Ultrasound-Guided Modified Pectoral Nerve Block Versus Erector Spinae Plane Block for Perioperative Analgesia in Unilateral Breast Cancer Surgery

Hind Abd El-Fattah Salah, Hala Abd El-Sadek El-Attar, Samia Mohammed Masoud, Marwa Mahmoud Abdallah Zakzouk

Department of Anesthesia, Intensive Care and Pain management, Faculty of Medicine, Zagazig University, Egypt

Corresponding author: Hind Abd El-Fattah Salah
Email: hindsalah1111@gmail.com, **Mobile:** 01066315271

Article History: Received: 12.06.2023 **Revised:** 09.07.2023 **Accepted:** 17.07.2023

Abstract:

Background: Ultrasound-guided modified pectoral nerve block and erector spinae plane block are simple regional techniques that can be used as perioperative analgesia to decrease the consumption of opioids so decrease their side effects as well as devoid of complications of other regional techniques.

Aim: To evaluate and compare between ultrasound-guided modified pectoral nerve block and erector spinae plane block for perioperative analgesia in unilateral breast cancer surgeries.

Methods: This prospective, controlled research was conducted in Zagazig University Hospitals on 36 female patients aged between 21 and 60 years, with ASA class (I, II), scheduled for elective unilateral modified radical mastectomy under general anesthesia (GA). Patients were randomly allocated into three equal groups: group C(control group) (n=12):Patients received only GA, group P (n=12):Patients received unilateral ultrasound-guided modified pectoral nerve block before induction of GA and group E (n=12): Patients received unilateral ultrasound-guided erector spinae plane block before induction of GA.

Results: There was statistically significant increase in total intraoperative fentanyl and postoperative pethidine consumption in control group compared to group P and E. Visual analogue scale was higher in control group compared to group P and E at different time intervals and higher in group E than group P at 4, 8 and 12 hours but with no significant difference between group P and E 30 min after the operation, 2, 18 & 24 hours postoperatively. There was significant delay in 1st time to rescue analgesia in group P > group E > control group.

Conclusion: Ultrasound-guided modified pectoral nerve block provides more duration of analgesia and better pain scores with lesser amount of opioid requirement in comparison with

ultrasound-guided erector spinae plane block in the first 24 h after unilateral breast cancer surgeries.

Keywords: Modified Pectoral Nerve Block, ESPB, Breast Cancer.

DOI: 10.53555/ecb/2023.12.1164

Introduction

Worldwide, breast cancer is the most frequent cancer that affects women. Although surgery is the main treatment for breast cancer, 40% of women who undergo breast cancer surgery experience acute postoperative pain and up to 60% develop persistent pain after surgery **(1).**

Multimodal analgesia can control postoperative pain and reduce complications of using single mode of analgesia. Reliance on opioid analgesia only, increases the incidence of side effects of opioids, such as respiratory depression, nausea and vomiting. Local anesthetic (LA) block could be a good alternative to excessive used opioids **(2).**

Many analgesic techniques, such as multiple intercostal nerve blocks, thoracic epidural block, thoracic paravertebral block (TPVB), and local anesthetic infiltration, have been shown to attenuate the acute postoperative pain after breast surgery but those techniques have disadvantages include hypotension, dural puncture, epidural hematoma and pneumothorax **(3).**

Pectoral nerve (PECS) block, which Blanco introduced it in 2011 as a novel interfascial plane block between the pectoralis major and minor muscles, blocks the medial pectoral nerve (C8, T1) and lateral pectoral nerve (C5,6,7) to provide analgesia to the anterior chest wall. This block later became known as PECS I block **(4).**

In 2012, **Blanco et al** introduced modified pectoral nerve (PECS II) block as the local anesthetic (LA) is administered between the pectoralis major and minor muscles then another injection is administered between the pectoralis minor and the serratus anterior muscle. This modification aimed to block thoracic intercostal nerves (T2-6) including intercostobrachial nerve and long thoracic nerve (C5-C7) to extend analgesia to the axilla **(5).**

Forero et al. (6) described regional anesthetic approach known as erector spinae plane block (ESPB). It was first described for treating thoracic neuropathic pain. In this block, the LA instilled in the interfascial plane between the transverse process of the vertebra and the erector spinae muscles, spreading to multiple paravertebral spaces **(7).**

Aim of the work

To evaluate and compare between ultrasound-guided modified pectoral nerve block and erector spinae plane block for perioperative analgesia in unilateral breast cancer surgeries.

The primary outcome:

The primary outcome is the duration of the block.

The secondary outcomes:

The total amount of intraoperative fentanyl and postoperative pethidine consumption, pain intensity for 24 hs postoperatively, first time to rescue analgesia postoperatively and incidence of side effects

Patients and Methods

This prospective, randomized, controlled clinical research was conducted in oncological surgery operating rooms of Zagazig University Hospitals from April 2020 to December 2022 after approval from Institutional review board (IRB) (number 5879) and patient informed written consent.Thirty six female patients aged between 21 and 60 years, with ASA class I, II (American society of anesthesiologists physical status), Body mass index (BMI) < 35 kg/m², scheduled for elective unilateral modified radical mastectomy under general anesthesia were included in the study.

Exclusions from the study included patients with a history of clinically significant heart, liver, kidney, or neurological conditions; uncooperative patients; long-term opioid use; contraindications to regional anesthesia, such as allergies to local anesthetics; coagulopathy or septic focus at the injection site; surgery lasting longer than three hours; and presence of distant metastases (lung and bone).

Withdrawal criteria: The patient had the right to withdraw from the study at any time without any negative consequences on her medical or surgical treatment plan.

Patients were randomly allocated into three equal groups using computer generated randomization tables: group C (control group) (n =12): Patients received only general anesthesia (GA), group P (n=12): Patients received unilateral ultrasound-guided modified pectoral nerve block before induction of general anesthesia and group E (n=12): Patients received unilateral ultrasound-guided erector spinae plane block before induction of general anesthesia.

Steps of performance:

A. Preoperative day:

Interviews with each of the participating patients took place at the preoperative clearance visit. Their agreement was obtained after discussion of the study's objectives and endpoints. The ten-centimeter visual analog scale (VAS), which ranges from 0 (no pain) to 10 (the worst pain imaginable), was well-known to the patients **(8).** The patient was instructed to indicate on this line where their level of pain was. The numerical distance between the patient's mark and the point of no pain represents the intensity of pain.

Preoperative evaluation was conducted routinely on all patients, including a complete blood count (CBC), general examination, coagulation profile (PT, PTT, INR), liver function tests, kidney function tests, random blood glucose, and electrocardiography (ECG) if necessary to assess the patients' medical status and identify any exclusion criteria. Prior to the procedure, every patient was required to fast for at least six hours.

B. Operative day:

On entering the operation room, all patients had routine monitoring using pulse oximetry, non-invasive arterial blood pressure (NIBP), and electrocardiography (ECG). Heart rate (HR), peripheral oxygen saturation, and mean arterial blood pressure (MAP), were recorded preoperatively as baseline data.

A 18 gauge intravenous (IV) cannula was placed on the contralateral side of the procedure, and ringer solution was started at a rate of 10 ml/kg. Supplemental O^2 was administered at 6–8 L per minute using face mask. All the patients were pre-medicated using midazolam 0.03 mg/ kg IV.

Equipment for the block: High frequency linear probe (10–15 MHz) of LOGIQ ER8 ultrasound, skin gel, 22gauge short bevel needle, 20 ml syringe, bupivacaine 0.5% vial, normal saline, disinfectant, gauze and plaster.

Group P: Ultrasound-guided modified pectoral nerve block group:

Before induction of anesthesia, the patient was placed in supine position with the ipsilateral upper limb abducted 90°. The probe was positioned beneath the lateral third of the clavicle. the following structures should be identified (subcutaneous tissue, pectoralis major muscle (PMM), pectoralis minor muscle (pmm) and pleura) from superficial to deep. In between PMM and pmm, there was thoracoacromial artery.

Under complete aseptic circumstances 22gauge needle was inserted in the plane view of the ultrasound probe to target the interfascial plane between the pectoralis major and minor muscle, then 10 mL of bupivacaine 0.25% was deposited after frequent negative aspiration with direct visualization of its spread between the two muscles. Then the probe was moved inferolaterally towards the axilla, and when the serratus anterior muscle was identified above the third and fourth ribs, 20 mL of bupivacaine 0.25% was administered between the pectoralis minor and the serratus anterior muscle after frequent negative aspiration with direct visualization of its spread between the two muscles **(5)**.

Group E: Ultrasound-Guided Erector Spinae Plane Block Group:

Before induction of anesthesia, the patient was placed in sitting position. The spine was palpated from C7 downward to T5 and point marked to identify the spinous process. The probe was placed 3 cm lateral to the T5 spinous process. The three muscles were recognised from outward trapezius, rhomboidus major and erector spinae muscle. Under complete aseptic

conditions 22gauge needle was inserted in-plane superior to inferior approach to place the tip into fascial plane on the deep aspect of the erector spinae muscle and 20 mL of 0.25% bupivacaine was injected deep to the erector spinae muscle at the tip of the transverse process of the vertebra after frequent negative aspiration with direct visualization of its spread **(6)**.

Time of performance of each block was recorded (from end of skin sterilization till end of local anesthetic injection).

Then sensory block was assessed in both regional groups over 20 minutes after local anesthetic injection by pin prick on skin dermatomes on the side of the block and the patients reported the sensation of cold verbally as present or absent. Onset of sensory block was recorded {it is the time from the moment of administration of the local anesthetic to the moment at which complete sensory blockade in the dermatomal area supplied by (T1-T8)}. The block was considered failed if the dermatomes supplied by (T1-T8) did not have analgesia after 20 minutes of drug injection. After 20 min from injection of LA the patient received general anesthesia. Total duration of the block was recorded (it is the time between onset of sensory block to the first report of postoperative pain at the surgical site that is VAS $\geq$ 4, with first analgesic requirement by the patient).

Complications from the block in the form of pneumothorax, vascular puncture or LA systemic toxicity were recorded.

Group C (control group): Patients received general anesthesia only.

General Anesthesia Technique: It was the same for all patients in the three groups.

After three minutes of 100% oxygenation via face masks, induction and intubation was done using IV fentanyl (1 µg/kg), propofol (2 mg/kg), and cis-atracurium (0.15 mg/kg). An appropriate-sized endotracheal tube was utilized to intubate the trachea. Volume-controlled mechanical ventilation was used to keep the patients' end-tidal carbon dioxide levels between 35 and 40 mmHg. 100% oxygen was used to maintain anesthesia, and the inhalational agent's concentration was titrated to an appropriate depth of anesthesia (1.2% isoflurane). Additional doses of cis-atracurium (0.04 mg/kg) were administered every 20 min.

Each patient received the calculated required amount of fluids taking in consideration any blood loss. HR and MAP were recorded at baseline, during intubation, during the surgical incision, after 20 minutes, and then every 10 minutes until the procedure was completed. IV fentanyl 0.5–1 µg/k was given for any intraoperative increase in HR or MAP above 20% of baseline. The total amount of IV fentanyl required during the procedure was calculated and recorded for each group.

At the end of the procedure, isoflurane was stopped, and neuromuscular blockade was reversed with intravenous neostigmine (0.05 mg/kg) and atropine (0.02 mg/kg) and the patient was extubated,

Postoperative:

After surgery, patients were transferred to the Post Anesthesia Care Unit (PACU). Postoperative, all patients were given paracetamol intravenously (IV) at a dose of 1 gram every 8 hours (hrs) as standard analgesic (maximum dose 4 gm/day).

They were monitored for pain intensity using VAS score at 30 min after the operation then, at 2, 4, 8, 12, 18 and 24 hrs postoperatively both at rest and during movement. When VAS score was ≥4, incremental doses of 20 mg of pethidine was administered intravenously.

When the patients met the standard criteria for discharge (modified Aldrete score of 9 or higher), they were transferred from the PACU to the ward **(9).**

For the first 24 hours after surgery, hemodynamic parameters, HR and MAP, were recorded every two hours. First-time to rescue analgesia (the time between a patient's admission to the PACU until VAS ≥4) and the total amount of IV pethidine consumption in the 24 hours after surgery were recorded.

Incidence of side effects of opioid usage were recorded as follow:

a) **Sedation:** was assessed postoperatively using a categorical scoring system (0 = awake and alert, 1 = quietly awake, 2 = asleep but easily aroused, 3 = deep sleep) **(10).**

b) **Postoperative nausea and vomiting (PONV):** was measured using a categorical scoring system (0= none, 1 = mild, 2 = moderate, 3 = severe) **(11).**

Ondansetron (4 mg) was administered intravenously in case of reported nausea and/or vomiting. Incidence of attacks of (PONV), number of patients and doses of ondansetron taken by the patients in the first 24 hrs postoperatively were recorded.

c) **Respiratory depression:** respiratory rate < 8 breath/min (treated with O2 therapy and mechanical ventilation).

d) **Hypoxia:** spo2 < 90% on room air (treated with 100% O2).

Patients satisfaction using satisfaction score (1= dissatisfied, 2= good or satisfied, 3= excellent or very satisfied) was recorded **(12)**.

Sample size:

Assuming that mean ± SD of duration of the block in hours was 6 ± 1.47 in erector spinae plane block group versus 7.26 ± 0.69 in modified pectoral nerve block group **(13),** so the sample size was 36 (12 in each group) using open EPI program with test power 80%, CI 95%.

Statistical analysis

Statistical analysis was done by SPSS v28 (IBM©, Armonk, NY, USA). The Shapiro-Wilks test and histograms were used to evaluate the normality of the distribution of data.

Quantitative parametric data were presented as mean and standard deviation (SD) and were analyzed by analysis of variance (ANOVA (F) test with post hoc test (Tukey).

Quantitative non-parametric data were presented as median and interquartile range (IQR) and were analyzed by Kruskal-Wallis test with Mann Whitney-test to compare each group.

A paired sample t-test is a statistical technique that is used to compare two population means in the case of two samples that are correlated.

Qualitative variables were presented as frequency and percentage (%) and were analysed utilizing the Chi-square test.

A two tailed P value < 0.05 was considered statistically significant.

Results:

Forty female patients scheduled for unilateral modified radical mastectomy under general anesthesia were enrolled in this study. Four patients were excluded from the study: one patient with age > 60years, one patient had BMI >40 Kg/m², one patient had chronic opioid consumption and one suffered from psychiatric disorder. The remaining thirty six patients were allocated into the study groups. These patients were randomly allocated by a computer-generated table into one of the three study groups; control group received general anesthesia only, group P received unilateral ultrasound-guided modified pectoral nerve block before induction of general anesthesia and group E received unilateral ultrasound-guided erector spinae plane block before induction of general anesthesia. All the 36 patients participated in the study completed the study as shown in the study flow diagram **(fig.1).**

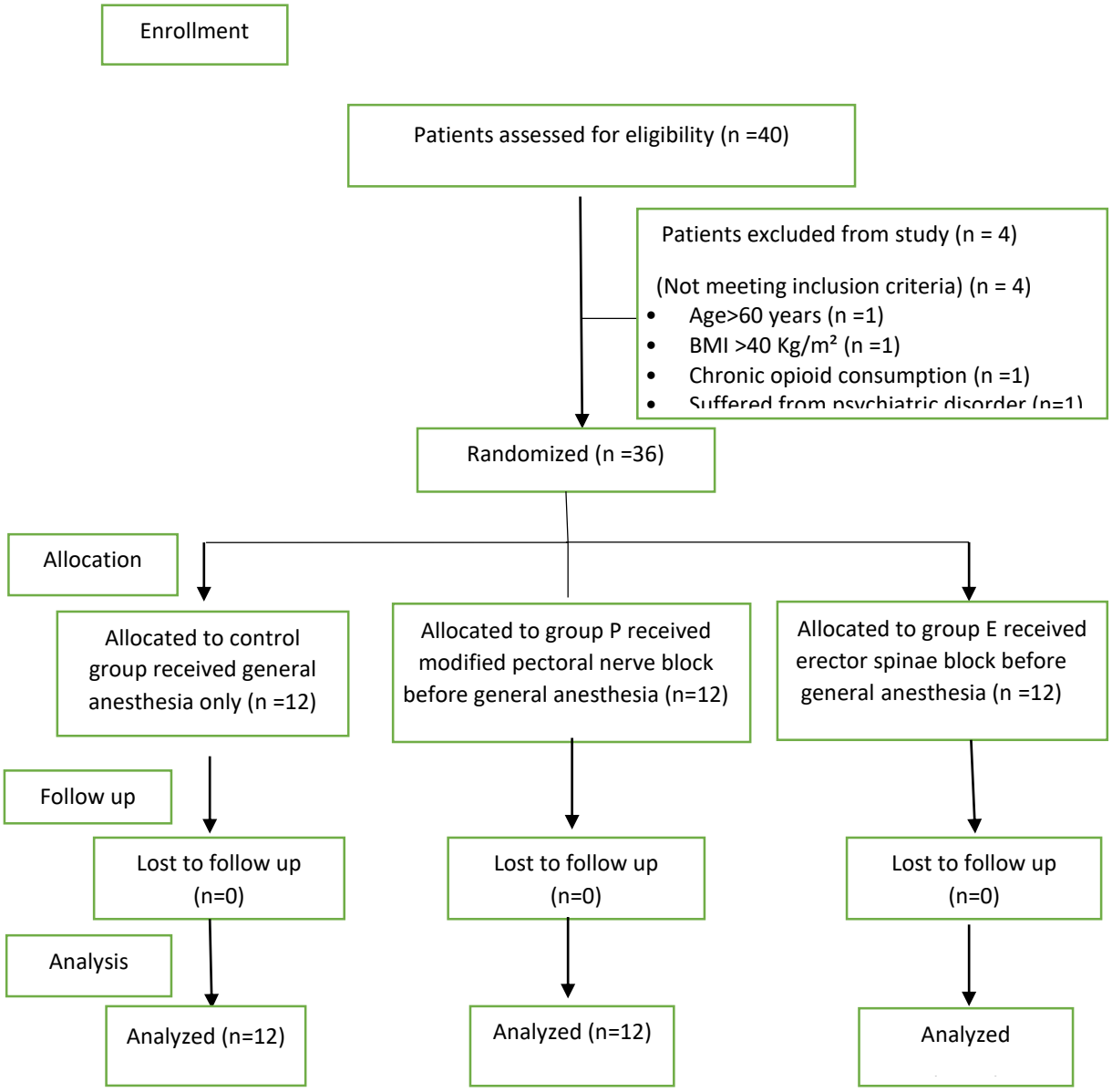

Figure (1): Study Flow Chart.

There was non-significant difference ($p > 0.05$) among the three studied groups as regards age, BMI, ASA status and duration of general anesthesia and surgery **(Table 1).**

Table (1): patients' characteristics and duration of general anesthesia and surgery among the three studied groups.

Variables	Control group (N=12)	Group P (N=12)	Group E (N=12)	F	P Value
Age (years) (mean ± SD)	48.1 ± 7.6	48 ± 8.8	48.1 ± 7.4	**0.001**	**0.99 (NS)**
BMI (Kg/m^2) (mean ± SD)	28.7 ± 2.05	28.3 ± 1.96	29.5 ± 2.06	**1.01**	**0.37 (NS)**
ASA (I/ II) I (N%) II (N%)	5 (41.7%) 7 (58.3%)	6 (50%) 6 (50%)	7 (58.3%) 5 (41.7%)	**X^2=0.66**	**0.71 (NS)**
Side of surgery Right Left	6 (50%) 6 (50%)	5 (41.7%) 7(58.3%)	3 (25%) 9 (75%)	**X^2=1.63**	**0.44(NS)**
Duration of surgery(min) (mean ± SD)	118.1 ± 8.2	117.4 ± 8.01	117.67 ± 8.2	**0.03**	**0.93 (NS)**
Duration of general anesthesia (min) (mean ± SD)	132.5 ± 8.54	131.9 ± 7.7	132.3 ± 7.79	**0.016**	**0.984 (NS)**

Data were reprsented as mean ± standard deviation (SD) or number (N) of cases and (%) percentage. X^2= Chi square test. *NS: non-significant difference ($p>0.05$). (F) ANOVA test. *(BMI) Body mass index. (ASA) American society of anesthesiologists. Group P= modified pectoral nerve block group. Group E= erector spinae plane block group.

There was no statistically significant difference between group P and E regarding time needed to perform the block nor the onset of sensory block **(Table 2).**

Table (2): Time of performance of the block and onset of sensory block between the three studied groups

	Group P (N=12)	Group E (N=12)	F	P Value
Time of performance of the block (min) (mean ± SD)	8 ± 2	8.58 ± 2.02	**0.5**	0.48 **(NS)**
Onset of sensory block (minutes)	10.8 ± 2.8	12.4 ± 2.5	**1.45**	**0.16 (NS)**

Data were represented as mean ± standard deviation (SD). (N) number. (NS): non-significant difference, (F) Anova test, (min) minutes. Group P= modified pectoral nerve block group. Group E= erector spinae plane block group.

There was no statistically significant difference among the three studied groups in baseline MAP (P value=0.31) nor during intubation (P value = 0.8).

Although there was a statistically significant difference in MAP among the three studied groups from the time of surgical incision (P Value=0.03) to the end of the procedure, the control group's MAP was statistically higher than that of groups P and E (P value<0.0001), and there was no significant difference between groups P and E (P value>0.05) **(fig.2).**

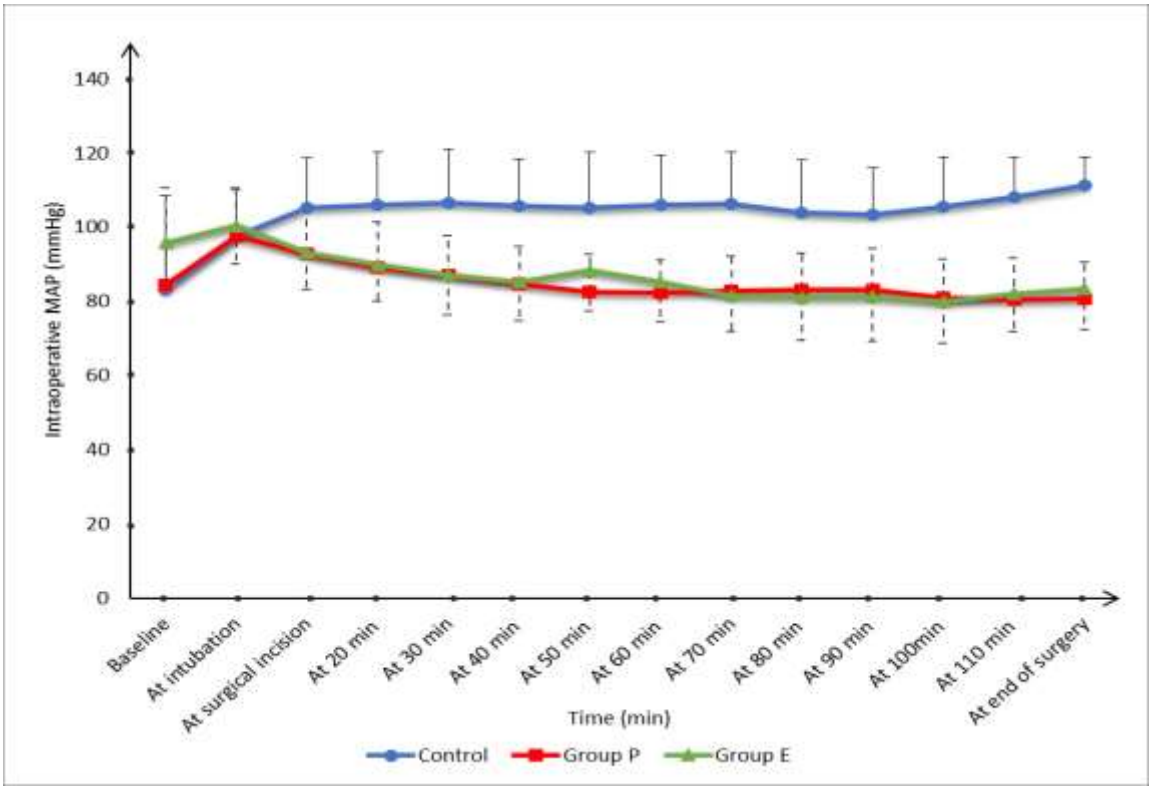

Figure (2): Intraoperative mean arterial pressure among the three studied groups (Data were expressed as mean± standard deviation)

There was no statistically significant difference among the three studied groups in baseline HR (p value= 0.92) nor during intubation (p value=0.86). While there was statistically significant difference among the studied groups regarding HR at surgical incision (p value= 0.0002) till the end of surgery, it was statistically higher in control group compared to group P and E (p value<0.0001) without significant difference between group P and E (P value>0.05) **(fig.3).**

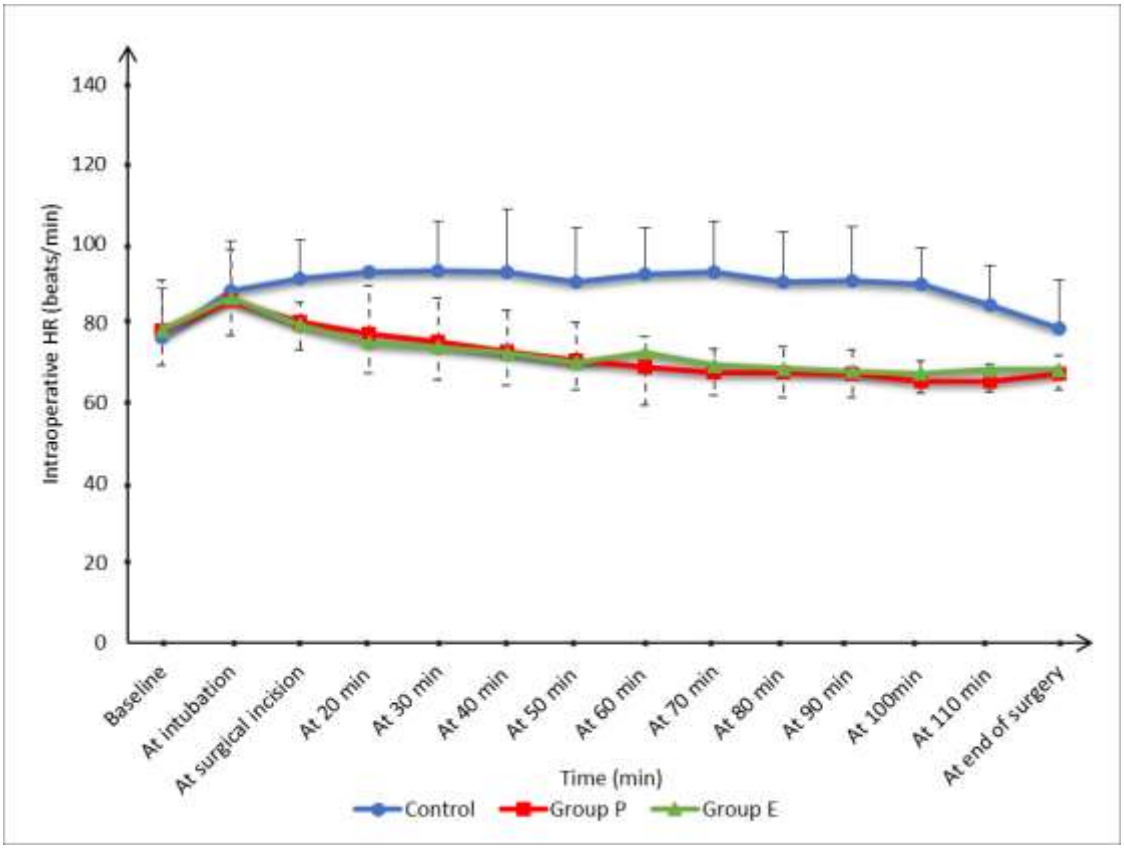

Figure (3): Intraoperative heart rate among the three studied groups (Data was expressed as mean± standard deviation).

The control group's total intraoperative fentanyl consumption was statistically significantly higher than that of groups P and E (P Value <0.0001), but there was no statistically significant difference between groups P and E (P Value = 0.69) **(Table 3).**

Table (3): Total intraoperative fentanyl consumption among the three studied groups.

Total intraoperative fentanyl consumption (µg) (mean ± SD)	**Control (N=12)**	**Group P (N=12)**	**Group E (N=12)**	**F**	**P Value**	
	151.6 ± 29.7	82.1 ± 9.6	88.3 ± 9.3	**17.8**	**<0.0001*(S)**	**P1<0.0001*(S) P2<0.0001*(S) P3=0.69 (NS)**

Data were represented as mean ± standard deviation (SD). Data were analyzed using oneway ANOVA followed by Tukey's test. P1 between Control group Vs. group P, P2 between Control group Vs. group E, P3 between group P Vs. group E. (N) number. (NS) non-significant difference. * (S) significant difference. Group P= modified pectoral nerve block group. Group E= erector spinae plane block group.

There was statistically significant difference between control group when compared to group P and group E as regarding visual analogue scale (VAS) measured 30 min after the operation, then at 2, 4, 8, 12, 18 and 24 hours postoperatively both at rest and movement. The control group showed statistically higher score when compared to group P and group E at different time intervals (P value<0.001). As regard group P and E there was no statistically significant difference between them 30 min after the operation, 2, 18 & 24 hours postoperatively (P value>0.05), but it was statistically significantly higher in group E than group P at 4, 8 and 12 hours (P value<0.05) **(fig.4,5).**

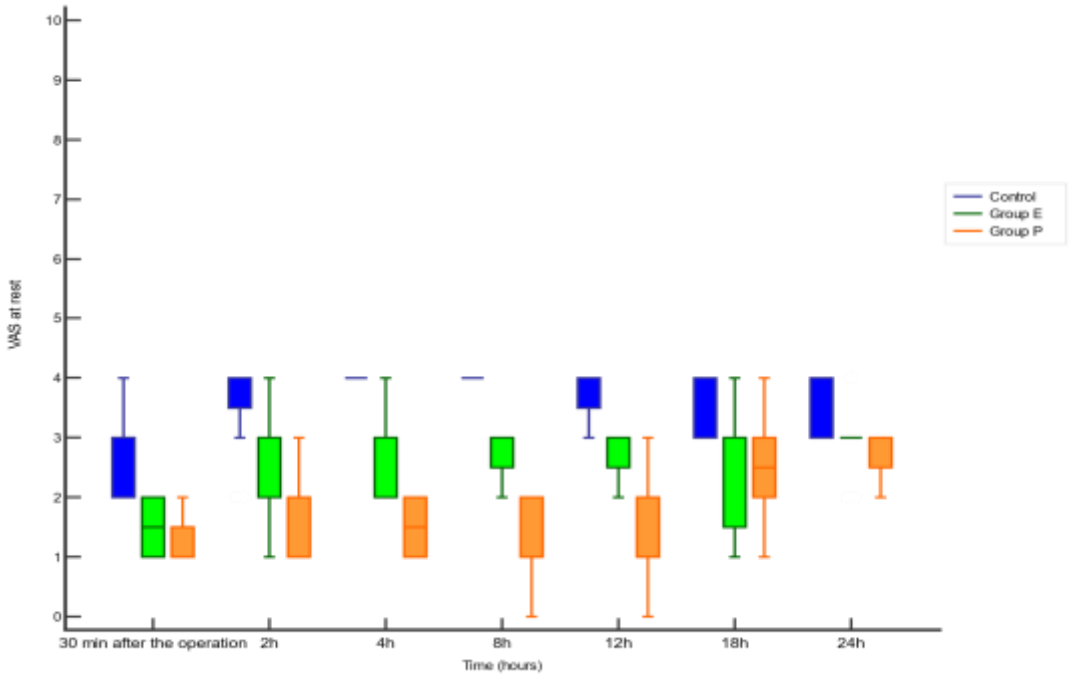

Figure (4): Visual analogue scale at rest among the three studied groups (Data were expressed as median and interquartile range).

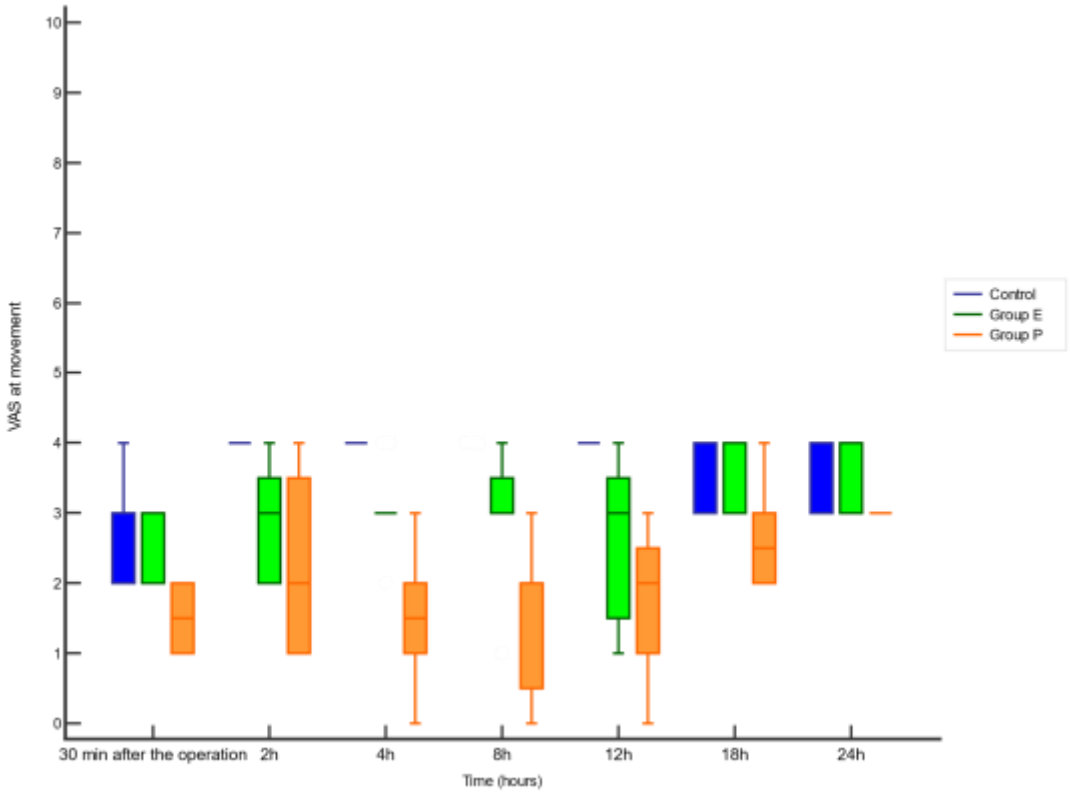

Figure (5): Visual analogue scale at movement among the three studied groups (Data was expressed as median and interquartile range).

As regard postoperative MAP, there was statistically significant difference among the three studied groups at all time intervals, it was statistically higher in control group compared to group P and E (p value <0.0001) and there was no statistically significant difference between group P and E (P value>0.05) **(fig.6)**.

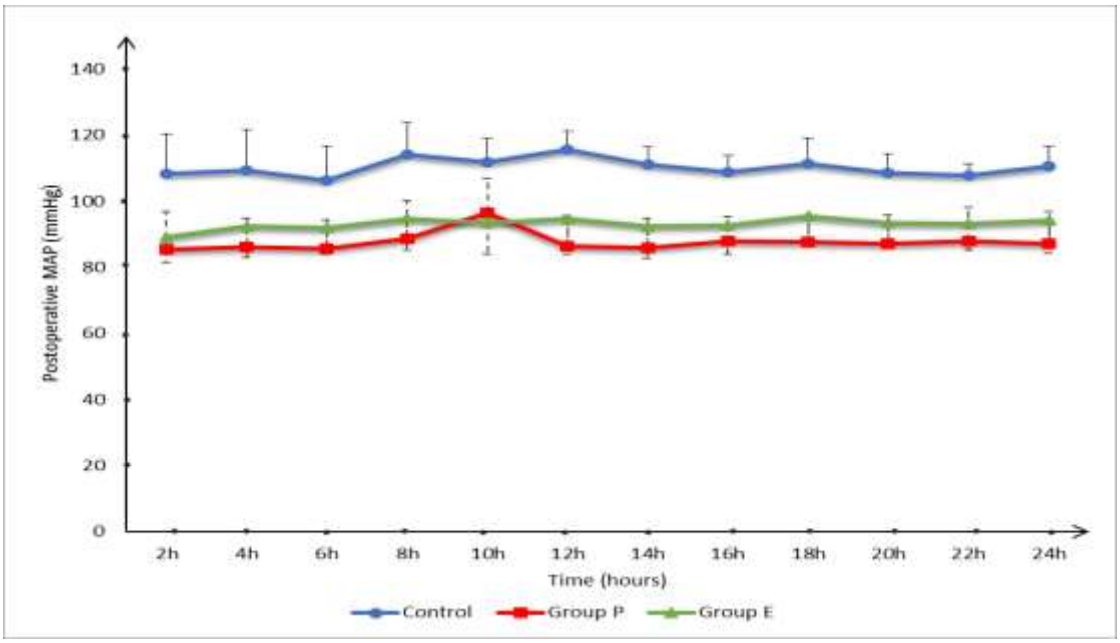

Figure (6): Post-operative mean arterial pressure among the three studied groups (Data were expressed as mean± standard deviation).

Regarding postoperative HR, there was statistically significant difference among the three studied groups at all time intervals, it was statistically lower in group P and E than control group (p value <0.0001) and there was no statistically significant difference between group P and E (P value>0.05) **(Fig7).**

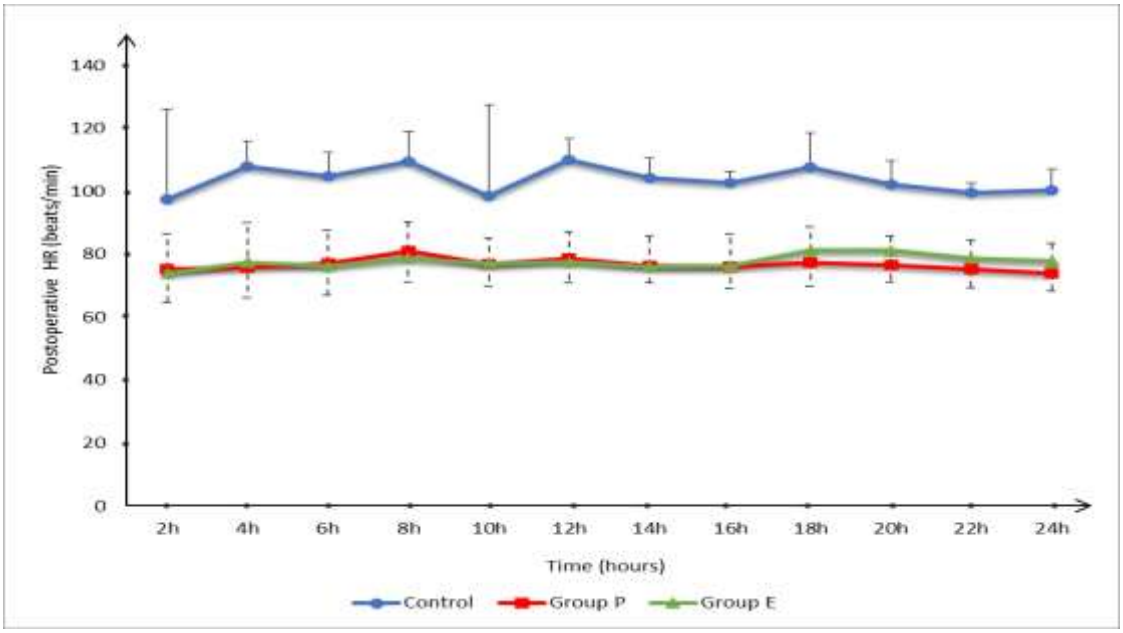

Figure (7): Postoperative heart rate among the three studied groups (Data was expressed as mean± standard deviation).

There was statistically significant difference among the three studied groups regarding first time to rescue analgesia and total amount of pethidine consumption in the first 24 hours postoperative. There was statistically significant delay in the 1st time to rescue analgesia in group P > group E > control group (p value<0.0001)**.**

Regarding total amount of pethidine consumption in the first 24 hours postoperatively, there was statistically significant less consumption of pethidine in group P and E when compared with control group. Also there was statistically significant less consumption in group P compared to group E (p value<0.0001)

There was statistically significant difference between group P and E regarding total duration of the block that was prolonged in group P compared to group E (P Value<0.001) **(Table 4).**

Table (4): First time to rescue analgesia, total amount of pethidine consumption in the first 24 hours postoperative and total duration of the block among the three studied groups

Variables	Control (N=12)	Group P (N=12)	Group E (N=12)	F	P Value	
First time to rescue analgesia in min (mean ± SD)	73± 8.2	380 ± 70	290 ± 33	**93.6**	**<0.0001*(S)**	**P1<0.0001*(S) P2<0.0001*(S) P3=0.01*(S)**
Total amount of pethidine consumption in the first 24 hours postoperative by mg(mean ± SD)	61.6 ± 10.2	28.3 ± 10.2	43.3 ± 18.7	**17.8**	**<0.0001*(S)**	**P1<0.0001*(S) P2=0.007*(S) P3=0.003*(S)**
Total duration of the block (minutes)	-	500.0 ± 69.95	410.0 ± 32.81	**t=3.2**	**<0.001*(S)**	

The information was displayed as mean ± standard deviation (SD). One-way ANOVA was used to evaluate the data, and then Tukey's, Chi square, or Fischer exact tests were performed. (N) number; * (S) significant difference; P1 between Control group vs. group P; P2 between Control group vs. group E; and P3 between group P vs. group E. (minutes) in minutes. Group P is the group with modified pectoral nerve block. Group E is the planar block group of erector spinae.

There was statistically significant difference among the three studied groups regarding postoperative sedation. Sedation score was statistically significant higher in control group when compared to group P and E (p value=0.004).

There was statistically significant difference among the three studied groups regarding PONV score. It was statistically significant higher in control group when compared to group P and E (p value<0.0001). Also there was statistically significant difference among the three studied groups regarding number of patients and dose of ondansetron with statistically increased number of patients taken higher doses of ondansetron in the first 24 hrs postoperatively in control group more than group P and E (p value<0.0001).

None of patients in the three studied groups had respiratory depression nor hypoxia. Regarding complications related to the block, none of patients in both groups P and E had complications from the block in the form of pneumothorax, vascular puncture nor LA systemic toxicity **(Tab.5).**

Table (5): postoperative sedation and postoperative nausea & vomiting (PONV), dose of ondansetron, respiratory depression, hypoxia and complications related to the block among the three studied groups

Variables	Control (N=12)	Group P (N=12)	Group E (N=12)	test	P Value
Sedation score (N%) **0** awake and alert **1** quietly awake **2** asleep but easily aroused **3** deep sleep	 1 (8%) 5 (42%) 5 (42%) 1 (8%)	 9 (75%) 3 (25%) 0 (0%) 0 (0%)	 8 (67%) 4 (33%) 0 (0%) 0 (0%)	**X^2=18.6**	**0.004 *(S)**
PONV score (N%) **0** none **1** mild **2** moderate **3** severe	 1 (8%) 3 (25%) 6 (50%) 2 (17%)	 11(92%) 1 (8%) 0 (0%) 0 (0%)	 10(83%) 2 (17%) 0 (0%) 0 (0%)	**F**	**<0.0001 *(S)**
Number of patients and doses of ondansetron (N%) **0 mg** **4 mg** **8 mg**	 1 (8%) 9 (75%) 2 (17%)	 11(92%) 1 (8%) 0 (0%)	 10 (83%) 2 (17%) 0 (0%)	**F**	**<0.0001 *(S)**
Respiratory depression (N%)	0(0%)	0(0%)	0(0%)	-	-
Hypoxia (N%)	0(0%)	0(0%)	0(0%)	-	-

Complications related to block (N%): **-pneumothorax** **-vascular puncture** **-LA toxicity**	-	0(0%) 0(0%) 0(0%)	0(0%) 0(0%) 0(0%)	-	-

Data were represented as number of cases (N) & percentage %, *(S) significant difference, χ 2:chi-square test used, PONV: postoperative nausea & vomiting. Group P= modified pectoral nerve block group. Group E= erector spinae plane block group.

There was statistically significant difference among the three studied groups regarding patient satisfaction. Patients in group P and E were statistically more satisfied than control group and in group P were more satisfied than group E **(Tab.6).**

Table (6): Patients satisfaction among the three studied groups.

Patients satisfaction (N%)	Control (N=12)	Group P (N=12)	Group E (N=12)	P Value
Dissatisfied	8 (66.7%)	2 (16.7%)	3 (25%)	**0.03*(S)**
Good or satisfied	4 (33.3%)	4 (33.3%)	5 (41.7%)	
Excellent or very satisfied	0 (0%)	6 (50%)	4 (33.3%)	

Data were represented as number of cases (N) & percentage %, Data were analyzed using Chi square test or Fischer exact test as appropriate. *(S) significant difference. Group P= modified pectoral nerve block group. Group E= erector spinae plane block group.

Discussion:

In the current study there was no significant difference among the studied groups regarding age, BMI and ASA status preoperatively. The hemodynamic parameters HR & MAP were recorded throughout the operation and in the first 24 hours postoperative, there was no significant difference among the three studied groups at baseline and at intubation but they were significantly higher level in control group than PECS group and ESP group at surgical incision and extended to the first 24 hours postoperative. There was no statistically significant difference between PECS group and ESP group as regard HR and MAP intra- and postoperative.

Sinha et al. (13) found that hemodynamic parameters including HR&MAP in PECS group compared to ESP group were similar intraoperatively which was in accordance to our study.

Kim et al. (14) stated that there was significant reduction in MAP and HR after surgical incision in PECS II group compared to control group which was agreed with the results of the current study.

In contrary, **Kumar et al. (15)** found that there was no significant difference in intra- and post-operative hemodynamic parameters in PECS group compared to control group. **Singh et al. (16)** found that there was no significant difference with respect to HR and MAP during the perioperative period in ESP group compared to control group which was not in agreement with our study.

As regards total intraoperative fentanyl consumption in the current study, it was significantly higher in control group compared to PECS and ESP groups but with no significant difference between PECS and ESP groups intraoperatively. Also, the total amount of pethidine consumption in the first 24 hours postoperative was statistically significant lower in PECS group < ESP group < control group.

The current study's findings corroborated those of **Kumar et al**. **(15)**, who reported that the PECS group's 24-hour tramadol intake was considerably less than that of the GA group. Additionally, **Deng et al. (17)** found that, in patients undergoing modified radical mastectomy (MRM), the control group's overall analgesic requirements were significantly higher than those of the PECS II group. This finding is consistent with our research.

The current study's findings corroborated those of **Gürkan et al. (18)**, who reported that, in comparison to the control group, ESP block significantly decreased the overall amount of morphine consumed 24 hours after surgery.

He et al. (19) reported similar results to our study that ESP block was found to be an effective technique that provided favorable pain relief and reduced postoperative analgesic consumption than those in the control group. But unlike our study, they administered the ESP block at the vertebral T3 level. Their justification to extend the analgesic efficiency of the ESP block at theT3 level for the axillary region. In addition, they injected a total of 20 milliliters of 0.5% ropivacaine into the fascial plane between the transverse process and the erector spinae muscle, whereas in our trial, we used the same volume but a different concentration (20 milliliters of.025% bubivacaine).

In a-study done by **Altiparmak et al. (20)** demonstrated a dose-response relationship of the erector spinae plane block as ultrasound-guided ESP block performed with 20 ml of 0.375% bupivacaine reduced postoperative tramadol consumption more significantly than ESP block performed with 20 ml of 0.25% bupivacaine which is the same concentration that used in our study.

As regard the postoperative VAS at rest and movement in the current study, it was satistically significant higher in control group than ESP group and PECS group at all time intervals and it was statistically significant lower in PECS group than ESP group at 4, 8, 12 hours postoperative and the scores were lower at another time points also but this difference was not statistically significant. Also duration of the block was significantly prolonged in the PECS group than ESP group.

In a-study published by **Altiparmak et al. (21)** where they compared PECS block with ESP block in 40 patients undergoing MRM surgery. NRS scores at the 15th and 30th min were similar between the groups. However, NRS scores were significantly higher in the ESP group at all other time intervals. They reported that PECs block is better than ESP block with lower pain scores in the postoperative period and these results were similar to our study.

In the current study, there was a statistically significant delay in the first time to rescue analgesia in the PECS group > ESP group > control group.

The results of the present study agreed with **Kumar et al. (15**) who found that the time taken for the first rescue analgesia postoperatively in the first 24 h was significantly increased in PECS group compared to GA group.

In study done by **Bakeer and Abdallah (22)** compared the analgesic efficacy of ultrasound-guided ESP and PECS blocks in unilateral modified radical mastectomy (MRM) found that ESP group showed a significantly shorter time to request analgesia than PECS group which was in agreement of our study.

Regarding performance of the block in the current study, modified PECS block was performed while the patients were in the supine position. So, it has the advantage of easy positioning. Although ESP block has the advantage of simple technique, it was performed in sitting position. This may cause a stress effect on patients. And regarding time needed to perform the block and onset of sensory block there was no statistically significant difference between PECS group and ESP group and we performed both blocks before induction of general anesthesia to assess success of block either by pin prick or by cold sensation.

Altiparmak et al. (21) & Gad et al. (23) performed both blocks while all patients were under general anesthesia; therefore, they could not evaluate the sensory area after block procedures.

Regarding to PONV in the current study, there was statistically significant decrease in PONV in PECS and ESP groups when compared to control group.

These results agreed with the results of **Bashandy and Abbas (24) & Kumar et al. (15)** who demonstrated significant reduction in PONV scores in patients who received (GA + PECS) block compared to control (GA) group.

Also **Hassn et al. (25)** revealed that there was significant reduction of the incidence of PONV in the (PECS group using bupivacaine+ dexmedetomidine) in comparison to the control (placebo) group which agreed with the results of the current study.

The current results agreed with **Senapathi et al. (1)** who reported that there was reduction in PONV in PECS group than placebo group.

In contrast to the results of the present study, **Morioka et al. (26)** stated that the incidence of PONV was not significantly different between Total intravenous anesthesia (TIVA) group and (TIVA + PECS group).

Regarding complications related to the block, none of patients in both PECS and ESP groups had complications from the block in the form of pneumothorax, vascular puncture nor LA systemic toxicity.

Sinha et al. (13) found that there was no incidence of adverse effects in PECS group and ESP group which agreed with the results of our study.

Bakshi et al. (27) have reported difficulty during surgery due to fluid filled spaces after PECS block. We did not encounter this problem in any of our patients. This could be explained due to the time gap between the block and the surgery about 30 minutes which could have led to the absorption of local anesthetic.

Ueshima et al. (28) reported a patient to develop pneumothorax after ESP block but we did not encounter this problem in any of our patients.

Conclusion:

Both ultrasound-guided modified pectoral nerve block and erector spinae plane block are effective for perioperative pain relief in the first 24 hours after unilateral breast cancer surgeries. However, ultrasound-guided modified pectoral nerve block is better than ultrasound-guided erector spinae plane block in terms of more length of analgesic duration, better pain score and less opioid requirement.

References:

1. **Senapathi TG, Widnyana MG, Aribawa GN, Jaya GB and Junaedi MD:** Combined ultrasound-guided Pecs II block and general anesthesia are effective for reducing pain from modified radical mastectomy. J Pain Res **2019**; 12: 1353–8.
2. **Bulka CM, Shotwell MS, Gupta RK, Sandberg WS and Ehrenfeld JM:** Regional anesthesia, time to hospital discharge, and inhospital mortality: a propensity score matched analysis. Reg Anesth Pain Med **2014**; 39:381-6.
3. **Sherwin A and Buggy DJ:** Anesthesia for breast surgery. BJA Educ 2018; 18: 342-8.
4. Blanco R: The‘pecs block’: a novel technique for providing analgesia after breast surgery. Anesthesia **2011**; 66(9):847–8.

5. **Blanco R, Fajardo M and Maldonado TP:** Ultrasound description of Pecs II (modified Pecs I): a novel approach to breast surgery. Revista espanola de anestesiologia y reanimacion. **2012**; 59(9):470-5.
6. **Forero M, Adhikary SD, Lopez H, Tsui C and Chin KJ:** The erector spinae plane block: a novel analgesic technique in thoracic neuropathic pain. Regional Anesthesia and Pain Medicine **2016**; 41: 621–7.
7. **Chin KJ, Taylor JM, Harvey NR, Epperson TI and Gunselman RJ:** Thoracolumbar interfascial plane (TLIP) block: A pilot study in volunteers. Can J Anaesth **2017**; 62:1196-200.
8. **McCormack HM, Horne DJ and Sheather S.**: Clinical applications of visual analogue scales: a critical review. Psychol Med **1988**; 18: 1007– 19.
9. **Aldrete JA:** The post-anesthesia recovery score revisited. Journal of Clinincal Anesthiology. **1995**; 7(1):89-91.
10. **Ramsay M, Savage T, Simpson B and Goodwin R.:** Controlled sedation with Alphaxalone-Alphadolone. BMJ **1974**; 2:656-9.
11. **Apfel CC, Laara E and Koivuranta M.:** A simplified risk score for predicting postoperative nausea and vomiting: conclusions from cross-validations between two centers. Anesthesiology **1999**; 91:693–700.
12. **Tamburini M, Asadi-Lari M and Gray D.:** Patients' needs, satisfaction, and health related quality of life: Towards a comprehensive model. Health Qual Life Outcomes **2004**; 2:32-41
13. **Sinha C, Kumar A, Prasad C, Singh PK and Priya D:** Pectoral nerve versus erector spinae block for breast surgeries: a randomised controlled trial. Indian Journal of Anaesthesia. **2019**; 63(8):617.
14. **Kim DH, Kim S, Kim CS, Lee S, Lee IG and Kim HJ:** Efficacy of pectoral nerve block type II for breast-conserving surgery and sentinel lymph node biopsy: A prospective randomized controlled study. Pain Res Manag **2018**; 20: 1-8.
15. **Kumar S, Goel D, Sharma SK, Ahmad S, Dwivedi P and Deo N:** A randomised controlled study of the post-operative analgesic efficacy of ultrasound-guided pectoral nerve block in the first 24 h after modified radical mastectomy. Indian J Anesth. **2018**; 62(6): 436–42.

16. **Singh S, Kumar G and Akhileshwar G:** Ultrasound-guided erector spinae plane block for postoperative analgesia in modifed radical mastectomy: a randomised control study. Indian J Anaesth. **2019**; 63:200–4.

17. **Deng W, Fu D and He L:** Evaluation of pectoral nerve block in modified radical mastectomy: comparison of three concentrations of ropivacaine. Clinical Interventions in Aging. **2020**; 22:937-44.
18. **Gurkan Y, Aksu C, Kus A, Yorukoglu UH and Kilic CT:** Ultrasound guided erector spinae plane block reduces postoperative opioid consumption following breast surgery: a randomized controlled study. J Clin Anesth. **2018**; 50:65–8.
19. **He W, Wu Z, Zu L, Sun H and Yang X:** Application of erector spinae plane block guided by ultrasound for postoperative analgesia in breast cancer surgery: a randomized controlled trial. Cancer Communications. **2020**; 40:122-5.
20. **Altıparmak B, Toker MK and Uysal A:** Comparison of the efficacy of erector spinae plane block performed with different concentrations of bupivacaine on postoperative analgesia after mastectomy surgery: ramdomized, prospective, double blinded trial. BMC Anesthesiology **2019**; 19(31):1-9
21. **Altıparmak B, Toker MK, Uysal Aİ, Turan M and Demirbilek SG:** Comparison of the effects of modified pectoral nerve block and erector spinae plane block on postoperative opioid consumption and pain scores of patients after radical mastectomy surgery: a prospective, randomized, controlled trial. Journal of Clinical Anesthesia. **2018**; 54:61-5.
22. **Bakeer A and Abdallah NM:** Erector spinae plane block versus pecs block type II for breast surgery: a randomized controlled trial. Anesthesiology and Pain Medicine. **2022**; 12(2):1-6.
23. **Gad M, Abdelwahab K, Abdallah A, Abdelkhalek M and Abdelaziz M:** Ultrasound-guided erector spinae plane block compared to modified pectoral plane block for modified radical mastectomy operations. Anesthesia, Essays and Researches **2019**; 13: 334– 9.
24. **Bashandy GM and Abbas DN:** Pectoral nerves I and II blocks in multimodal analgesia for breast cancer surgery: A randomized clinical trial. Reg Anesth Pain Med. **2015**; 40:68-74.

25. **Hassn AM, Zanfaly HE and Biomy TA:** Pre-emptive analgesia of ultrasound-guided pectoral nerve block II with dexmedetomidine-bupivacaine for controlling chronic pain after modified radical mastectomy. Res Opin Anesth Intensive Care. **2016**; 3(1): 6-13.

26. **Morioka H, Kamiya Y, Yoshida T and Baba H:** Pectoral nerve block combined with general anesthesia for breast cancer surgery: a retrospective comparison. JA clinical reports. **2015**; 1:1-5.

27. **Bakshi SG, Karan N and Parmar V:** Pectoralis block for breast surgery: A surgical concern? Indian J Anaesth **2017**; 61:851-2.

28. **Ueshima H:** Pneumothorax after the erector spinae plane block. J Clin Anesth. **2018**; 48:12.24.