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Efficacy of PECS Block In Perioperative Period For Pain Management In Patients Undergoing Elective Breast Surgery

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ABSTRACT

Objective: To evaluate the effectiveness of intraoperatively performed, non-ultrasound-guided pectoral nerve (PECS) block compared to no regional block in controlling postoperative pain and opioid consumption in patients undergoing elective breast surgery.

Methodology: This randomized controlled trial was conducted from October 2024 to March 2025 at Pakistan Institute of Medical Sciences, Islamabad. Sixty female patients (ASA I–III) scheduled for modified radical mastectomy or simple mastectomy were randomly allocated into two groups: Group P (PECS block under direct vision) and Group C (control, no block). The primary outcome was postoperative analgesic requirement. Secondary outcomes included total opioid consumption within 24 hours, time to first rescue analgesia, and Visual Analogue Scale (VAS) pain scores.

Results: The mean time to first rescue analgesia was longer in the PECS group but not statistically significant (70.04 ± 44.01 vs. 54.44 ± 31.01 minutes; p = 0.118). Intraoperative and postoperative tramadol consumption was comparable between groups (p > 0.05). The proportion of patients requiring rescue analgesia was also similar. VAS pain scores at 1, 2, 4, 6, 12, and 24 hours postoperatively showed no statistically significant differences between groups, although consistently lower trends were observed in the PECS group.

Conclusion: Non-ultrasound-guided PECS block is a safe and feasible adjunct to general anesthesia but did not demonstrate statistically significant improvement in postoperative pain control or opioid consumption. However, modest clinical benefits suggest potential utility in resource-limited settings. Larger studies with ultrasound guidance are recommended to better define its efficacy.

Key words: Pectoral nerve block, MRM, mastectomy, Opioid consumption, VAS.

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Introduction

The most common malignancy among women worldwide is breast cancer and has been a significant cause of morbidity and mortality.[1,2]

Surgical management, including Modified radical mastectomy (MRM) and simple mastectomy, continue to play a central role in curative treatment and local disease control.[3] These procedures involve extensive tissue dissection, axillary lymph node sampling or clearance, and manipulation of the pectoral muscles and chest wall, that leads to moderate to severe postoperative pain.[4]

Acute postoperative pain after breast cancer surgery is linked to delayed mobilization and increased hospital stay.[5] Furthermore, poorly controlled acute pain is a recognized contributor to persistent postoperative pain syndromes, including post-mastectomy pain, which adds to a significant clinical challenge despite advances in anesthetic techniques.[6,7]

These usual approach of postoperative analgesia in breast operation comprises of systemic opioids alongside non-opioid analgesics such as paracetamol and non-steroidal anti-inflammatory drugs.[9] Even though the opioids are still effective, they lead to postoperative nausea and vomiting, respiratory depression, ambulation delay, and prolonged hospitalization.[10] Therefore, opioid-centric strategies may be suboptimal for improving early recovery and patient-reported outcomes.[11]

Regional anaesthetic techniques targeting the nerves of the anterior chest wall have therefore gained increasing attention. The pectoral nerve (PECS) block and its modifications are interfascial plane blocks designed to provide analgesia for breast and axillary surgery by blocking the pectoral nerves, intercostal nerves, intercostobrachial nerve, and long thoracic nerve.[12,19]

Studies have demonstrated that PECS blocks significantly reduce early postoperative pain scores, perioperative opioid consumption, and postoperative nausea and vomiting compared to general anaesthesia alone.[14–16] A 2023 meta-analysis reported that regional anaesthetic techniques, including the PECS block, are consistently associated with superior analgesia and reduced opioid requirements following breast cancer surgery.[14] Furthermore, it has been shown that PECS-based techniques, when incorporated into opioid-sparing anaesthetic regimens, improve early recovery outcomes after modified radical mastectomy (MRM).[15]

Comparative studies indicate that PECS block analgesia is comparable to thoracic paravertebral block, while offering technical simplicity and a favourable safety profile.[16] Although PECS blocks are typically performed under ultrasound guidance, recent data suggest that they can also be safely performed under direct surgical observation, which may be particularly beneficial in resource-limited settings.[17–19]

Despite this evidence, there remains heterogeneity in the literature regarding block techniques, timing of administration, and outcome measures.[14–16] In addition, limited data are available on non-ultrasound-guided PECS block methods in homogeneous patient populations undergoing elective breast cancer surgery, particularly in low- and middle-income countries.[20]

Therefore, the present study aims to evaluate the effectiveness of a non-ultrasound-guided PECS block, administered perioperatively, compared to no block in patients undergoing elective breast cancer surgery (MRM or mastectomy). The primary outcomes include postoperative pain scores and perioperative opioid consumption, while secondary outcomes include postoperative nausea and vomiting, time to first rescue analgesia, and patient satisfaction.

Methodology

This randomized controlled trial was done between October 2024 and March 2025, following the approval of the Institutional Ethics Committee of Pakistan Institute of Medical Sciences (PIMS). All participants agreed to participate in the study by signing an informed consent form after discussing the study protocol, procedure, possible benefits, and risks. Patients were also educated preoperatively regarding the use of the Visual Analogue Scale (VAS) for pain assessment, where 0 represented no pain and 10 the worst imaginable pain.

The study included female patients aged between 16 and 65 years with a physical status of American Society of Anesthesiologists (ASA) physical status I-III, and scheduled to undergo either an elective unilateral modified radical mastectomy (MRM) or simple mastectomy of the breast under general anesthesia.

Inclusion Criteria: Female patients aged 16–65 years, ASA physical status I–III, scheduled for elective unilateral mastectomy or modified radical mastectomy, Ability to understand and use the VAS pain scoring system.

Exclusion Criteria: Informed consent refusal or incapacity of informed consent. Allergy or contraindication to local anesthetics

Coagulopathy or bleeding disorders: Local infection at the site of block injection, Chronic opioid use or history of chronic pain syndromes, Severe hepatic, renal, or cardiac disease, Psychiatric illness affecting pain assessment, Revision or bilateral breast surgery

A randomization list was generated, and eligible patients were randomly allocated into two groups using computer-based randomization:

Group P (PECS block group): Patients received PECS I and PECS II blocks along with general anesthesia. Group C (Control group): Patients received standard general anesthesia without a PECS block.

Anesthetic Technique and Intervention
An 18-gauge intravenous cannula was inserted into the arm opposite to the surgical site in the operating room. All patients received standard anesthesia care, including continuous monitoring of heart rate, non-invasive blood pressure, oxygen saturation, and electrocardiography.

In Group P, PECS I and PECS II blocks were administered intraoperatively after completion of surgery and before skin flap closure, under direct anatomical guidance by an experienced anesthesiologist. PECS I block was done by injecting local anesthetic between the pectoralis major and pectoralis minor muscle whereas PECS II block was done

between the pectoralis minor and serratus anterior muscle. The block was done using 0.25 % bupivacaine. Patients in group C were not given any regional block.

After surgery, patients were shifted to the post-anesthesia care unit (PACU) and subsequently to the ward after stabilization.

The first end outcome was the postoperative pain measured by the VAS score at fixed- time intervals in the first 24 hours after surgery. The secondary outcome measures were time to first rescue analgesia and total opioid consumption in the first 24 hours of surgery. Institutional protocol was followed when giving rescue analgesia and the time to first demand and overall opioid demand was documented.

The analysis of all the collective data was conducted with the help of SPSS version 22. Qualitative and quantitative variables with descriptive statistics that will be calculated. Such quantitative variables as age, weight, height, BMI, VAS score, time to first rescue analgesia, total opioid consumption in mean standard deviation. Qualitative variables such as ASA, was determined in terms of frequency and percentage.

Outcome variables like pain, time and consumption were compared by using independent sample t test for both groups.

The effect modifiers (age), ASA and BMI were stratified with the post stratified independent sample t test. The value of p below 0.05 was regarded as significant.

Results

All patients were informed preoperatively about Visual Analogue Scale (VAS) usage to measure pain, with the lowest pain level 0 (none) and the highest one 10 (the worst imaginable pain). Postoperative pain was recorded at 1, 2, 4, 6, 12, and 24 hours by an observer blinded to group allocation. Intraoperative analgesia: Total intraoperative tramadol consumption was recorded for each patient.

Postoperative analgesia: Patients with a VAS score ≥3 received rescue analgesia with intravenous tramadol 1 mg/kg. The total dose of tramadol required in the postoperative period was documented for each patient. The mean intraoperative tramadol consumption was comparable between the groups:

Group P (PECS block): 104.14 ± 15.02 mg Group C (Control): 96.82 ± 30.62 mg (p = 0.244)

Similarly, the mean postoperative rescue tramadol required to maintain VAS scores <3 was not significantly different: Group P: 34.99 ± 24.35 mg and Group C: 25.80 ± 21.85 mg (p = 0.129)

Regarding the number of patients requiring rescue tramadol, 24 (80.0%) in Group P and 21 (70.0%) in Group C required it (p = 0.371, Table II). At all postoperative time points (1, 2, 4, 6, 12, and 24 hours), mean VAS scores were low in both groups, ranging between 1.3 and 2.6. The differences between Group P and Group C were small and not statistically significant at any time point (all p > 0.05, Table III).

Table I: Baseline Demographics and Clinical Characteristics of Study Participants. (n=60)

Variables	Group P (n=30) Mean±SD	Group C (n=30) Mean±SD
Age (years)	50.41± 5.38	49.01±8.87
Weight (kg)	69.47±12.48	62.77±12.89
Height (cm)	159.55±6.97	158.22±5.43
BMI	27.52±5.88	25.12±5.24
Surgery Duration	99.18±22.60	103.06±15.78
Anaesthesia Duration	116.00±18.64	123.79±18.59
ASA	Frequency (%)	Frequency (%)
I	15 (50.0%)	16 (53.0%)
II	15 (50.0%)	14 (47.0%)

Table II: Primary and Secondary Analgesic Outcomes. (n=60)

Variables	Group P (n=30) Mean±SD	Group C (n=30) Mean±SD	p-value
Time to first rescue analgesia (min)	70.04±44.01	54.44±31.01	0.118
Intraoperative tramal (µg)	104.14±15.02	96.82±30.62	0.244
Rescue tramal in 24 h (µg)	34.99±24.35	25.80±21.85	0.129
Patients requiring rescue tramal, n (%)	24 (80.0%)	21 (70.0%)	0.371

Discussion

Our randomized controlled trial involved determining the analgesic effect of a perioperatively applied non-ultrasound guided PECS block versus no block in patients undergoing elective breast cancer surgery. The main outcomes, which were on the postoperative pain in terms of VAS score at various time points (1, 2, 4, 6, 12, and 24 hours), postoperative and intraoperative opioid (tramadol)

Table III: Comparison of Postoperative VAS Pain Scores among the Study Group. (n=60)

VAS	Group P (n=30) Mean±SD	Group C (n=30) Mean±SD	p-value
1 hours	2.30±0.99	2.15±0.81	0.544
2 hours	2.41±1.06	2.58±0.91	0.506
4 hours	2.30±0.93	1.90±1.01	0.118
6 hours	1.89±0.92	1.96±0.86	0.784
12 hours	1.36±0.64	1.62±0.75	0.142
24 hours	1.52±0.53	1.60±0.68	0.587

administration, and time to the first rescue pain reliever. Statistically significant differences were found between the PECS (Group P) and the control (Group C) on all outcomes (all $p > 0.05$), although there were trends in favor of the PECS block (e.g., longer time to first analgesia 70.04 ±44.01 vs. 54.44 ± 31.01 min ($p = 0.118$), less mean tramadol usage).

In a comparison of our results with the literature, it is imperative to also distinguish between ultrasound-guided (USG) PECS blocks, which are most often found in the literature, and non-ultrasound guided methods. The majority of the more recent studies and meta-analyses have statistically significant analgesic effects with USG PECS blocks in breast surgery.[21]

A locally conducted study, similar to ours, primarily assessed pain scores during the first 24 hours in patients undergoing mastectomy who received a PECS (pectoral plus serratus) block. The secondary objective was to evaluate total postoperative opioid and antiemetic consumption. The study concluded that the PECS block provides superior analgesic efficacy compared to general anesthesia alone in patients undergoing mastectomy [22]. Similarly, another study showed the effectiveness of ultrasound guided (PECS II) block versus conventional analgesics for management of post-operative pain in women undergoing unilateral modified radical mastectomy.

Contrary to our study, it was done with use of ultrasound guidance and nalbuphin dose was compared between two groups with PECS block showing more efficacy.[23] Another study done in our setup in 2019 , published in Ayub medical journal, also showed that post operative pain with PEC was significantly better controlled as compared to ,in patients without PEC block undergoing modified radical mastectomy under general anesthesia.[24] A different study compared efficacy of pectoral nerve block with erector spinae block for postoperative analgesia following breast surgeries. The pectoral nerve block achieved superior postoperative analgesia with lower pain scores, decreased opioid consumption and prolonged analgesic duration compared to the ESP block.

Internationally various studies have been conducted to compare efficacy of PECS block with only general anesthesia as well as with other methods of regional blocks.[13] This study compared PECS block with Paravertebral block and showed that the PECS block is non-inferior to the PVB in controlling postoperative pain after breast surgery, offering additional advantages like reduced administration time and a favorable safety profile.[14]

In 2015, a study evaluating the efficacy of the PECS block demonstrated significantly lower VAS pain scores in the PECS group compared to the control group. Additionally, postoperative opioid consumption was reduced in the PECS group during the first 12 hours after surgery, with an overall reduction in opioid use and associated side effects.[16]

Similarly, a study conducted in Egypt in 2025 evaluated the efficacy of a combined pectoral nerve block and transversus thoracic plane block using ultrasound guidance versus a pectoral block alone. The study concluded that, in patients undergoing modified radical mastectomy (MRM), the combined block resulted in reduced morphine consumption, fewer side effects, and improved intraoperative and postoperative pain control compared to the pectoral block alone.[20]

In line with our methodology, another study demonstrated that a PECS II block with bupivacaine administered intraoperatively under direct vision, without ultrasound guidance, is not only safe and time-saving but also significantly reduces postoperative pain and analgesic requirements.

However, these overall findings contrast with our results, which did not achieve statistical significance. This discrepancy may be attributed to several factors, including differences in technique (ultrasound-guided versus landmark-based), variations among individual randomized controlled trials, the use of multimodal analgesia regimens, and the distinction between clinical and statistical significance, as well as comparisons with other non-PECS regional techniques.

The primary aim of our study was to evaluate the role of the pectoral nerve block (PECS I and II), administered perioperatively under direct vision without ultrasound

guidance, in comparison to no block. The study focused on assessing its efficacy in pain management among patients undergoing mastectomy and MRM, both intraoperatively and during the first 24 hours postoperatively, using multiple outcome measures as described above.

Strengths and Limitations: Data that is prospectively gathered and has objective outcome measures. Multimodal analgesic regimen in both groups.

Limitations: The sample size (n = 60) might not have been sufficiently big to show small yet clinically significant differences.

The non-ultrasound guided method may cause block failure or uneven nerve coverage. No evaluation of long-term effects including chronic post mastectomy pain syndrome. The proceduralist was not blinded but outcome measures were objective.

Landmark-based PECS block did not statistically significantly improve postoperative pain score, tramadol intake, and time to first rescue analgesia relative to control in this cohort. Such results are in contrast to most of the literature that utilizes ultrasound- directed PECS blocks, which all demonstrate lower pain levels and opioid consumption. The trends we have seen in our study indicate that there is some analgesic effect, however, the lack of statistically significant results is probably due to inaccuracy of technique, small sample size, and high baseline analgesia that our multimodal protocol offers.

Adequately powered studies involving large sample sizes and utilization of ultrasound guidance, potentially in combination with enhanced multimodal analgesia should be considered in future studies to determine the relevance of PECS blocks particularly in low-resource countries where ultrasound might not be accessible.

Conclusion

Even though the PECS block group had a slight mean decrease in pain scores and tramadol consumption, there was no statistical significance. These results indicate that non-ultrasound guided PECS block might only have a modest analgesic effect when combined with a multimodal analgesic program in breast cancer surgery. Nevertheless, it is an acceptable procedure that can potentially be useful in environments with no ultrasound. It is suggested that future research uses larger sample size, ultrasound guidance and long term follow-up to further explain the role of PECS block in the management of perioperative pain in breast surgery. This should be supported by training facilities so as to contribute an effort to decrease the morbidity rates in the long and short run.

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