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Comparative Study between Ultrasound Guided Pectoral Nerves Block and Thoracic Paravertebral Block as Postoperative Analgesia in Breast Surgeries

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ABSTRACT

Background: Breast surgery is an exceedingly common procedure and is associated with an increased incidence of acute and chronic pain in 25–60% of cases. Regional anesthesia techniques may improve postoperative analgesia for patients undergoing breast surgery.

Objective: This study aimed to compare the efficacy and safety of an ultrasound-guided Pecs II block versus TPVB for postoperative analgesia after breast surgeries.

Patients and Methods: The present study was conducted on sixty female patients ASA I-II, their ages ranged from 18- 65 years old scheduled for unilateral breast surgery. The patients were allocated randomly into two groups *(n=30)* according to type of regional anesthesia administrated. (PECS block or TPVB).

Results: The results demonstrated that PECS block caused hemodynamic stability, decreased the intensity of post-operative pain, reduced postoperative analgesic requirement, prolonged the time needed for first request of analgesia and decreased PONV. Therefore it can be considered as quite safe procedure and effective as well for intraoperative and postoperative pain control in breast surgeries.

Conclusion: PECS blocks can produce excellent pain relief during the first twelve postoperative hours. They hold great promise due to their simplicity, easy-to-learn techniques and relative lack of contraindications and complications. It maintained hemodynamic stability. Also, it produced low pain scores and less total (morphine) consumption in the early postoperative period after unilateral breast cancer surgery.

Keywords: Arterial blood pressure, Non-steroidal anti-inflammatory drugs, Paravertebral block. Ultrasound.

INTRODUCTION

There is an interest in the use of regional anesthesia for breast surgery as it gives good postoperative pain control with decreasing opiate dosage and side effects. When combined with general anaesthetics, it allows great reduction in general anaesthetics side effects. So, early recovery, low incidence of nausea and vomiting [(1)].

Thoracic paravertebral blocks are considered the ‘‘gold standard’’ regional anesthesia technique for patients undergoing breast surgery. They provide anesthesia or analgesia to the chest wall and may be utilized as the primary anesthetic or for postoperative pain management. Further, paravertebral blocks have been associated with decreased opioid consumption resulting in decreased related side-effects [(2)].

On the other hand, attributed to the recent application of ultrasound (US) in anesthetic practice, several interfascial plane blocks have been described recently. Pectoral nerve block (Pecs) is a novel interfascial plane block which can provide analgesia after breast surgery [(3)].

The pectoral nerves block (Pecs block) is an easy and reliable superficial block. Once the pectoralis muscles are located under the clavicle the space between the two muscles is dissected to reach the lateral pectoral and the medial pectoral nerves. The main indications are breast expanders and subpectoral prosthesis where the distension of these muscles is extremely painful. A second version of the Pecs block is called ‘‘modified Pecs block’’ or Pecs block type II. This novel approach aims to block at least the pectoral nerves, the intercostobrachial, intercostals III-IV-V-VI and the long thoracic nerve. These nerves need to be blocked to provide complete analgesia during breast surgery [(4)].

AIM OF THE WORK

The aim of this study was to compare the efficacy and safety of an ultrasound-guided Pecs II block versus TPVB for postoperative analgesia after breast surgeries.

PATIENTS AND METHODS

- **Design:** Prospective, double blind randomized clinical study.
- **Setting:** The study was carried out in AL-Azhar University Hospitals.
- **Ethical Considerations: After approval of The Institutional Ethics Committee of The Faculty of Medicine, Al-Azhar University.** 60 Patients scheduled for breast surgery were enrolled in this study. All patients were counseled for the study protocol and a written informed consent was obtained from study participants.
- **Inclusion Criteria:** Patients undergoing breast surgeries. Age: (20-60) years. Female gender. ASA class (I-II) patients.
- **Exclusion Criteria**: Previous surgery for breast cancer (except diagnostic biopsies). Inflammatory breast cancer. Scheduled free flap reconstruction. ASA Physical Status ≥ 4. Any contraindication to regional analgesia (including

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coagulopathy and abnormal anatomy). Any contraindication to midazolam, propofol, isoflurane or fentanyl. Obesity defined as BMI ≥ 30 kg/m^2. Chronic use of pain medication (started > 3 months ago). Chronic drug or alcohol abuse. Dementia. Pregnancy. Kidney or liver failure.

Methods of randomization: Randomization of patients was done using a computerized program (SPSS). Sealed envelopes were numbered according to the randomization tables. Packing, sealing and numbering of the envelops was performed by a neutral medical personnel (Under the supervision of doctors from the Department of Anaesthesiology). The number of cases included in this study was simple randomly allocated into two groups (30 in each group).

Sample size justification: Sample size was calculated using EpiInfo® version 6.0, setting the type-1 error (α) at 0.05 and the power (1-β) at 0.80.

Study groups:

Group A (n =30): (PECS II B) group: received ultrasound guided pectoral nerves (PECS II B) block.

Group B (n =30): (TPVB) group: Received ultrasound guided thoracic paravertebral (TPVB) block.

Baseline Assessment: Preoperative basic investigations in the form of electrocardiography (**ECG**), complete blood picture (**CBC**), coagulation profile, liver and kidney function tests and random blood sugar. All patients instructed how to be familiar with the visual analogue scale (VAS) for pain and the modes of analgesia including their advantages and disadvantages.

Materials: Ultrasound machine (SIEMENS, ACUSON P300, ITALY) a linear probe of high frequency (6–13 MHz). Drugs – bupivacaine 0.25% vial and xylocaine 2%.

Anaesthesia techniques: On the day of surgery we checked if there has been any recent change in the patient's condition or therapy particularly one that might affect the surgical event. Check that the patient has taken his regular medications. Confirm that the patient has been well since the preoperative assessment visit and does not have any acute illness such as an upper respiratory tract infection or influenza. Check that the consent form has been completed. Blood pressure rechecked if indicated by preoperative assessment. Standard patient monitoring was attached to the patient and an IV access was inserted.

Patient monitoring: Pulse oximetry (SpO2). ECG (heart rate; HR). Non-invasive blood pressure monitoring. Capnography.

Premedication: All patients received midazolam 1–2 mg before the procedure. All the patients infused 500 ml normal saline.

Anaesthesia technique

Anaesthesia technique of (Group A) (n= 30): The patient in the supine position with placing the ipsilateral upper limb in abduction 90° position, The infraclavicular and axillary regions cleaned, a high frequency linear probe of ultrasound (US) at the mid clavicular level and angled inferolaterally, first locate the axillary artery and vein. Next move the probe laterally until pectoralis minor and serratus anterior are identified.

Locate the 2nd rib immediately under the axillary artery, then count the 3rd rib, and with further lateral probe movement, the 4th rib. With the image centered at the level of the 3rd rib the skin point of puncture is infiltrated with 2% lidocaine and once the structures are identified by ultrasound advance the needle in-plane from medial to lateral in an oblique manner until the tip lies between pectoralis minor and serratus anterior. Then we proceed to inject 20 ml of 0.25% bupivacaine under pectoralis minor muscle above the serratus muscle and 10 ml between the pectoralis major and minor muscles.

Anaesthesia technique of (Group B) (n= 30): Thoracic paravertebral (TPVB) block was performed under ultrasonographic guidance in the preoperative area with the patient in the sitting position. The anatomical landmarks were identified with standard technique by palpating the most prominent cervical spine that of C7, the inferior border of the scapula: corresponding to the spinous process of T7, the highest points of the iliac crests: corresponding to L4-5 interspace. The desired interspace was identified (T3-4) and confirmed by counting the spinous processes up and down. Surgical disinfection of thoracic paravertebral area was done. A linear high-frequency transducer was used. The scanning process (longitudinal out-of-plane technique) was started at 5 to 10 cm lateral to the spinous process to identify the rounded ribs and parietal pleura underneath. The transducer is then moved progressively more medially to identify the transverse process. The best views of the paravertebral anatomy were obtained with the transducer tilted slightly obliquely, i.e., with the upper part of the transducer directed slightly medially in the sagittal axis.

The superior costotransverse ligament was identified as a collection of homogeneous linear echogenic bands alternating with echo-poor areas running from one transverse process to the next. Inject 20 ml LA (Bupivacaine 0.25%) in the space between the pleura and the costotransverse ligament at the level of T3.

For both groups: **1**-The patients were observed for 30 min after performing the block. The sensory level of block will be assessed by a blinded observer with pin-prick sensation every 5 min in each dermatomal distribution from T1 to T8.

2- Both groups recieved general anesthesia (G.A.) after the technique by propofol (2 mg/kg), atracurium (0.5 mg/kg) and fentanyl (1 ug/kg) for induction and isoflurane (0.8-1.2 %) in 100% O2 for maintenance of anesthesia.

3- Postoperative analgesia: a. All patients of both groups received non steroidal anti inflammatory drugs in form of tenoxicam (Epicotil) 8mg intravenous just after transferring to ward and every 12 hours. b. Patients with VAS score 4 or more received 5mg morphine intravenous as rescue analgesia.

***The following will be assessed:* - Multiple variables used to assess patients:**

***1-Primary Assessment*:** The primery outcome measures of the study was the duration of analgesia (time to first rescue analgesia after administration of block) and total analgesic consumption in 24 h after surgery.

2 -Secondary assessment: Postoperative pain at 0, 2, 4, 6,8,12 and 24 hrs from the recovery from anesthesia using the visual analogue scale (**VAS);** a scale graded from 0 to 10 where 0=no pain and 10=severe pain It was used to assess the intensity of post-operative pain. Patient was asked to place a mark on 10 cm horizontal line with two end points "no pain" at one of them and "the worst pain ever" at the other one. The mark corresponds to the level of pain intensity the patient presently felt at that moment. The distance in cm from the low end of the **(VAS)** to the patient's mark was used as numerical index of the severity of pain.

The intensity of pain was assessed during rest and on coughing or during physiotherapy. Cardiovascular variables included **MAP** and **HR**. Recorded data were collected before beginning of anesthesia (baseline), after block, after induction, 15min. after block, 1 hr after block, end of surgery, PACU, 4hrs post operative and 8hrs post operative. Postoperative Nausea and Vomiting **(PONV)** using a 5-point scale (0–4), where 0 = no nausea or vomiting, 1 = mild nausea, 2 = severe nausea, 3 = vomiting once, and 4 = vomiting more than once.

Patients with score 2 or more received Ondansetron (Danset) 4mg intravenous. Incidence of complications as hemodynamic instability, injury to the underlying structures (pnumothorax), hematoma formation or local anaethetic toxicity. Hypotension treated by 250 saline and ephedrine. Bradycardia treated by atropine (0.01mg /kg). Severe nausea and vomiting treated by 4mg ondansetron.

Statistical analysis

Recorded data were analyzed using the statistical package for social sciences, version 20.0 (SPSS Inc., Chicago, Illinois, USA). Quantitative data were expressed as mean ± standard deviation (SD). Qualitative data were expressed as frequency and percentage.

The following tests were done: Independent-samples t-test of significance was used when comparing between two means. Mann Whitney U test: for two-group comparisons in non-parametric data. Chi-square (x^2) test of significance was used in order to compare proportions between qualitative parameters. The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value was considered significant as the following: Probability (P-value): P-value < 0.05 was considered significant, P-value < 0.001 was considered as highly significant and P-value > 0.05 was considered insignificant.

RESULTS

Table (1): Comparison between group A: PECS and group B: TPV according to demographic data.

Demographic data	Group A: PECS *(n=30)*	Group B: TPV *(n=30)*	t/x2#	p-value
Age (years) Mean±SD Range	 48.37±13.43 18-64	 47.80±10.72 23-65	0.033	0.857
ASA I II	 14 (46.7%) 16 (53.3%)	 15 (50.0%) 15 (50.0%)	0.067#	0.796
Weight (kg) Mean±SD Range	 75.83±7.47 60-90	 75.70±8.35 60-90	0.004	0.948

t-Independent Sample t-test; #x^2: Chi-square test
p-value>0.05 NS

This table showed no statistically significant difference between group A: PECS and group B: TPV according to demographic data.

Table (2): Comparison between groups according to type of operation.

Type of operation	Group A: PECS (N=30)	Group B: TPV (N=30)	x2	p-value
Modified radical mastectomy	15 (50.0%)	14 (46.7%)	0.387	0.943
Lumpectomy	8 (26.7%)	7 (23.3%)		
Simple mastectomy	6 (20.0%)	8 (26.7%)		
Axillary dissection	1 (3.3%)	1 (3.3%)		

x^2 Chi-square test; p-value >0.05 NS

Table (3): Comparison between group A: PECS and group B: TPV according to surgical duration (min).

Surgical Duration (min)	Group A: PECS *(n=30)*	Group B: TPV *(n=30)*	t-test	p-value
Mean±SD	97.50±15.13	96.33±17.59	0.076	0.784
Range	60-120	60-120		

t-Independent Sample t-test; p-value >0.05 NS

This table showed no statistically significant difference between group A: PECS and group B: TPV according to surgical duration (min).

Table (4): Comparison between group A: PECS and group B: TPV according to heart rate (beat/min).

Heart Rate (beat/min)	Group A: PECS *(n=30)*	Group B: TPV *(n=30)*	t-test	p-value
Baseline Mean ± SD Range	70.93 ± 6.05 60-81	70.87 ± 5.37 60-79	0.002	0.964
After block Mean ± SD Range	70.80 ± 5.56 59-84	68.83 ± 7.38 54-84	1.360	0.248
After induction Mean ± SD Range	70.93 ± 5.04 61-83	69.63 ± 6.86 59-80	3.848	0.864
15min. after block Mean ± SD Range	71.77 ± 4.64 63-80	70.30 ± 5.29 59-80	1.302	0.259
1 hr after block Mean ± SD Range	71.40 ± 3.58 66-79	71.13 ± 3.68 66-79	0.081	0.777
End of surgery Mean ± SD Range	70.67 ± 3.57 65-76	71.67 ± 3.66 65-81	1.149	0.288
PACU Mean ± SD Range	71.73 ± 3.81 64-79	71.30 ± 4.11 63-79	0.179	0.673
4hrs post operative Mean ± SD Range	72.27 ± 3.44 64-79	71.03 ± 4.60 60-79	1.380	0.245
8hrs post operative Mean ± SD Range	71.30 ± 4.00 63-78	69.70 ± 4.56 60-77	2.084	0.154

t-Independent Sample t-test;
*p-value>0.05 NS; *p-value <0.05 S*

This table showed no statistically significant difference between group A: PECS and group B: TPV according to heart rate.

Table (5): Comparison between group A: PECS and group B: TPV according to mean arterial blood pressure (mmHg).

	Mean arterial blood pressure (mmHg)	Group A: PECS *(n=30)*	Group B: TPV *(n=30)*	t-test	p-value
Baseline	Mean ± SD Range	89.10 ± 3.78 80-96	89.90 ± 3.74 80-96	0.678	0.414
After block	Mean ± SD Range	85.23 ± 3.97 73-91	82.60 ± 9.26 63-88	1.430	0.158
After induction	Mean ± SD Range	84.60 ± 3.89 72-90	87.90 ± 3.74 80-96	14.284	0.112
15min. after block	Mean ± SD Range	86.10 ± 3.83 74-92	83.57 ± 10.09 53-90	1.284	0.204
1 hr after block	Mean ± SD Range	87.10 ± 5.90 75-93	84.00 ± 7.27 60-90	1.813	0.075
End of surgery	Mean ± SD Range	87.40 ± 3.97 75-93	84.07 ± 5.71 70-90	1.900	0.211
PACU	Mean ± SD Range	87.10 ± 3.76 76-94	85.10 ± 2.67 78-90	1.637	0.321
4hrs post operative	Mean ± SD Range	87.30 ± 3.75 76-94	85.60 ± 3.92 75-94	2.946	0.091
8hrs post operative	Mean ± SD Range	89.10 ± 3.69 80-96	88.70 ± 3.81 80-95	0.171	0.681

*t-Independent Sample t-test; p-value>0.05 NS; *p-value <0.05 S; **p-value <0.001 HS*

This table showed no statistically significant difference between group A: PECS and group B: TPV according to mean arterial blood pressure.

Table (6): Comparison between group A: PECS and group B: TPV according to VAS score.

VAS score	Group A: PECS *(n=30)*	Group B: TPV *(n=30)*	z-test	p-value
PACU Mean ± SD Range	 0.40 ± 0.50 0-a1	 1.43 ± 0.82 0-3	34.967	<0.001**
2hrs post-operative Mean ± SD Range	 1.00 ± 0.74 0-a2	 2.60 ± 1.22 1-4	37.622	<0.001**
4hrs post-operative Mean ± SD Range	 2.03 ± 1.16 0-a4	 2.47 ± 0.82 2-4	3.796	0.048*
6hrs post operative Mean ± SD Range	 2.20 ± 1.06 1-a4	 2.80 ± 1.00 2-4	5.084	0.028*
8hrs post operative Mean ± SD Range	 2.67 ± 1.27 0-a4	 3.37 ± 0.56 2-4	7.663	0.008*
12hrs post operative Mean ± SD Range	 1.87 ± 1.53 0-a4	 2.97 ± 0.67 2-4	13.088	<0.001**
16hrs post operative Mean ± SD Range	 2.30 ± 0.75 1-a4	 2.33 ± 0.48 2-3	0.042	0.838
24hrs post operative Mean ± SD Range	 2.33 ± 0.76 0-a3	 2.30 ± 0.47 2-3	0.042	0.838

*z-Mann-Whitney test , p-value>0.05 NS; *p-value <0.05 S; **p-value <0.001 HS*

This table showed statistically significant decrease mean of group A compared to group B according to VAS score from PACU to 12hrs post-operative.

Table (7): Comparison between group A: PECS and group B: TPV according to time for first analgesic (min).

Time for first Analgesic (min)	Group A: PECS *(n=30)*	Group B: TPV *(n=30)*	t-test	p-value
Mean ± SD	390.0 ± 95.3	210.0 ± 101.6	7.078	<0.001**
Range	240-480	120-360		

t-Independent Sample t-test; p-value <0.001 HS

This table showed statistically significant decrease of mean of group B compared to group A according to time for first analgesic (min).

Table (8): Comparison between group A: PECS and group B: TPV according to morphine rescue.

Morphine rescue	Group A: PECS *(n=24)*	Group B: TPV *(n=25)*	t-test	p-value
Totalmorphine Mean ± SD	180 7.50 ± 2.53	240 10.0 ± 0.0	14.683	<0.001**

t-Independent Sample t-test; p-value>0.05 NS; p-value <0.001 HS

This table showed statistically significant decrease of mean of group A compared to group B according to morphine rescue.

Table (9): Comparison between group A: PECS and group B: TPV according to nausea and vomiting.

Nausea and Vomiting	Group A: PECS *(n=30)*	Group B: TPV *(n=30)*	x2	p-value
PACU				
No Nausea or Vomiting	27 (90.0%)	29 (96.7%)		
Mild Nausea	0 (0%)	0 (0%)		
Sever Nausea	3 (10.0%)	1 (3.3%)	1.071	0.301
Vomiting Once	0 (0%)	0 (0%)		
Vomiting More	0 (0%)	0 (0%)		
2hrs post operative				
No Nausea or Vomiting	29 (96.7%)	28 (93.3%)		
Mild Nausea	0 (0.0%)	0 (0.0%)		
Sever Nausea	0 (0.0%)	2 (6.7%)	3.018	0.221
Vomiting Once	1 (3.3%)	0 (0.0%)		
Vomiting More	0 (0%)	0 (0%)		
4hrs post operative				
No Nausea or Vomiting	30 (100.0%)	28 (93.3%)		
Mild Nausea	0 (0.0%)	0 (0.0%)		
Sever Nausea	0 (0.0%)	0 (0.0%)	2.069	0.150
Vomiting Once	0 (0.0%)	2 (6.7%)		
Vomiting More	0 (0%)	0 (0%)		

x^2: Chi-square test; p-value >0.05 NS

This table showed no statistically significant difference between groups according to nausea and vomiting.

Table (10): Comparison between group A: PECS and group B: TPV according to side effects.

Side Effects	Group A: PECS *(n=30)*	Group B: TPV *(n=30)*	x2	p-value
Pneumothorax				
No	30 (100.0%)	30 (100.0%)	0.000	1.000
Yes	0 (0%)	0 (0%)		
Urinary Retention				
No	30 (100.0%)	30 (100.0%)	0.000	1.000
Yes	0 (0%)	0 (0%)		
Hypotension				
No	30 (100.0%)	27 (90.0%)	3.158	0.076
Yes	0 (0.0%)	3 (10.0%)		
Bradycardia				
No	30 (100.0%)	27 (90.0%)	3.158	0.076
Yes	0 (0.0%)	3 (10.0%)		
Nausea				
Yes	3 (10%)	3 (10%)	0.000	1.000
No	27 (90%)	27 (90%)		
Vomiting				
Yes	1 (3.35)	2 (6.7%)	0.079	0.896
No	29 (96.7%)	28 (93.3%)		

x^2: Chi-square test;
*p-value>0.05 NS; *p-value <0.05 S*

This table showed no statistically significant difference between groups according to hypotension, bradycardia or vomiting.

Table (11): Comparison between group A: PECS and group B: TPV according to surgeon satisfaction.

Surgeon Satisfaction	Group A: PECS *(n=30)*	Group B: TPV *(n=30)*	x2	p-value
Fair	5 (16.7%)	14 (46.7%)	19.189	<0.001**
Good	11 (36.7%)	16 (53.3%)		
Very good	7 (23.3%)	0 (0.0%)		
Excellent	7 (23.3%)	0 (0.0%)		

*x^2: Chi-square test; **p-value <0.001HS*

This table showed highly statistically significant difference between groups according to surgeon satisfaction.

DISCUSSION

The breast surgery is one of the most common procedures conducted in a hospital setting and is associated with the onset from moderate to severe postoperative pain. Despite the efforts of the anesthesiologists and the multiple therapeutic strategies actually available, there is an increase, following breast surgery, of chronic pain onset syndromes with a significant quality of life impairment. Opioids, are a good option to control postsurgical pain however, these drugs while having a proven analgesic efficacy are characterized by many side effects such as nausea, vomiting, pruritus, sedation, respiratory depression, hypotension, urinary retention, as well as immunosuppressive effects and recently pro-metastatic rule [(5)].

Although GA is the conventional technique used for oncologic breast surgeries that produce the desired state of unconsciousness, it does not eliminate the surgical stress response; it may aggravate immunosuppression and may cause undesirable side effects such as post-operative pain, nausea and vomiting [(6)].

Currently, Thoracic Epidural Anesthesia (TEA) and Thoracic Paravertebral Block (TPVB) represent the main techniques to manage postoperative analgesia in breast surgery. However, although these techniques allow excellent control of pain, they are not always easy to perform and their clinical effectiveness is limited by the presence of several contraindications, as well as the possible occurrence of systemic side effects or procedural complications. Recent literature emphasizes the role of new chest wall block in this surgical field as innovative and simple reproducible RA techniques, placed in the context of a multimodal approach. Concomitant use of regional blocks can not only help to minimize pain, but also improves the pulmonary function and reduce narcotic requirement during the perioperative period [(7)].

On the other hand, attributed to the recent application of US in anesthetic practice, PECS is a novel interfascial plane block have been described recently, that aims to block the lateral and medial

pectoral, the intercostobrachial, the intercostals II and VI and the long thoracic nerves. These nerves need to be blocked to provide complete analgesia during breast surgery. The effectiveness based on our understanding that the brachial plexus nerves are the main component of this painful surgery [8].

The present study was conducted to compare the efficacy and safety of the PECS II block with TPVB for postoperative analgesia, hemodynamics and complications in patients undergoing unilateral breast surgery.

As regards hemodynamic measurements (MAP, HR), the results of the current study showed that there was no statistically significant difference found between the two studied groups at baseline values, 15min. after block, 1 hr after block, End of surgery, PACU, 4hrs post operative, 8hrs post operative (P-value > 0.05) while there was decrease in (MAP, HR) in 3cases after induction, after block in TPVB group compared to PECS group. This hemodynamic response is due to epidural spread of local anesthetic and bilateral sympathetic blockade observed in TPVB group. As the PECS blocks are peripheral nerve blocks, they do not produce sympathectomy so no hemodynamic affection. The results obtained in this study are similar to the study done by **Wahba and Kamal** [9] in which they compared the analgesic efficacy of thoracic paravertebral block VS pectoral nerve block for postoperative pain relief in modified radical mastectomy surgery for carcinoma breast which implies that only one patient in TPVB group was recorded to have bilateral blockade and hypotension which presumably due to epidural spread of local anesthetic. Also, in agreement with the results of the current study, study done by **Bashandy and Abbas** [10] where they performed randomized study on 120 patients allocated to receive either GA plus PECS block or GA alone and **Blancoa *et al.*** [4] who performed the PECS II block in 50 patients undergoing modified radical mastectomies, they reported that there is no change in hemodynamic with the PECS block because there is no sympathetic block was associated with it as that is associated to paravertebral. Also**, ELdeen** [11] reported that when compared PECS block with thoracic spinal at the T5 in breast cancer surgery, there was no change with PECS block in HR and MAP as it is away from sympathetic supply of breast and chest area whereas the thoracic spinal blocks bilateral sympathetic supply to breast and chest area, and also the extent of the spread of the drugs is greater. These differences might explain the significance in the incidence of hypotension and bradycardia between the 2 groups.

Additionally, we found that there was a significant prolongation in duration of postoperative analgesia in the patients receiving the PECS block. The mean duration was 390.0 ± 95.3 min in PECS group and 210.0 ± 101.6 min in TPVB. Postoperative total morphine consumption in first 24 hrs was less in PECS group [7.50 ± 2.53 mg] compared to TPVB group [10.0 ± 0.0 mg] with a P value of < 0.001. Therefore; PECS block is efficient after surgery with axillary dissection. The results of **Wahba and Kamal** [9] are consistent with our results. They found that postoperative morphine consumed at 24 h was significantly lower in PECS group [21 (20–25) mg] than in TPVB group [28 (22–31) mg] with lower intensity of pain in the first 12 h. The time for first request of morphine was significantly longer in PECS group [175 (155–220) min] than in TPVB group [137.5 (115–165) min]. They concluded that PECS II block favors mastectomy and axillary clearance, since medial and lateral pectoral nerves, long thoracic and thoracodorsal nerves are involved but TPVB does not therefore, lack of adequate analgesia with TPVB is definitely coexisting. **El-Sheikh *et al.*** [12] who studied TPVB versus PECS block for analgesia after breast surgery also reported that the mean time for first request of morphine was prolonged in PECS group (5.20 ± 4.79 hr) than in TPVB group (4.95 ± 3.50hr). In the same line with our results, the study of **Bashandy and Abbas** [10] who studied PECS block VS GA in breast cancer surgery using 0.25% bupivacaine, they found that the total amount of postoperative morphine was significantly lower in the PECS group than in the GA group. They reported that the PECS block is a combination of motor and sensory nerve blocks produce excellent analgesia when combined with GA for breast surgery with axillary dissection.

Study of ***Kulhari et al.*** [13] on patients undergoing breast surgery revealed that the mean duration of analgesia was significantly prolonged in patients receiving the PECS II block compared to TPVB. Also, there was a 33.3% reduction in total morphine consumption in the PECS II block group compared to the TPVB group during the 24 h postoperative period. They demonstrated that because the TPVB does not block the medial and lateral pectoral nerves as effectively as the long thoracic and thoracodorsal nerves, leading to inadequate analgesia. In contrast, the PECS II block leads to complete block of these nerves leading to good analgesia.

In present study, pain scores assessed by VAS and the results showed that, patients with PECS block experienced less intense pain at the first 12 hrs postoperative than TPVB group with statistically significant decrease of VAS. This explained why patients with TPVB having radical mastectomy were frequently complaining of pain in the axilla and upper limb. In contrast, the PECS block led to better pain relief. Supporting to our results, **Kulhari *et al.*** [13] studied PECS block versus TPVB for postoperative analgesia after radical mastectomy also reported that pain scores were lower in patients receiving the PECS

II block in the immediate postoperative period for 2 h after surgery compared to the TVPB group [median, 2 (2–2.5) vs 4 (3–4) in the PECS II and TPVB group, respectively (P < 0.0001). Similar results were observed by **Wahba and Kamal** [9] who compared TPVB with PECS in breast cancer surgery they concluded that pain scores were significantly lower in PECS group in first 12 h postoperative (P < 0.001) and pain intensity was higher in the next 12 h in comparison with PVB group probably because of effacing effect of local anesthetic. **ELdeen** [11] found that VAS was significantly decreased in PECS group throughout surgery and first 24 h postoperative when compared to thoracic spinal in breast surgery. Also, **Bashandy and Abbas** [10] and **Yuki *et al.*** [14] studied PECS block versus GA in breast cancer surgery and they observed significant lower VAS pain scores in the PECS group at all postoperative periods. On the other hand, **Hetta and Rezk** [15] found that on comparing PECS with TPVB the intensity of pain at rest and movement was low in both groups in VAS 0, 2, and 4 hours postoperatively and no significant differences were observed. However, there was significant reduction in the median VAS at rest and movement in group TPVB compared with group PECS at 8, 16 and at 24 hours. It can be explained by that authors injected the LAs in three level in PVB group at T2, T4, T6 in the area supplied by intercostal nerves from T1 to T7, including the axilla that was anesthetized in all patient. In group PECS, the whole amount of Las was injected in the fascial plane between Pmm and Sam. They did not block the pectoral nerves therefore the axilla was not anesthetized in 12 patients, and the block did not cover dermatomal area of T6 and dermatomes below it in 9 patients.

As regarding hypotension (MAP < 20% of preoperative value) and bradycardia (heart rate < 50 b/min), the results of the current study showed that hypotension occurred in 3 patients in TPVB group and no one in PECS group. The decrease in MAP was treated with IV fluid and ephedrine 6 mg in incremental dose. On the other hand, there was 3 patients in TPVB developed bradycardia and non in PECS group. The decrease in heart rate was managed by atropine IV (0.01mg/kg). This incidence of hypotension and bradycardia was correlated with bilateral sympathetic block in TPVB. In addition, induction of anesthesia after giving of LA may have a role. **Kulhari *et al.*** [13] compared PECS with TPVB in MRM patients and reported that one patient in the TPVB group developed intraoperative hypotension. The TPVB can produce bradycardia and hypotension by blocking sympathetic fibres. In the same line **Wahba and Kamal** [9] showed that one patient in TPVB group developed hypotension, which presumably due to epidural spread of local anesthetic. Therefore, PECS block is considered to be a technique that almost devoid of predicted complication.

Postoperative nausea and vomiting, (PONV) can result in serious adverse effects extending the duration of hospital care with decreased satisfaction. In terms of PONV according to 5-point scale (0–4), where 0 = no nausea or vomiting, 1 = mild nausea, 2 = severe nausea, 3 = vomiting once and 4 = vomiting more than once. This study done at PACU and 2, 4 hrs from the end of procedure and showed lower incidence of PONV in both groups with no significant statistical difference in between. ***Davies et al.*** [16] in meta-analysis study between paravertebral and epidural in patients undergoing thoracotomy found that nausea and vomiting occurred less often with TPVB although there was no difference in pain scores or analgesic consumption between TPVB and epidural. In the same line **Wahba and Kamal** [9] observed that PONV was comparable between TPVB (56.7%) and PECS (53.3%). The higher incidence might be due to high dose used of morphine. **Bashandy and Abbas** [10] and **Yuki *et al.*** [14] studied MRM patients under GA with and without PECS blocks; they found lower PONV scores in the PECS group in MRM surgery.

As regard block-related complications (pnumothorax and local anaethetic toxicity), current study did not encounter any complications during the study. This might be because of the small number of patients taken for the study. However, blood was aspirated in two patients when the paravertebral space was entered which required second attempts at the blocks.

As regard surgeon satisfaction among the studied groups, the surgeons were satisfied with patients underwent PECS block as surgeons for 14 patients (46.6%) with very good and excellent grades than TBVB group with no surgeons gave very good or excellent grades. We explain that because of hydrodissection produced by PECS block between PM and pmm which facilitate dissection intraoperative in MRM.

Finally, we recommend that future studies are needed using larger volume, higher concentration or using local anesthetic adjuvant to increase the duration and intensity of analgesia. Also, future clinical trials should be performed to assess the possibility of using of PECS block as sole anesthetic technique in patients undergoing breast surgeries.

CONCLUSION

PECS block can produce excellent pain relief during the first twelve postoperative hours. It hold great promise due to their simplicity, easy-to-learn techniques and relative lack of contraindications and complications. It maintained hemodynamic stability. Also, it produced low pain scores and less total (morphine) consumption in the early postoperative period after unilateral breast cancer surgery. These advantages, suggest the usefulness especially in outpatient surgery. Also, it made hydro-

dissection between pectorlis major and minor muscles which increase surgeon satisfaction.

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