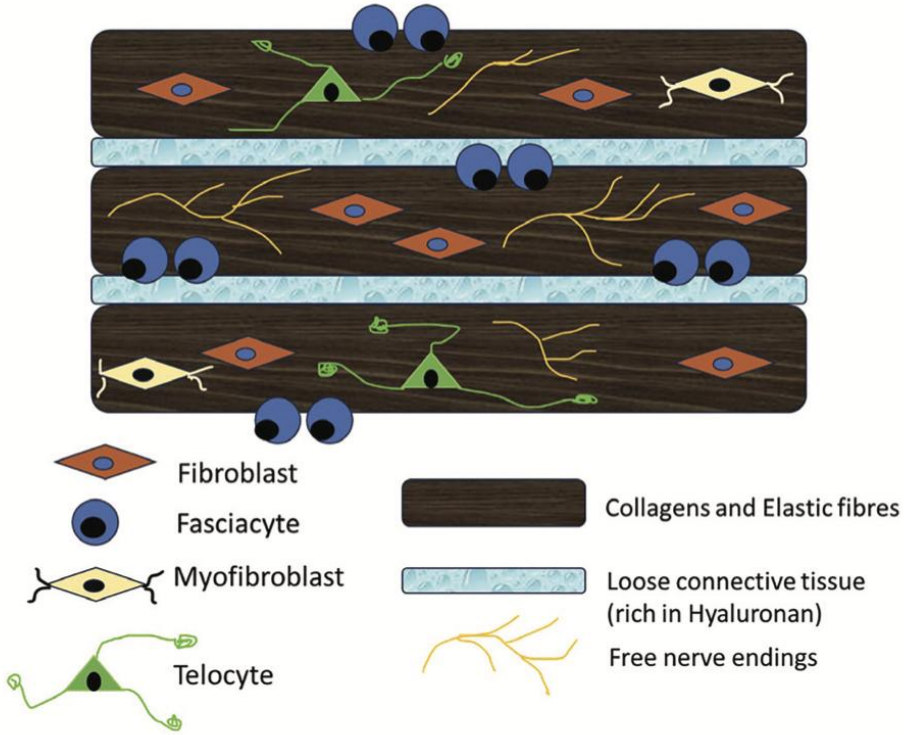
Spread was evident posterior to the transverse process deep to the erector spinae muscle, as well as **the paravertebral and intercostal spaces**. (Vidal et al.)

Anatomical spread of injectate in human cadaveric studies of the ESPB

Author/Year	ESP injections	Epidural space	Paravertebral space	Ventral rami	Dorsal rami	Sympathetic chain	Intercostal space
Thoracic ESP block (16 studies)							
Aponte 2019 [20]	T7 (*n*=6)	No	No	No	Yes (*n*=4)	NA	NA
Forero 2016 [1]	T5 (*n*=4)	No	No	Yes (*n*=1)	Yes (*n*=2)	No	Yes (*n*=2)
Ivanusic 2018 [15]	T5 (*n*=20)	No	No	Yes (*n*=1)	Yes (*n*=14)	No	No
Chin 2017[49]	T7 (*n*=2)	No	No	NA	NA	NA	Yes (*n*=2)
Shibata 2020 [24]	T4 (*n*=5)	NA	No	No	Yes (*n*=5)	NA	No
Vidal 2018 [50]	T4/5/10 (*n*=9)	No	Yes (*n*=9)	NA	NA	NA	Yes (*n*=9)
Nielsen 2019 [139]	T5 (*n*=5)	No	Yes (*n*=3)	Yes (*n*=3)	Yes (*n*=3)	NA	NA
Elsharkawy 2019 [143]	T10–11 (*n*=6)	No	Yes (*n*=3)	Yes (*n*=3)	Yes (*n*=6)	NA	Yes (*n*=4)
Govender 2020 [144]	T8 (*n*=1) T10 (*n*=1)	No	Yes (*n*=2)	Yes (*n*=2)	Yes (*n*=2)	NA	Yes (*n*=2)
Yang 2018 [48]	T5 (*n*=10)	NA	Yes (*n*=10)	Yes (*n*=10)	Yes (*n*=10)	Yes (n=10)	No
Dautzenberg 2019 [141]	T2 (*n*=11) T8 (*n*=11)	NA	Yes (*n*=5)	Yes (*n*=5)	Yes (*n*=5)	NA	NA
Choi 2019 [128]	T5 (*n*=14)	Yes (*n*=1)	Yes (*n*=7)	Yes (*n*=7)	Yes (*n*=14)	Yes (n=1)	No
Altinpulluk 2019 [142]	T9 (*n*=8)	Yes (*n*=5)	Yes (*n*=6)	Yes (*n*=6)	Yes (*n*=8)	NA	NA
Adhikary 2018 [47]	T5 (*n*=3)	Yes (*n*=3)	Yes (*n*=3)	Yes (*n*=3)	Yes (*n*=3)	NA	Yes (*n*=3)
Diwan 2019 [140]	T4–5 (*n*=5)	Yes (*n*=5)	Yes (*n*=5)	Yes (*n*=5)	Yes (*n*=5)	Yes (*n*=2)	Yes (*n*=5)
Govender 2020 [130]	T5 (*n*=1) T8 (*n*=1)	Yes (*n*=2)	Yes (*n*=2)	Yes (*n*=2)	Yes (*n*=2)	NA	NA







Deep fascia

Thoracolumbar fascia (TLF)

The TLF is a girdling structure consisting of several aponeurotic and fascial layers that separates the paraspinal muscles from the muscles of the thoracic and abdominal wall.

The **superficial** lamina of the posterior layer of the TLF (PLF) is dominated by the **aponeuroses**.

The **middle layer** of the TLF appears to derive from an intermuscular septum. The **deeper** lamina of the PLF forms an encapsulating retinacular sheath around the paraspinal muscles.

Pirri c. et al. Current Opin Anesthesiology 2024, 37(5): 526-532

Diffusion

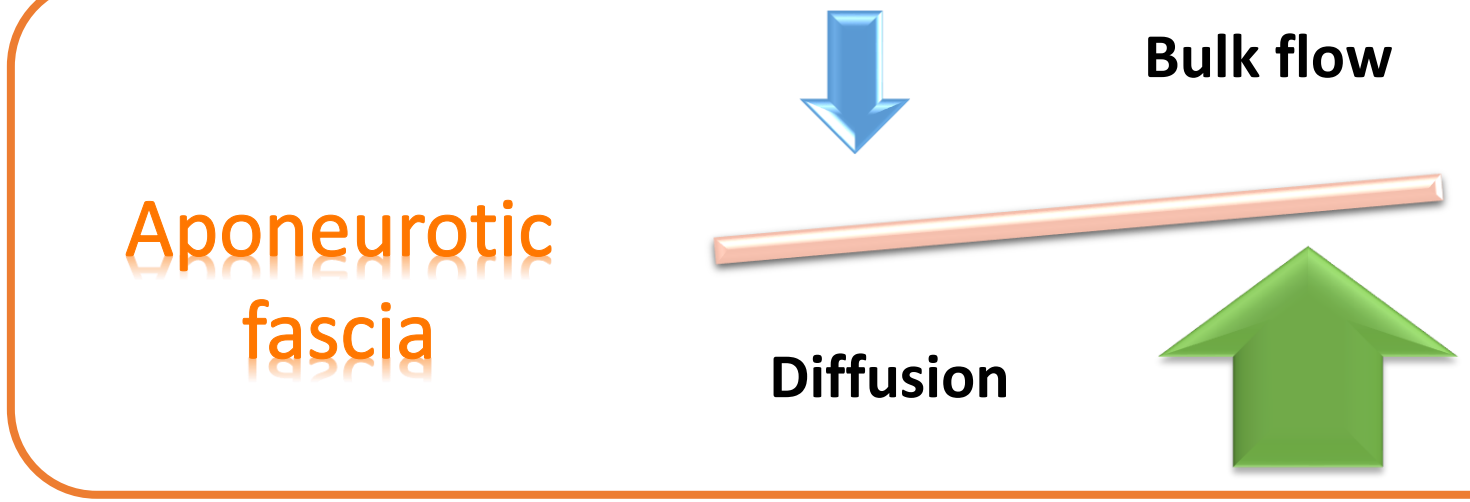
- Movement of anaesthetic molecules from areas of high **concentration** to low concentration
- Diffusion is facilitated by the ECM and this is influenced by the local anaesthetic's properties and the features of the fascial plane

Concentration

Bulk flow

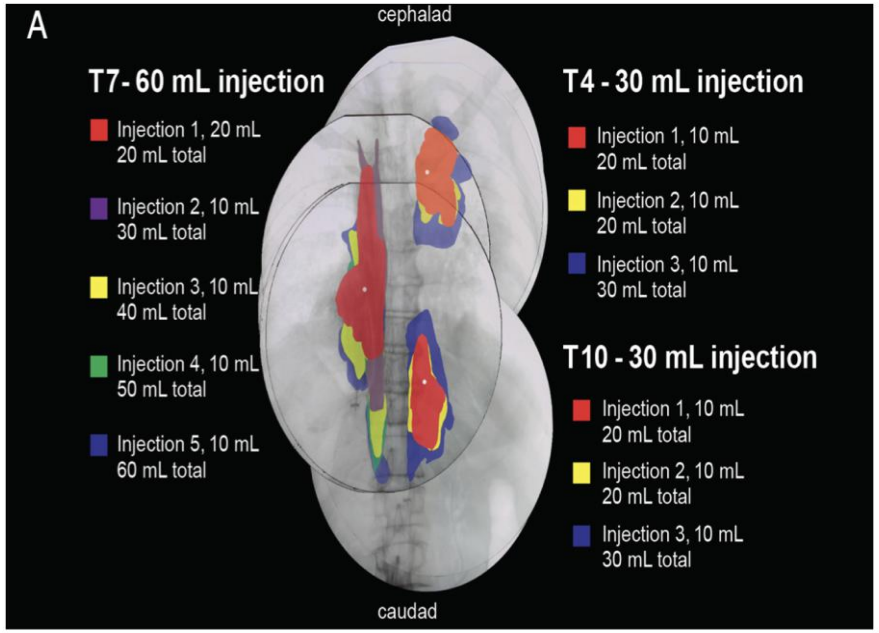
- Movement of the injected fluid en masse through the fascial plane, driven by the **pressure** of the injection.
- Hydro-dissection involves the separation and expansion of the fascial layers.
- Factors influencing this include the injected speed, the direction of injection and the inherent elasticity of the fascia.

Volume and pressure



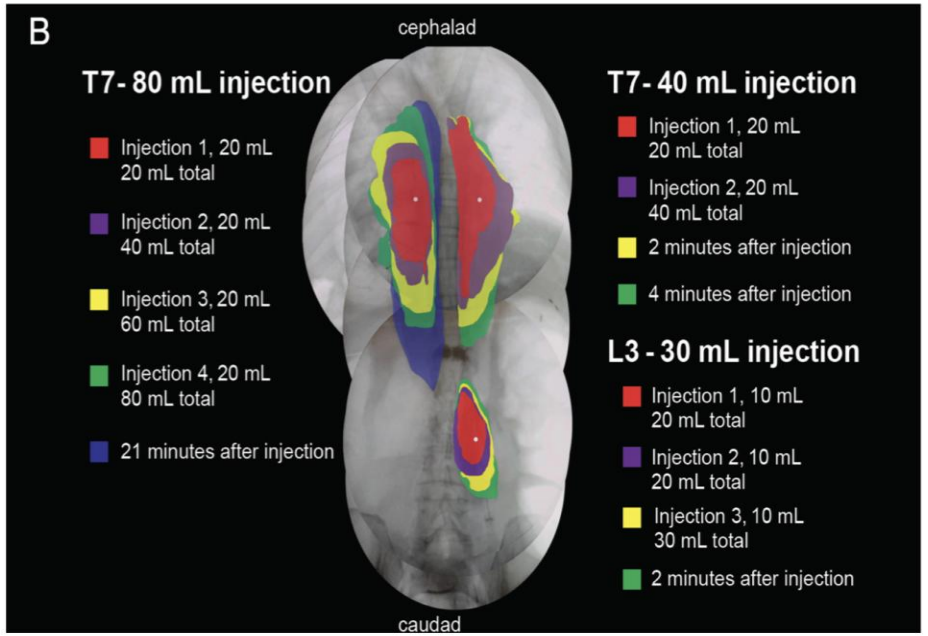
Chin KJ. Et al . Anatomical basis of fascial plane blocks. Reg Anesth Pain Med 2021; 46:581–599

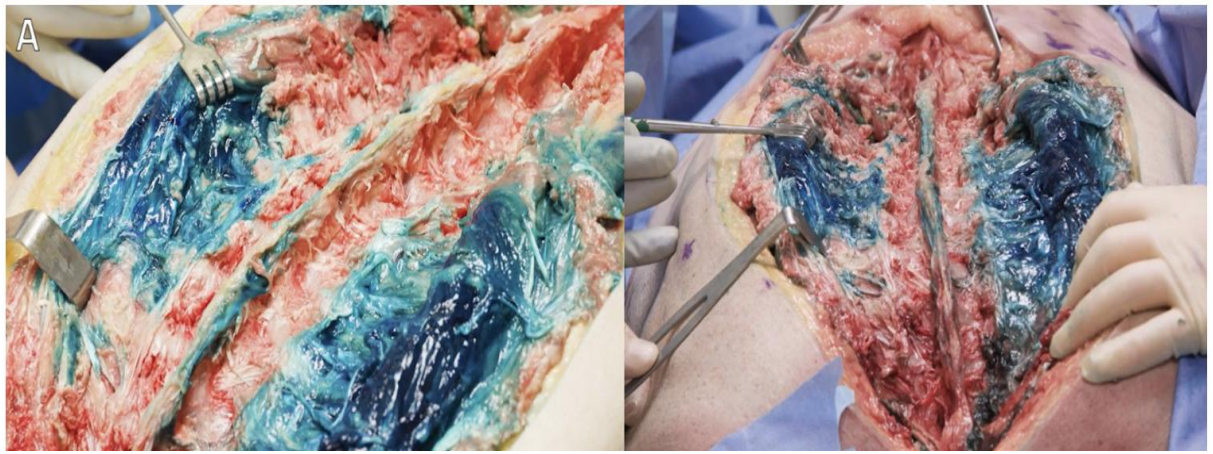
Larger injectate volumes resulted in greater cephalocaudal spread.



For thoracic injections:

- 30 mL spread across 4–7 vertebral levels.
- 60–80 mL extended the spread slightly, reaching up to 9 levels in some cases.





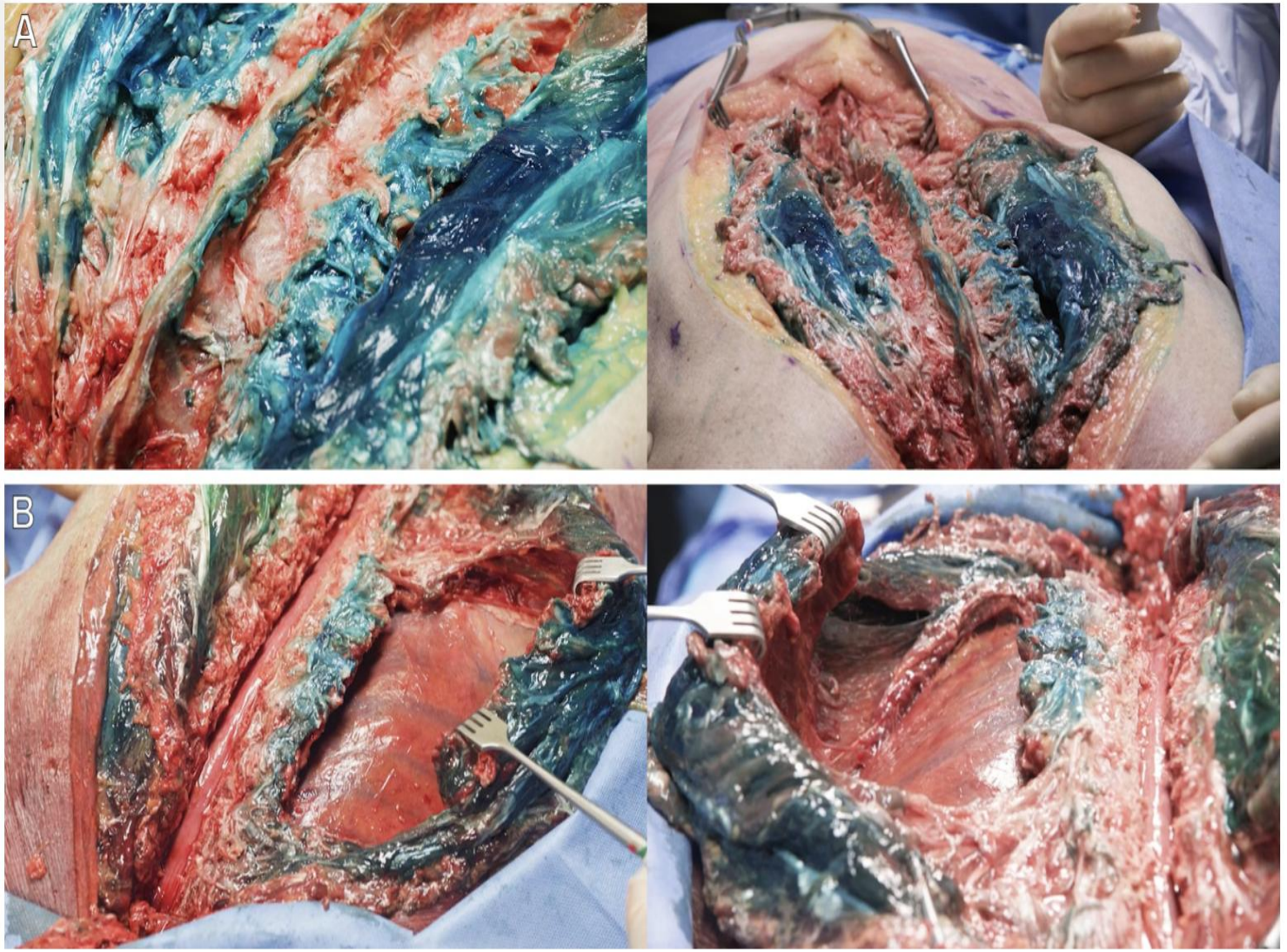
Gadsden J, et al. Reg Anesth Pain Med 2024;49:511–517

Original research

Relationship between injectate volume and disposition in erector spinae plane block: a cadaveric study

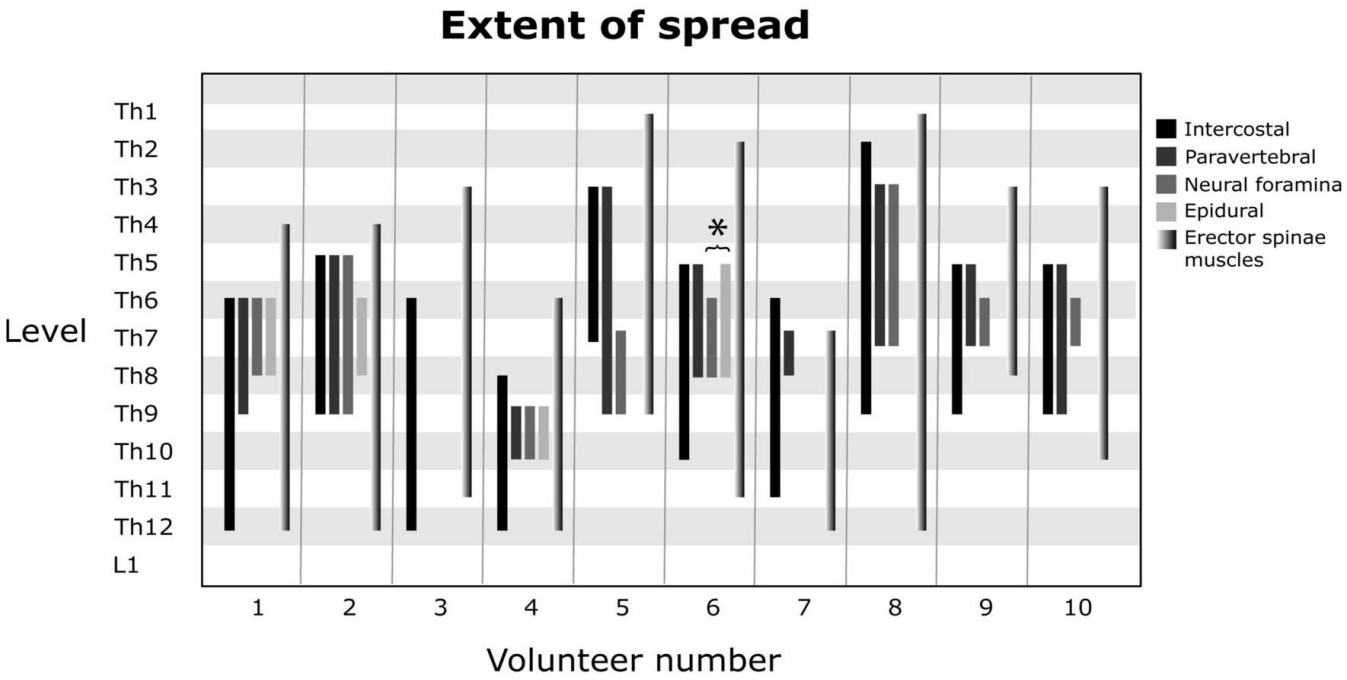
Jeffrey Gadsden [1], Jeffrey Gonzales,[2] An Chen[3]

- Dye predominantly stained the ventral surface of the ES muscle and dorsal rami.
- No staining was observed in the paravertebral, epidural, or pleural spaces, regardless of volume.
- Larger volumes showed lateral and dorsal staining but failed to reach ventral rami or anterior structures.



This study highlights the **effectiveness of 30 mL for routine clinical use** and reassures practitioners about the safety of larger volumes in avoiding critical areas.

Gadsden J, et al. Reg Anesth Pain Med 2024;49:511–517



The extent of spread was evaluated using **MRI** after injection of **30 mL** 2.5 mg/mL ropivacaine with 0.3 mL gadolinium at the level of Th7

Cutaneous mapping of loss of sensation to **cold** and **pin-prick** after ESPB

Sensory testing 30-50 min after an ESPB shows highly variable results, and generally under-represents what could be expected from the visualized spread on MRI 60 min after block performance.

Sorenstua M. et al. Spread of local anesthetics after erector spinae plane block: an MRI study in healthy volunteers. Regional Anesthesia & Pain Medicine 2023;48:74-79

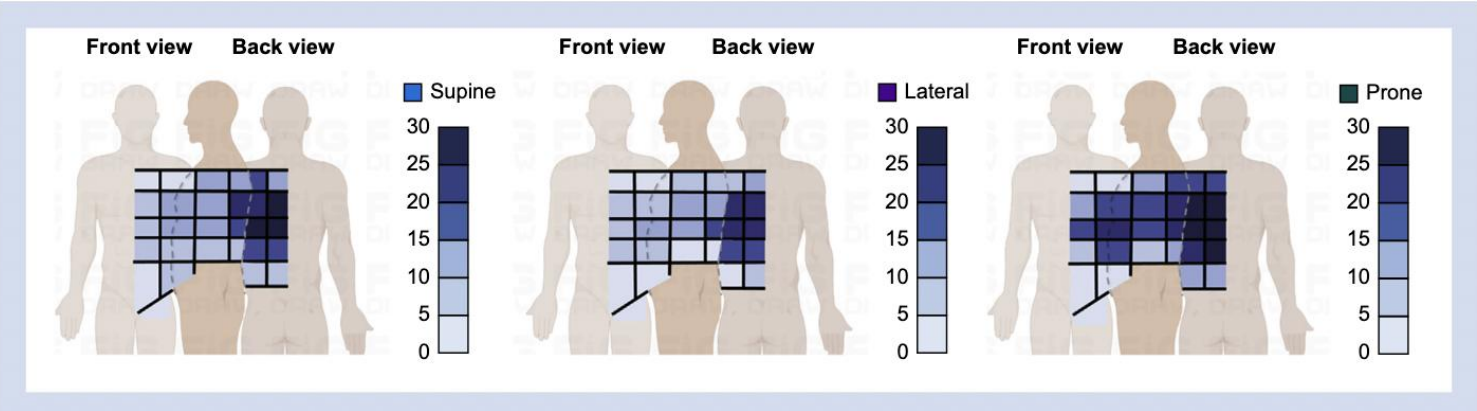
The Analgesic Mechanism and Recent Clinical Application of Erector Spinae Plane Block: A Narrative Review

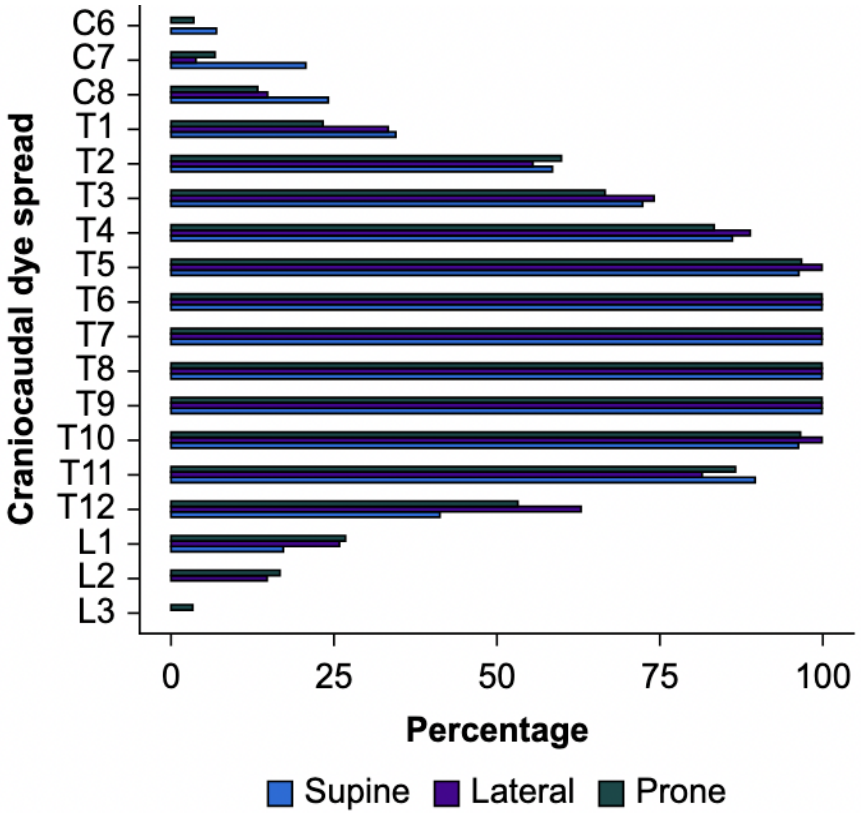
Authors	Research object	Blocking level	Blocking side(s)	Types of liquid	Liquid volume	Detection method(s)	Diffusion range
Schwartzmann 2020[33]	6 patients	T10	Unilateral	0.25% bupivacaine mixed	30mL(0.3mL gadolinium)	MRI	Persistent spread to the posterior ramus of the spinal nerve, intervertebral foramen, and intercostal spaces, causing anterior and posterior chest and abdominal wall blockade, but varying degrees of spread to the intervertebral foramen and intercostal spaces.
Zhang 2020[34]	12 volunteers	T5	Unilateral	0.5% ropivacaine	20mL	Cold stimulation measures the cutaneous sensory loss area and cutaneous sensory declination area	Loss of cold sensation is concentrated in T6-T9; The decline area is mainly concentrated in T4-T11. The left side does not cross the posterior axillary line, and the right side reaches the posterior median line. extensive cutaneous sensory blockade in the posterior chest that does not reach the anterior chest, lateral chest, or abdominal wall; The posterior branch is widely blocked.
Aponte 2019[28]	4 fresh corpses	T7	Bilateral, Unilateral	Radioactive contrast agent dye mixture	20mL	Autopsy CT	Dorsal regions of T1-T11 were observed to spread the dye in the cephalocaudal region and extend transversely towards the costoverte region, covering a wide range of posterior spinal nerve innervation, without spreading to the paravertebral space or involving the anterior branch of the spinal nerve.
Sørenstua 2023[31]	10 volunteers	T7	Unilateral	2.5mg/mL ropivacaine	30mL(0.3mL gadolinium)	MRI; The loss of sensation to cold and pinprick	MRI showed anesthetic spread in the intercostal spaces in all volunteers, 9/10 to the paravertebral space, 8/10 to the intervertebral foramen, and 4/10 to the epidural space.
Bonvicini 2021[25]	2 fresh, frozen corpses	T5	Bilateral	Diluted black tissue marking dye	20mL	Autopsy	T2/3 to T10/11 dorsally of the chest, extending transversely up to 10 cm, and ventral T2/3-T9/10 of the thorax, spreading along the posterior branches and blood vessels of the spinal nerve and passing through the costotransverse foramen to the anterior paravertebral space and the intercostal nerves.
Zhang 2021[32]	28 patients	T12	Bilateral	0.4% ropivacaine hydrochloride and 2 mg of dexamethasone	25mL	The cold-warm method	The effective longitudinal plane of T12 ESPB was mainly distributed in the dorsal cutaneous branch of T9-L5, and the blockade area distribution was safe and stable

Compared with other fascial plane blocks, **ESPB is safer, more effective, has fewer complications, and can produce good intraoperative and postoperative analgesia** and it is increasingly used in various surgical procedures, it has shown various advantages in intraoperative and postoperative analgesia.

It is impossible to clarify the diffusion plane of local anesthetics in the erector spinae muscle group fascia, and thus **its analgesic area cannot be determined**, which may limit the application scope of ESPB to a certain extent.

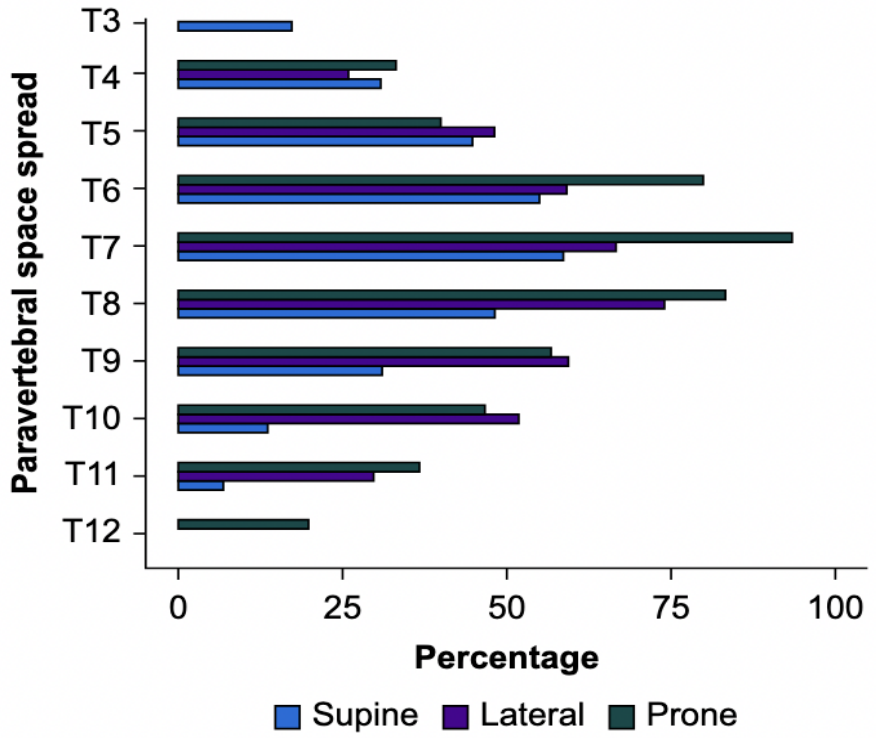
Yang et al. Journal of Pain Research 2024:17





The **patient positioning significantly influences local anesthetic spread after ESPB**.

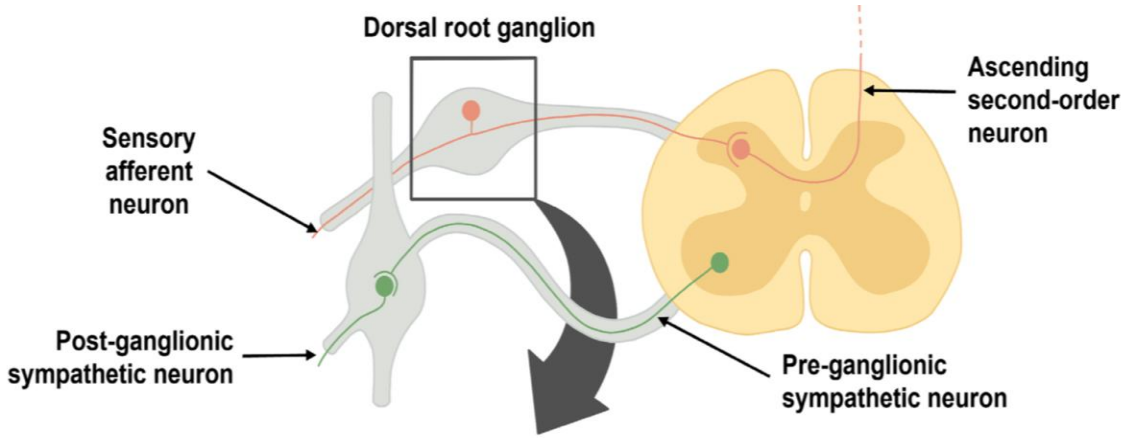
The **prone position** resulted in the greatest spread to the **paravertebral space, intercostal space, and neural foramina.**

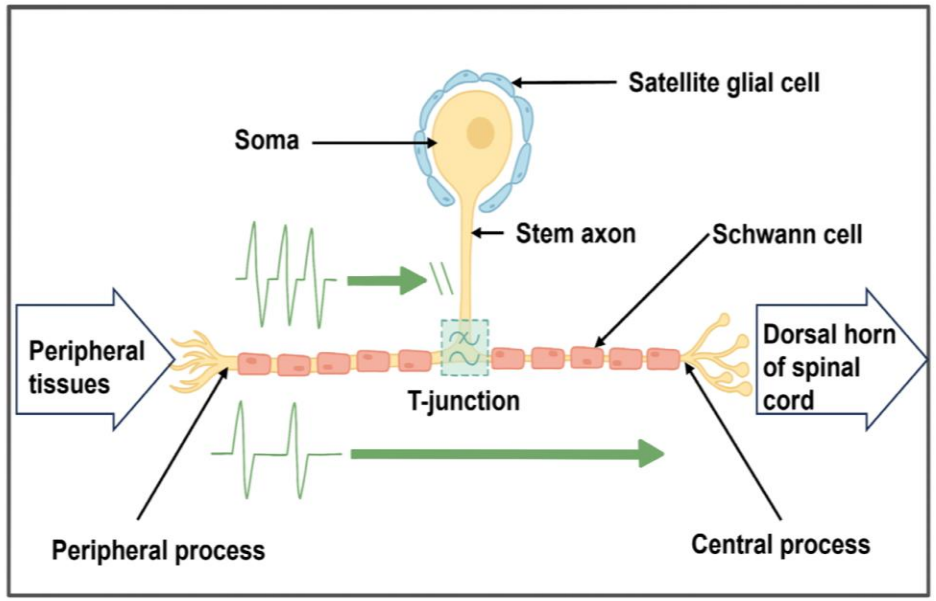


Shan T. et al. Spread of local anaesthetic after erector spinae plane block: a randomised, three-dimensional reconstruction, imaging study British Journal of Anaesthesia, 134 (3): 830e838 (2025)

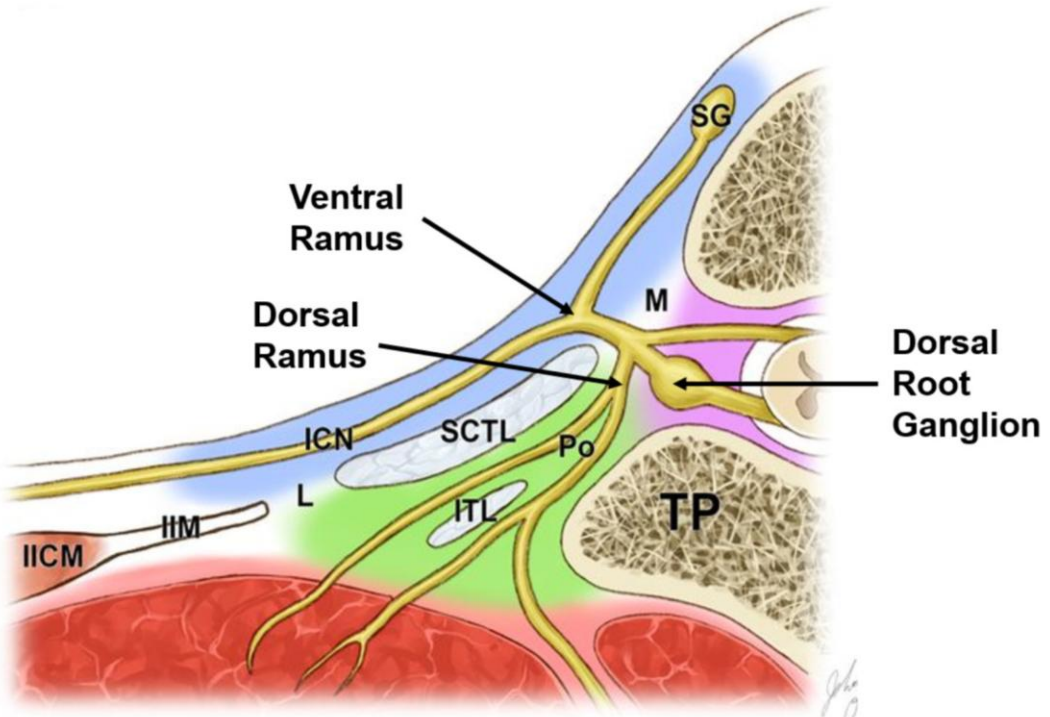
Dorsal root ganglion: a key to understanding the therapeutic effects of the erector spinae plane (ESP) and other intertransverse process blocks?

Marie Sørenstua [1,2] Ann-Chatrin Linqvist Leonardsen [1,3] Ki Jinn Chin [4]





The lack of tight junctions in the DRG capsule means that it is more permeable to LA molecules. The implication is that the **DRG will be more sensitive to conduction block by an equivalent concentration of LA in the interstitial space, compared with a peripheral nerve**. This may be another explanation for the clinically apparent analgesia produced by the relatively small mass of LA that reaches the interforaminal region following an ESPB.



Sørenstua M, *et al*. *Reg Anesth Pain Med* 2024;**49**:223–226.

Local anesthetics and erector spinae plane blocks: a spotlight on pharmacokinetic considerations and toxicity risks

Alessandro De Cassai[a], Federico Geraldini[a], Fabio Costa[b] and Serkan Tulgar[c]

The overall rate of complications associated with ESP block has been estimated to be low, with **less than two complications every 10.000 patients**.

Only a **few case reports describe LAST** associated with the use of the ESP block.

All pharmacokinetic studies focused on upper thoracic ESPB applications.

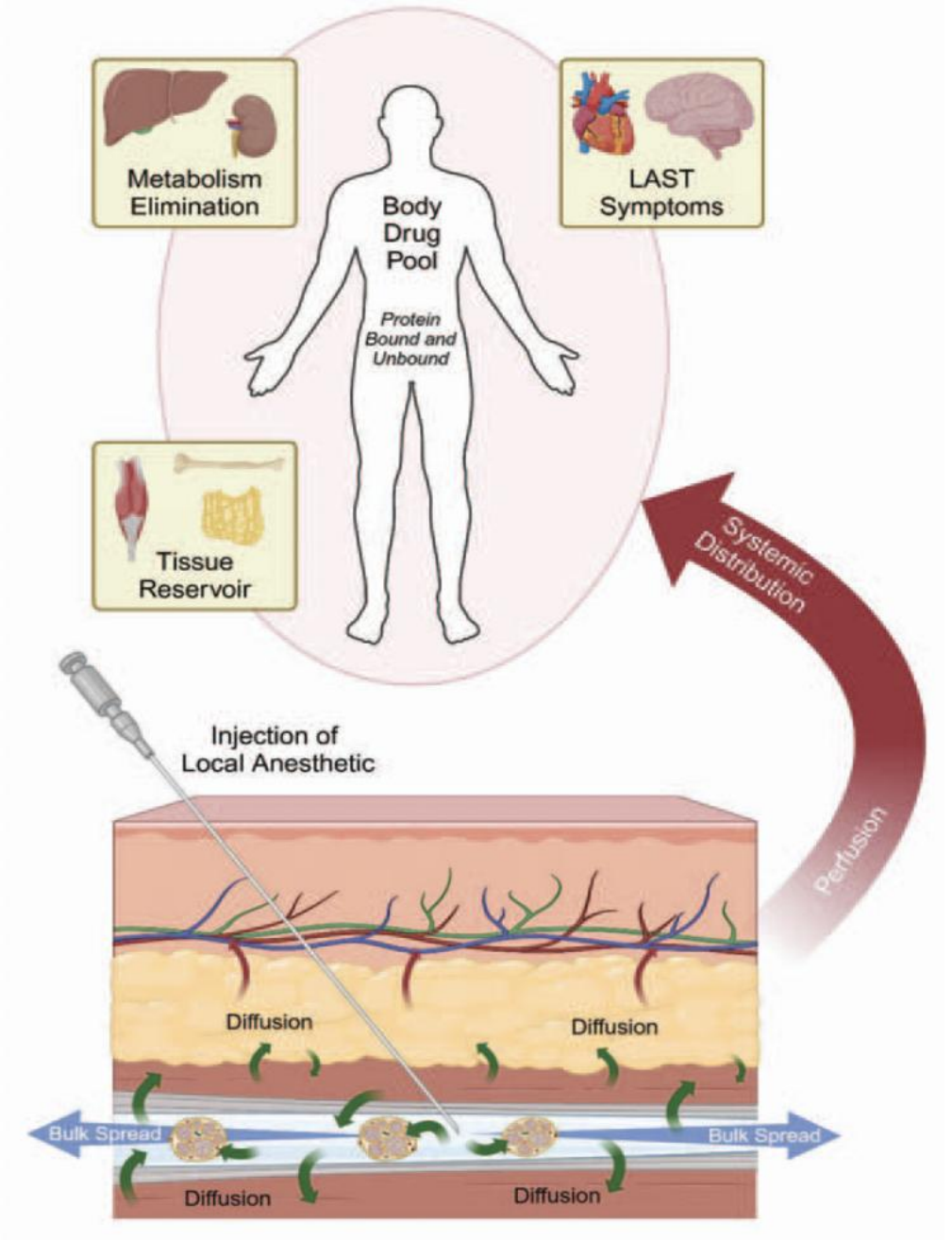
1 A successful ESP block relies on the use of **large volumes** of anesthetics. Given that the target is not a nerve or a small compartment but a virtual plane where the anesthetic spreads, large volumes are usually necessary to reach the desired effect.

2 The ESP is performed in a **highly vascularized surface**, as on the erector spinae muscle group lies a rich vascular bed. Given the above, it is of foremost importance to evaluate the pharmacokinetics of the drugs injected in the ESP to evaluate the possibility of local anesthetic systemic toxicity (LAST).

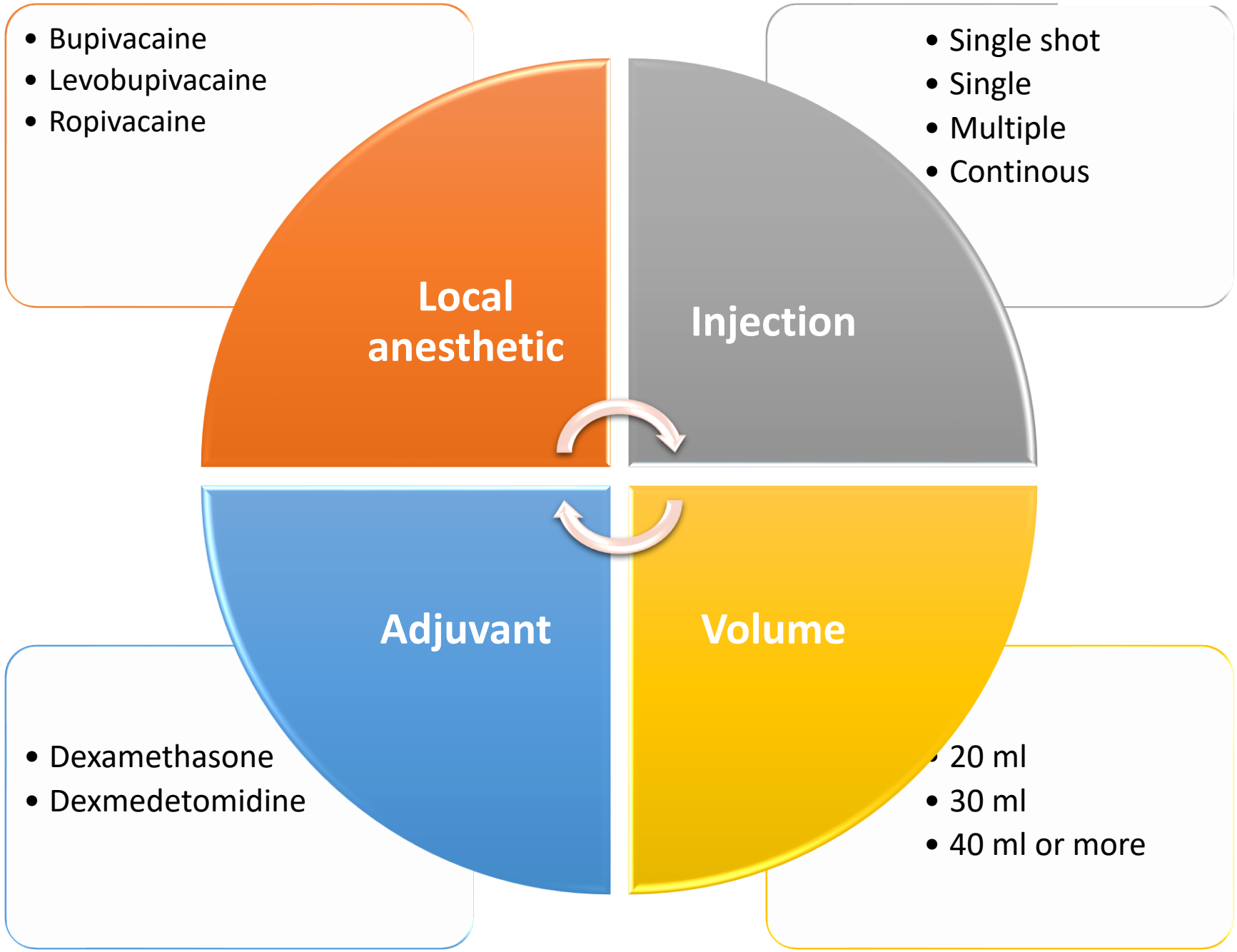
EXPERT OPINION ON DRUG METABOLISM & TOXICOLOGY 2022, VOL. 18, NO. 9, 537–539

KEY POINTS

- Traditional maximum recommended doses of local anesthetics may not be applicable to modern regional anesthesia techniques, necessitating further research to ensure patient safety and optimal outcomes.
- Injection volume and tissue compliance are major determinants of local anesthetic spread, while the mechanism of action for some fascial plane blocks remains unclear.
- Factors such as high local anesthetic dose, bilateral catheters, cardiac surgery, cytochrome P-450 inhibitors, and hypoalbuminemia increase the risk of systemic toxicity, especially with continuous infusions.



Leite-Moreira et al. Pharmacokinetics in regional anesthesia. Curr Opin Anesthesiol 2024, 37


Local anesthetic
Injection
Adjuvant
Volume
• Bupivacaine
• Levobupivacaine
• Ropivacaine
• Single shot
• Single
• Multiple
• Continous
• Dexamethasone
• Dexmedetomidine
• 20 ml
• 30 ml
• 40 ml or more

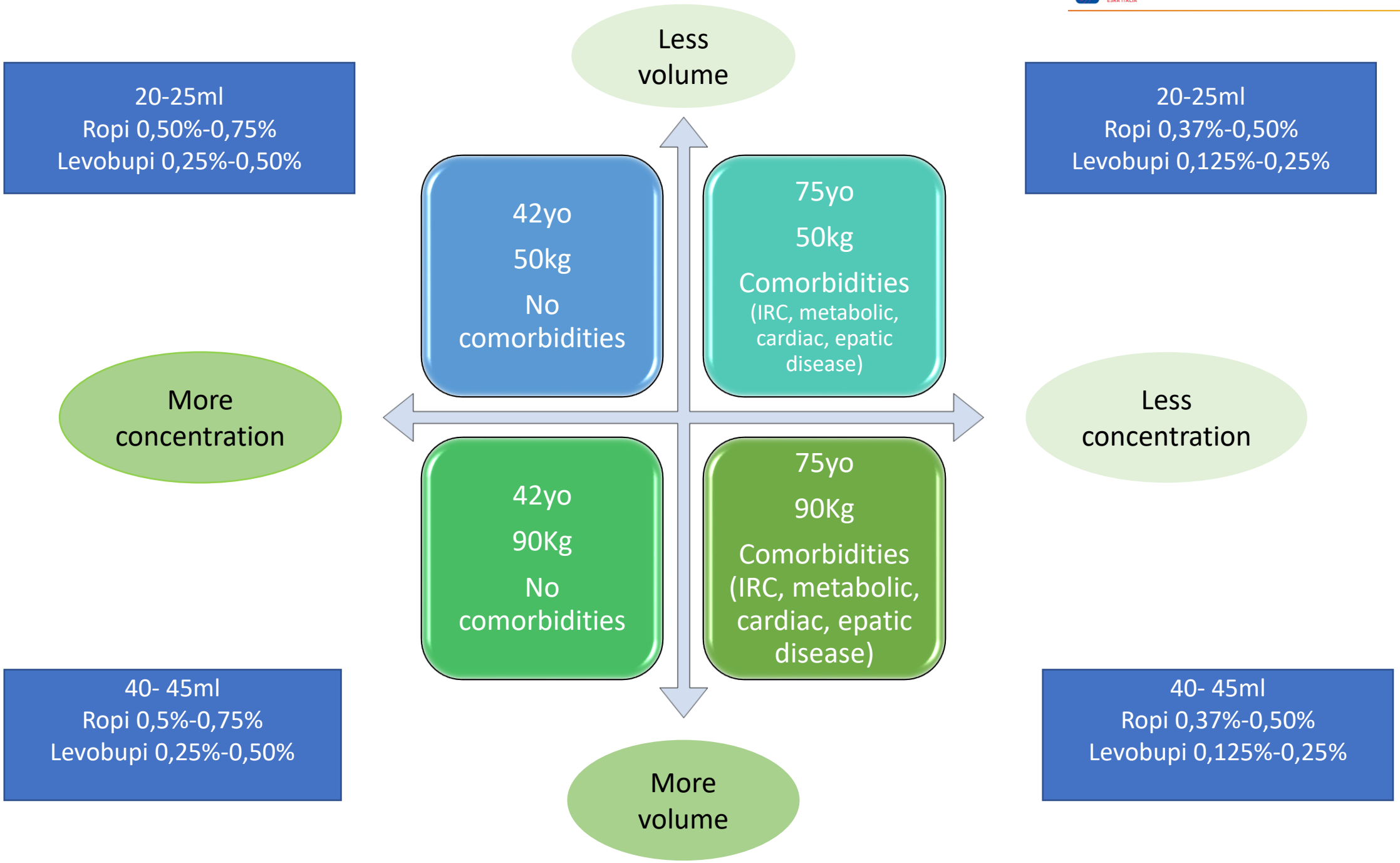
Local anesthetic

The choice of local anesthetic agent has been reported to be ropivacaine, levobupivacaine, bupivacaine (at concentrations of 0.5%, 0.25%, or 0.375%), and lidocaine (1% or 2% concentration).
Higher **concentrations** may be required for surgical anesthesia and lower concentrations for postoperative analgesia.

Volume

This **dosage** is generally 0.4-0.5 mL/kg or 3,4ml for one dermatomer, without exceeding the maximum dosage of local anesthetic (risk of LAST).

Journal of Pain Research 2019:12 2597–2613

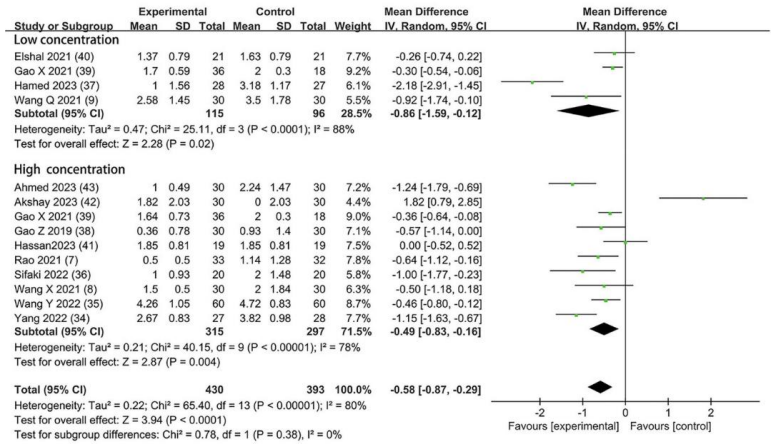

Less volume
20-25ml
Ropi 0,50%-0,75%
Levobupi 0,25%-0,50%
20-25ml
Ropi 0,37%-0,50%
Levobupi 0,125%-0,25%
42yo
50kg
No comorbidities
75yo
50kg
Comorbidities (IRC, metabolic, cardiac, epatic disease)
More concentration
Less concentration
42yo
90Kg
No comorbidities
75yo
90Kg
Comorbidities (IRC, metabolic, cardiac, epatic disease)
40- 45ml
Ropi 0,5%-0,75%
Levobupi 0,25%-0,50%
40- 45ml
Ropi 0,37%-0,50%
Levobupi 0,125%-0,25%
More volume

Dexmedetomidine with different concentrations added to local anesthetics in erector spinae plane block: a meta-analysis of randomized controlled trials

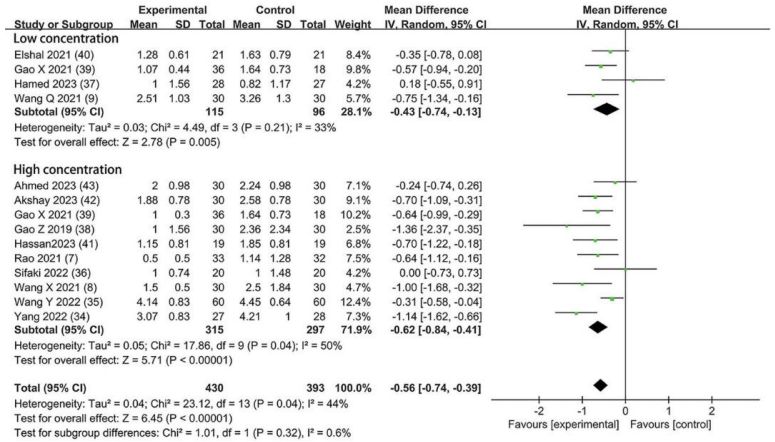
823 pz
13 RCTs

Using perineural **dexmedetomidine** at a dose concentration of **0.5 µg/kg** or **1 µg/kg** in ESPB reduces postoperative pain severity, extends the duration of sensory block, decreases the time to first request for pain relief, reduces the consumption of morphine, lowers incidence of postoperative rescue analgesic, reduces the occurrence of chronic pain.

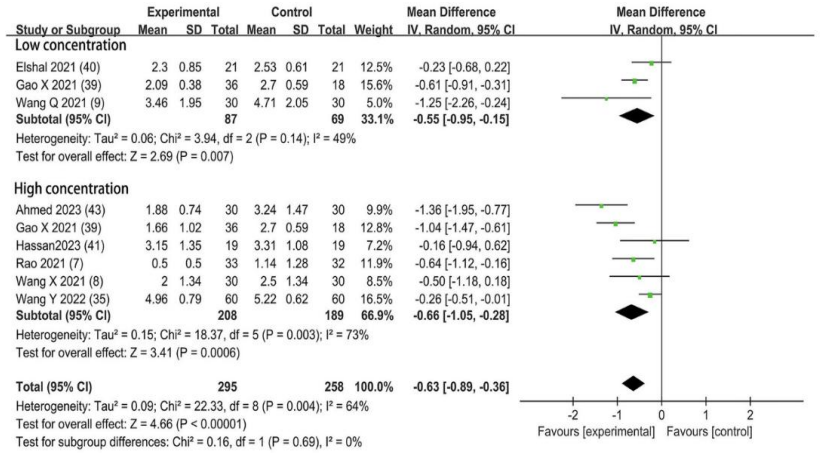
The rest VAS scores at 12 h postoperatively



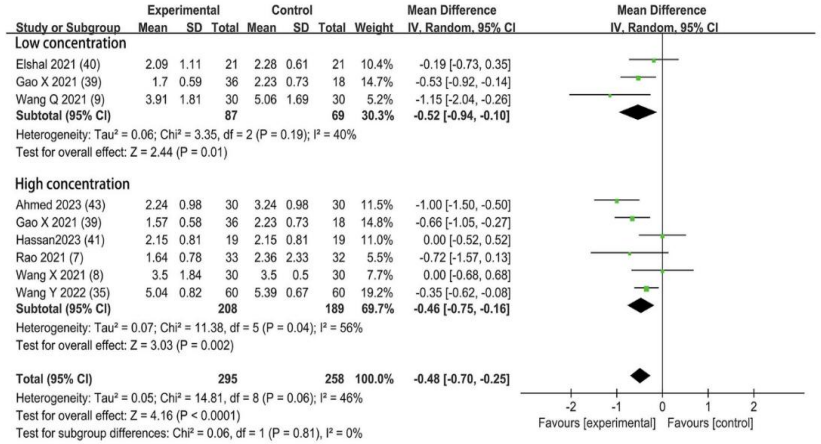
The rest VAS scores at 24 h postoperatively



The dynamic VAS scores at 12 h postoperatively



The dynamic VAS scores at 24 h postoperatively



Qian Li et al. Front Med (Lausanne) 2024 May 22:11:1326566.

The intravenous administration of dexamethasone with dexmedetomidine after erector spinae plane block and serratus anterior plane block further decreased the incidence of moderate- to-severe pain.

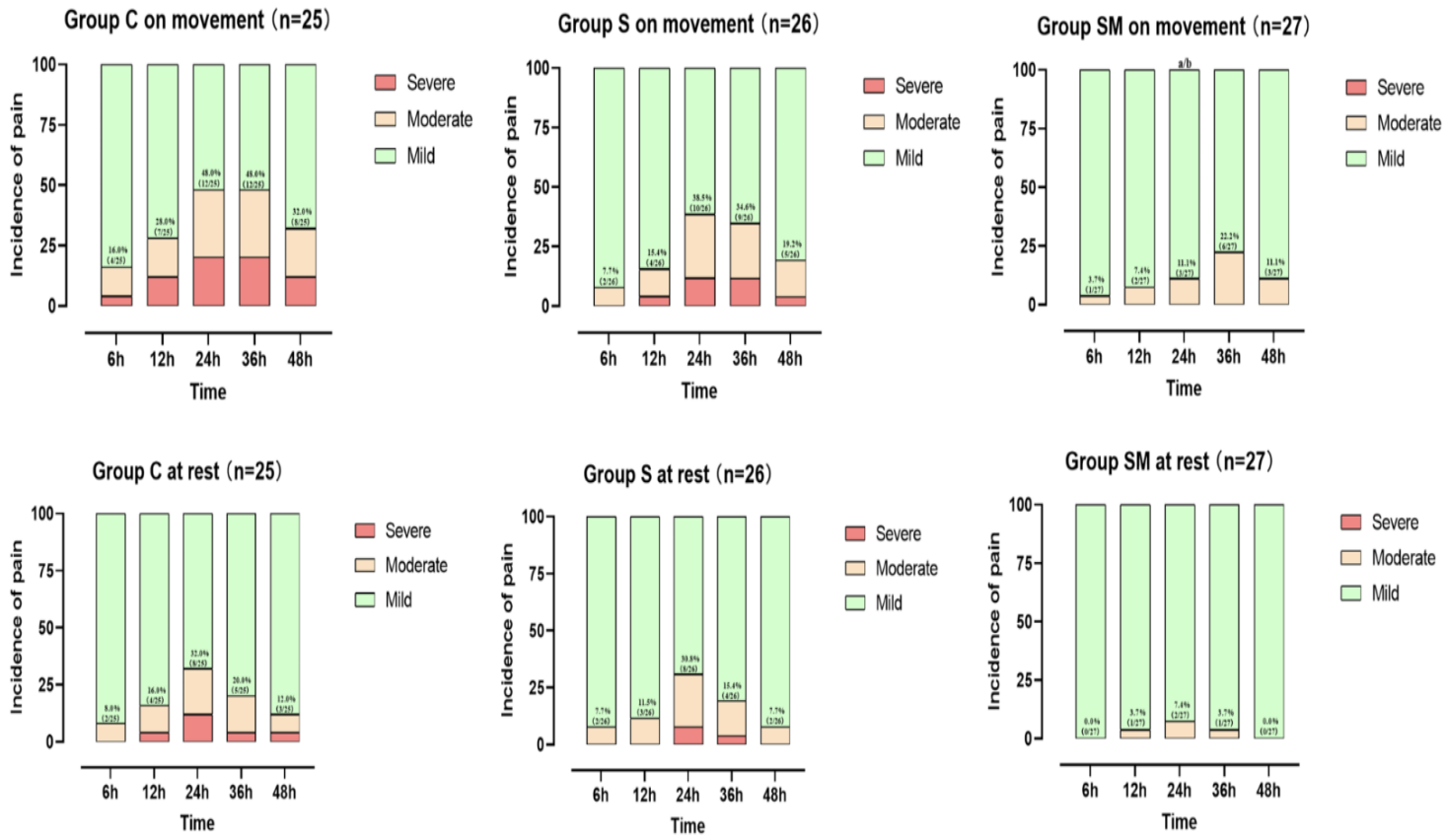


Table 2 Postoperative analgesic efficacy, adverse reactions and quality of recovery

Variables	Group C (*n* = 25)	Group S (*n* = 26)	Group SM (*n* = 27)	*P*-value
Duration of effective analgesia (min)	915.0 [366.5]	1073.0 [668.5]	1500.0 [785.0] [a, b]	<0.001
Total consumption of opioids (mg)				
0–24 h after surgery	32.0 [9.0]	28.0 [2.5]	26.0 [6.0] [a, b]	0.004
24–48 h after surgery	26.0 [4.0]	25.0 [4.5]	24.0 [2.0]	0.074
Number of patients required rescue analgesia (%)				
0–24 h after surgery	12 (48.0)	10 (38.5)	3 (11.1) [a, b]	0.009
24–48 h after surgery	8 (32.0)	4 (15.4)	1 (3.7) [a]	0.021
Postoperative adverse reactions				
Nausea and vomiting	8 (32.0)	8 (30.8)	2 (7.4) [a, b]	0.047
Bradycardia	0	0	0	1.000
Hypotension	1 (4.0)	1 (3.8)	1 (3.7)	1.000
Hypoxemia	0	0	0	1.000
Drowsiness	1 (4.0)	0	0	0.321
Dizzy	1 (4.0)	0	0	0.321
Pruritus	0	0	0	1.000
Wound infection	0	0	0	1.000
Hematoma at the puncture site	0	0	0	1.000
Time to first eating after surgery (h)	7.0 [3.0]	7.0 [3.0]	7.0 [4.0]	0.416
Time to first ambulation after surgery (h)	20.0 [6.0]	20.0 [6.0]	18.0 [6.0]	0.056
Time to remove chest drain after surgery (days)	3.0 [1.0]	3.0 [2.0]	3.0 [1.0]	0.399
Length of stay after surgery (days)	5.0 [3.0]	5.0 [2.3]	4.0 [2.0]	0.162
QoR-15 score 24 h after surgery	123.0 [8.0]	127.5 [10.8]	132.0 [10.0] [a, b]	<0.001

group C (20 mL normal saline),
group S (10 mg dexamethasone + normal saline to 20 mL),
group SM (10 mg dexamethasone + 1 μg/kg dexmedetomidine + normal saline to 20 mL)

Zhang et al. Improvement in postoperative pain control by combined use of intravenous dexamethasone with dexmedetomidine after erector spinae plane block and serratus anterior plane block for thoracoscopic surgery: a randomized controlled trial BMC Anesthesiology (2025) 25:171

A **high-frequency linear probe** is usually chosen for the thoracic area, although a **curvilinear probe** may be required for obese patients.

The **in-plane or out-of-plane technique** should be used according to the physician's experience when inserting the needle for either thoracic applications.

generally a **22 G needle measuring 50, 80, or 100 mm** is used for thoracic applications.

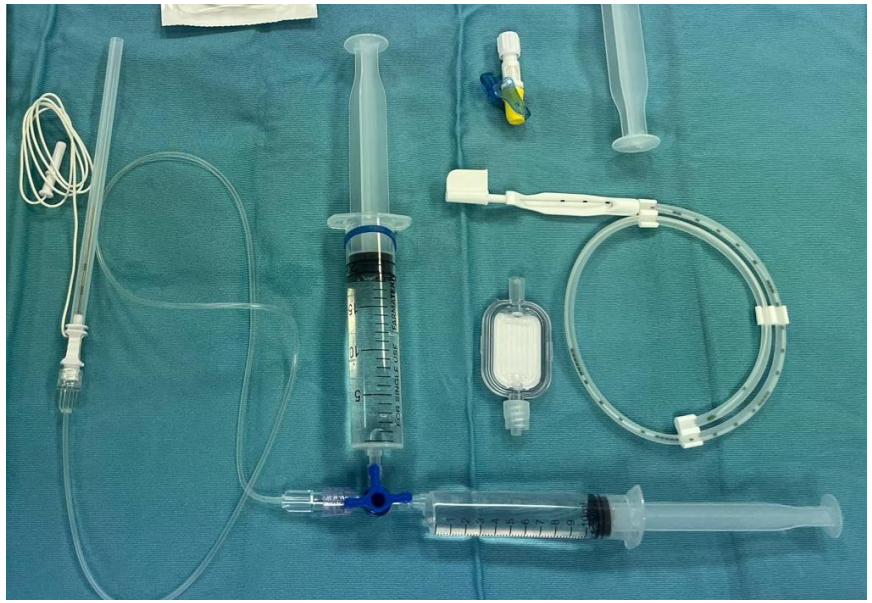
Single shot ESPB

- Easy and safe
- Limited pain coverage
- VATS and breast surgery

Continuous ESPB

- Long-lasting analgesic coverage
- Thoracotomies and open surgery
- Catheter dislocation

Journal of Pain Research 2019:12 2597–2613



Strategies **to mitigate the phenomeno of rebound pain (RP)** include thorough preoperative patient education, the implementation of **multimodal analgesic protocols**, the use of **continuous PNB techniques**, and the administration of **systemic agents**, such as intravenous dexamethasone.

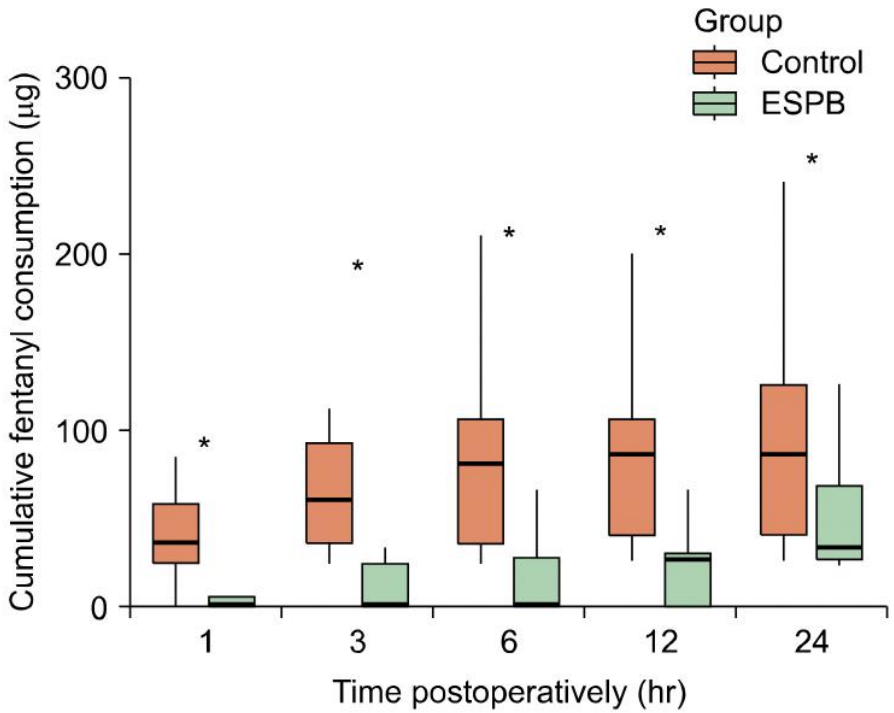
Eleni Moka. J. Clin. Med. 2025, 14, 6257

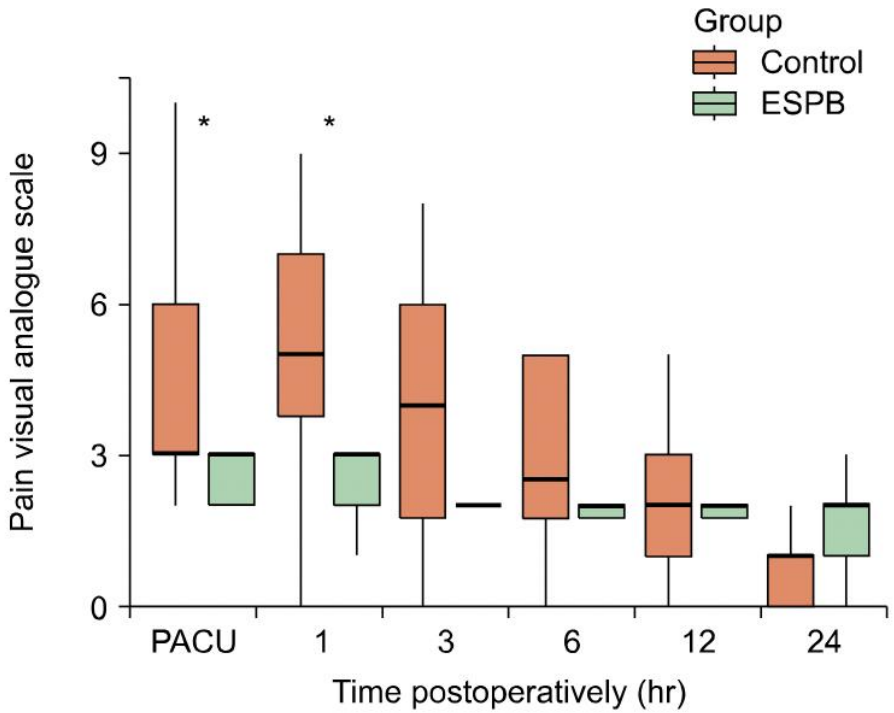
Multimodal analgesia with multiple intermittent doses of erector spinae plane block through a catheter after total mastectomy: a retrospective observational study

Boohwi Hong[1], Seunguk Bang[2,3], Woosuk Chung[1], Subin Yoo[2,3], Jihyun Chung[2,3], and Seoyeong Kim[2,3]

Table 2. Postoperative Analgesia Outcomes and Incidence of PONV

Variable	ESPB (n = 20)	Control (n = 20)	*P* value
Frequency of rescue analgesics			0.072
1	1 (5.0)	0 (0)	
2	0 (0)	4 (20.0)	
PONV	0 (0)	11 (55.0)	<0.001





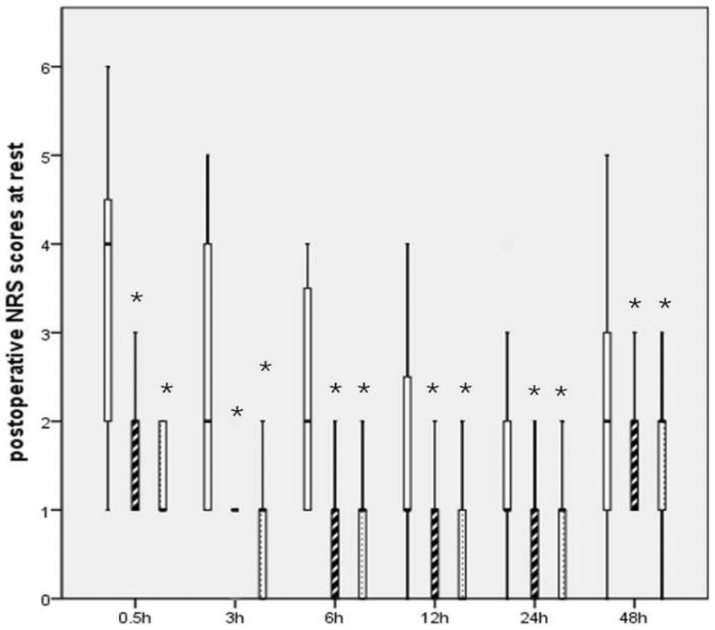
Korean J Pain 2019 July; Vol. 32, No. 3: 206-214

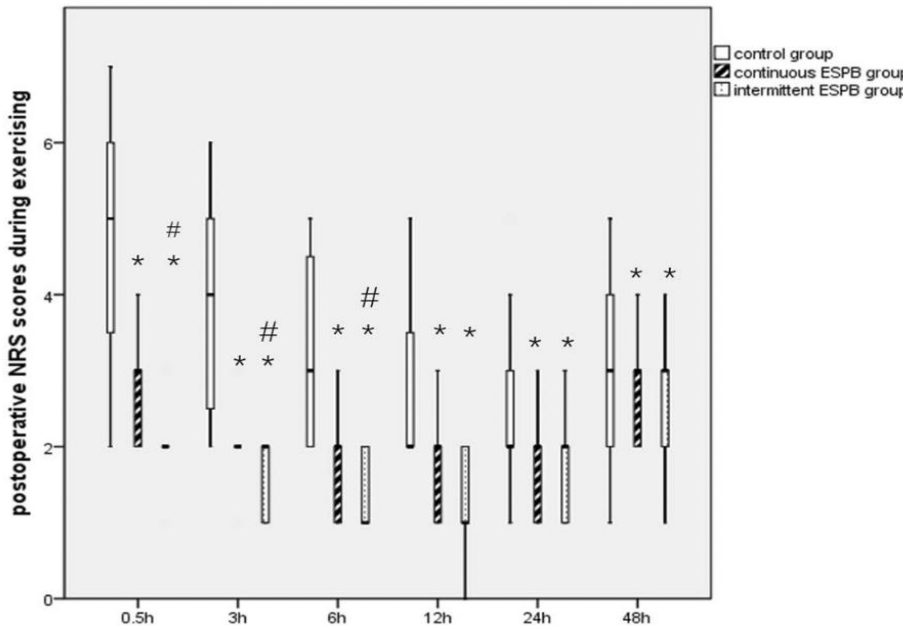
Comparative retrospective review of perioperative analgesia using ultrasound-guided programmed intermittent erector spinae plane block for video-assisted thoracoscopic lobectomy

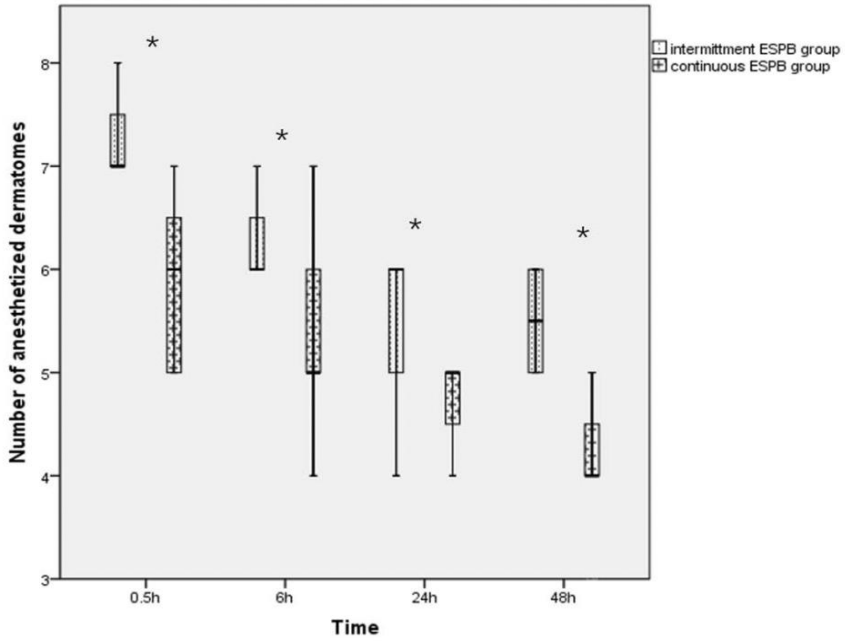
The PIB patients received **0.125% levobupivacaine** with programmed **bolus of 20 m**l 2 hourly.
The CI patients received **0.125% levobupivacaine** with CI **at 10 ml/h rate**

Table 2 Comparison of perioperative cumulative opioid consumption, duration of first-time usage of PCIA, number of PCIA press as rescue analgesia and QoR-15 scores among three groups within 48 h after surgery

Outcome		Control group (n = 36)	CI group (n = 71)	PIB group (n = 73)	F/χ^2 value	P	Post-hoc analysis
Perioperative cumulative opioid consumption (expressed as IV MEQ) (mg, mean ± SD)		468.91 ± 79.84	339.68 ± 56.07	305.30 ± 51.35	37.348	< 0.001	PIB vs. control group: p < 0.001 CI vs. control group: p < 0.001 PIB vs. CI group: p = 0.028
Duration of first-time usage of PCIA (min, median [IQR])		35.52 ± 17.24	260.81 ± 63.89	312.80 ± 83.72	96.111	< 0.001	PIB vs. control group: p < 0.001 CI vs. control group: p < 0.001 PIB vs. CI group: p = 0.015
Number of PCIA press (median [IQR])		10 (8, 12)	4 (3, 5)	3 (2, 4)	26.40	< 0.001	PIB vs. control group: p < 0.001 CI vs. control group: p < 0.001 PIB vs. CI group: p = 0.031
QoR-15 scores	At baseline	143.02 ± 5.73	142.90 ± 5.25	143.20 ± 6.21	0.007	0.993	PIB vs. control group: p = 0.969 CI vs. control group: p = 0.934 PIB vs. CI group: p = 0.908
	At postoperative 48 h	73.30 ± 9.64	87.60 ± 13.28	91.80 ± 12.55	6.614	0.005	PIB vs. control group: p = 0.002 CI vs. control group: p = 0.012 PIB vs. CI group: p = 0.438

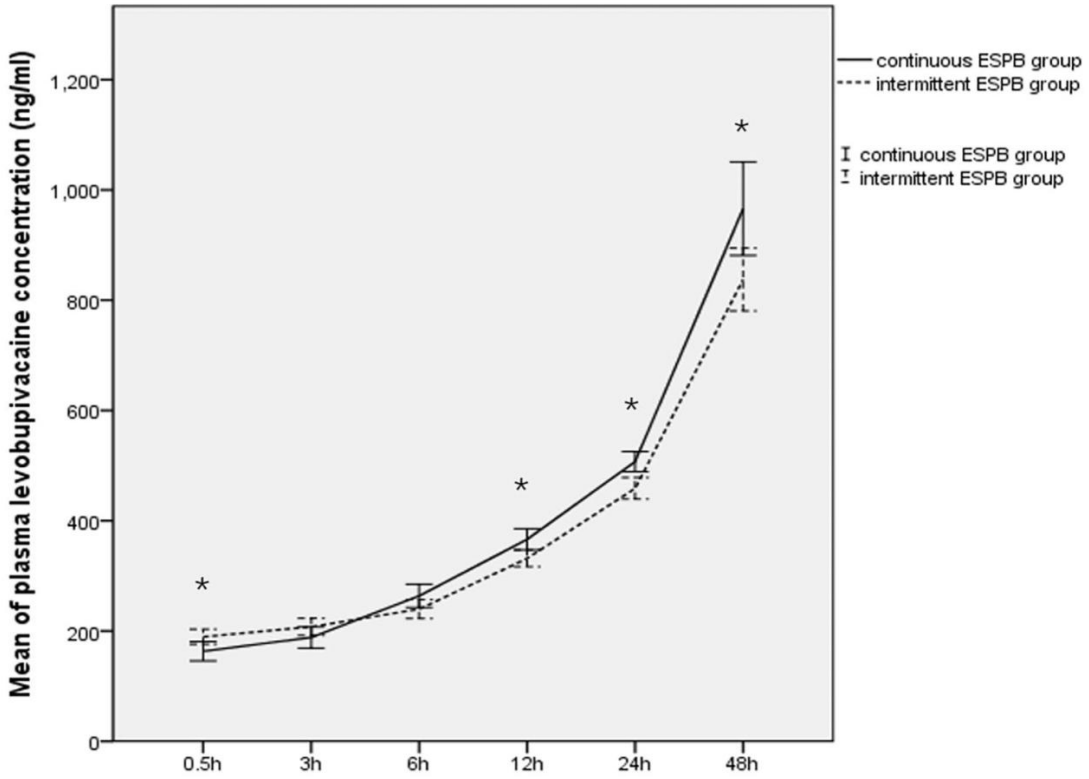






Zhu et al. BMC Anesthesiology (2023) 23:370

Comparative retrospective review of perioperative analgesia using ultrasound-guided programmed intermittent erector spinae plane block for video-assisted thoracoscopic lobectomy



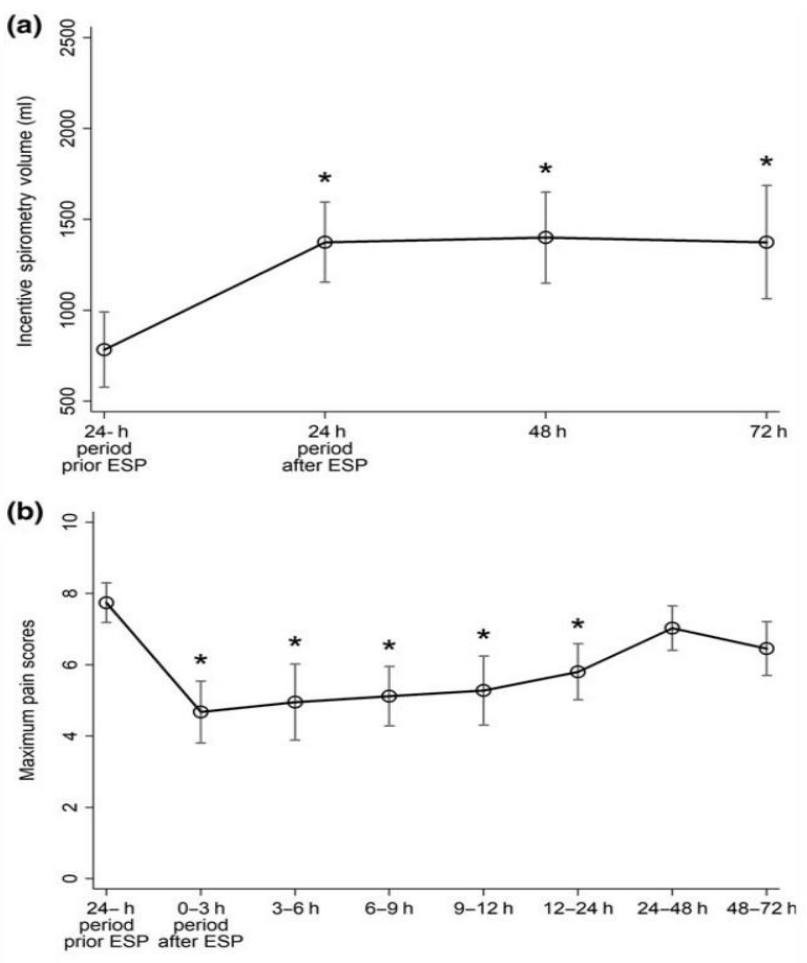
When US-guided ESPB using PIB was performed preoperatively, it contributed to the minimization of intra- and post-operative opioid consumption when compared with continuous ESPB and standard opioid-based anesthesia.

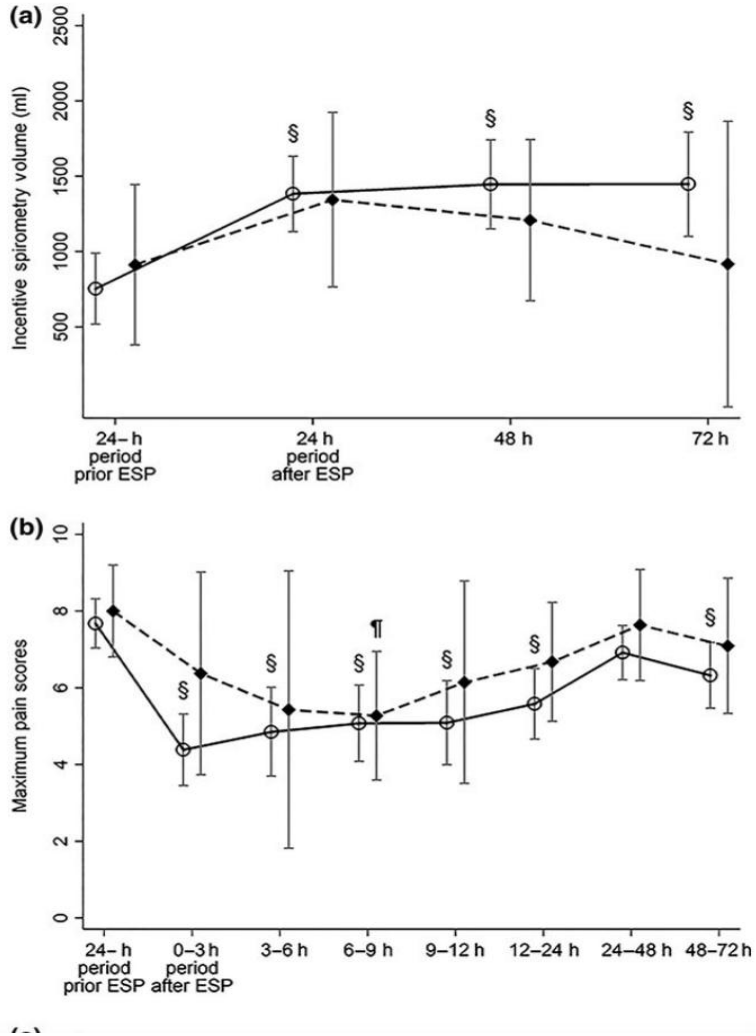
It provided superior postoperative analgesia, larger anesthetized dermatomes, lower risk of local anesthetic toxicity and fewer incidence of postoperative side effects related to opioid overuse.

Zhu et al. BMC Anesthesiology (2023) 23:370

The effect of erector spinae plane block on respiratory and analgesic outcomes in multiple rib fractures: a retrospective cohort study*

S. D. Adhikary,[1] W. M. Liu,[2] E. Fuller,[3] H. Cruz-Eng[4] and K. J. Chin[5]





Sub-group presentation of pre- and post-erector spinae plane (ESP) block outcome data according to whether patients received a continuous catheter ESP block or a single-injection ESP block.

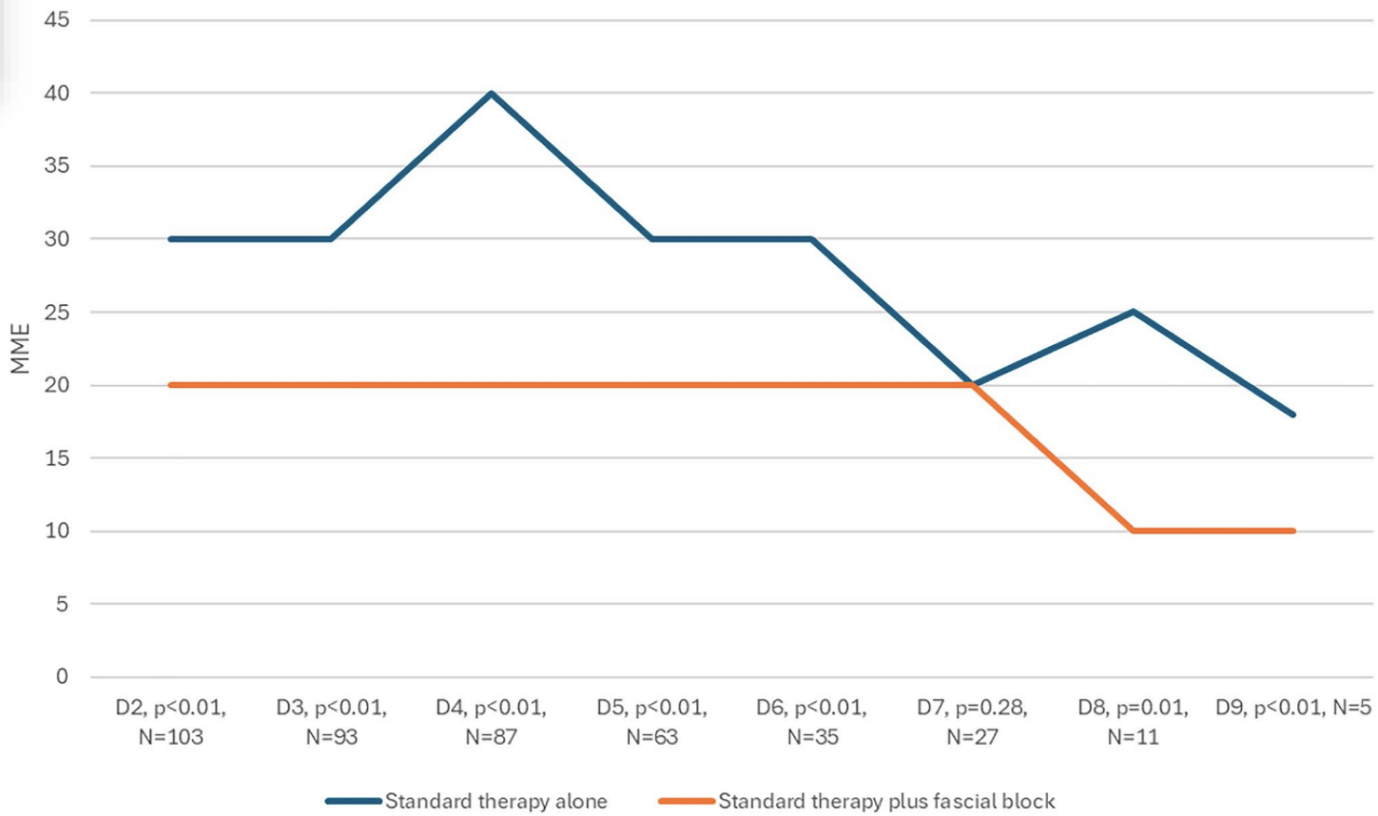
ESPBs were associated with **improved inspiratory capacity and analgesic outcomes** following rib fracture, without haemodynamic instability.

Anaesthesia 2019, 74, 585–593

The effect of fascial block on opioid consumption in patients with multiple rib fractures: a retrospective observational study

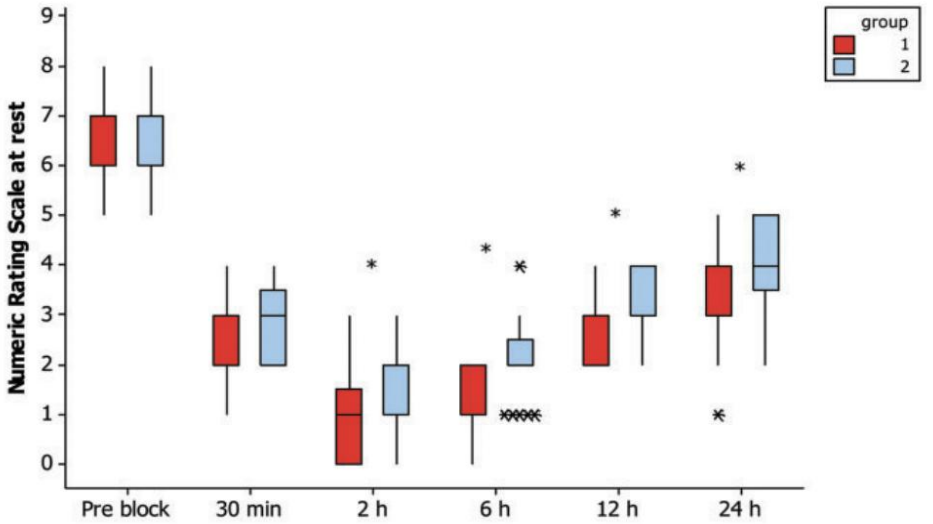
Sossio Serra[1] · Domenico Pietro Santonastaso[2] · Giuseppe Romano[3] · Alessandro Riccardi[4] · Francesca Ortu[5] · Vanni Agnoletti[2] · Mario Guarino[6] · Claudia Sara Cimmino[6] · Michele Domenico Spampinato[7] · Michela Cascio[3] · Raffella Francesconi[3] · Fabio De Iaco[8]

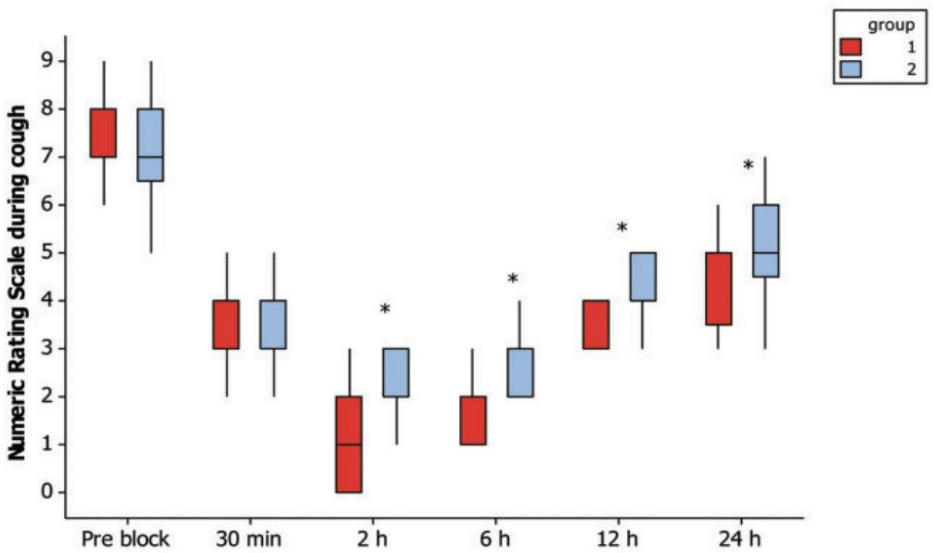
Results	Fascial block performed		
Characteristic	No, N = 37 (36%)	Yes, N = 66 (64%)	p-value
Sex, male	26 (70%)	49 (74%)	0.66
Mild cognitive impairment	3 (8.1%)	2 (3.0%)	0.25
COPD	7 (19%)	3 (4.6%)	0.03
CCI	2 (1–4.3)	2 (1–4)	0.43
Right ribs fractured	0 (0–5)	0 (0–5)	0.82
Left ribs fractured	3 (0–6)	4 (0–7)	0.41
Sternal fracture	2 (5.4%)	5 (7.6%)	0.67
TTSS	8 (7–8)	8 (6–9)	0.79
NRS at admission	6 (5–7)	8 (7–9)	< 0.01
Total opioid consumption, MME	150 (110–210)	71 (60–101)	< 0.01
Complicance			0.3
Delirium	1 (2.7%)	0 (0%)	
Stipsi	2 (5,4)	2 (3%)	
Pneumonia	1 (2.7%)	1 (1.5%)	
Stupor	2 (5.4%)	0 (0%)	
LOS, days	3 (3–4)	4 (3–5)	0.08

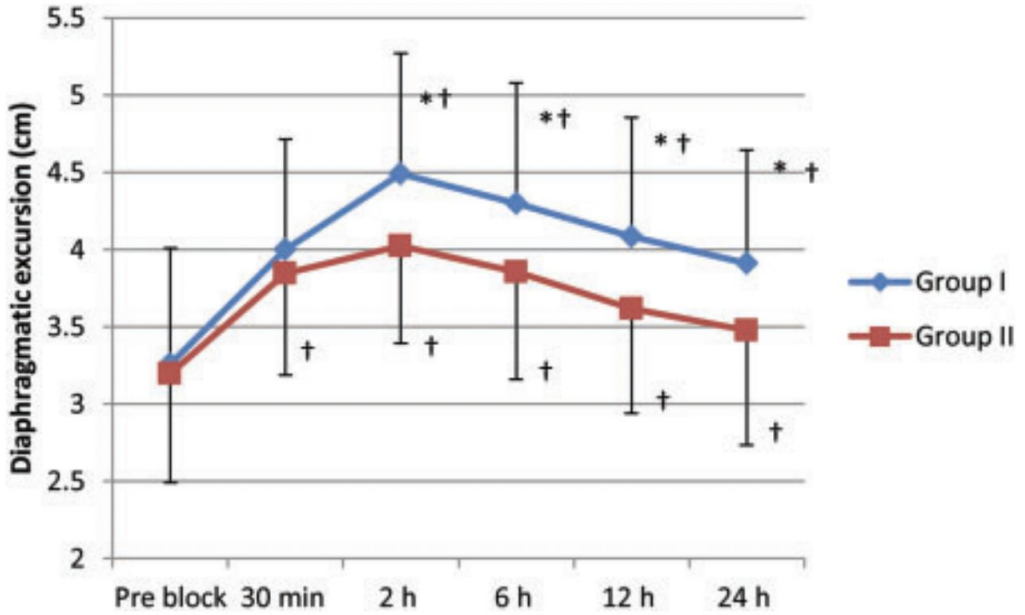


Early multimodal analgesic strategies, including fascial blocks, in the pain management of patients admited to the **emergency medicine unit for multiple rib fractures** appear to be effective in reducing overall opioid consumption during hospitalisation, with higher analgesic efficacy and no specific side effects.

Internal and Emergency Medicine 2025







ESPB being advantageous over SAPB in lowering the **pain scores**, reducing the **opioid consumption**, as well as **improving the diaphragmatic excursion** in patients with multiple rib fractures

El Malla DA et al. The effect of erector spinae block versus serratus plane block on pain scores and diaphragmatic excursion in multiple rib fractures. A prospective randomized trial. Pain Med 2022 (Malden, Mass) 23(3):448–455.

Erector spine plane block as postoperative rescue analgesia in thoracic surgery

Marco Rispoli[1], Roberta Tamburri[2], Moana Rossella Nespoli[1], Marianna Esposito[1], Dario Maria Mattiacci[1], Domenico Pietro Santonastaso[3], Dino Casazza[4], Dario Amore[4] and Antonio Corcione[1]

Table 1. Patient characteristics and surgical approach.

	Overall sample ($n = 84$)	Rescue ESPB cases ($n = 7$)
Age, y	63 (39–78)	56 (48–68)
Sex, M/F	58/26	5/2
BMI	29 (19–36)	22 (19–26)
Thoracotomy	18	4
RATS	8	1
VATS	55	2
Thoracotomy to VATS conversion	3	
Surgery time, min	167 (61–268)	199 (164–268)

Table 2. Static and dynamic numeric rating scale (NRS) score before and 40 and 80 minutes after erector spine plane block.

	0	40 minutes; *p*	80 minutes; *p*
NRS rest	4 (2–8)	1 (0–3); 0.03	1 (0–3); 0.01
NRS dynamic	7 (6–10)	4 (4–5); 0.0001	4 (3–5); 0.00004

Table 3. PaO_2/FiO_2 (P/F), forced vital capacity (FVC), and forced expiratory volume in 1 second (FEV_1) before and 40 and 80 minutes after erector spine plane block.

	Preoperative	0	40 minutes; *p*	80 minutes; *p*
P/F	331 (257–385)	290 (116–275)	314 (192–390); 0.1	310 (214–420); 0.2
FVC, L	1.5 (1.2–2)	0.8 (0.6–1.2)	1.0 (0.8–1.4); 0.03	1.3 (0.8–2.1); 0.01
FEV_1, L	1.6 (1.4–2.2)	0.7 (0.4–0.8)	0.9 (0.8–1.3); 0.01	1.1 (0.7–1.6); 0.001

Tumori Journal 2020 Oct;106(5):388-391

- The **Regional Anesthesia** is uniquely positioned **to advance the goals** and **support the evolving** paradigm of **modern perioperative medicine**—delivering care that is not only effective and efficient but also individualized, humane, and grounded in the principles of precision and compassion.
- Unlike systemic analgesics, which affect the entire body and carry a higher burden of adverse effects, RA techniques enable site-specific interventions that can be adjusted to suit **individual anatomy**, the type of **surgical procedure**, **patient comorbidities** and **individual characteristics**, and **recovery goals**.
- These tailored strategies improve not only the **physiological outcomes**—such as pain control, reduction in postoperative nausea and vomiting, and early mobilization—but also **psychological well-being** and overall satisfaction.

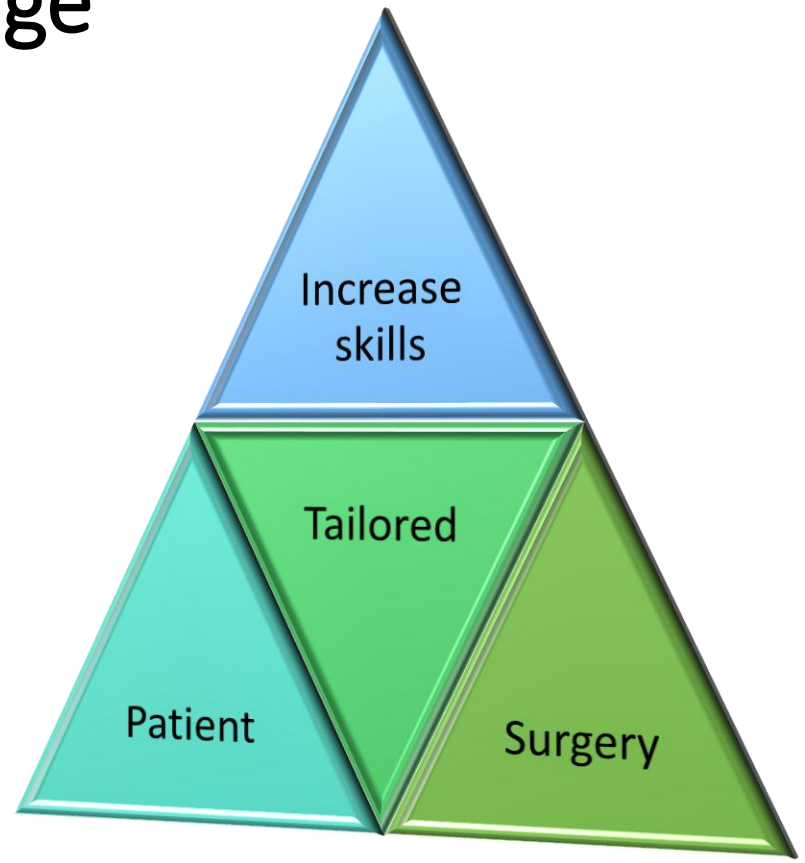
Eleni Moka. J. Clin. Med. **2025**, *14*, 6257

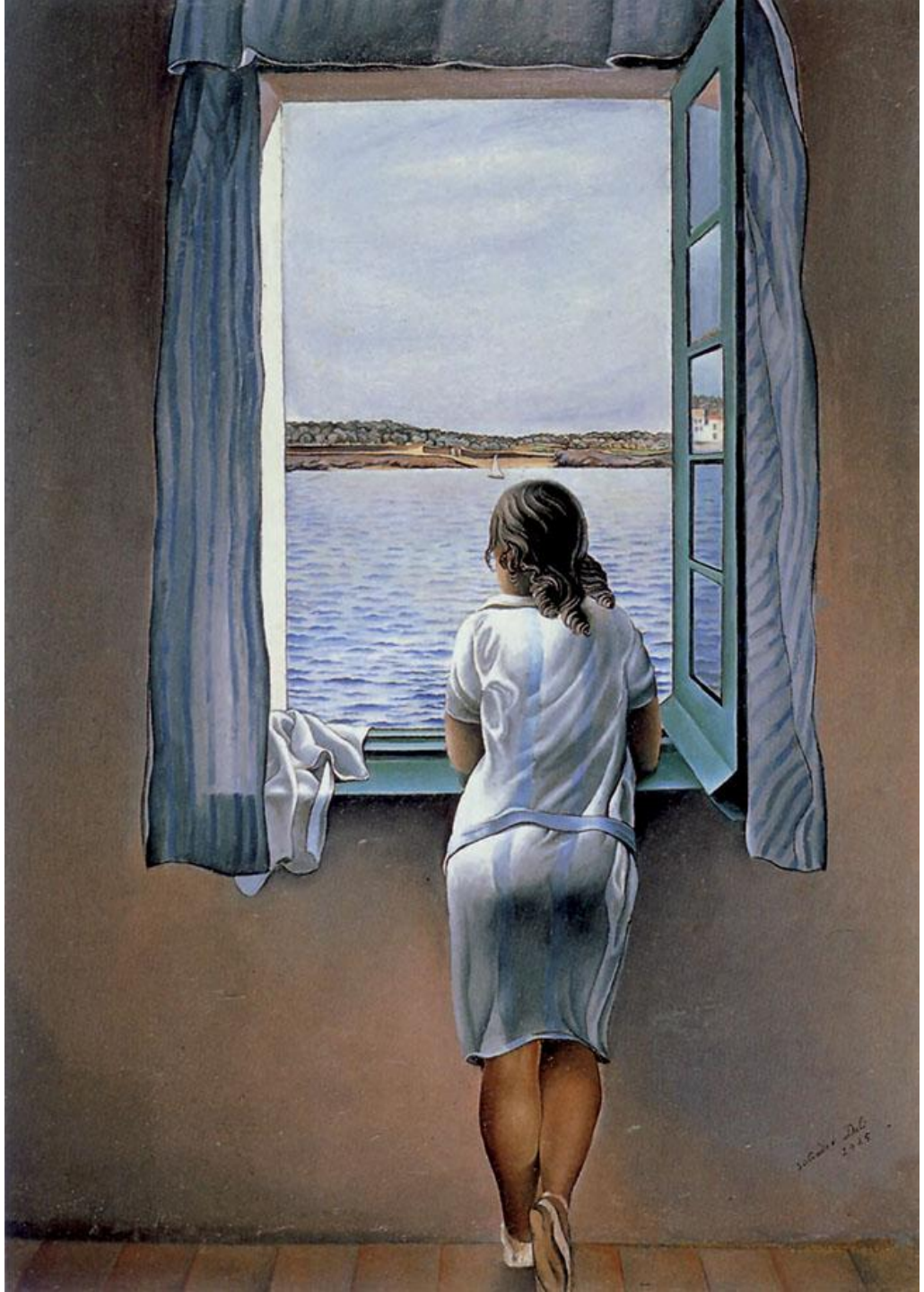
Take home message

Thoracic ESPB:

one technique, multiple solutions…

…when the ESPB is tailored!





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