

Erector Spinae Plane Block versus Paravertebral Block in Breast Surgery and Postoperative Pain Scores Within the First 24 Hours: An Integrative Review

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INTRODUCTION

- Pain caused by surgical manipulation of breast tissue is challenging to control^{1,2,4,5}
- Innervation of breast tissue is complex and extensive¹⁻⁵
- Poor control of acute pain in the postoperative period has a higher incidence of the development of chronic pain syndromes¹⁻⁵
- The ultrasound-guided paravertebral block (PVB) technique has been known as the gold-standard regional anesthetic (RA) technique for reducing perioperative pain in patients undergoing breast surgery^{1,2,4,5}
- The PVB is an advanced RA technique^{1,2,4,5}
- In 2016 the ultrasound-guided erector spinae plane block (ESPB) technique was described by Forero et al⁶
- The ESPB has proven technically easier to perform, especially for novice practitioners^{1,4}
- This project aims to answer the PICOT question: For adult female patients undergoing breast surgery, what is the impact of an ESPB versus a PVB on postoperative pain scores within the first 24 hours after surgery?

METHODS

- PubMed, CINAHL, and Embase systematically searched
- Limits applied: English language, adult population, and female gender
- CINAHL retrieved 48 citations, PubMed retrieved 44 results, and Embase retrieved 71 citations
- The most relevant studies included 1 prospective clinical quality improvement project, 3 randomized controlled trials (RCTs) and 1 systematic review with meta-analysis
- Keywords: *breast surgery, erector spinae plane block, paravertebral nerve block, postoperative pain*
- IRB/IACUC approval does not apply to this evidence-based project.

The erector spinae plane block is a safe and effective alternative to the well-established paravertebral block for controlling postoperative breast surgical pain.



Reference and LOE	Treatment groups	Results: pain assessment intervals and findings	Limitations	Comments
Stewart JW, et al. ³ Level 3	• ESPB n = 25 • TPVB n = 25 • Each block placed contralaterally	• PACU, 2, 6, 12, and 24 hours at rest or with movement • P < .077 at any postoperative time point at rest or with movement indicating insignificant difference in reported pain scores between groups	• Bias could have led to reduced block quality • Did not assess long-term outcomes on chronic pain • Not randomized • Not blinded • Inability to evaluate difference in opioid requirements • Small sample size from single institution	• NRS pain scores • USG • Blocks placed at T4 transverse process with 20 mL of 0.5% ropivacaine • TPVB on cancer side in 14 cases • ESPB on cancer side in 11 cases • Number of patients reporting decreased sensation greater (P < .05) with TPVB than with ESPB • Blocks placed before surgery • GA primary anesthetic • ASA NR
Santonastaso DP, et al. ² Level 2	• ESPB n = 41 • TPVB n = 41	• Awakening, 2, 6, 12, and 24 hours, at rest and with movement • P < .001 at 2 hours and P = .012 at 6 hours indicating significantly lower pain scores reported in TPVB group	• Bias could have led to reduced block quality • Investigators aware of randomization results • Lack of a control group • Not able to standardize postoperative analgesic use without PCAs • Inconsistent concentration and dosing of LA used between blocks • Unclear if significant findings in NRS pain scores were at rest or with movement • Small sample size from single institution	• NRS pain scores • USG • TPVB at T2-T3 and T4-T4 with 8 mL of 0.75% ropivacaine at each level • ESPB at T2 and T5 with 12 mL of 0.5% ropivacaine at each level • Blocks placed before surgery • GA primary anesthetic • ASA I to IV
Elewa AM, et al. ⁵ Level 3	• ESPB n = 30 • TPVB n = 30 • GA n = 30	• 1, 4, 8, 12, and 24 hours • P < .001 at 8 hours and P < .002 at 12 hours indicating significantly lower pain scores reported in ESPB group	• Bias could have led to reduced block quality • Did not assess long-term outcomes on chronic pain • Lack of pain assessments during movement • Single shot nerve blocks instead of catheters • High probability of detection bias	• VAS pain scores • USG • ESPB at T3 with 30 mL of 0.25% bupivacaine • TPVB at T4 with 30 mL of 0.25% bupivacaine • GA at ESPB or TPVB with 30 mL 0.9% saline • Blocks placed after induction of GA • GA primary anesthetic • PCA used postoperatively • ASA I and II
Chen W, et al. ¹ Level 1	• ESPB n = 155 • TPVB n = 155	• NRS: during block, PACU, 1, 6, 12, and 24 hours • VAS: PACU, 2, 4, 6, 8, 12, 18, and 24 hours • No significant difference reported in pain scores (P < .05) at any time interval	• Lack of pain analysis during movement • Inconsistencies in intraoperative GA, surgical procedures, and LA volume and concentrations • Blocks either unilateral or bilateral • No patient-centered outcomes assessed • Small sample size from single institution	• VAS and NRS pain scores • USG • Compared to TPVB, US-guided ESPB reduced duration of procedure time and improved block success rate • Blocks placed before surgery • GA primary anesthetic • ASA I and II for three studies • ASA NR in 1
Agarwal S, et al. ¹ Level 2	• ESPB n = 40 • TPVB n = 40	• No significant difference in pain scores found at 0 and 30 minutes, 1, 2, 6, 12, and 24 hours at rest and with movement	• Bias could have led to reduced block quality • Did not assess long-term outcomes on chronic pain • Lack of pain assessments during movement • Single shot nerve blocks instead of catheters • Not able to standardize postoperative analgesic use without PCAs	• NRS pain scores • USG • TPVB at T4 • ESPB at T5 • 20 mL of 0.5% ropivacaine used for each block • Blocks placed before surgery • GA primary anesthetic • ASA I and II

Table 1. Summary of Evidence Table
 Abbreviations: ASA, American Society of Anesthesiologists; ESPB, erector spinae plane block; GA, general anesthesia; LA, local anesthetic; NR, not recorded; NRS, numeric rating scale; PACU, post-anesthesia care unit; PCA, patient-controlled analgesia; TPVB, thoracic paravertebral block; USG, ultrasonography; VAS, visual analog scale.

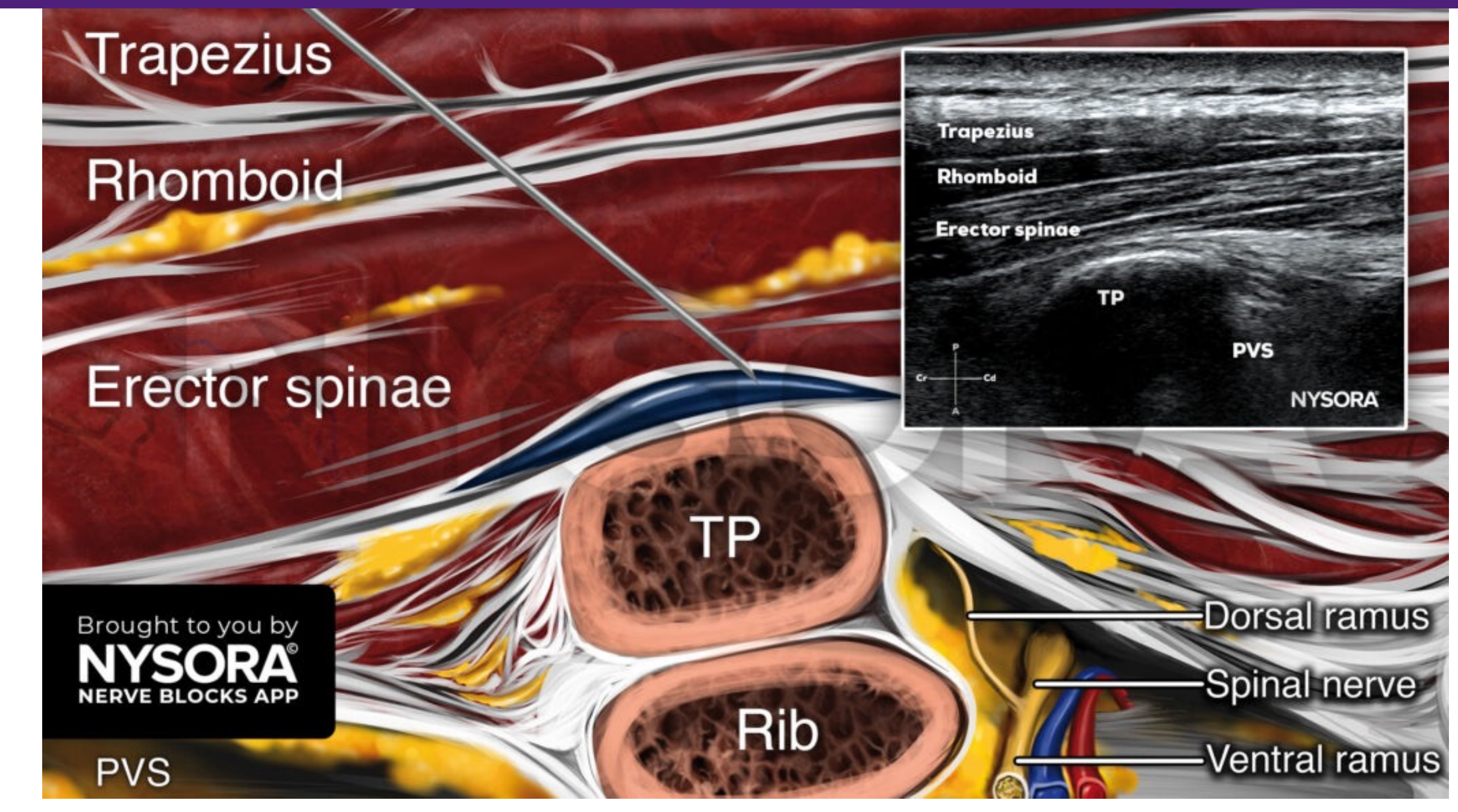


Figure 1. Anatomical landmarks and target for ultrasound-guided ESPB⁷

REVIEW of LITERATURE / CRITICAL APPRAISAL

- Chen et al concluded both techniques provided effective perioperative analgesia during breast surgery with ESPB taking less time to perform and having higher success rates among resident anesthetists⁴
- Santonastaso et al concluded both techniques provided effective perioperative analgesia during modified radical mastectomy (MRM) with or without axillary dissection⁴
- Stewart et al found no significant difference in median resting or movement-evoked pain scores at any postoperative time period¹
- Agarwal et al concluded both techniques are comparable for postoperative analgesia in MRM, however, the ESPB can be used as a safe and easy alternative to more technically challenging PVB in breast cancer surgeries⁵
- Elewa et al concluded both techniques are effective in providing postoperative analgesia for patients undergoing MRM when compared to general anesthesia (GA) alone³

RECOMMENDATIONS for PRACTICE / CONCLUSIONS

- Ultrasound-guided ESPB appears to be safe and effective for postoperative pain control within the first 24 hours for MRMs
- No recommendation for cases beyond MRMs
- Providers must evaluate their level of comfort and skill performing each technique
- Further research should focus on comparing the efficacy of ESPB and PVB to a wider variety of breast procedures
- Optimal concentration and volume of local anesthetic should be explored as current studies differ
- Studies tracking longer-term outcomes of ESPB should be executed
- Potential use of continuous catheter techniques should be explored