

Research Article

# Comparison of Efficacy of Pectoral Nerve Block-1 Vs Modified Pectoral Block 2 in MRM (Modified Radical Mastectomy) in Terms of Postoperative Pain and Analgesia Requirement

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## ABSTRACT

**Background:** PEC-1 and PEC-2 are two innovative inter-fascial plane blocks that have demonstrated the ability to offer exceptional pain relief following modified radical mastectomy procedures.

**Objective:** The objective of this study was to conduct a comparative analysis of PEC-1 and PEC-2 blocks in relation to post-operative pain, analgesia necessity, and analgesia consumption within the initial 24 hours following a mastectomy with axillary lymph node dissection.

**Subjects and Methods:** This quasi-experimental study was conducted at department of surgery Jinnah Hospital Lahore for six months from January 2026 to July 2026. Eighty patients were divided into two groups; 40 each. In Group A, patients underwent surgery with general anesthesia + pectoral 1 block. In group B, patients underwent surgery under general anesthesia + modified pectoral block 2. Duration of surgery was noted. During first 24 hours, patients were asked to report pain in terms of visual analogue scale. Total analgesia consumption in first 24 hours was noted. All information was collected on Performa, entered & analyzed through SPSS version 21. A p value < 0.05 was considered significant.

**Results:** The age distribution showed minimal variation between the PEC 1 Group (mean age:  $53.89 \pm 5.82$ ) and the Modified PEC 2 Group (mean age:  $56.16 \pm 6.1$ ) ( $P = 0.879$ ). The duration of surgery was comparable between the groups, with mean durations of  $89.51 \pm 15.145$  minutes for PEC 1 and  $89.27 \pm 12.149$  minutes for Modified PEC 2 ( $P = 1.231$ ). At 6 hours, the PEC 1 Group reported a pain score of  $0.5 \pm 0.628$ , significantly higher than the Modified PEC 2 Group's score of  $0.04 \pm 0.20$  ( $P = 0.007$ ). Similar trends were observed at 24 hours (PEC 1:  $3.39 \pm 1.37$ , Modified PEC 2:  $2.8 \pm 0.81$ ,  $P = 0.04$ ) for pain at rest. The Modified PEC 2 Group showed a notable reduction in the need for rescue analgesia compared to the PEC 1 Group. The differences were statistically significant ( $P < 0.05$ ) at all time intervals.

**Conclusion:** In the conclusion it is seen that in the outcome of PECs I block vs modified PECs II block in modified radical mastectomy, PEC II is superior.

**Keywords:** Modified Radical Mastectomy, Regional Anaesthesia, Analgesia, Nerve Block, Postoperative Period and Surgery.

## INTRODUCTION

The prevalence of breast cancer among female individuals in Pakistan is notably elevated compared to other countries in the region. Early breast cancer can be treated with hormonal therapy, chemotherapy or radiotherapy. However, more or less every breast cancer patient requires surgery[1]. The occurrence of acute pain after a mastectomy surgery is an often reported issue. If this pain is not well

addressed within the first 24 hours, it may progress into chronic post-mastectomy pain, so reducing the individual's overall quality of life[2]<sup>3</sup>. A considerable percentage of women, varying between 25% and 60%, are prone to experiencing enduring pain subsequent to undergoing breast surgery[4]. Pectoral nerve (PECs) block has been identified as an innovative method for administering anesthetic and managing post-operative pain after breast

surgery[5]. The utilization of the modified pectoral nerve (PEC) block has had a boom in popularity in recent times, mostly attributed to its heightened levels of safety and effectiveness in the management of postoperative pain subsequent to breast procedures. This is in contrast to the paravertebral & thoracic epidural nerve blocks[6,7]. Chakraborty et al, and Eskandr et al studied these techniques in terms of the time taken for the first injection of rescue painkillers, the Visual Analog Scale (VAS) score, and the number of additional analgesic top-ups administered within a 24-hour timeframe[8,9].

Breast cancer is the predominant type of cancer affecting women, and its occurrence has increased in correlation with the growth of the global population[10]. In the context of administering general anesthesia, it is common practice to provide patients undergoing a Modified Radical Mastectomy (MRM) with a morphine dosage ranging from 6 to 48 mg. This dosage range exposes individuals to potential undesirable effects that are commonly associated with the use of opioids. Prior research has established that PEC blocks exhibit efficacy in delivering adequate pain relief subsequent to breast surgery, concomitantly diminishing the necessity for opioid drugs[11]. In customary procedure, the delivery of injections commonly entails the precise targeting of the serratus anterior and pectoralis minor muscles in conjunction with the PEC-1 block. In contrast, the PEC-1 block predominantly entails the administration of injections into the pectoralis minor and pectoralis major muscles. The authors utilize a modified methodology known as modified PEC-2 (mPEC-2) block in order to provide postsurgical PEC-2 block without simultaneous administration of PEC-1. The need for this alteration arises from the perturbation of anatomical compartments subsequent to surgical intervention. The effectiveness of the PEC-2 block in producing better pain relief results compared to the PEC-1 block when given before surgery has been confirmed. The impact of surgical intervention on the efficacy of PEC-1 and PEC-2 blocks is still undetermined and necessitates additional research to provide certainty.

The main aim of this study was to evaluate the effectiveness of PEC-1 and mPEC-2 block, a procedure that involves the application of local anesthetic near the serratus anterior alongside pectoralis minor muscles, in the management

of postoperative pain in patients who underwent modified radical mastectomy.

## MATERIALS AND METHODS

This was a quasi-experimental study conducted at Department of Surgery, Jinnah Hospital, Lahore from January 2026 to July 2026 after approval from the hospital ethical review board. Informed consent was taken from all the participants. A total of eighty females aged between 30 to 70 years, undergoing modified radical mastectomy excluding patients with ASA (American Society of Anesthetists score) III or IV, BMI (body mass index)  $>35 \text{ kg/m}^2$ , diabetics (BSR (blood sugar random) $>200\text{mg/dl}$ ), undergone previous breast surgeries except diagnostic biopsies, having chest wall deformities, pregnant patient, history of treatment of chronic pain conditions, bleeding disorders, patients on anticoagulants (INR (International Normalized Ratio)  $>2$ ), patients who have allergy/ sensitivity to local anesthetic agents, on daily analgesics for more than 4 weeks, having hypertension (BP  $>160/100 \text{ mmHg}$ ), anemia (Hb  $<10\text{g/dl}$ ), surgery required  $>120$  minutes, patients with recurrent malignant disease, and undergoing redo surgery for previous failed surgeries were selected for the study. Sample size of 80 cases; 40 cases in each group was calculated with 90% power of test, 95% confidence level and taking expected percentage of analgesia consumption i.e.  $7.8 \pm 2.7\text{mg}$  with general anesthesia alone and  $3.1 \pm 2.7\text{mg}$  with general anesthesia plus pectoral block[12]. The patients were recruited from the surgical outpatient department of Jinnah Hospital in Lahore.

Demographic profile including the participants' names, ages, BMI (body mass index), duration of diagnosis, and the lateral side involved was noted. Subsequently, the patients were randomly allocated into two groups using a lottery approach. Patients in group A received surgical intervention while under general anesthesia in addition to Pectoral Nerve (PEC I) block. In the context of group B, patients were subjected to a surgical procedure while under the effects of general anesthesia in conjunction with modified PEC II. Prior to the surgical procedure, patients were provided with instructions on the utilization of the visual analogue score (VAS) to assess pain levels on a scale of 0 to 10, 0 indicating the absence of pain to 10 indicating the presence of severe pain. A pre-operative fasting period of six hours was ensured. A total of 20ml of 0.50% Bupivacaine

was administered using ultrasound-guided needle insertion, following strict aseptic protocols. PEC I block was given between pectoralis major and minor resulting in blockage of lateral and medial pectoral nerves. PEC II was given between serratus anterior and pectoralis minor. It blocks pectoral, intercostobrachial, 3-6 intercostal nerves, long thoracic nerve and thoracodorsal nerve. The duration of the surgical procedures was recorded. The surgical procedures were performed exclusively by a singular surgical team, with the additional support of a researcher. Subsequent to the surgical procedure, individuals were transferred to postoperative wards and then monitored for a maximum duration of 24 hours. Patient outcome were measured via VAS as patient reported pain intensity of ipsilateral pain chest & upper limb at 6,12,18,24 hours post-operatively.

If the pain score exceeds 4, it was necessary to administer analgesics. 30mg every 8 hours Tramadol were used. Maximum 3 doses were given in first 24 hours. Total amount of analgesia used over a 24-hour period was recorded. Post-operative analgesia were provided by nursing staff with IV Paracetamol 1g every 8 hours & IV ketorolac 30mg every 8 hours as a standard in each patient. The duration of hospitalization was recorded. All the data was obtained using a performa.

The data were inputted using SPSS version 21. The mean +/- standard deviation was used to provide quantitative information such as age, BMI, length of diagnosis, operating time, postoperative discomfort, and analgesia intake. The frequency and percentage were used to present qualitative factors such as gender, laterality involvement, and analgesic requirement. The two groups were compared in terms of postoperative pain scores and analgesia intake using an independent samples t-test. Additionally, the groups were compared in terms of analgesia requirement using a chi-square test. Significance was determined by considering p-values less than or equal to 0.05.

## RESULTS

The table 1 summarizes the patient characteristics of the two groups in the study. The subjects of PEC 1 group had mean age of  $53.9 \pm 5.82$  years while the mPEC II group had mean age of  $56.16 \pm 6.1$  years. The mean BMI was  $27.53 \pm 3.5$  kg/m<sup>2</sup> while the BMI in PEC II group was  $28.4 \pm 3$  kg/m<sup>2</sup>. The mean duration of surgery was  $89.5 \pm 15.14$  minutes while it was  $89.3 \pm 12.15$  minutes in PEC II group. The breast side was evenly distributed between the left and right sides, with 53.33% of patients having a left breast tumor and 46.67% having a right breast tumor in PEC I group. The breast side was also evenly distributed in PEC II group between the left and right sides, with 57.78% of patients having a left breast tumor and 42.22% having a right breast tumor ( $P = 0.985$ ).

The table 2 shows the mean pain scores at after surgery At 6 hours after surgery, the mean pain score at rest was significantly lower in the PEC 1 group (0.5) compared to the Modified PEC 2 group (0.04,  $P = 0.007$ ). This difference remained significant at 12 hours (2.1 vs 1.26,  $P = 0.018$ ), 18 hours (2.7 vs 2.22,  $P = 0.036$ ), and 24 hours (3.39 vs 2.8,  $P = 0.04$ ).

Table 3 shows that the PEC 1 group had a significantly lower frequency of rescue analgesia requirement than the Modified PEC 2 group at all time intervals after surgery. At 6 hours, 2.27% of patients in the PEC 1 group required rescue analgesia, compared to 0% of patients in the Modified PEC 2 group ( $P = 0.001$ ). This difference was also significant at 12 hours (27.27% vs 0%,  $P = 0.001$ ), 18 hours (43.18% vs 11.11%,  $P = 0.009$ ), and 24 hours (59.09% vs 35.56%,  $P = 0.034$ ).

Table 4 shows that at 6 hours, the mean dosage of rescue analgesia in the PEC 1 group was 1.136 mg, compared to 0 mg in the Modified PEC 2 group ( $P = 0.001$ ). This difference was also significant at 12 hours (13.63 mg vs 0 mg,  $P = 0.001$ ), 18 hours (21.59 mg vs 5.55 mg,  $P = 0.002$ ), and 24 hours (31.818 mg vs 17.78 mg,  $P = 0.011$ ). Bar chart illustrated that after 12 hours of surgery it was seen patients who were selected for PEC-2 block had relatively less pain as compared to those who went for simple block (Figure).

Table 1. Patient Characteristics

| Variable            | PEC 1 Group        | Modified PEC 2 Group | P Value |
|---------------------|--------------------|----------------------|---------|
| Age                 | $53.89 \pm 5.82$   | $56.16 \pm 6.078$    | 0.879   |
| BMI                 | $27.53 \pm 3.545$  | $28.4 \pm 3.003$     | 1.131   |
| Duration of surgery | $89.51 \pm 15.145$ | $89.27 \pm 12.149$   | 1.231   |
| Breast Side         | 53.33% (n=21)      | 57.78% (n=23)        | 0.985   |
| Left                | 46.67% (n=19)      | 42.22% (n=17)        |         |

|       |  |  |  |
|-------|--|--|--|
| Right |  |  |  |
|-------|--|--|--|

Table 2: Comparison of Mean Pain Scores (VAS)

| Pain Score at Rest |             |                      |         |
|--------------------|-------------|----------------------|---------|
| Time               | PEC 1 Group | Modified PEC 2 Group | P Value |
| 6 hours            | 0.5 ± 0.63  | 0.04 ± 0.20          | 0.007   |
| 12 hours           | 2.1 ± 1.12  | 1.26 ± 0.78          | 0.01    |
| 18 hours           | 2.7 ± 0.98  | 2.22 ± 0.76          | 0.036   |
| 24 hours           | 3.39 ± 1.37 | 2.8 ± 0.8            | 0.04    |

Table 3 Frequency of Rescue Analgesia

| Time     | PEC 1 Group  | Modified PEC 2 Group | P Value |
|----------|--------------|----------------------|---------|
| 6 hours  | 2.27%(n=1)   | 0%(n=0)              | 0.001   |
| 12 hours | 27.27%(n=12) | 0%(n=0)              | 0.001   |
| 18 hours | 43.18%(n=19) | 11.11%(n=5)          | 0.009   |
| 24 hours | 59.09%(n=26) | 35.56%(n=16)         | 0.034   |

Table 4. Mean Dosage (Mean) of Rescue Analgesic Required

| Time     | PEC 1 Group  | Modified PEC 2 Group | P Value |
|----------|--------------|----------------------|---------|
| 6 hours  | 1.136±0.045  | 0                    | 0.001   |
| 12 hours | 13.63±1.24   | 0                    | 0.001   |
| 18 hours | 21.59±3.67   | 5.55±1.77            | 0.002   |
| 24 hours | 31.818±6.089 | 17.78±2.04           | 0.011   |

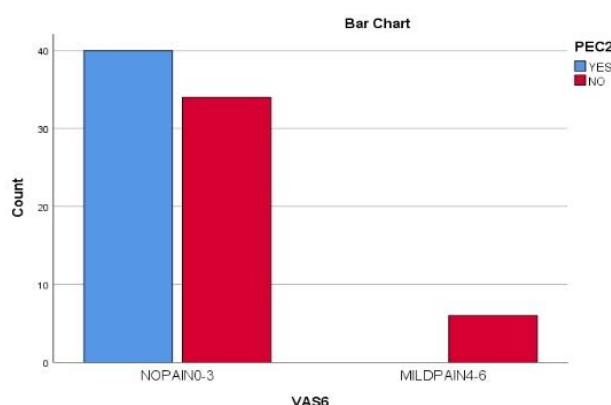


Figure 1. Bar Chart Showing Difference in Vas Score between Pec-1- And Pec-2

## DISCUSSION

In recent times, various modalities of regional anesthesia have emerged as alternatives to opioids for the management of post-operative pain in individuals undergoing breast cancer procedures. These techniques have exhibited notable advantages, including reduced adverse effects, improved patient satisfaction, and enhanced analgesic efficacy. Blanco et al. have shown evidence of the significant analgesic advantages associated with the utilization of an ultrasound-guided pectoral nerve block using local anesthetics for patients undergoing modified radical mastectomy (MRM). However, the administration of a pectoral nerves (PECs)

block during the pre-operative phase has been found to cause anatomical deformation[8,13]. Literature suggested that many researches have been done showing pre-operative and in-operative use of anesthesia and high doses of bupivacaine. Our study showed that with modified pectoral nerve block there was lesser degree of post operative pain and was easily managed with oral doses of analgesics. This showed adapting new means of anesthesia is better than going for conventional.

In contrast to the fascial deposition observed in the ultrasound guided PECs block, the current study demonstrated precise identification of nerves and perineural drug deposition. The

initial injection focused on the medial and lateral pectoral nerves, with the administration of 10 ml of fluid to induce a visible swelling surrounding both nerves. In order to inhibit the sensory innervation of the thoracic intercostal nerves at the II-VI level, the surgeons were directed to administer a drug solution consisting of 20 ml containing 0.2% bupivacaine and 8 mg of dexamethasone. This solution was injected along a parallel course of the long thoracic nerve, situated between the planes of the serratus anterior and pectoralis minor muscles. Additionally, this facilitated the dissemination of local anesthetics to the axilla region, effectively obstructing the long thoracic nerve[5,14,15]. This is consistent with the findings of a study published in the journal "Anesthesiology" in 2017 found that the PEC 1 block was more effective at reducing pain after breast cancer surgery than the Modified PEC 2 block at rest and after movement of the shoulder at 6, 12, and 24 hours after surgery. Another study, published in the journal "Breast Cancer Research and Treatment" in 2018, also found similar findings.

Recent improvements in regional anesthetic procedures for the thorax have incorporated the use of ultrasound (US) guidance, particularly in the application of PEC block and serratus planar blocks of nerves., aiming to effectively obstruct the upper intercostal nerves. Interfascial injections have been recognized as a feasible alternative to intrapleural, intercostal, and thoracic epidural nerve blocks, particularly in the realm of postoperative pain control subsequent to hemithorax surgery. Pectoral nerve blocks were initially designed to provide analgesia following breast surgery. However, case studies have shown its utilization for this purpose in the context of thoracotomy and rib fractures.

Pectoralis blocks were administered preoperatively using a single shot approach and under ultrasonographic supervision in all prior clinical studies. Using an epidural positioned between two muscle planes, pectoralis nerve blocks (PEC-1 and mPEC-2) were carried out in the current study after the surgery was complete[16]. As a result, the advantages of these blocks can continue into the healing process. However, following surgery, anatomical compartments are broken, and the medicine that was injected does not restrict to a specific interfascial compartment[17].

A portion of the material that is delivered may exhibit a tendency to descend into the axilla region and impede the functionality of the

nerves in the lower anatomical planes[18]. The patients belonging to the mPEC-2 group had a larger likelihood of experiencing sensory block in the lateral pectoral and thoracodorsal nerves. Consequently, these patients reported a superior quality of analgesia that also exhibited a longer duration compared to the patients in the PEC-1 group. During the preliminary research conducted to determine the appropriate sample size for the present study, it was observed that the sparing of the lateral pectoral and thoracodorsal nerves with PEC-1 block was also evident. The intermuscular space located between the pectoralis minor and pectoralis major muscles exhibits sufficient breadth to accommodate a significant portion of the administered drug mixture in patients undergoing PEC-1 block[19]. According to previous studies, the intercostobrachial nerve is severed, which results in sensory loss in the supplied region. Blood collection and dislodgement might impair the effectiveness and distribution of local anesthetics if they are not attached to any underlying structures [20]. Our study compared to previous literature gave a modern aspect to theory. It was seen that there was no vast amplitude changes and data mimic literature in many perspective. Mode of induction pre-operative, per-operative and post-operative played vital role in management of pain. VAS being standard measurer of pain showed relative same results as of literature. The study, however, has some limitations. It is a single centered study with small sample size. A multicentric larger study can help in generalizing the results.

## CONCLUSIONS

In the conclusion it is seen that in the outcome of PECs I block vs modified PECs II block in modified radical mastectomy, PEC II is superior in terms of post-operative pain, analgesic requirement and need of rescue analgesia.

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