E-ISSN: 2664-8857
P-ISSN: 2664-8849
www.anesthesiologyjournal.in
IJAR 2024; 6(1): 27-31
Received: 05-01-2024
Accepted: 13-02-2024

Sidharth B Venu
Senior Resident, Sree Gokulam Medical College & Research Foundation, Trivandrum, Kerala, India

Yaasir Bin Malick
Junior Resident, Sree Gokulam Medical College & Research Foundation, Trivandrum, Kerala, India

Venugopalan PG
Professor, Sree Gokulam Medical College & Research Foundation, Trivandrum, Kerala, India

Corresponding Author:
Yaasir Bin Malick
Junior Resident, Sree Gokulam Medical College & Research Foundation, Trivandrum, Kerala, India

ESPB vs TPVB in modified radical mastectomy

Sidharth B Venu, Yaasir Bin Malick and Venugopalan PG

DOI: https://doi.org/10.33545/26648849.2024.v6.i1a.40

Abstract
Background: Effective pain management following modified radical mastectomy (MRM) is essential for patient comfort and recovery. Erector spinae plane block (ESPB) and thoracic paravertebral block (TPVB) have emerged as promising regional anesthesia techniques for postoperative pain control. This study aims to compare the analgesic efficacy, safety, and perioperative outcomes of ESPB and TPVB in patients undergoing MRM.
Methods: 70 adult female patients, scheduled for modified radical mastectomy were randomized into two groups, Group P (n=35, received USG guided TPVB with 20 ml of 0.25% bupivacaine prior to GA) & Group E (n=35, received USG guided ESPB with 20 ml of 0.25% bupivacaine prior to GA). Heart Rate (HR), Mean Arterial Pressure (MAP), post-op VAS score, 1st analgesic request time, 24 hr morphine consumption & complications recorded.
Results: 24 hr morphine consumption & 1st analgesic request time comparable between both groups (*P* = 0.32 and 0.075, respectively). No significant difference in the VAS scores between both groups. 4 patients in group P developed pneumothorax with no significant differences between both groups (*P* = 0.114). Nausea and vomiting incidence was comparable between both groups. Both groups showed stable hemodynamic profile.
Conclusion: Both TPVB and ESPB provided effective post mastectomy analgesia and reduced both intra & post-operative opioid consumption.

Keywords: Erector spinae plane block, modified radical mastectomy, paravertebral block, visual analogue scale

Introduction
Postoperative pain management is essential for optimizing recovery and patient satisfaction after modified radical mastectomy, a common procedure for breast cancer treatment. Regional anesthesia techniques such as erector spinae plane (ESP) block and paravertebral block (PVB) have shown promise in providing effective pain relief. However, comparative studies evaluating their role specifically in modified radical mastectomy are limited. This prospective randomized trial aims to directly compare ESP block versus PVB in terms of pain control, opioid usage, and safety outcomes in this patient population. The findings will help clarify the optimal analgesic approach for enhancing postoperative recovery and patient comfort in breast cancer surgery.

Aim
This prospective RCT aims to compare the efficacy, opioid consumption, and safety profile of erector spinae plane (ESP) block versus paravertebral block (PVB) for pain control after modified radical mastectomy.

Materials and Methods
This was a prospective double blind randomized controlled trial study conducted in a tertiary medical university hospital in Trivandrum over a 12-month period from January 2023 to December 2023.70 ASA I & II adult females between the ages of 20 and 60 years scheduled for unilateral modified radical mastectomy were enrolled in this study after obtaining written informed consent and approval from the institutional ethics committee.
Patients with cardio respiratory conditions, psychiatric disorders, neurologic deficits, pregnancy, LA allergy, local infections, and anticoagulants were excluded from the study.

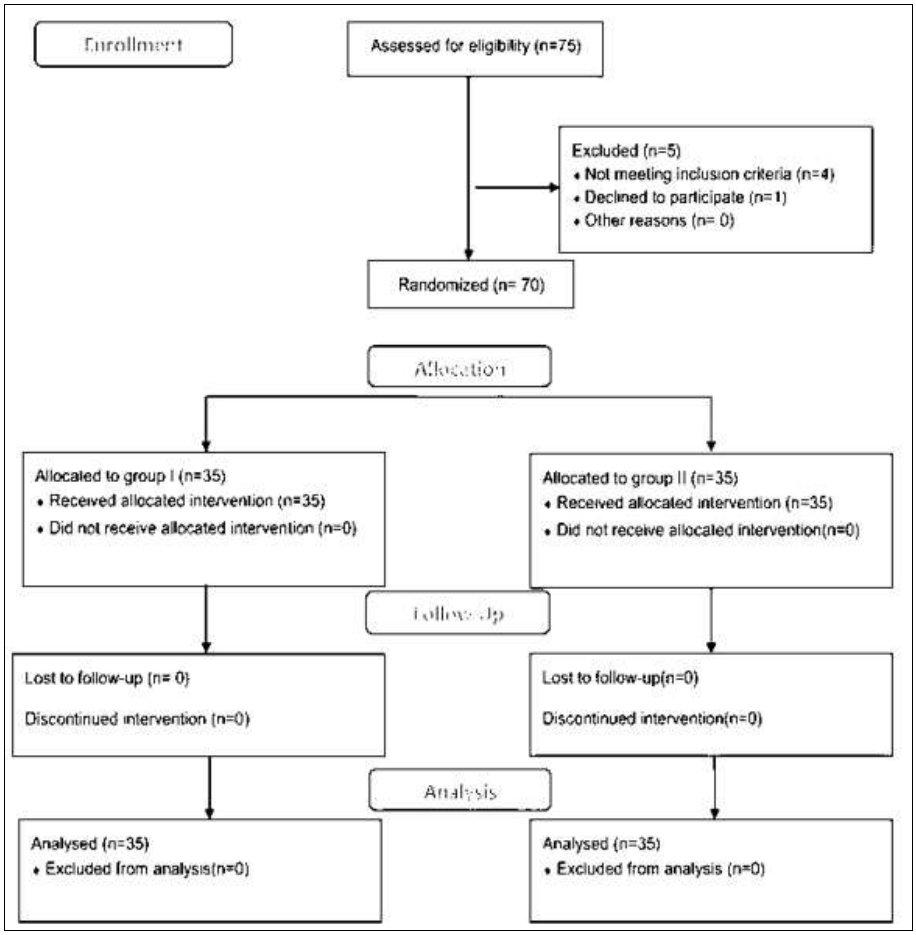

Fig 1: Consort Flow Diagram

All participants were randomly allocated (allocation ratio 1:1) into two groups: Group P (PVB group) & Group E (ESPB group) using computer-generated randomization. General anaesthesia & regional block were done by one anaesthetist whereas data collection was done by an anaesthetist, blinded to group allocation; however all surgeries were conducted by the same surgeon.

All the participants underwent a detailed pre-anaesthetic check-up and were briefed on the VAS pain score on the pre-operative day. On the operative day, upon arrival in the OR suite, all participants were connected to standard monitors (ECG, NIBP, pulse oximeter) and IV access was secured. Additionally, all participants were premedicated with Inj. Midazolam 1 mg IVand Inj. Ondansetron 4 mg IV and positioned laterally.

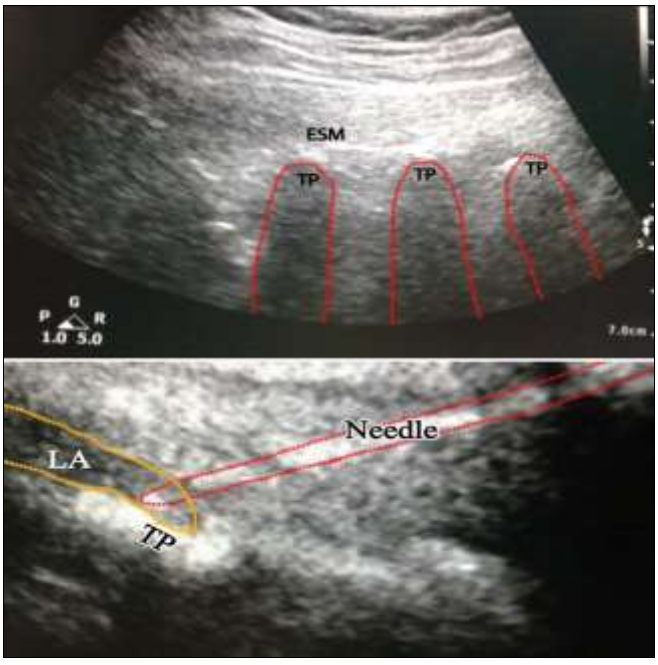

Fig 2: T_5 vertebrae level Sonoanatomy

Under strict asepsis and ultrasound guidance, all participants in Group P (PVB) received a thoracic paravertebral block at the T_4 level with 20 ml of 0.25% bupivacaine on the ipsilateral side of surgery, while all participants in Group E (ESPB) received an erector spinae plane block at the T_4 level with 20 ml of 0.25% bupivacaine on the ipsilateral side of surgery.

After performing the regional anesthetic block, all participants were positioned supine, preoxygenated, and general anesthesia was induced with Inj. Propofol 2 mg/kg IV, Inj. Fentanyl 1 µg/kg, and Inj. Atracurium 0.5 mg/kg. They were intubated with COETT #7 and secured, then connected to the anesthesia machine (VCV mode, TV- 400 ml, f-12/min, I: E-1:2) and maintained on O2/Air/Sevoflurane with intermittent boluses of Atracurium 5 mg IV.

At the end of surgery, all anesthetic gases were tapered and cut, and neuromuscular blockade reversed with Inj. Neostigmine 50 µg/kg IV & Inj. Glycopyrrolate 10 µg/kg IV. Extubation was performed after achieving extubation criteria, and patients were then transferred to the PACU.

The main aim of the research was to gauge the total amount of morphine consumed by patients within 24 hours following their surgery. If patients reported a pain score higher than 3 on

the Visual Analog Scale (VAS), they were administered morphine intravenously at a dosage of 0.1 mg/kg for pain relief. Secondary goals involved evaluating pain levels using the 10 cm VAS upon admission to the Post-Anesthesia Care Unit (PACU), and subsequently at intervals of 2, 4, 6, 8, 12, 18, and 24 hours post-surgery, as well as determining the duration until the first request for pain relief. Measurements of Mean Blood Pressure (MBP) and Heart Rate (HR) were taken at various time points: initially at baseline (T0) before the regional block, then at 5, 10, and 15 minutes after the block (T_1–T_3), at the time of skin incision, and every 30 minutes thereafter until the conclusion of surgery (T_4–T_8). Postoperative HR and MBP readings were taken upon arrival at the PACU and subsequently at intervals of 2, 4, 6, 8, 12, 16, 20, and 24 hours post-surgery (T_9–T_{17}).

Complications monitored included postoperative nausea and vomiting (PONV), with intravenous administration of metoclopramide 10 mg as required. Other complications associated with either the medication used or the techniques employed (e.g., pneumothorax, local anesthetic toxicity) were documented for up to 24 hours post-surgery.

Statistical analysis

Variables and data collected over 24 hours were entered into an Excel spreadsheet and analyzed using SPSS version 25 software. Numerical parametric data were presented as mean ± SD and compared using Student's independent t-test. Non-parametric data (VAS) were presented as the median ± IQR and compared using the Mann–Whitney U test. Categorical variables were expressed as number and percentage (%) and were analysed using the Chi-square test or Fisher's exact test when appropriate. $p< 0.05$ was considered significant

Results

The demographic data, ASA class and duration of surgery in both groups were comparable & no significant differences were observed [Table 1].

Table 1: Demographics, ASA class & durationofsurgery

Variable	Group p	Group e	*p*
Age(year)	41±11.8	37.7±12.9	0.279
BMI(kg/m2)	27.7±5.4	28.4±5.4	0.45
ASA (%)			
I	20(57.1%)	22(62.9%)	0.62
II	15(42.8%)	13(37.1%)	
Durationofsurgery (min)	173.2±8.7	170±8.2	0.11

24 hr morphine use, 1st analgesic request time, PONV were comparable & no significant differences were observed between the 2 groups [Table 2]. 4 patients developed pneumothorax in group P vs 0 in group E, with no significant difference between both groups ($P = 0.114$). One patient needed ICD insertion while in three patients, pneumothorax resolved spontaneously [Table 2]. No other complications were noticed. No block failure was observed in both groups,

Table 2: 24 Hr morphine use, 1st analgesic request time &complications

Variable	Group p	Group e	*p*
Total post-op morphine(mg)	27.3±2.9	26.7±2.1	0.32
1st analgesic request time (h)	6.35±0.42	6.58±0.60	0.075
Nausea (%)	12(34.3%)	10(28.6%)	0.60
Vomiting (%)	4(11.4%)	3(8.6%)	0.69
Pneumothorax (%)	4(11.4%)	0(0.0%)	0.114

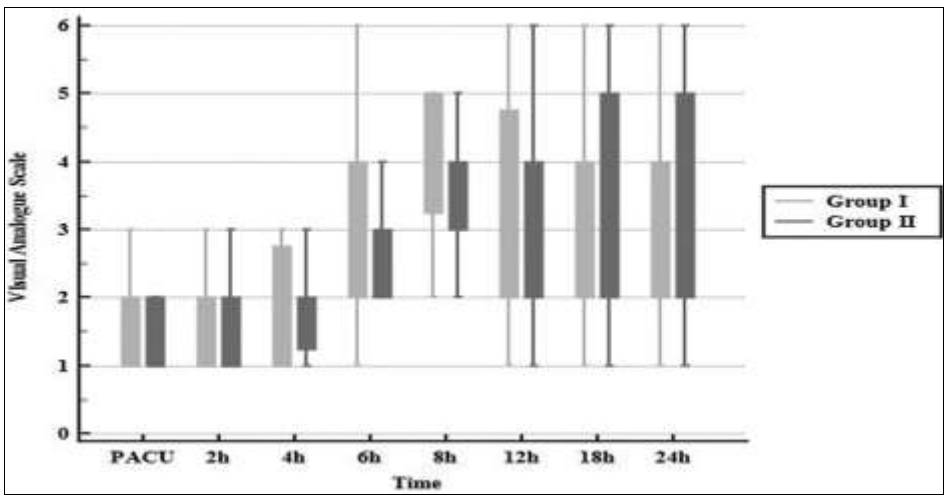

Fig 3: Post-Op VAS Scores

No notable disparities were observed in postoperative Visual Analog Scale (VAS) pain scores between the two groups. However, it's worth noting that VAS scores escalated to levels exceeding 3 in both groups 6 hours following the surgical procedure (Figure 3). Both groups showed intraoperative & postoperative haemodynamic stability with no significant difference noted between them (Figure 4).

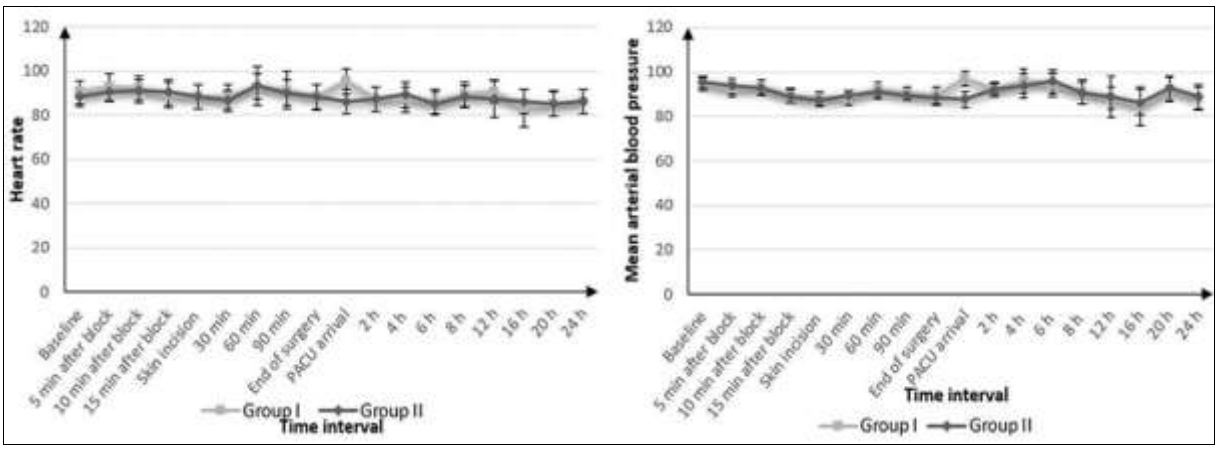

Fig 4: Haemodynamics

Discussion

Injecting LA into the paravertebral space or performing ESPB blocks spinal nerve roots, causing analgesia by diffusion into the epidural and adjacent spaces. Both techniques are effective for post-mastectomy pain management, reducing opioid consumption and maintaining stable hemodynamics. ESPB shows lower complication rates compared to TPVB, particularly in regards to pneumothorax risk. Though complications may arise due to patient factors or technique challenges, ultrasound guidance can mitigate risks. Studies underscore ESPB's efficacy and ease of use, with comparable results to TPVB in pain reduction after breast surgery. Further research should explore different LA types and concentrations and compare ESPB with other techniques for optimal pain management, particularly regarding pneumothorax prevention

Conclusion

Both TPVB and ESPB effectively control pain after breast surgeries, showing comparable durations of pain relief, reduced intraoperative and postoperative opioid usage, and stable hemodynamics. US-guided ESPB emerges as a promising alternative to TPVB due to its simplicity and reliance on superficial anatomical landmarks, potentially minimizing complications especially pneumothorax and injury to deeper structures.

References

1. Hong B, Bang S, Chung W, Yoo S, Chung J, Kim S, *et al*. Multimodal analgesia with multiple intermittent doses of erector spinae plane block through a catheter after total mastectomy: A retrospective observational study. Korean J Pain. 2019;32:206-214.
2. Talawar P, Kumar A, Bhoi D, Singh A. Initial experience of erector spinae plane block in patients undergoing breast surgery: A case series. Saudi J Anaesth. 2019;13:72-74.
3. Selvi O, Tulgar S. Use of the ultrasound-guided erector spinae plane block in segmental mastectomy. Turk J Anaesthesiol. Reanim. 2019;47:158-160.
4. Altıparmak B, Toker MK, Uysal Aİ, Demirbilek SG. Comparison of the efficacy of erector spinae plane block performed with different concentrations of bupivacaine on postoperative analgesia after mastectomy surgery: Randomized, prospective, double-blinded trial. BMC Anesthesiol. 2019;19:31.
5. Aldrete JA. The post-anesthesia recovery score revisited. J Clin. Anesth. 1995;7:89-91.
6. Kulkarni KR. Single needle thoracic paravertebral block with ropivacaine and dexmeditomidine for radical mastectomy: Experience in 25 cases. Int. J Anesth. Pain Med. 2016;2:1.
7. Forero M, Rajarathinam M, Adhikary SD, Chin KJ. Erector spinae plane block for the management of chronic shoulder pain: A case report. Can J Anesth. 2018;65:288-293.
8. López MB, Cadórniga ÁG, González JM, Suárez ED, Carballo CL, Sobrino FP, *et al*. Erector spinae block. A narrative review. Cent Eur. J Clin Res. 2018;1:28-39.
9. Fallatah S, Mousa WF. Multiple levels paravertebral block versus morphine patient-controlled analgesia for postoperative analgesia following breast cancer surgery with unilateral lumpectomy, and axillary lymph nodes dissection. Saudi J Anaesth. 2016;10:13-17.
10. Wahba SS, Kamal SM. Thoracic paravertebral block versus pectoral nerve block for analgesia after breast surgery. Egypt J Anaesth. 2014;30:129-135.
11. Abdel-Halim JM. Continuous thoracic paravertebral block: An adjunct to general anaesthesia in major breast surgery. Egypt J Anaesth. 2011;27:83-87.
12. Tsui BC, Fonseca A, Munshey F, McFadyen G, Caruso TJ. The erector spinae plane (ESP) block: A pooled review of 242 cases. J Clin. Anesth. 2019;53:29-34.
13. Melvin JP, Schrot RJ, Chu GM, Chin KJ. Low thoracic erector spinae plane block for perioperative analgesia in lumbosacral spine surgery: A case series. Can J Anaesth. 2018;65:1057-1065.
14. Leyva FM, Mendiola WE, Bonilla AJ, Cubillos J, Moreno DA, Chin KJ, *et al*. Continuous erector spinae plane (ESP) block for postoperative analgesia after minimally invasive mitral valve surgery. J Cardiothorac. Vasc. Anesth. 2018;32:2271-2274.
15. El Mourad MB, Amer AF. Effects of adding dexamethasone or ketamine to bupivacaine for

ultrasound-guided thoracic paravertebral block in patients undergoing modified radical mastectomy: A prospective randomized controlled study. Indian J Anaesth. 2018;62:285-291.
16. Krishna SN, Chauhan S, Bhoi D, Kaushal B, Hasija S, Sangdup T, *et al*. Bilateral erector spinae plane block for acute post-surgical pain in adult cardiac surgical patients: A randomized controlled trial. J Cardiothorac. Vasc. Anesth. 2019;33:368-375.
17. Singh S, Chowdhary N. Erector spinae plane block an effective block for postoperative analgesia in modified radical mastectomy. Indian J Anaesth. 2018;62:148-149.
18. Takahashi H, Suzuki T. Erector spinae plane block for low back pain in failed back surgery syndrome: A case report. J Clin. Rep. 2018;4:60.
19. Law LS, Tan M, Bai Y, Miller TE, Li YJ, Gan TJ, *et al*. Paravertebral block for inguinal herniorrhaphy: A systematic review and meta-analysis of randomized controlled trials. Anesth. Analg. 2015;121:556-569.
20. Davies R, Myles P, Graham J. A comparison of the analgesic efficacy and side-effects of paravertebral vs epidural blockade for thoracotomy a systematic review and meta-analysis of randomized trials. Br J Anaesth. 2006;96:418-426.
21. Fahy AS, Jakub JW, Dy BM, Eldin NS, Harmsen S, Sviggum H, *et al*. Paravertebral blocks in patients undergoing mastectomy with or without immediate reconstruction provides improved pain control and decreased postoperative nausea and vomiting. Ann Surg Oncol. 2014;21:3284-3289.
22. Aufforth R, Jain J, Morreale J, Baumgarten R, Falk J, Wesen C, *et al*. Paravertebral blocks in breast cancer surgery: Is there a difference in postoperative pain, nausea, and vomiting? Ann Surg Oncol. 2012;19:548-552.
23. Naja Z, Lönnqvist PA. Somatic paravertebral nerve blockade incidence of failed block and complications. Anaesthesia. 2001;56:1181-1201.
24. Pace MM, Sharma B, Anderson-Dam J, Fleischmann K, Warren L, Stefanovich P, *et al*. Ultrasound-guided thoracic paravertebral blockade: A retrospective study of the incidence of complications. Anesth. Analg. 2016;122:1186-1191.
25. Ueshima H. Pneumothorax after the erector spinae plane block. J Clin. Anesth. 2018;48:12.
26. D'Ercole F, Arora H, Kumar PA. Paravertebral block for thoracic surgery. J Cardiothorac. Vasc. Anesth. 2018;32:915-927.
27. Saito T, Den S, Cheema S, Tanuma K, Carney E, Carlsson C, *et al*. A single-injection, multisegmental paravertebral block–extension of somatosensory and sympathetic block in volunteers. Acta Anaesthesiol. Scand. 2001;45:30-33.
28. Gürkan Y, Aksu C, Kuş A, Yörükoğlu UH. Erector spinae plane block and thoracic paravertebral block for breast surgery compared to IV-morphine: A randomized controlled trial. J Clin Anesth. 2020;59:84-88.

How to Cite This Article
Venu SB, Malick YB, Venugopalan PG. ESPB vs TPVB in modified radical mastectomy. International Journal of Anesthesiology Research. 2024;6(1):27-31.