

Comparison of Analgesic Efficacy of Thoracic Erector Spinae Plane Block Versus Pectoral Block in Patients Undergoing Mastectomy

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ABSTRACT

Objective: to assess the Analgesic efficacy of single-shot ultrasound guided Pectoral Block-II and Thoracic Erector Spine Plane Block were evaluated for postoperative pain in breast surgery.

Study Design: Quasi-experimental study.

Place and Duration of Study: Combined Military Hospital, Rawalpindi Pakistan, from Mar to Aug 2022.

Methodology: We enrolled 68 female patients in this study, who were between 25-55 years of age, booked for unilateral mastectomy and classified as American Society of Anesthesiologists I and II. They were divided randomly into two groups, where Group-M (n=34) received ultrasound guided Pectoral II Block and Group-N (n=34) received ultrasound guided Erector Spine Plane Block, with 25ml of 0.25% bupivacaine used in both groups. Pain was measured postoperatively by Visual Analog Scale for pain and 1g intravenous paracetamol was given 8 hourly with rescue pain-relieving Nalbuphine used if the score was greater than 4.

Results: Postoperatively nalbuphine consumption was found to be considerably less in patients on whom ultrasound guided Pectoral II Block was given compared to Group-N, while mean analgesia requirement was found to be 0.05 ± 0.07882 mg/kg in Group-M compared with 0.1118 ± 0.01 mg/kg in Group-N with *p*-value less than 0.007, which was statistically significant.

Conclusion: Ultrasound Guided Pectoral II Block is more significantly effective in female patients for relieving pain especially after having undergone unilateral mastectomy.

Keywords: Mastectomy, Opioids, Regional Anesthesia, Ultrasound Imaging, Visual Analogue Scale.

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INTRODUCTION

The occurrence of breast cancer has significantly increased among female population¹ with 1 out of every 9 women at risk of being diagnosed with this disease in her lifetime² with lifestyle, genetic makeup and environmental factors causing this risk to rise globally.³ Post-breast surgery, persistent chronic pain can lead to anxiety, depression and low quality of life with almost 55% of patients experiencing chronic pain if adequate analgesia is not provided.^{4,5} Breast surgery is a very challenging procedure as the breast has a complex nerve supply due to which providing adequate analgesia can be difficult peri-operatively.⁶ With regional blocks, lesser perioperative opioids are required with low risk of postoperative nausea or vomiting (PONV) and chronic pain, leading to faster recovery.^{7,8} Thoracic neuropathic pain can be treated very effectively by an inter-fascial plane block called the Erector Spinae Plane Block (ESP).⁹ As local anesthetic spreads cranio-caudally in erector spine

plane, which is a space deep to iliocostalis, longissimus, and spinalis muscles, paralleling and extending from nuchal fascia to the sacrum, the local anesthetic then passes over the costo-transverse foramina and effectively blocks dorsal and ventral rami of spinal nerves and rami communicants.^{10,11} Thus, the rationale of this study was to determine if PEC-II block is more effective than ESP block, in terms of perioperative pain relief, for patients undergoing modified radical mastectomy.

METHODOLOGY

This quasi-experimental study was carried out at Combined Military Hospital (CMH), Rawalpindi Pakistan, from March to August 2022, after attaining the approval of our institutional Ethics Committee, vide certificate number 1087. We enrolled 68 female patients who were allocated randomly into two groups, after obtaining their informed consent.

Inclusion Criteria: Female patients, aged between 25 to 55 years, with ASA status I and II, planned for unilateral mastectomy under general anesthesia (GA) and no history of coagulopathy, were included.

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Exclusion Criteria: Patients with previous history of chest wall surgery, injection site infection, morbid obesity, history of chronic pain, psychiatric ailment and emergency surgery were excluded.

The patients were assessed by a qualified anesthesiologist in the pre-anesthesia check-up clinic with surgical procedure and regional block technique explained to the patients and written informed consent was obtained. Group-M patients were given PEC II Block and Group-N was given ESP Block 30 minutes before surgery with sensory block levels judged by the researcher by means of pinprick after 15 minutes of administration of block. The effectiveness was evaluated for 30 minutes after administration and if found ineffective then excluded. The patients were pre-medicated with midazolam 0.03mg/kg, ondansetron 8mg IV, after which general anesthesia was induced with propofol 2.5mg/kg, and atracurium 0.5mg/kg with patients intubated and maintenance on volume-controlled mode with 50% oxygen and 1.2 minimum alveolar concentration of isoflurane. Nalbuphine 0.1mg/kg was given to patients who had a sympathetic response during surgical procedure with 1g IV paracetamol given at the closing time of incision and 8 hourly during postoperative period. Patients were shifted to a high-dependency unit (HDU) or intensive care unit (ICU) depending on their pain which was assessed postoperatively via VAS and if VAS score was more than 4, Nalbuphine 0.1mg/kg was given. Nalbuphine consumption and PONV was noted for 24-hours postoperatively.

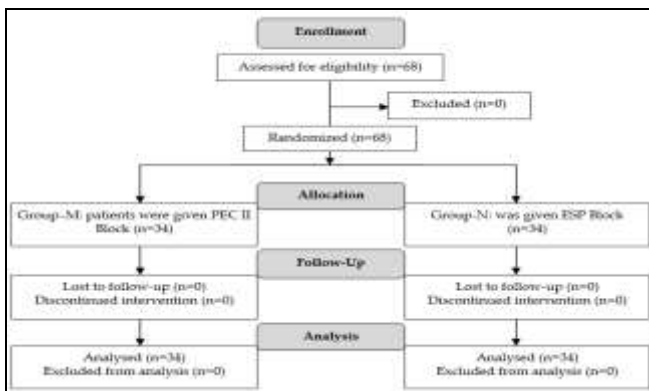


Figure: Patient Flow Diagram (n=68)

RESULTS

In this study, 68 patients were divided into two groups, labelled "M" and "N", and received PEC II and ESP Block respectively. Patients had a mean age of 50.47±4.06 years in Group-M and 50.02±4.05 years in

Group-N, as shown in Table-I. Mean BMI was 25.64±1.91 kg/m² in Group-M and 26.46±3.44 kg/m² in Group-N. Mean IV Nalbuphine for pain relief was found to be 0.05±0.07882 mg/kg in Group-M compared with 0.1118±0.01779 mg/kg in Group-N patients with *p*-value <0.007, which was statistically significant, as shown in Table-II. In Group-M, 6(17.64%) out of 34 participants developed PONV while 8(23.52%) out of 34 participants in Group-N (*p*-value =0.549) developed the same, which was not statistically significant.

Table-I: Demographic Characteristics of Both Groups (Mean±Standard Deviation) n=(68)

Demographic Characteristics	Group-M (n=34)	Group-N (n=34)
Age (years)	50.47±4.06	50.02±4.05
Weight (kg)	65.58±6.21	65.55±8.39
Height (cm)	159.91±5.67	157.55±7.23
BMI (kg/m ²)	25.64±1.91	26.46±3.44

n=Number of patients, Data are in mean±SD, BMI=Body mass index, SD=Standard deviation.

Table-II: Use of Opioid in 24-hours in Both Groups (n=68)

Drug (Opioid)	Group-M (n=34)	Group-N (n=34)	<i>p</i> -value (≤0.05)
Nalbuphine dose (mg/kg)	0.05±0.07882	0.1118±0.01	0.007

DISCUSSION

The important contributor for the quality and extent of block are concentration of drug, entry point level, and the volume of local anesthetic for the distribution of the block in dermatomes especially in many thoracic and abdominal surgeries, where ESP Block provides good pain relief^{12,13} while in PEC Blocks, the drug is infused in the middle of pectoralis major and minor and pectoralis minor and serratus anterior muscles.¹⁴ In our study, we noted decreased nalbuphine consumption, rescue analgesia, and less severe pain intensity with PEC II Block than ESP Block but no significant difference emerged as far as PONV was concerned. After breast cancer surgery, pain is caused by thoracodorsal and long thoracic nerves¹⁵ due to which PEC II provides good pain relief, superior to ESP Block, with lower pain scores and reduced use of opioids postoperatively.¹⁶ One study carried out on transgender patients undergoing breast surgery, noted postoperative pain and opioid use but found PEC II Block was superior to intercostal nerve block,¹⁷ similar to another study which found PEC II Block had longer duration of postoperative pain relief¹⁸ as local anesthetic (LA) volume is infused

around the surgical field in PECs Block¹⁹ but this problem was not encountered in our study, possibly due to lapse of more than 30 minutes in block application and start of surgery causing absorption of LA. Thoracic paravertebral blocks decrease the chances of post-mastectomy pain syndrome, but in unskilled hands there is risk of pneumothorax,^{20,21} as lungs and pleura can be inadvertently ruptured²² which makes ESP Block safer and pleural injury less likely²³ so the thoracic ESP Block, might replace thoracic paravertebral block (TPVB) as the regional anesthesia block for chest wall surgeries.²⁴ However, the PEC-II Block technique provided superior pain relief than the ESP Block.

LIMITATIONS OF STUDY

Our study had several important limitations. First, no blinding of patients was implemented in the study design. This lack of blinding means that patients were aware of their treatment group assignment, which could have introduced expectation bias. Patient expectations about their assigned treatment may have influenced their subjective pain reports and overall satisfaction scores, potentially affecting the validity of our outcomes. Second, our post-operative pain assessment was limited to only 24 hours after surgery. This relatively short follow-up period means we were unable to evaluate persistent post-surgical pain or identify any longer-term pain patterns that may have emerged. Some patients might have developed chronic post-operative pain or experienced different pain trajectories beyond the initial 24-hour window. The absence of extended follow-up data limits our understanding of the intervention's long-term effectiveness and any potential delayed complications or pain patterns that could have clinical significance.

CONCLUSION

USG PEC-II Block reduced postoperative nalbuphine consumption and pain scores more effectively than ESP Block after unilateral mastectomy surgical procedure.

Conflict of Interest: None.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

AA & GS: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

MRI & KHQ: Conception, data analysis, drafting the manuscript, approval of the final version to be published.

MI & TM: Data acquisition, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity

of any part of the work are appropriately investigated and resolved.

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