Original article

Addition of PECS Block to Multimodal Analgesia for Postoperative Analgesia after Breast Cancer Surgery: A Randomized Clinical Trial

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Abstract:

Background: Postoperative pain can seriously reduce the quality of life in patients, and acute pain can even trigger chronic pain syndrome. We aimed to compare efficacy of adding PECS block under general anesthesia with preoperative oral multimodal Analgesia (MMA) or alone on postoperative opioid consumption in subjects undergoing breast surgery. **Methods:** This prospective double-blinded randomized controlled study was conducted on 120 adult women underwent breast surgeries. Patients were randomly allocated into 3 equal groups; group I, only MMA was administered, group II; both PECS and MMA were administered and group III only PECS was administered. All patients were evaluated full clinical assessment and laboratory investigations. In group I, preoperative MMA with oral acetaminophen 975 mg and/or gabapentin 600 mg as preventive analgesia was given within 2 hours prior to surgery. **Results:** There was an insignificant difference among the studied groups regarding the VAS at all time measurement and perioperative opioid consumption. The incidence of PONV and the need for PONV rescue medication were significantly different among the studied group, being less prevalent in group C followed by group B (P=0.001, 0.001). **Conclusions:** We found comparable results in the postoperative VAS score and perioperative opioid consumption suggesting that the use of PECS block combined with MMA may not reduce intraoperative and/or postoperative opioid consumption in subjects undergoing elective breast surgery. However, the incidence of PONV was less prevalent in PECS group followed by PECS block combined with MMA.

Keywords: PECS Block; Multimodal Analgesia; Postoperative Analgesia; Postoperative pain; Breast Cancer Surgery

Introduction

Breast cancer is the most common malignancy in women; surgery is one of the mainstays of treatment of breast cancer, and modified radical mastectomy is one of the standard treatments [1]. Patients undergoing breast surgeries experience high grade postoperative pain, thus increasing patient morbidity [2]. Patients in whom pain is controlled in the early postoperative period may be able to actively participate in postoperative rehabilitation, which may improve short- and long-term recovery after surgery. Thus, control of post-operative pain is an essential requirement in these surgeries [3].

Postoperative pain can seriously reduce the quality of life in patients, and acute pain can even trigger chronic pain syndrome. Effective management of acute postoperative pain has a significant impact on patient's immediate and long-term recovery and/or quality of life. A poorly controlled perioperative pain management strategy on this surgical population, may result in delayed functional recovery, delayed post anesthesia care unit (PACU) discharge and/or extended length of hospital stay with subsequent financial burden [4]. In addition, inadequate postoperative pain management is recognized as one of the most relevant risk factors for the development of chronic postoperative breast pain [5].

Regional anaesthesia techniques with or without general anaesthesia have been reported to provide better acute pain control [6]. Although the thoracic paravertebral block (TPVB) is the most widely used technique to provide postoperative analgesia after breast surgeries, patients having radical mastectomy under TPVB frequently complain of pain in the axilla and upper limb, because TPVB does not block medial and lateral pectoral nerves as effectively as long thoracic and thoracodorsal nerves, leading to inadequate analgesia. The TPVB also involves the risk of pneumothorax, spinal cord trauma, sympathetic block, and hypotension [7].

Pectoral nerve (PECS) block is a new technique for providing surgical anaesthesia and postoperative analgesia during breast surgery that relies upon the placement of local anaesthetic between the thoracic wall muscles and is therefore devoid of major adverse effects [8]. The PECS I block is a superficial block that has been used effectively for surgical procedures such as placement of breast expanders and subpectoral prosthesis, shoulder surgery with deltopectoral groove involvement, and insertion of a pacemaker or intercostal drain [9]. The PECS II block favours mastectomy and axillary clearance, because long thoracic and thoracodorsal nerves are also blocked in addition to the lateral branches of the intercostal nerves that exit at the level of the mid-axillary line to innervate the mammary gland and the skin from T2 to T6 [10].

The last two decades there has been an increasing emphasis on promoting the use of multimodal analgesia (MMA), particularly in the context of postoperative enhance recovery after surgery (ERAS) protocols, reducing perioperative opioid consumption and, subsequently, their side effects [9,11]. The use of oral gabapentinoids and acetaminophen alone or in conjunction with regional anesthesia as part of MMA, has shown an adequate reduction on pain scores and opioid consumption [12]. Controversially, recent literature suggests that the reduction of opioid consumption associated to the use of perioperative gabapentinoids is not often clinically relevant [13,14].

We aimed to compare efficacy of adding PECS block under general anesthesia with preoperative oral MMA (with acetaminophen and/or gabapentin) or alone on postoperative opioid consumption in subjects undergoing breast surgery.

Patients and methods

This prospective double-blinded randomized controlled study was conducted on 120 adult women, aged 18–70 years underwent different breast surgeries [modified radical mastectomy (MRM), MRM with sentinel lymph node biopsy (SLNB), MRM with axillary lymph node dissection (ALND)]. It was approved by the ethics committee of Benha University (RC13.1.2022). A written informed consent was obtained from all patients. This study was conducted in compliance with the 1964 Helsinki declaration and its later amendments. The manuscript is written in accordance with Consolidated Standards of Reporting Trials (CONSORT) guidelines.

Study setting: This study was carried out in Internal Medicine Department Benha University Hospitals.

Study period: This study was carried out from January 2021 till January 2022.

Exclusion criteria were patient refusal, hypersensitivity to study drugs, hemodynamically unstable patients, chest wall deformity, coagulopathy, infections at the site of block, uncontrolled hypertension and diabetes, pregnancy, cardiac disease, previous breast surgery, Chronic use of opioids due to any medical/surgical conditions, opioid consumption within 48 h prior to surgery, use of gabapentin within 30 days prior to surgery and use of acetaminophen within 7 days prior to surgery.

Randomization and blindness:

Patients were randomly allocated into three equal groups using computer-generated random numbers. The group allocation numbers were concealed in sealed opaque envelopes that were opened after enrolment of the patients. Group I (n=40): only MMA was administered, group II (n=40): both PECS and MMA were administered and group III (n=40): only PECS was administered. Both patients and assessors were blinded in this trial.

Preoperatively:

All patients were evaluated by complete history taking and full clinical assessment including general examination of chest, heart, abdomen and vitals and laboratory investigations including complete blood picture and renal function tests.

In group I, preoperative MMA with oral acetaminophen 975 mg and/or gabapentin 600 mg as preventive analgesia was given within 2 hours prior to surgery.

Induction of general anesthesia:

The patients received 8 mg of intravenous dexamethasone sodium phosphate before induction of anaesthesia as prophylaxis for nausea. After patients had been taken to the preoperative area, measurements (pulse oximetry, electrocardiography (ECG), blood pressure) were carried out. Anesthetic management followed a standard protocol.

Induction was conducted with intravenous (IV) fentanyl 1.5–2.5 µg/kg and lidocaine 40– 100 mg followed by IV propofol 2.0–2.5 milligrams per kilo (mg/kg) as a hypnotic agent and IV rocuronium 0.6–1.0 mg/kg for the neuromuscular blockade to facilitate endotracheal intubation. Ventilation was set with positive pressure to maintain an end-tidal level of carbon dioxide ~35 mmHg. Anesthesia maintenance was achieved with sevoflurane in a 45/55% oxygen/air mixture to attain an additional amount of fentanyl (0.1–1.0 µg/kg. min) was injected (i.v) as needed. If the blood pressure decreased by >20% from the baseline value, 250 mL of 0.9% (physiologic) saline and ephedrine (0.1 mg/kg) were given. If the heart rate decreased by >20% of the baseline value, atropine (0.01 mg/kg) was given. At the end of surgery, the effect of cisatracurium was reversed by neostigmine (0.05 mg/kg) and atropine (0.02 mg/kg)

Intraoperative opioids included intravenous fentanyl and hydromorphone, while oral oxycodone was prescribed after PACU/hospital discharge.

PECS block technique:

The ultrasound-guided PECS block was performed following institutional recommended guidelines, immediately after anesthesia induction. A local anesthetic infiltration was performed at the levels of 3rd and 4th ribs, along the mid-axillary line from each side. PECS I was performed by introducing the needle in plane from medial to lateral and injecting 20–30 ml of 0.5% ropivacaine in the interfascial plane between pectoralis minor and pectoralis major muscles form each side. PECS II blocks consisted of the same steps as PECS I block, but with the bilateral infiltration of the local anesthetic between the pectoralis minor and serratus anterior muscles.

Ultrasound-guided PECS II block:

Ultrasound-guided PECS II block was performed following general anesthesia to obviate any pain and anxiety associated with a regional block in conscious patients. This procedure was conducted according to the techniques described by Blanco et al. [15] and therefore also included a PECS I block. Patients were placed in the supine position on an operating table with their arm abducted. After sterile preparation for the procedure, a 12 MHz linear ultrasound probe (NextGen LOGIQ e Ultrasound, GE Healthcare, USA) was positioned below the lateral third of the clavicle. The positions of the axillary artery and vein were confirmed, and the ultrasound probe was moved inferolaterally until the pectoralis major and minor, and the serratus anterior muscles were identified in one plane at the level between the third and fourth ribs.

A 23- gauge Quincke type spinal needle (TaeChang Industrial Co., Korea) was advanced in plain view of the ultrasound probe from the medial to lateral direction until it reached the interfascial plane between the pectoralis major and minor muscles. After the position of the needle tip was confirmed, 10 ml of 0.25% ropivacaine was administered. The needle was subsequently advanced further until its tip was in the interfascial plane between the pectoralis minor and serratus anterior muscles, and an additional 20 ml of 0.25% ropivacaine was administered above the serratus anterior muscles. All these nerve block procedures were performed by two anesthesiologists who were proficient and experienced in ultrasound-guided PECS II block.

Pain assessment:

Postoperative pain was assessed using a visual analogue scale (VAS, 0–10; 0=no pain and 10=worst imaginable pain) [16]. The VAS was assessed at PACU, 1 h, 2h, 6h, 12h and 24h. Rescue analgesia was provided by nursing staff who were blinded to the study protocol when the patient complained of pain and having a VAS score >3 at rest. A maximum of four doses were given in 24 h. Intraoperative opioids included intravenous fentanyl and hydromorphone. Any adverse effects, such as hypotension, respiratory depression, shivering, and urinary retention, were recorded. Postoperative nausea and vomiting (PONV) were assessed.

Combination anti-emetics, including ondansetron 0.1–0.15 mg kg^{-1} IV, dexamethasone 0.1–0.2 mg kg^{-1} IV, or droperidol 0.01–0.015 mg kg−1 IV, were administered according to patient risk factors, with dexamethasone given to all patients regardless of risk of PONV. Patient satisfaction according to Likert scale was assessed and recorded 48 h after surgery [17].

The primary outcome was to compare MME in subjects who underwent outpatient elective breast surgery and received oral MMA with or without the use of preoperative PECS block. Secondary outcomes included the length of surgery, anesthesia, and PACU stay, incidence of PONV and rescue antiemetic medication requirements.

Sample size:

The sample size calculation was done by G*Power 3.1.9.2 (Universität Kiel, Germany). We performed a pilot study (10 cases in each group) and we found that the

mean (± SD) of postoperative opioid consumption was 14.3 ± 4.9 mg in group A (only MMA), 13.7 ± 4.5 in group B (PECS and MMA) and 11.4 ± 2.2 in group C (only PECS). The sample size was based on the following considerations: 0.99 effect size, 95% confidence limit, 90% power of the study, and 6 cases were added to each group to overcome dropout. Therefore, we recruited 40 patients in each group.

Statistical analysis:

Statistical analysis was done by SPSS v28 (IBM©, Armonk, NY, USA). 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 analysed by ANOVA (F) test with post hoc test (Tukey). Quantitative non-parametric data were presented as median and interquartile range (IQR) and were analysed by Kruskal-Wallis test with Mann Whitney-test to compare each group. 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

In this study, 157 patients were assessed for eligibility, 28 patients did not meet the criteria and 9 patients refused to participate in the study. The remaining 120 patients were randomly allocated into three equal groups (40 patients in each). All allocated patients were followed-up and analysed statistically. Figure 1
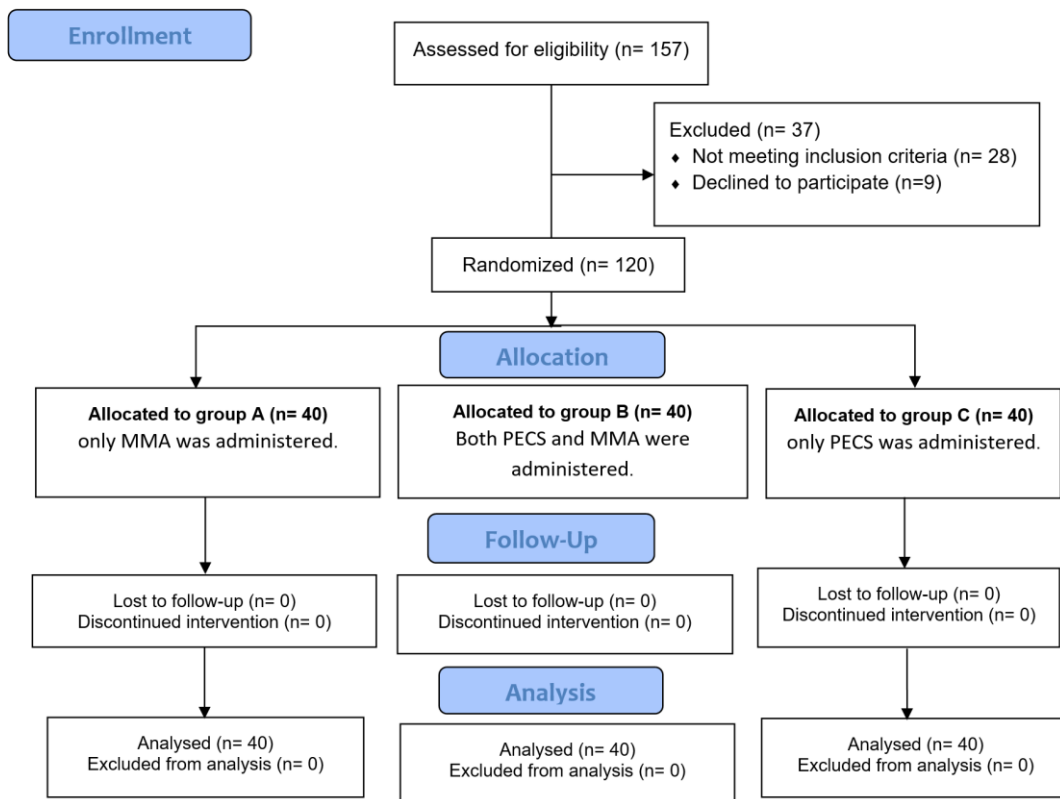

Figure 1: CONSORT flowchart of the enrolled patients

Table 1 shows that there was an insignificant difference among the studied groups regarding the baseline characteristics (age, weight, height, BMI, and ASA physical status), and type of surgery.

Table 2 demonstrates the MMA preoperative data of groups A and B, where number of patients received MMA preoperative with acetaminophen alone and those received MMA preoperative with gabapentin & acetaminophen were significantly lower in group B compared to group A (P=0.007, 0.001). There was an insignificant difference between both groups regarding MMA preoperative with gabapentin alone, mean MMA preoperative gabapentin dose, and mean MMA preoperative acetaminophen dose.

Table 1: Baseline characteristics of the studied groups

		Group A (n=40)	Group B (n=40)	Group C (n=40)	P value
Age (years)		43.8 ± 13	46.1 ± 11.3	40.8 ± 11.78	0.147
Weight (Kg)		72.4 ± 11.07	73 ± 11.34	70.4 ± 10.02	0.532
Height (m)		1.6 ± 0.05	1.6 ± 0.04	1.6 ± 0.04	0.128
BMI (Kg/m^2)		27.5 ± 4.42	27.2 ± 4.72	26.1 ± 3.95	0.337
ASA physical status	ASA I	12 (30%)	14 (35%)	13 (32.5%)	0.892
	ASA II	28 (70%)	26 (65%)	27 (67.5%)	
Type of surgery	Breast reduction	16 (40%)	10 (25%)	12 (30%)	0.498
	Partial mastectomy	5 (12.5%)	12 (30%)	13 (32.5%)	
	Mastopexy	10 (25%)	11 (27.5%)	10 (25%)	
	Breast augmentation	7 (17.5%)	6 (15%)	3 (7.5%)	
	Breast reconstruction	2 (5%)	1 (2.5%)	2 (5%)	

Data presented as mean ± SD or frequency (%), BMI: body mass index, ASA: American society of anesthesiologists.

Table 2: MMA preoperative data of the studied groups

	Group A (n=40)	Group B (n=40)	P value
MMA preoperative with gabapentin alone	4 (10%)	1 (2.5%)	0.166
Mean MMA preoperative gabapentin dose (mg)	530.2 ± 186.1	586.4 ± 159.3	0.150
MMA preoperative with acetaminophen alone	15 (37.5%)	4 (10%)	**0.007***
Mean MMA preoperative acetaminophen dose (mg)	786.1 ± 104.7	812.2 ± 74.7	0.482
MMA preoperative with gabapentin & acetaminophen	21 (52.5%)	5 (12.5%)	**0.001***

Data presented as mean ± SD or frequency (%), *: statistically significant as P value <0.05.

There was an insignificant difference among the studied groups regarding the intraoperative intravenous medication (Dexamethasone (%), mean dexamethasone dose, Ketamine (%), mean Ketamine dose, ondansetron, and fentanyl). There was an insignificant difference between groups A & B regarding the intraoperative intravenous Hydromorphone. Table 3 Regarding the intraoperative data, length of surgery and length of anaesthesia were significantly prolonged in groups B&C compared to group A (P<0.05), with no significant difference between groups B&C. There was an insignificant difference among the studied groups regarding the type of surgery and length of PACU stay. There was an insignificant difference between groups B & C regarding the type of PECS block.

Data presented as mean ± SD or frequency (%), PECS: pectoral nerve, PACU: post anesthetic care unit, *: statistically significant as P value <0.05, P1: p value between groups A & B, P2: p value between groups A&C, P3: p value between groups B&C.

Table 4 shows that there was an insignificant difference among the studied groups regarding the VAS at all time measurement (PACU, at 1, 2, 6, 12 and 24h). Figure 2 The perioperative opioid consumption (both intra and postoperative) was insignificantly different among the studied groups.

Regarding the adverse events, PONV occurred and PONV rescue medication was administrated in 18 (45%) patients in group A, 8 (20%) patients in group B and 4 (10%) patients in group C, hematoma occurred in 3 (7.5%) patients in group A, 1 (2.5%) patient in group B, and 1 (2.5%) patient in group C and wound infection occurred only in 1 (2.5%) patient in group B. Urinary retention, respiratory depression and pruritis not observed in any patient in the studied groups. The incidence of PONV and the need for PONV rescue medication were significantly different among the studied group, being less prevalent in group C followed by group B (P=0.001, 0.001), whereas hematoma and wound infection were insignificantly different among the studied groups.

Table 3: Intraoperative intravenous medication of the studied groups and Intraoperative data of the studied groups

		Group A (n=40)	Group B (n=40)	Group C (n=40)	P value	
Dexamethasone (%)		9 (22.5%)	4 (10%)	6 (15%)	0.305	
Dexamethasone dose (mg)		8 ± 0	8 ± 0	8 ± 0	NS	
Ketamine (%)		9 (22.5%)	4 (10%)	6 (15%)	0.305	
Ketamine dose (mg)		36.7 ± 7.07	42.5 ± 9.57	36.7 ± 8.16	0.444	
Hydromorphone (ucg)		1.3 ± 0.47	1.4 ± 0.5	---	0.492	
Ondansetron (mg)		4.3 ± 0.44	4.3 ± 0.45	4.2 ± 0.42	0.878	
Fentanyl (ucg)		143.5 ± 31.2	149.3 ± 33.23	145.5 ± 25.41	0.687	
		Group A (n=40)	**Group B (n=40)**	**Group C (n=40)**	**P value**	
Type of PECS block	**PECS I bilateral**	---	8 (20%)	12 (30%)	0.558	
	PECS II bilateral	---	24 (60%)	20 (50%)		
	PECS II unilateral	---	8 (20%)	8 (0.5%)		
Type of surgery	**Breast reduction**	16 (40%)	10 (25%)	12 (30%)	0.498	
	Partial mastectomy	5 (12.5%)	12 (30%)	13 (32.5%)		
	Mastopexy	10 (25%)	11 (27.5%)	10 (25%)		
	Breast augmentation	7 (17.5%)	6 (15%)	3 (7.5%)		
	Breast reconstruction	2 (5%)	1 (2.5%)	2 (5%)		
Length of surgery (min)		112.7± 28.2	126.9 ± 34.7	128.9± 29.5	**0.043***	**P1=0.049*** **P2=0.015*** P3= 0.781
Length of anesthesia (min)		162.7± 36.6	200.5 ± 17.22	194.9 ± 20.1	**<0.001***	**P1<0.001*** **P2<0.001*** P3= 0.190
Length of PACU stay (min)		152.3± 18.6	149.8 ± 16.72	150.4± 17.6	0.807	

Data presented as mean ± SD or frequency (%).

Table 4: Assessment of postoperative pain using visual analogue scale (VAS) of the studied group and Perioperative opioid consumption of the studied groups and Adverse events of the studied groups

		Group A (n=40)	Group B (n=40)	Group C (n=40)	P value
VAS	**PACU**	2 (1 - 3)	1 (0.75 - 2)	2 (1 - 3)	0.070
	1h	1 (0 - 2)	2 (0 - 3)	2 (1 - 2.25)	0.377
	2h	3 (2 - 4)	3 (2 - 4)	3 (1 - 3)	0.674
	6h	2 (1.75 - 4)	3 (2 - 3.5)	2 (1 - 4)	0.761
	12h	3 (2 - 3)	2 (1 - 3)	2 (1 - 3)	0.352
	24h	2 (1 - 3)	2 (1 - 3)	1.5 (1 - 2.25)	0.814
		Group A (n=40)	Group B (n=40)	Group C (n=40)	P value
Intraoperative opioid consumption (mg)		27.5 ± 5.32	26.9 ± 5.27	27.8 ± 5.03	0.758
Postoperative opioid consumption (mg)		13.1 ± 4.23	11.9 ± 3.83	11.7 ± 1.87	0.133
		Group A (n=40)	Group B (n=40)	Group C (n=40)	P value
PONV		18 (45%)	8 (20%)	4 (10%)	**0.001***
PONV rescue medication		18 (45%)	8 (20%)	4 (10%)	**0.001***
Hematoma		3 (7.5%)	1 (2.5%)	1 (2.5%)	0.434
Wound infection		0 (0%)	1 (2.5%)	0 (0%)	0.365
Urinary retention		0 (0%)	0 (0%)	0 (0%)	---
Respiratory depression		0 (0%)	0 (0%)	0 (0%)	---
Pruritis		0 (0%)	0 (0%)	0 (0%)	---

Data presented as median (IQR), VAS: visual analogue scale, PACU: post anesthetic care unit.
Data presented as mean ± SD.
Data presented as frequency (%), PONV: postoperative nausea and vomiting, *: statistically significant as P value <0.05.
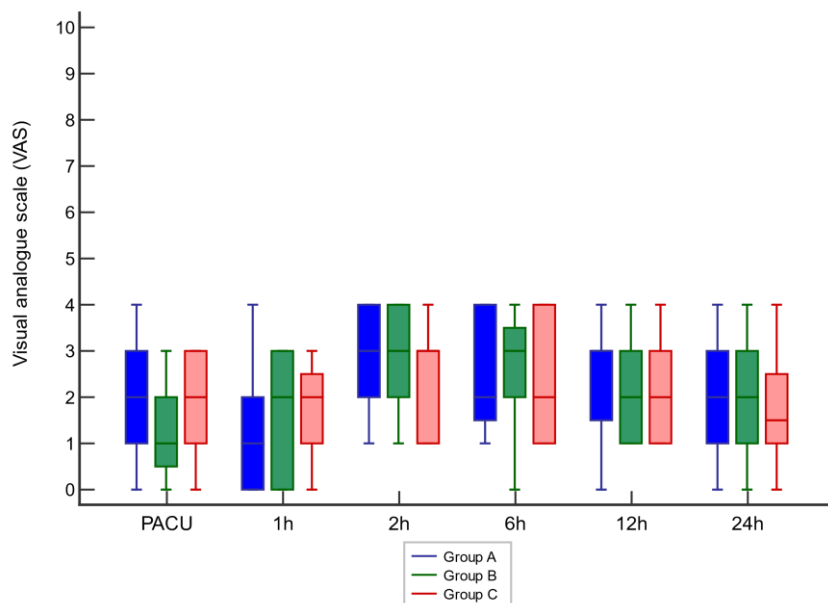

Figure 2: Postoperative visual analogue scale (VAS) of the studied groups

Discussion

The vast majority of prospective and retrospective studies, systematic reviews, and meta-analysis published in recent years have shown that the PECS block, especially PECS II block, is a safe and effective option for analgesia in modified radical mastectomy. Compared with GA alone, PECS block combined with GA was

more advantageous in reducing intraoperative opioid consumption, postoperative opioid consumption, postoperative early pain, incidence of PONV, and the need for postoperative rescue analgesia when compared to MMA strategies without loco-regional anesthesia techniques [18, 19]. Therefore, the addition of PECS blocks to general anesthesia may provide adequate postoperative analgesia and substantially reduce perioperative opioid consumption [20, 21].

It was reported that PECS block combined with GA can significantly reduce the amount of opioids used during the perioperative period. This is mainly due to the nerve block produced by the non-opioid drugs used in PECS block, which reduces the sensitivity of the nerve to intraoperative stimulation, alleviates muscle spasm, facilitates maintenance of the depth of anesthesia, and reduces the consumption of opioids during maintenance of anesthesia[22].

It was found that PECS I block produced an effective motor blockade by anesthetic injection into the interfascial space between the pectoralis major and the pectoralis minor muscle but could not produce a sensory block. The analgesic effects of PECS block are mainly dependent on the reduction of spasm after stimulation of the pectoralis major muscle [23]. The PECS II block includes the PECS I block, and also entails blocking the intercostal nerve, thoracic nerve, and intercostal brachial nerve, which reduces the sensations on the skin of the thoracic wall and the armpit and achieves a greater range of analgesia [24].

We found that number of patients received MMA preoperative with acetaminophen alone and those received MMA preoperative with gabapentin & acetaminophen were significantly lower in group B compared to group A (P=0.007, 0.001). There was an insignificant difference among the studied groups regarding the intraoperative intravenous. The length of surgery and length of anesthesia were significantly prolonged in groups B&C compared to group A (P<0.05), with no significant difference between groups B&C. There was an insignificant difference among the studied groups regarding the type of surgery, length of PACU stay, the postoperative VAS at all time measurement (PACU, at 1, 2, 6, 12 and 24h) and the perioperative opioid consumption (both intra and postoperative).

Researchers retrospectively studied the perioperative opioid consumption in 80 subjects who underwent breast conservative surgery plus sentinel lymph node biopsy. Forty subjects (N = 40) were allocated in the control group (balanced anesthesia) and 40 in the PECS II group (balanced anesthesia + PECS II). They reported a reduced opioid consumption during the first 24 postoperative hours in the PECS II group when compared to the control group (43.8 ± 28.5 g vs. 77.0 ± 41.9 g; p < 0.001). However, the intergroup incidence of rescue analgesia was equivalent during the same period [25].

Scientists, in the results of their meta-analysis, proved that early postoperative pain (0–6 hours) was significantly reduced in patients administered PECS block combined with GA as compared with those administered GA alone [22], but this difference gradually disappeared in the late postoperative period (24hours). This is consistent with the initial reports [15, 26].

A retrospective study to assess the efficacy of preoperative PECS block in addition to preoperative MMA, was performed [9]. The researchers observed that PECS block combined with MMA may not reduce intraoperative and/or PACU opioid consumption in patients undergoing outpatient elective breast surgery.

The analgesic efficacy of single-shot PECs block was compared with LA infusion *vs* a combination of both PECs block and LA infusion, in women undergoing non-ambulatory breast surgery. They showed that the area under the pain VRS *vs* time curve (AUC) was

significantly lower in the combined PECs and LA infusion group, both at rest and with movement, in the first 24 postoperative hours. The 24 h mean postoperative opioid consumption was similar between groups, and the incidence of adverse effects was low [27].

Thirty-nine subjects undergoing breast surgery under TIVA (propofol-remifentanil) were analysed [28]. Subjects were randomized to receive either TIVA + PECS II block with ropivacaine 0.5% (PECS group; n = 20) or TIVA alone (control group; n =18). They concluded that not only the total remifentanil infused dose was much lower in the PECS group than in the control group (6.8 ± 2.2 µg/kg/h vs. 10.1± 3.7 µg/kg/h; P = 0.001), but also the rescue analgesic requirements in the PACU were lower in the PECS group [28].

Conversely, some authors have reported similar results to our study, in which the use of PECS block did not significantly reduce perioperative opioid use when compared to MMA alone [29 , 30]. A dual-centred, placebo-controlled RCT performed by Cros et al. [31] in 128 subjects to evaluate the efficacy of ultrasound- guided PECS I vs. placebo in managing pain after unilateral cancer breast surgery, showed that there was no significant intergroup differences in intraoperative sufentanil consumption (20.0 [15.0–20.0] µg vs. 20.0 [15.0–25.0] µg, respectively; p = 0.8536). Likewise, there were no statistical differences in PACU morphine consumption (1.5 [0.0–6.0] mg vs. 3.0 [0.0–6.0] mg; p = 0.20) and up to 24-h postoperatively.

It was found that patients who received the PECS block under general anesthesia (PECS group) reported lower VAS pain scores at 0, 1, 2, 4, 6, 12, 24 hours after the operation than patients who did not receive PECS block under general anesthesia (control group). Moreover, the use of additional analgesic drugs during the first 24 hours after surgery was lower in the PECS group than in the control group [32].

Regarding the overall incidence of PONV, PONV occurred and PONV rescue medication was administrated in 18 (45%) patients in group A, 8 (20%) patients in group B and 4 (10%) patients in group C, and were significantly different among the studied group, being less prevalent in group C (P=0.001, 0.001).

A previous meta-analysis showing a significant impact of PECS blocks on opioid consumption have reported a marked reduction in PONV frequency when compared with control groups or with MMA regimens without peripheral nerve block [33 , 34].

The reduction in opioid use after PECS block combined with GA may have contributed to the lower incidence of PONV in these patients. PONV is a common side effect of opioid use. Cumulative opioid consumption after simple intravenous anesthesia and postoperative analgesia can cause itching, nausea and vomiting, gastrointestinal dysfunction, and intestinal obstruction, which results in some patients discontinuing the analgesic treatment or enduring the side effects. PECS block effectively reduces the incidence of PONV and improves the patient's quality of life [22]. In the sensitivity analysis, the study by Neethu et al. [35] was the main source of heterogeneity, mainly because of the excessive proportion of overweight patients in the study (PECS group accounted for 46.67% of the patients and GA group accounted for 30% of the patients); overweight patients would require increased dosages of anesthetic and sedative drugs.

In subjects who underwent breast cancer surgery under anesthesia with either total intravenous anesthesia (TIVA) + PECS or TIVA without PECS, it proved a substantial reduction in the use of intraoperative remifentanil in the TIVA + PECS group compared with the group that received TIVA alone (TIVA: 10.9 ± 2.9 µg/kg/h; TIVA + PECS: 7.3 ± 3.3 µg/kg/h; p < 0.001) [36]. However, no differences

were found between groups in regard to the requirement of postoperative supplemental analgesia (TIVA: 24.3% [9/36]; TIVA + PECS: 17.1% [6/35]; p = 0.32) and the incidence of PONV (TIVA: 16.7% [6/36]; TIVA + PECS: 11.4% [4/35]; p = 0.39). The perioperative opioid consumption in 80 subjects who underwent breast conservative surgery plus sentinel lymph node biopsy was studied retrospectively [25]. Forty subjects (N = 40) were allocated in the control group (balanced anesthesia) and 40 in the PECS II group (balanced anesthesia + PECS II). They reported a reduced opioid consumption during the first 24 postoperative hours in the PECS II group when compared to the control group (43.8 ± 28.5 g vs. 77.0 ± 41.9 g; p < 0.001). However, the intergroup incidence of rescue analgesia was equivalent during the same period.

In this present study we found that regarding complications, hematoma occurred in 3 (7.5%) patients in group A, 1 (2.5%) patient in group B, and 1 (2.5%) patient in group C and wound infection occurred only in 1 (2.5%) patient in group B. Urinary retention, respiratory depression and pruritis not observed in any patient in the studied groups. Hematoma and wound infection were insignificantly different among the studied groups.

It was observed that the prevalence rate of 30-day surgical complications was 3%, with no significant between-groups difference (3 vs. 4%). Hematoma (0.88%) and wound infection (0.88%) were the most common complications observed in that timeframe [9].

Our study had some limitations such as single centre study with relatively small sample size most of study population received preoperative acetaminophen and gabapentin and intraoperative dexamethasone as part of the MMA regimen, and a few subjects received intraoperative ketorolac. Consequently, the doses of MMA regimen were not consistent among subjects because

clinicians guided their clinical postoperative pain management according to institutional clinical guidelines, pre-existing medical conditions and/or their own or personalized clinical discretions could also play a role in this variability. Third, an important factor that could have influenced the slightly higher intraoperative opioid requirements in the PECs group is the longer duration of surgical procedures in the PECS block group when compared to the control group

Conclusion:

We found comparable results in the postoperative VAS score at all time measurement and perioperative opioid consumption suggesting that the use of PECS block combined with MMA may not reduce intraoperative and/or postoperative opioid consumption in subjects undergoing elective breast surgery. However, the incidence of PONV was less prevalent in PECS group followed by PECS block combined with MMA.

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