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Research Article

Role of Pectoral Block in Postoperative Analgesia after Modified Radical Mastectomy

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ABSTRACT

Purpose: The present study aimed to evaluate the efficacy of the Pectoral (Pecs) nerve block as an adjunct to general anaesthesia in improving postoperative analgesia following modified radical mastectomy (MRM). Methodology: A hospital-based observational study was conducted over 12 months at the Department of Anaesthesiology, Government Medical College, Kottayam. Sixty ASA I and II female patients aged 30–70 years undergoing elective MRM were randomly allocated into two equal groups: Group A received general anaesthesia with a Pecs block, while Group B received general anaesthesia alone. Postoperative pain was assessed using Visual Analogue Scale (VAS) at specified intervals. Hemodynamic parameters, analgesic consumption, and incidence of postoperative nausea and vomiting (PONV) were also recorded. Results: The Pecs block group showed a significantly longer duration of analgesia (5.30 ± 2.17 hours vs. 0.20 ± 0.48 hours; $p = 0.001$). VAS scores were significantly lower in this group at all time points ($p < 0.01$). Hemodynamic stability was better maintained, with significantly lower heart rate and blood pressure values at multiple intervals ($p < 0.05$). The Pecs group also required fewer rescue analgesic doses (16.43 vs. 44.57; $p = 0.01$) and had reduced PONV scores ($p = 0.01$). Conclusion: The Pecs block is an effective adjunct to general anaesthesia for MRM, significantly enhancing postoperative pain relief, minimizing analgesic requirements, improving hemodynamic stability, and reducing PONV.

Keywords: *Pectoral nerve block, modified radical mastectomy, postoperative analgesia, regional anaesthesia, PONV*

INTRODUCTION: Breast cancer is the most common cancer among females in India [1,2]. Surgical intervention, particularly modified radical mastectomy (MRM), is a mainstay in its management [3]. It involves removal of the entire breast along with most of the axillary lymph nodes [3]. Conventionally, general anaesthesia with opioids is used for perioperative analgesia; however, opioids, especially, morphine have been known to promote tumour angiogenesis and enhance cancer progression [4].

To improve outcomes and minimize incidence of opioid-related adverse effects, various regional anaesthetic techniques have been employed in breast surgeries, including thoracic epidural, paravertebral and intercostal blocks. More recently, interfascial plane blocks like Pecs I and II are being used [5]. These regional techniques are associated with reduced need for post-operative analgesics, lower incidence of postoperative nausea and vomiting (PONV), improved pulmonary function, shorter Intensive Care Unit (ICU) stays, and potentially reduced recurrence of cancer by attenuating the surgical stress response [5].

The goal of effective anaesthetic management in MRM is to ensure patient comfort, minimize perioperative complications, and promoting rapid recovery [6]. Enhanced Recovery After Surgery (ERAS) protocols address key factors that prolong hospital stay, such as continued need for intravenous fluids, parenteral analgesia, decreased mobility, and intolerance to enteral nutrition [7]. Use of ERAS pathways also improves quality of care and patient satisfaction. [7]

Postsurgical pain management is a critical component of ERAS [8]. A major challenge after MRM is managing postoperative pain and preventing post-mastectomy pain syndrome (PMPS), for which poorly controlled immediate post-operative pain is a known risk factor [8]. Currently thoracic epidural anaesthesia and thoracic paravertebral blocks represent the main regional anaesthetic techniques to manage this pain, however their use is limited by technical difficulty and potential complications [9,10]. The Pecs block type I and II are novel techniques described by Blanco to block the pectoral, intercostobrachial nerve, intercostal (T3-T6), long thoracic and the thoracodorsal nerves [11,12]. Pecs I block involves injection of local anaesthetic between the pectoralis major and minor muscles to anaesthetise the lateral and medial pectoral nerves. The present study sought to assess the role of Pecs block in providing adequate analgesia for patients undergoing modified radical mastectomy. Multimodal analgesic regimen involving a regional anaesthesia technique is an important part of ERAS protocol which helps in minimizing opioid consumption and hence facilitates early recovery. [13] The objective of the present study was to evaluate the efficacy and duration of analgesia of pectoral nerve block in patients undergoing modified radical mastectomy.

METHODOLOGY:

The present study was a hospital-based, observational study conducted over a period of twelve months in the Department of Anaesthesiology, Government Medical College, Kottayam, after approval from the Institutional Ethics Committee. The study population included 60 ASA I and II female patients aged 30–70 years, weighing less than 85 kg, who were scheduled for elective modified radical mastectomy under general anaesthesia. The sample size was calculated based on a study by Bashandy GMN and Abbas DN [14], where 20% of patients in the intervention group and 60% in the control group required rescue analgesia. Using the formula:

with $Z\alpha=1.96$, $Z\beta=0.84$, $P=(P1+P2)/2=40$, and $Q=1-P$, the minimum required sample size per group was calculated as 24. To improve accuracy, 30 patients were enrolled in each group.

Patients were randomized into two groups of 30 each using computer-generated tables:

- **Group A (n=30):** Received general anaesthesia with Pectoral (Pecs) block.
- **Group B (n=30):** Received general anaesthesia alone.

Patients with known allergies to local anaesthetics, on anticoagulants, those with bleeding diathesis, inability to understand Visual Analogue Scale (VAS), or unwilling to participate were excluded. All the patients underwent standardized general anaesthesia with induction using propofol (2 mg/kg), fentanyl (2 µg/kg), and atracurium (0.5 mg/kg), followed by airway management and maintenance with oxygen, nitrous oxide, isoflurane, and atracurium. Intraoperative analgesia included paracetamol (15 mg/kg) and fentanyl boluses.

In Group A, Pecs block was administered under direct vision post-surgery. 10 mL of 0.25% bupivacaine was administered between pectoralis major and minor muscles, and 20 mL between the pectoralis minor and serratus anterior muscles. Postoperative pain was assessed using VAS scores at 0, 2, 4, 6, and 12 hours. Hemodynamic parameters, incidence of postoperative nausea and vomiting (PONV), rescue analgesic requirement, and duration of analgesia were also recorded. Rescue analgesia was administered on demand.

Data was analyzed using SPSS version 18. Categorical variables were assessed using chi-square tests and continuous variables using t-tests or ANOVA. A p-value < 0.05 was considered statistically significant.

RESULTS:

The study enrolled a total of 60 female participants, equally distributed into two groups of 30 each. Table 1 depicts that the age and weight distributions were comparable between the groups. The duration of analgesia was significantly longer in the Pecs block group compared to the GA-only group ($p=0.001$), indicating the efficacy of the Pecs block in prolonging postoperative pain relief. Table 2 compares hemodynamic parameters (heart rate, systolic and diastolic blood pressure) and Visual Analogue Scale (VAS) pain scores at various postoperative time points. The Pecs block group consistently demonstrated lower heart rate values at 0, 2, and 4 hours postoperatively, with statistically significant differences ($p=0.002$, 0.001, and 0.02 respectively). Similar trends were observed for systolic and diastolic blood pressures, which were significantly lower in the Pecs block group at multiple intervals (SBP at 0, 2, 4, and 6 hours; DBP at all time points except 12 hours, with p-values < 0.05). VAS scores for postoperative pain were markedly lower in the Pecs block group at all time points (0, 2, 4, 6, and 12 hours), with highly significant p-values (all < 0.01 except 12-hour score at $p = 0.014$). Table 3 reports the mean number of analgesic doses required within the first 12 hours postoperatively. Patients in the GA-only group required significantly more doses compared to those in the Pecs block group, with a p-value of 0.01. Table 4 highlights that PONV score was significantly lower in the Pecs block group than in the GA-only group, with a p-value of 0.01.

Table 1: Comparison of Demographic Parameters and Duration of Analgesia Between Groups

Parameters	Group	Mean±S.D
Age (in years)	GA With Pecs Block	49.50±7.519

	GA Alone	50.67±8.778
Weight (in kg)	GA With Pecs Block	61.50±7.375
	GA Alone	63.70±6.182
Duration of analgesia (hours)	GA With Pecs Block	5.30±2.172
	GA Alone	0.20±0.484

Table 2: Comparison of Hemodynamic Parameters and VAS Scores at Various Postoperative Intervals

Parameter and Time (hours)	Group	Mean	p-value	Statistical test(t/U)
Heart Rate (HR)				
HR 0	With Pecs Block	82.63±9.190	0.002	t=3.32
	GA Alone	89.53±7.065		
HR 2	With Pecs Block	83.27±7.158	0.001	t=3.64
	GA Alone	90.97±5.346		
HR 4	With Pecs Block	83.77±6.826	0.02	t=2.45
	GA Alone	87.87±6.516		
HR 6	With Pecs Block	86.03±6.046	0.06	t=1.92
	GA Alone	89.04±7.857		
HR 12	With Pecs Block	88.07±8.379	0.310	t=1.03
	GA Alone	85.90±7.993		
Systolic Blood Pressure (SBP)				
SBP 0	With Pecs Block	123.33±13.570	0.001	t=3.78
	GA Alone	136.67±9.223		
SBP 2	With Pecs Block	124.03±11.285	0.001	t=3.65
	GA Alone	134.27±9.187		
SBP 4	With Pecs Block	124.27±12.168	0.02	t=2.44
	GA Alone	130.67±8.277		
SBP 6	With Pecs Block	126.80±16.177	0.03	t=2.23
	GA Alone	134.67±11.391		
SBP 12	With Pecs Block	129.47±12.306	0.520	t=0.65
	GA Alone	131.40±10.804		
Diastolic Blood Pressure (DBP)				
DBP 0	With Pecs Block	77.20±5.189	0.01	t=5.25
	GA Alone	91.33±6.814		
DBP 2	With Pecs Block	75.13±7.099	0.01	t=5.14
	GA Alone	88.33±8.339		
DBP 4	With Pecs Block	79.27±5.132	0.01	t=4.05

	GA Alone	88.00±8.469		
DBP 6	With Pecs Block	77.33±6.915	0.01	t=3.88
	GA Alone	85.47±7.682		
DBP 12	With Pecs Block	80.87±7.459	0.014	t=2.56
	GA Alone	85.67±7.279		
Visual Analogue Scale (VAS)				
VAS 0	With Pecs Block	15.53	0.01	U=90
	GA Alone	45.47		
VAS 2	With Pecs Block	15.75	0.01	U=85
	GA Alone	45.25		
VAS 4	With Pecs Block	18.43	0.01	U=95
	GA Alone	42.53		
VAS 6	With Pecs Block	16.95	0.01	U=92
	GA Alone	44.05		
VAS 12	With Pecs Block	21.27	0.014	U=108
	GA Alone	39.73		

t:students t test, U: Mann Whitney U test

Table 3: Mean Number of Analgesic Doses Required in First 12 Hours

Parameter	Group	number of doses	p-value	istical test
Analgesic doses in first 12 hours	With Pecs Block	16.43	0.01	U=88
	GA Alone	44.57		

U: Mann-Whitney U test

Table 4: Incidence of Postoperative Nausea and Vomiting (PONV)

Parameter	Group	n PONV Score	p-value	istical test
Post-operative nausea and vomiting	GA With Pecs Block	23.30	0.01	U= 93
	GA Alone	37.70		

U: Mann Whitney U test

DISCUSSION:

The present study evaluated the efficacy of the Pectoral (Pecs) nerve block as an adjunct to general anaesthesia (GA) in patients undergoing modified radical mastectomy (MRM). In our study, both the Pecs block group and the GA-only group had a comparable mean age (49.50 ± 7.52 vs. 50.67 ± 8.77 years), which aligns closely with the demographic data reported by **Mane et al. (2020)** [15] (mean age 54.76 ± 10 years) and **Kulhari et al. (2016)** [10] (mean age ~52– 54 years). Similarly, **Mostafa Fouad et al. (2021)** [16] documented a mean age of 48.5 ± 8.37 years in the Pecs group and 44.9 ± 8.45 years in the control group ($p = 0.092$), confirming demographic similarity.

Our study demonstrated a significantly prolonged duration of analgesia in the Pecs block group (5.30 ± 2.17 hours) compared to the GA-only group (0.20 ± 0.48 hours). This finding aligns with **Kulhari et al. (2016) [10]**, who reported a significantly longer analgesia duration in the Pecs group (294.5 ± 52.76 minutes) compared to the thoracic paravertebral block (TPVB) group (197.5 ± 31.35 minutes; $p < 0.0001$). Similarly, **Mostafa Fouad et al. (2021)** [16] noted a significantly longer time to first rescue analgesia in the Pecs group (156 ± 12.85 minutes vs. 122.64 ± 23.02 minutes; $p < 0.001$), while **Rosyadi et al. (2024)** [17] also observed a delayed onset of analgesic need in the Pecs II group ($p = 0.00$). These findings consistently affirm the efficacy of the Pecs block in prolonging postoperative analgesia duration.

Our study found significantly lower heart rate and blood pressure values in the Pecs block group at multiple postoperative time points. This is comparable to **Mostafa Fouad et al. (2021)** [16], who observed significantly lower intraoperative heart rates at 30, 60, and 120 minutes ($p = 0.003$, 0.014, and 0.039 respectively) and lower postoperative heart rates at PACU arrival, 2, 6, and 16 hours (p- values ranging from 0.017 to 0.037). Mean arterial pressures were also significantly reduced in the Pecs group at similar time points ($p<0.05$). These findings align with our study and support the hypothesis that better pain control with the Pecs block contributes to cardiovascular stability.

VAS scores in our study were significantly lower at all recorded intervals in the Pecs group ($p < 0.01$ at all points except 12 hours: $p = 0.014$), demonstrating superior pain control. This finding is in concordance with **Mane et al. (2020)** [15], who found significantly lower median VAS scores at 6 and 12 hours postoperatively. Likewise, **Kulhari et al. (2016)** **[10]** reported significantly lower pain scores in the Pecs group at 0, 0.5, 1, and 2 hours (all $p < 0.05$). **Zhao et al. (2019)** **[18]**, in a meta-analysis of six studies, observed significantly reduced pain scores in the Pecs group at 0 hours (SMD = −1.93; $p = 0.006$) and at 6 hours (SMD = −0.73; $p = 0.04$), although the difference at 24 hours was not statistically significant (SMD = −0.72; $p = 0.28$). **Rosyadi et al. (2024)** [17] also found significantly lower pain scores at 4, 12, and 24 hours ($p = 0.001$, 0.013, 0.003 respectively), further supporting our findings.

Our study recorded a significantly reduced need for postoperative analgesics in the Pecs group (mean doses: 16.43 vs. 44.57; $p = 0.01$). This is corroborated by **Kulhari et al. (2016)** **[10]**, who found lower morphine consumption over 24 hours in the Pecs group (3.90 ± 0.79 mg vs. 5.30 ± 0.98 mg; $p < 0.0001$). **Mostafa Fouad et al. (2021)** [16] also noted reduced nalbuphine usage in the Pecs group (3.25 ± 4.94 mg vs. 9.5 ± 6.46 mg; $p < 0.001$), and fewer patients requiring postoperative opioids (7 vs. 16). The meta-analysis by **Zhao et al. (2019)** **[18]** also demonstrated a significant reduction in postoperative opioid consumption (SMD = −1.15; $p < 0.001$), with both PECS I and II blocks contributing to this outcome. Likewise, **Rosyadi et al. (2024)** [17] reported significantly lower total rescue analgesic dose in the Pecs group ($p = 0.00$).

The Pecs block, particularly when administered at the conclusion of surgery, is a safe and effective technique for enhancing postoperative analgesia in MRM. It significantly improves pain scores, stabilizes haemodynamics, and reduces PONV, contributing to improved recovery profiles.

This study has several limitations. Firstly, while rescue analgesia was administered using intravenous boluses of paracetamol and tramadol, the use of patient-controlled analgesia (PCA) could have provided a more accurate and individualized assessment of postoperative analgesic requirements. Secondly, as the Pecs block was performed after the induction of general anaesthesia, we were unable to assess the onset time of the block or map the sensory dermatomal spread, which could have provided valuable insights into the block's efficacy and coverage. Additionally, we were unable to evaluate the clinical safety profile of the block in detail or assess its long-term impact, such as the potential development of chronic postoperative pain. These limitations highlight the need for further studies with extended follow-up and more comprehensive analgesic monitoring protocols.

CONCLUSION:

The present study demonstrates that Pecs block given under direct vision at the end of the surgery provides adequate analgesia in the early postoperative period. It prolonged analgesia duration, reduced pain scores, stabilized haemodynamics, and decreased analgesic requirements and PONV. Despite limitations such as inability to assess block onset and sensory spread, the Pecs block proves to be a safe and effective adjunct. Further studies are recommended to evaluate long-term outcomes and safety.

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