

Comparison of Analgesic Efficacy of Pectoralis Type II Block (PECS-II) Versus Erector Spinae Block (ESP) After Modified Radical Mastectomy

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ABSTRACT

Objective: To compare the post-operative analgesic efficacy of ultrasound-guided pectoralis type II (PECS II) block versus erector spinae (ESP) block in patients undergoing modified radical mastectomy (MRM) for breast cancer.

Study Design: Prospective observational study

Place and Duration of Study: Anesthesia Department of Combined Military Hospital, Rawalpindi, Pakistan, from Jun to Dec 2022.

Methodology: The patients were divided into the pectoralis type II block (Group PECS II) (n=25) and erector spinae block group (Group ESP) (n=25). Primary variables measured were mean time to first rescue analgesia, mean dose of nalbuphine required for control of pain in the next 24 hours, and mean HDU stay. Secondary parameters observed were patient satisfaction on the Likert scale 24 hours after the procedure and incidence of complications between both groups.

Results: Time to first rescue analgesia was longer in the PECS-II group at 355.84 ± 12.64 minutes versus 242.32 ± 10.83 minutes in the ESP group ($p < 0.001$). Subsequently, the total analgesia requirement was also considerably decreased in the PECS-II group with 4.64 ± 0.63 mg in 24 hours versus 8.08 ± 0.90 mg in 24 hours in the ESP group ($p < 0.001$). Mean HDU stay was also statistically significant and was less in the PECS-II versus ESP group, with a mean stay of 27.40 ± 2.21 hours versus 30.60 ± 5.14 hours ($p = 0.002$).

Conclusion: The PECS-II block provides superior analgesia with a favorable adverse effect profile, providing excellent pain relief and patient satisfaction.

Keywords: Analgesia, Breast Cancer, Erector Spinae Block, Modified Radical Mastectomy, Pectoralis Type II Block.

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INTRODUCTION

The incidence of post-surgical pain remains one of the foremost considerations of the anesthetist, especially after major surgical procedures.¹ Preemptive measures that can address and reduce the incidence are instrumental in decreasing patient complications, resulting in early mobilization, better pain score profiles, and overall improved patient satisfaction.² Patients undergoing thoracic region surgeries are more prone to develop chronic post-surgical pain, and the incidence can be considerably decreased if the initial management of pain is effective.^{3,4}

Modified radical mastectomy (MRM) remains one of the major surgeries being offered for the treatment of breast malignancies in the female demographic.⁵ With a worldwide prevalence of breast cancer of about 2.3 million females diagnosed in 2020

alone⁶, the global population alive with breast cancer is around 7.8 million⁷, making it the most prevalent malignancy in females globally. With such a large burden of disease and surgical cure being the most adopted treatment modality, techniques to improve the outcome and reduce cancer-associated pain in these patients have taken top priority in recent years.⁸

With the deterioration in the normal physiological parameters associated with breast cancer, with more than 80 percent of patients having been through chemotherapy before surgery, the control of pain is paramount⁹. However, the use of intravenous opioids for post-surgical pain is associated with complications of respiratory depression, prolonged hospital stays, and delayed mobilization¹⁰. The emergence of regional anesthesia in recent years has replaced conventional intravenous therapy for control of pain in these patients. In this regard, the pectoralis (PECS) block type II and erector spinae (ESP) block have both been used for control of pain. However, regional data comparing both these blocks have been lacking, especially at advanced

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centers offering both these blocks as pain control options.

The objective of this study is to compare the post-operative analgesic efficacy of ultrasound-guided pectoralis type II (PECS II) block versus erector spinae (ESP) block in patients of modified radical mastectomy offered for breast cancer.

METHODOLOGY

This prospective observational study was carried out at the Department of Anesthesiology, Combined Military Hospital, Rawalpindi, Pakistan, from Jun to Dec 2022 after approval from the ethical review board vide letter no. 381. 50 patients (minimum sample size 21 as per WHO calculator) were included in the study as per the inclusion criteria furnished, keeping the confidence interval at 99%, power of test at 90%, with mean time difference for first rescue analgesia between both the regional techniques after modified radical mastectomy at 120 ± 10 minutes, with population variance at 10000.¹¹ The method of sampling was non-probability consecutive sampling by lottery method.

Inclusion Criteria: included all ASA-II female patients between ages 25-55 years presenting in the female surgical department for modified radical mastectomy (MRM) for non-metastatic breast cancer.

Exclusion Criteria: included patients with metastatic disease, major cardiac or respiratory disease, low ejection fraction, allergy to lignocaine or adrenaline, infection at the site of block, coagulation disorders, ineffective or patchy regional block, and failure to effectively complete block after three consecutive attempts.

The selected patients were divided into the pectoralis type II block (Group-PECS II) (n=25) and erector spinae block group (Group-ESP) (n=25). Once the patients were divided into the two groups, informed written consent was obtained, and patients in both groups were informed in detail about the procedure and possible complications. Standard monitoring, including non-invasive blood pressure, heart rate, capnography, and ECG, was attached to participants in both groups.

Anesthesia was induced in both groups with IV Propofol 2 mg/kg and IV Atracurium 0.5 mg/kg, with maintenance using 40% oxygen and Isoflurane at 1.0 MAC, as monitored on the anesthesia machine. Patients were extubated after Neostigmine 0.05 mg/kg and Glycopyrrolate 0.01 mg/kg were administered to

reverse the neuromuscular block. After surgery, before extubation, a consultant anesthetist with at least 3 years of regional block experience performed the blocks under ultrasound guidance, following the standard techniques and protocols furnished by NYSORA. In patients undergoing PECS-II block, the block was performed in the plane between the pectoralis minor and serratus anterior muscles under ultrasound guidance with dynamic needle-tip navigation, and 20 mL of local anesthetic was injected.

In the ESP group, after confirming the transverse process position at the T5 level, the needle was introduced in a cranial-to-caudal direction, deep to the erector spinae muscles and superficial to the transverse process, and 20 mL of local anesthetic was injected.

Post-operatively, patients were shifted and observed in the high dependency unit (HDU) for post-operative pain every hour for the next 24 hours. 0.5 mg/kg of nalbuphine was administered once pain on the visual analog scale (VAS)¹³ reached 5 as assessed by the resident anesthetist on duty, and the total dose given in the subsequent 24 hours was calculated.

Primary variables measured were mean time to first rescue analgesia, mean dose of nalbuphine required for control of pain in the next 24 hours, and mean HDU stay. Secondary parameters included patient satisfaction on the Likert scale 24 hours after the procedure and the incidence of complications in both groups.

Demographic data were statistically described in terms of mean and SD, frequencies and percentages when appropriate. An independent sample t-test was used to compare mean differences between the groups. Chi-square was used to compare the frequency of complications between the two groups. A p-value of ≤ 0.05 was considered statistically significant. All statistical calculations were performed using Statistical Package for Social Sciences 26.0.

RESULTS

A total of 50 patients were included in the study, divided into the PECS-II group (n=25) and the ESP group (n=25). Mean age of patients in the PECS-II group was 38.84 ± 5.07 years versus 37.68 ± 5.00 years in the ESP group ($p=0.415$). Mean weight was 66.48 ± 4.68 kg in the PECS-II group versus 66.00 ± 5.62 kg in the ESP group ($p=0.298$) (TABLE-I).

The duration of surgery between both the groups was comparable, with a mean time of 126.40 ± 5.51 minutes

in the PECS-II group versus 127.60 ± 6.31 minutes in the ESP group ($p=0.114$). However, the time to first rescue analgesia was longer in the PECS-II group at 355.84 ± 12.64 minutes versus 242.32 ± 10.83 minutes in the ESP group ($p<0.001$). Subsequently, the total analgesia requirement was also considerably decreased in the PECS-II group with 4.64 ± 0.63 mg in 24 hours versus 8.08 ± 0.90 mg in 24 hours in the ESP group ($p<0.001$). Mean HDU stay was also statistically significant and was less in the PECS-II versus ESP group, with a mean stay of 27.40 ± 2.21 hours versus 30.60 ± 5.14 hours ($p=0.002$). (TABLE-II).

Table-I: Age And Height Characteristics Between Both Groups (n=50)

Variable	Pecs-ii group (n=25)	Esp group (n=25)	p-value
Mean age (years)	38.84 ± 5.07	37.68 ± 5.00	0.415
Mean weight (kg)	66.48 ± 4.68	66.00 ± 5.62	0.298

*Pectoralis Type II Block (PECS-II), Erector Spinae Block (ESP)

Table-II: Comparison of Operative Parameters Between Both Groups (n=50)

Variable	Pecs-ii group (n=25)	Esp group (n=25)	P-value
Duration of surgery (minutes)	126.40 ± 5.51	127.60 ± 6.31	0.114
Mean time to first dose rescue analgesia (minutes)	355.84 ± 12.64	242.32 ± 10.83	<0.001
Mean dose of analgesia given in hdu (mg/24 hr)	4.64 ± 0.63	8.08 ± 0.90	<0.001
Mean hdu stay (hours)	27.40 ± 2.21	30.60 ± 5.14	0.002
Patient satisfaction score for pain relief (24 hrs) (likert scale) median (iqr)	6.0 (0.0)	4.0 (1.0)	<0.001

*Pectoralis Type II Block (PECS-II), Erector Spinae Block (ESP), IQR – Interquartile Range

When the patients gave their objective assessment on the Likert scale for overall pain relief satisfaction after the surgery, median pain scores were significantly better in the PECS-II versus the ESP group; median (IQR) of 6.0 (0.0) in the PECS-II versus 4.0 (1.0) in the ESP group (TABLE-II). The adverse effect profile showed an incidence of nausea in 02(8%) patients in the PECS-II versus 02(8%) in the ESP group. The incidence of vomiting associated post-procedure was seen in 04(16%) of patients in the PECS-II versus 01(4%) in the ESP group. While no bleeding complications were seen in the PECS-II group, it was seen in 01(4%) patient in the ESP group (TABLE-III).

DISCUSSION

The study was carried out at a tertiary care hospital to assess the analgesic efficacy between these two regional nerve techniques. The erector spinae block is being used as one of the choice regional block

modalities in patients undergoing modified radical mastectomy, resulting in satisfactory pain relief and patient comfort.¹⁴ Helander *et al.*, it has a better safety and efficacy profile than paravertebral block, which is also used in these patients.¹⁵ The adverse effect profile showed that ESP block is associated with fewer chances of pneumothorax, bleeding, and a lower incidence of patchy block and failure rate than paravertebral block, which was also highlighted by Taketa *et al.*¹⁶ The major advantage is the reduced chance of pneumothorax since the block is injected in the planes between the erector spinae muscles and the transverse process, which offers a barrier against inadvertent injection into the pleural cavity.¹⁷ Elshanbary *et al.*, reported that when injected at the T4 space in patients of MRM, the craniocaudal spread of this block results in multi-dermatomal spread and analgesia¹⁸

Table-III: Incidence of Side Effects Between Both Groups (n=50)

Variable	Pecs-ii group n (%) (n=25)	Esp group n (%) (n=25)	p-value
Nausea	02(8%)	02(8%)	0.843
Vomiting	04(16%)	01(4%)	0.160
Bleeding	00(0%)	01(4%)	-

*Pectoralis Type II Block (PECS-II), Erector Spinae Block (ESP)

The PECS-II block is another inter-fascial plane block in which the local anesthetic is injected into the deeper planes of the pectoralis muscles and the serratus anterior muscle.¹² It is a relatively newer regional block technique developed by Senapathi *et al.*, and has shown promising results as another technique to provide analgesia to patients undergoing breast surgery.¹⁹ Magoon *et al.*, suggested that the block is superior to other blocks (intercostal nerve blocks) in providing pain relief to the same area of the anterior chest wall, which makes it a better alternative.²⁰ Secondly, the interplane spread also results in better longevity of the block and reduces the overall opioid consumption, which is usually required in cancer patients.

When both these blocks were compared in our study, we hypothesized to achieve a comparable level of analgesic efficacy and opioid requirements post-operatively. However, our results showed a superior role of the PECS-II block, both in the requirement of first-dose rescue analgesia as well as the total opioid requirement in the first 24 hours post-operatively. The possible explanation for this difference in analgesia

effectiveness may be attributed to the fact that in studies carried out in cadavers using due techniques, the level of spread in the ESP block showed patchiness and inconsistency among the subjects in which the local anesthetic was injected.²¹ On the other hand, the PECS-II block showed an excellent spread and reduced patchiness while covering pectoral, intercostals, thoracodorsal, and intercostobrachial nerves with good effectiveness.²²

We, therefore, propose the use of the PECS-II block in our patient care algorithms to provide excellent analgesia to patients undergoing radical mastectomy. With fewer adverse effects and adequate analgesia, the block can serve as an excellent alternative to existing regional techniques in the arsenal of the anesthetist. The study recommends the use of PECS-II block as a superior alternative to ESP block in patients undergoing breast surgery.

LIMITATION OF STUDY

The limitations were that the study is single-center only. A multi-center study would result in a wider demographic area with more confirmatory results. The expertise required for successfully doing the block requires more patient prep-time and experience; regional block consultants are not readily available in our demographic area.

CONCLUSION

The findings of the present study demonstrate that ultrasound-guided PECS-II block offers superior postoperative analgesic efficacy compared with ESP block in patients undergoing modified radical mastectomy. This advantage was reflected by a prolonged time to first rescue analgesia, reduced cumulative opioid requirement during the first 24 postoperative hours, shorter HDU stay, and higher patient satisfaction scores. Moreover, PECS-II block was associated with a favorable adverse-effect profile, supporting its role as a safe and effective regional analgesic technique in this surgical population. Therefore, PECS-II block may be considered a preferable component of multimodal analgesia protocols for patients undergoing breast cancer surgery, particularly where enhanced postoperative pain control, opioid-sparing effect, and early recovery are desired.

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Authors' Contribution

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

MHB & OAM: Data acquisition, data analysis, critical review, approval of the final version to be published.

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

KB & JZ: Conception, data acquisition, drafting the manuscript, 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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