

## COMPARISON OF ULTRASOUND GUIDED MODIFIED PECTORAL NERVE BLOCK WITH LOCAL ANAESTHETIC INFILTRATION FOR ANALGESIA IN BREAST CANCER SURGERY

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### ABSTRACT

**Objective:** To compare the frequency of pain and mean analgesia requirement after breast surgery under general anaesthesia when comparing pectoral nerve block with local anaesthesia infiltration.

**Study Design:** Comparative prospective study.

**Place and Duration of Study:** Combined Military Hospital, Rawalpindi, from Mar 2018 to Sep 2019.

**Methodology:** A total of 60 patients undergoing modified radical mastectomy were included in the study. Group A (n=30) received pectoral nerve blocks while Group B (n=30) received local anaesthetic infiltration. Outcome was assessed at 12 hours after injection of local anaesthetic.

**Results:** Pain in 7 (23.33%) patients in Group A (Pectoral nerve blocks) and in 20 (66.67%) patients in Group B (Local anaesthetic infiltration), *p*-value of 0.001 which was considered statistically significant. Mean analgesic requirement was found to be  $80 \pm 33.73$  mg in the Group A (pectoral nerve blocks) compared with  $141.67 \pm 47.50$  mg in Group B (Local anaesthesia infiltration) patients with a *p*-value of  $<0.001$  which was statistically significant.

**Conclusion:** Pectoral nerve block significantly reduces early postoperative pain and analgesia requirement when compared with Local anaesthesia infiltration after breast surgery.

**Keywords:** Breast cancer surgery, Local anaesthetic, Pectoral nerve blocks, Post-operative pain.

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### INTRODUCTION

Analgesia is a significant domain of perioperative anaesthetic management and acute postoperative pain control results in poor surgical outcomes leading to prolonged hospital stays and patient dissatisfaction.<sup>1</sup> Opioids and non-steroidal anti-inflammatory drugs, being components multimodal analgesic ladder, provide effective analgesia, however, they have significant adverse effects profile, especially having limitations in the pediatric and geriatric age group. Therefore, administration of local anaesthetics in epidural space is emerging on account of early mobilization, suppressing stress response and early post-operative recovery.<sup>2</sup>

Post-operative pain is the most common complication of any surgery. Soomer *et al.* stated 41% prevalence of moderate to severe pain after surgery despite of following acute pain protocols. Inadequately treated, acute postoperative pain may progress to chronic post-surgical pain (CPSP).<sup>3</sup> Prevalence of chronic post-surgical pain is stated to be 14.8% in patients after general surgery.<sup>4</sup>

Breast cancer is the commonest carcinoma among

women with a prevalence of 1 in 9 women in Pakistan becoming a victim of this disease.<sup>5</sup> Modified radical mastectomy (MRM) is a common surgical procedure performed for breast cancer cure. Lumpectomy with axillary lymph nodes dissection can be performed in certain cases. Extensive dissection is painful postoperatively and may result in acute neuropathic pain. Acute neuropathic pain after mastectomy left undertreated can develop into Post mastectomy pain syndrome (PMPS). The prevalence of PMPS has been reported to range from 20-68% in patients of MRM.<sup>6,7</sup>

Various regional techniques have been used to manage post-operative pain after mastectomy including multimodal analgesia, Local anaesthesia infiltration, intercostal nerve blocks, paravertebral nerve blocks and thoracic epidural.<sup>8</sup> Local Anaesthetic Infiltration and multimodal analgesia are routinely employed to treat post-operative pain in our set up.

The pectoral nerves block considered less invasive and novel technique which involves pectoral, intercostobrachial, intercostal and long thoracic nerves block for provision of adequate pain relief in acute post-operative period.<sup>9</sup> Bashady *et al.*, stated that postoperative Morphine requirement was significantly less in the Pectoral nerve block group ( $2.9 \pm 1.714$  mg) compared to the control group ( $6.9 \pm 1.861$  mg). 12 out of 60 (20%)

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in pectoral nerve blocks group and 36 out of 60 (60%) in the control group had post-operative pain, therefore statistically significant difference was observed ( $p < 0.001$ ).<sup>10</sup> They are reportedly very safe with no complications in the acute postoperative period. In our study we compared post-operative analgesia following use of Pectoral nerve blocks and compared it with Local anaesthesia infiltration as recommended in qualitative systemic review of Pectoral nerve blocks.

## METHODOLOGY

Comparative prospective study conducted at Combined Military Hospital, Rawalpindi, from March 2018 to September 2019. Permission from the hospital ethical committee (04A/03/2018) was obtained. A written informed consent was taken from patients enrolled in the study after explaining the purpose of study along with the advantages and disadvantages of each technique used. Patients were selected from the General Surgery OPD and Pre Anaesthesia Clinic.

**Inclusion Criteria:** Female patients, American Society of Anesthesiologists (ASA) status I and II, with normal coagulation profile and age range between 18 to 65 years were included.

**Exclusion Criteria:** Patients with Basal Metabolic Index (BMI) greater than 35, metastatic carcinomas, recurrent carcinoma of the breast who have undergone breast, history of other major pectoral region or chest wall surgery, infection at site of injection, history of allergy to local anaesthetics and pregnancy were excluded.

Study population was divided into two equal groups. The sample size was calculated to be 30 in each group, with a significance level ( $\alpha$ ) 5%, power of the test ( $1-\beta$ ) was 95%, anticipated population proportion P1-20% 10 and P2-60%.<sup>10</sup> Non-probability consecutive sampling technique was used.

Patients in Group A received pectoral nerve blocks whereas Group B received Local Anaesthetic Infiltration. General Anaesthesia was induced by using Propofol (2-2.5 mg/kg), Nalbuphine (0.1 mg/kg) as per standard premedication and induction protocols followed by maintenance with Isoflurane 1-2 MAC. Mastectomy was performed by Consultant Breast Surgeon on all patients. At the start of surgery, patients in group A were given pectoral nerve blocks under ultrasound guidance. Local Anaesthetic was injected at interfascial plane of pectoralis major and minor targets the lateral and median pectoral nerves.<sup>11</sup> Local Anaesthetic was also administered at interfascial plane of

pectoralis minor and serratus anterior to block pectoral, intercostobrachial, intercostals (III-VI) and long thoracic nerve.<sup>12</sup> 10ml of 0.25% bupivacaine in superficial pectoral nerve block and 20ml of 0.25% bupivacaine in deep pectoral nerve block was administered. All patients in group-B were given 30ml of 0.25% Bupivacaine as local anaesthesia infiltration around the wound margins by the surgical team towards surgery end. The dose of Bupivacaine did not exceed 2 mg/kg body weight. Postoperative analgesia in the form of 50 mg IV boluses of tramadol was administered strictly on patient demand. Postoperatively pain was surveyed with a Visual Analogue Scale (VAS) at 12 hours after surgery. VAS is a psychometric response scale for the estimation of reaction of emotional attributes of agony that cannot be estimated directly. In this scale subjects react to their degree of torment by demonstrating a situation on a ceaseless line between two endpoints (Figure).<sup>13</sup>

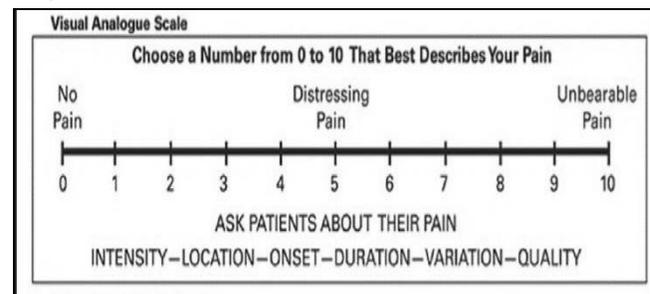


Figure: Visual analogue scale<sup>13</sup>.

Maximum dose of tramadol did not exceed 300 mg in 24 hours. Tramadol was recruited as postoperative analgesia on account of ease of availability, confidence of inpatient facility staff in drug administration and better adverse effect profile. Outcome was assessed at 12 hours after injection of Local Anaesthetic.

Data was analyzed using Statistical Package for the social sciences (SPSS) version 23. For Qualitative, variables like no pain, frequency and percentages were used to measure frequency between two groups. For quantitative variables like analgesic consumption and age, mean and standard deviation (SD) were calculated. Independent sample t-test was used to compare analgesic consumption in both groups. Chi-square test was used to compare the frequency of pain between two groups. The  $p$ -value less or equal to 0.05 was considered significant.

## RESULTS

Total sixty participants were enrolled in the study with equal distribution into two groups A (Pectoral nerve blocks) and B (Local anaesthesia infiltration).

Patients were of age range from 18-65 years with a mean age being of  $41.45 \pm 11.06$  years (Table-I). Out of these 60 patients, 26 (43.33%) were ASA I and 34 (56.67%) were ASA II. Mean BMI was  $28.47 \pm 3.12$  kg/m<sup>2</sup>. The mean BMI in group A was  $28.27 \pm 3.19$  kg/m<sup>2</sup> and in group B was  $28.67 \pm 3.08$  kg/m<sup>2</sup>. Pain was found in 7 (23.33%) patients in group A whereas 20 (66.67%) group B ( $p$ -value=0.001), statistically significant (Table-II). Mean analgesia requirement (Intravenous Tramadol) was found to be  $80 \pm 33.73$  mg in the group A (Pectoral nerve blocks) compared with  $141.67 \pm 47.50$  mg in group B (Local anaesthesia infiltration) patients with  $p$ -value <0.001 (Table-III).

**Table-I: Participants' age distribution (n = 60).**

Age (years)	Group A (n=30)	Group B (n=30)
	Frequency (%)	Frequency (%)
18-40	14 (46.67%)	12 (40.0%)
41-65	16 (53.33%)	18 (60.0%)
Mean $\pm$ SD	$40.50 \pm 11.18$	$42.40 \pm 11.05$

**Table II: Comparison of pain (n=60).**

		Group A (n=30)	Group B (n=30)	$p$ -value
Pain	Yes	07 (23.33%)	20 (66.67%)	
	No	23 (76.67%)	10 (33.33%)	

**Table-III: Mean post-operative analgesia requirement.**

Group A (n=30)	Group B (n=30)	$p$ -value
Analgesia Requirement	Analgesia Requirement	
Mean $\pm$ SD	Mean $\pm$ SD	<0.001*
$80 \pm 33.70$	$141.67 \pm 47.49$	

## DISCUSSION

Pectoral nerve blocks and serratus plane blocks are newer regional anaesthesia modalities based on ultrasound guidance for pain relief in the surgeries of the thoracic region. Pectoral nerve block I targets medial and lateral pectoral nerves, innervating pectoralis muscles. In Pectoral nerve block II, a second injection is administered lateral to the Pectoral nerve block I anaesthetize intercostal nerves, administered in the plane between the pectoralis minor and serratus anterior muscles. Employed primarily for breast surgery, however, can be effectively used following thoracotomy and rib fracture.<sup>14</sup>

Wahba *et al*, in their study concluded that pectoral nerve block provides longer duration analgesia with reduced requirement of morphine, compared with thoracic paravertebral block. Used 30 ml dosage of local anaesthetic in the pectoral nerve block whereas infiltrated 15-20 ml thoracic paravertebral block at T4 level. However, due to relatively less dosage of local anaesthetic (Levobupivacaine 0.25%) morphine was consumed considerably higher amount over 24 hours being

20-25 mg in Pectoral nerve block group and 22-31 mg in thoracic paravertebral block group.<sup>15</sup>

El-Sheikh *et al*, analyzed thoracic paravertebral block with Pectoral nerve blocks as pain management modality of breast surgery, and they concluded that there was the decreased requirement of intraoperative fentanyl in Pectoral nerve blocks group as compared with Thoracic vertebral block group. Moreover, the first dose of morphine was also reported to be delayed in Pectoral nerve block group.<sup>16</sup>

Yuki *et al*, used 0.25% levobupivacainepectoral nerve block versus general anaesthesia in carcinoma breast surgery. They concluded that fentanyl was consumed in significantly lower concentration over a period of 24 hours in the Pectoral nerve group than General anaesthesia group.<sup>17</sup>

Kulhari *et al*. determined the efficacy of pectoral nerve block versus thoracic paravertebral block as pain relief modality post breast surgery. They stated that participants were managed without fentanyl administration intraoperatively. As per their study, 60% nitrous oxide in oxygen and 0.5% ropivacaine in Pectoral nerve block and thoracic paravertebral block at T2-T3 levels provide improved analgesic efficacy without fentanyl consumption.<sup>18</sup>

Morioka *et al*. studied pain scores over a period of 48 hours postoperatively retrospectively, which were comparatively less in total intravenous anaesthesia augmented with Pectoral nerve block.<sup>19</sup>

It is recommended that pectoral nerve blocks should be used preferably in preventing postoperative pain after modified radical mastectomy to reduce the patient's morbidity.

## CONCLUSION

Pectoral nerve blocks significantly reduce early post-operative pain and analgesic requirement as compared to local anaesthesia infiltration after breast cancer surgery.

**Conflict of Interest:** None.

## Authors' Contribution

US: Conception, resarach analysis, data collection & manuscript draft, RI: Supervisor, SA: Research analysis, data collection & manuscript draft, MRH: Data collection.

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