

COMPARISON OF MULTILEVEL THORACIC PARAVERTEBRAL BLOCK VS THORACIC EPIDURAL BLOCK USING 0.25% ROPIVACAINE WITH DEXMEDITOMIDINE FOR PATIENTS UNDERGOING BREAST SURGERIES UNDER GENERAL ANAESTHESIA (RANDOMIZED PROSPECTIVE CLINICAL STUDY)

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Abstract

Background: Breast carcinoma often requires surgery under general anaesthesia. However, regional analgesic techniques such as thoracic paravertebral, epidural, and intercostal blocks can significantly reduce postoperative pain and complications. This study aimed to compare the analgesic efficacy and side effects of multilevel thoracic paravertebral block versus Thoracic Epidural block using 0.25% ropivacaine with dexmedetomidine for breast surgeries under general anaesthesia. **Materials and Methods:** This randomised prospective clinical study included 60 patients between December 2023 and May 2024. Patients were randomly allocated into two groups: Group P received multiple-level ipsilateral PVB at T2, T4, and T6, and Group E received a single-shot thoracic epidural at T4 preoperatively, both with ropivacaine and dexmedetomidine. Preoperative and postoperative monitoring included vital signs, VAS scores, and complications, with rescue analgesia administered as needed. **Results:** In the time to rescue analgesia, Group P had a substantially longer mean duration of 392±66.35 minutes compared than Group E 298±19.19 minutes. This difference was statistically significant ($p < 0.0001$). For postoperative nausea and vomiting, a higher percentage of patients in Group P (93.30%) did not experience these symptoms than those in Group E (76.70%). Intraoperative volatile anaesthetic usage at a concentration of 0.25% was predominant in both groups (73.30% in group P and 63.30% in group E). **Conclusion:** Thoracic paravertebral block provides a longer duration of postoperative analgesia according to better VAS scores with good patient satisfaction, and minimal and more stable haemodynamic changes make it a better alternative to Thoracic Epidural block for breast surgery.

INTRODUCTION

Carcinoma is the most common malignancy in women, and its incidence has steadily increased over the last decade. Breast surgeries are usually performed under general anaesthesia which is associated with postoperative pain, nausea, and vomiting. Sympathetic blockade abolishes noxious stimuli during surgical manipulation intraoperatively, decreasing stress responses during

the perioperative period. Selective sympathetic blockade also provides respiratory, cardiovascular, and gastrointestinal benefits. Freedom from the pain provided by the sympathetic blocks, as produced by regional analgesic techniques such as thoracic paravertebral block, epidural block, and intercostal block, leads to early mobilisation, feeding, and absence of postoperative respiratory complications, especially in high-risk cases associated with respiratory and cardiovascular comorbidities.

Aim: This study aimed to compare the analgesic efficacy and side effects of multilevel thoracic paravertebral block versus Thoracic Epidural block using 0.25% ropivacaine with dexmedetomidine for breast surgeries under general anaesthesia.

MATERIALS AND METHODS

This randomised prospective clinical study was conducted on 60 patients at the Department of Anaesthesiology, Government Medical College, Namakkal between December 2023 and May 2024. This study was approved by the Institutional Ethics Committee before initiation, and informed consent was obtained from all patients.

Inclusion Criteria

Patients aged 18-60 years, with BMI < 30 Kg/m², ASA I & II, elective surgery and valid informed consent were included in this study.

Exclusion Criteria

Patients with allergy to local anaesthetics, bleeding disorders and coagulation abnormalities, kyphoscoliosis, systemic or local sepsis, history of seizures, neurological deficits, CVS, RS, endocrine, renal, hepatic, psychiatric disease, pregnancy, or lactating mothers were excluded from this study.

Methods

Before surgery, the patients were randomly allocated into two equal groups based on a computer-generated sequence. Group P (PVB = 30 patients) received multiple levels of ipsilateral PVB at T2, T4, and T6 levels, while group E (epidural = 30 patients) received a single-shot Thoracic Epidural at T4 level preoperatively.

On arrival of the patient in the operating room, monitors such as ECG, NIBP and Pulse oximeter were connected, and all patients received 1-2 mg of midazolam intravenously before the procedure. Multilevel Thoracic PVB was performed with the patient in a sitting position at the level of the 2, 4, and 6th thoracic vertebrae under strict aseptic precautions with the loss of resistance technique with air using an 18-G Tuohy needle. After infiltrating the skin with 1-2 ml of 2% xylocaine, contact with the transverse processes of the 2, 4, and 6th thoracic vertebrae, then sliding the needle caudally for 1–1.5 cm into the paravertebral space. Then 0.3 ml/kg of Ropivacaine 0.25% with 0.5 mcg/kg of Dexmedetomidine was injected.

The thoracic epidural was performed while the patient was in a sitting position, skin infiltration with 3-4 ml of 2% xylocaine at the T5-T6 space and the catheter tip was placed at the T4 level. Ropivacaine (0.25%) and Dexmedetomidine 0.5 mcg/kg (2 ml/segment) were administered as a single shot preoperatively. Before the induction of general anaesthesia, vitals were noted and Inj Glycopyrrolate 0.2 mg, Inj Fentanyl (2 mcg/kg) were administered and induced with an Inj Thiopentone sodium 3-5 mg/kg and the tracheal tube was facilitated with Inj Atracurium 0.5 mg/kg.

Anaesthesia was maintained using sevoflurane and an O₂/N₂O mixture containing 50% Fio₂. After recovery from anaesthesia, patients were shifted to the post-anaesthesia care unit for the first 24 h, and VAS scores were monitored for up to 12 h.

Rescue analgesia with injections of paracetamol/tramadol is administered when VAS scores are ≥ 4 . Complications related to local anaesthetics and techniques were also recorded. The primary outcome was the duration of postoperative analgesia (time for rescue analgesia in minutes), which was correlated with a VAS score of ≥ 4 . The secondary outcome measures were the mean VAS scores, intra/postoperative haemodynamics, and complications.

Statistical Analysis

The collected data were analysed with IBM.SPSS statistics software 23.0 Version. Descriptive statistics, frequency analysis, and percentage analysis were used for categorical variables, and means and standard deviations were used for continuous variables. To find a significant difference between the bivariate samples in independent groups, the unpaired sample t-test and Mann-Whitney U test were used. Chi-square and Fisher's exact tests were used to determine the significance of the categorical data. Statistical significance was set at $p < 0.05$ for all the above statistical tools.

RESULTS

The mean ages of Groups P and E were 52.37 and 51.87 kg, respectively, and their mean weights were 65.27 kg and 64.57 kg, respectively. In time to rescue analgesia, group P had a longer mean duration of 392 ± 66.35 minutes compared to Group E 298 ± 19.19 minutes and it was statistically significant ($p < 0.0001$). [Table 1]

The percentage of patients in Group P who did not require an intraoperative muscle relaxant (Inj Atracurium) is 90.00% and 86.70% in Group E. Intraoperative volatile anaesthetic usage at a concentration of 0.25% was predominant in both groups (73.30% in Group P and 63.30% in Group E). For postoperative nausea and vomiting, a higher percentage of patients in Group P (93.30%) did not experience these symptoms than those in Group E (76.70%). [Table 2]

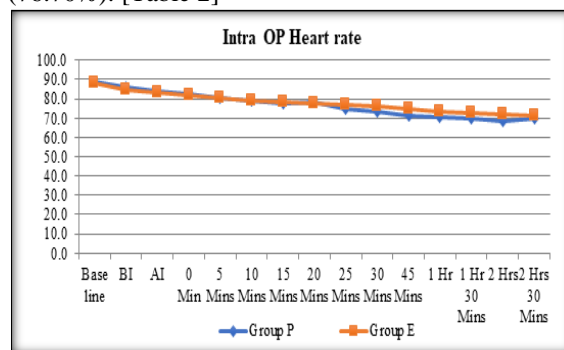


Figure 1: Intra OP Heart rate between the groups

The difference between the two groups was not statistically significant ($p > 0.05$). Heart rates in both groups were stable throughout the procedure. [Figure 1]

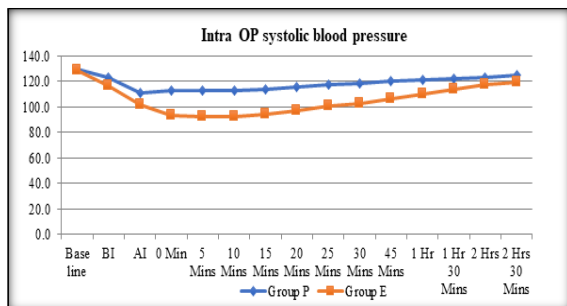


Figure 2: Intra OP systolic blood pressure between the groups

The mean intraoperative blood pressure of Group E was significantly lower than that of Group P, which required vasopressors and fluid boluses to treat hypotension, and the difference was statistically significant ($p \leq 0.01$). [Figure 2]

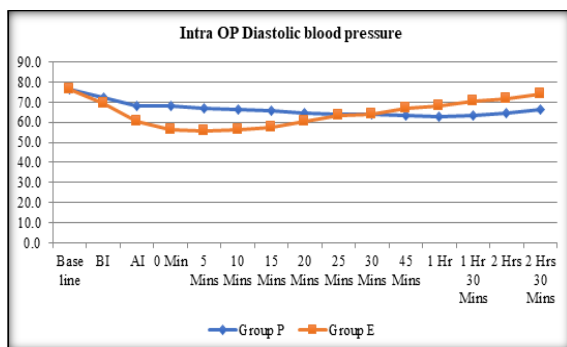


Figure 3: Intra OP diastolic blood pressure between the groups

The mean diastolic pressures of Group E were low during the intraoperative period requiring vasopressors and fluid boluses compared to Group P. The difference between the two groups was statistically significant ($p \leq 0.01$). [Figure 3]

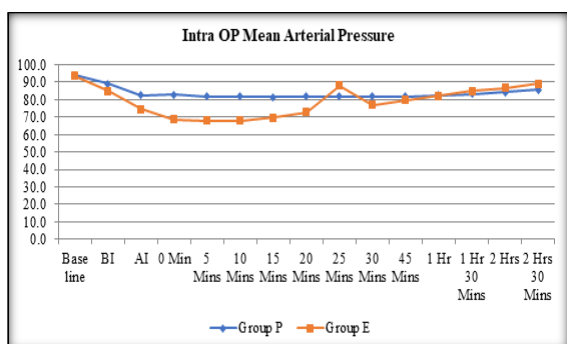


Figure 4: Intra OP mean arterial pressure between the groups

The mean MAP values are low and required vasopressors and fluid boluses for treating intraoperative hypotension in Group E. The

difference between the two groups was statistically significant ($p \leq 0.01$). [Figure 4]

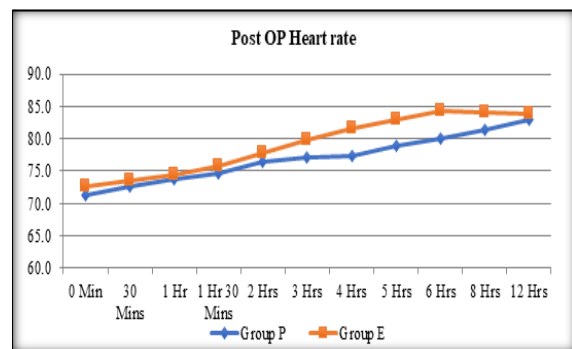


Figure 5: Post-op Heart rate between the groups

The mean postoperative heart rates of Group P were relatively low and stable compared to those of Group E, but the difference was not statistically significant ($p > 0.05$). [Figure 5]

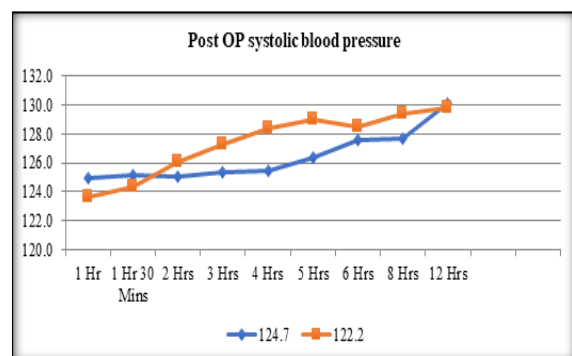


Figure 6: Post-op systolic blood pressure between the groups

The mean postoperative systolic blood pressure of Group P was relatively lower and more stable than the baseline values, but the difference between the two groups was not statistically significant ($p > 0.05$). [Figure 6]

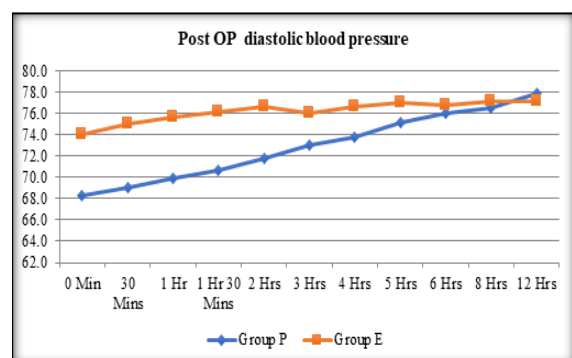


Figure 7: Post-op diastolic blood pressure between the groups

The mean diastolic pressures of Group P were relatively low and more stable during the postoperative period when compared to Group E. The difference between the two groups was statistically significant ($p \leq 0.01$). [Figure 7]

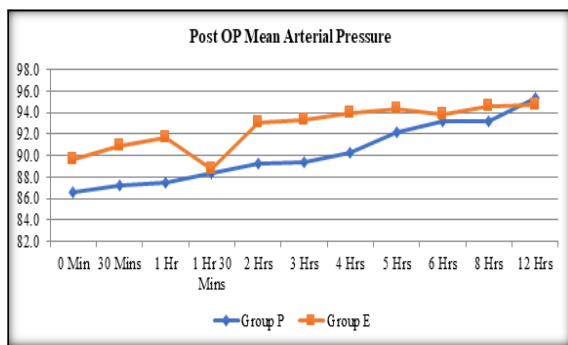


Figure 8: Post-op mean arterial pressure between the groups

The MAP values of Group P were relatively low and more stable when compared to Group E. However, the difference between these two groups was not statistically significant ($p > 0.05$). [Figure 8]

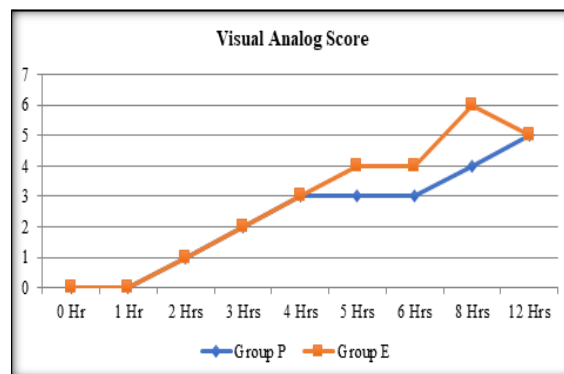


Figure 9: Visual Analog Score between the groups

Group P had better mean VAS scores than Group E, and the difference between the two groups was statistically significant ($p \leq 0.01$). [Figure 9]

Table 1: Demographic details and time of rescue analgesia

	Mean		P value
	Group P	Group E	
Age	52.37	51.87	-
Weight	65.27	64.57	-
Time of Rescue Analgesia	392±66.35	298±19.19	< 0.0001

Table 2: Clinical parameters between the groups

	Group P	Group E
Intra operative muscle relaxant (Inj Atracurium)	5mg	10%
	Nil	90%
Intra-operative volatile anaesthetics (sevoflurane)	0.25-0.5%	10%
	0.25-1%	3.30%
	0.25%	73.30%
	0.5-1%	3.30%
	0.50%	10%
Post-operative nausea and vomiting	No	93.30%
	Yes	6.70%

DISCUSSION

The current study aimed to compare the analgesic efficacy and side effects of multilevel thoracic paravertebral block and single-shot thoracic epidural block using ropivacaine with dexmedetomidine to prolong the duration of postoperative analgesia and reduce side effects.

The mean intraoperative heart rates of Groups P and E were similar, and the difference was statistically insignificant ($p > 0.05$). There was a statistically significant difference ($p \leq 0.01$) in intraoperative systolic blood pressure, diastolic blood pressure, and mean arterial pressure between the two groups, showing that Group E causes a more exaggerated fall during the intraoperative period, requiring vasopressors and fluid boluses to treat hypotension. Postoperatively, haemodynamics were monitored for up to 12 h. Systolic and mean arterial blood pressures during the postoperative period were relatively low and more stable in Group P than in Group E. However, the difference was statistically insignificant ($p > 0.05$). The diastolic BP was statistically significant ($p \leq 0.01$) but was stable during the postoperative period.

Postoperative visual analogue scores of both Group P and Group E were monitored for up to 12 hours, showing that Group P had better mean VAS scores than Group E, and the difference between the two groups was statistically highly significant with a p-value of ≤ 0.01 . The time for rescue analgesia in both Group P and Group E compared to the mean duration of postoperative analgesia lasted longer for Group P (392 min) than for Group E (298 min). The difference between the two groups was highly statistically significant, with a p-value of ≤ 0.01 . Comparison of intraoperative muscle relaxant requirements of both Groups P and E showed that both groups required a minimal single maintenance dose of atracurium (5 mg), and the difference between the two groups was statistically insignificant with a p-value of > 0.05 .

The results obtained in this study are similar to those of other studies conducted by Das et al. (2012),^[1] and Push et al. (1999),^[2] Gultekin Gulbahar et al. (2010),^[3] concluded significant changes in hemodynamics and complications. The intraoperative and postoperative analgesia showed similar results.

The intraoperative volatile anaesthetic requirements of both groups were compared and showed that both groups required only a minimal volume per cent of sevoflurane for the maintenance of anaesthesia, and the difference between the two groups was statistically insignificant ($p > 0.05$). The side effects and complications of groups P and E were compared. Postoperative nausea and vomiting were noted in both groups but relatively low in Group P. The difference between the two groups was not statistically significant ($p > 0.05$). No other procedure-related complications, such as pleural puncture, pneumothorax, intravascular injection, or dural tapping, were noted in either group.

CONCLUSION

In conclusion, the thoracic paravertebral block provides a longer duration of postoperative analgesia according to better mean VAS scores with

better patient satisfaction, and minimal and more stable haemodynamic changes make it a better alternative to thoracic epidural block for breast surgeries.

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