

Role of pectoral nerve block (PECS II) in post-operative pain management for breast surgeries



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ABSTRACT

Background: Pain after breast surgeries is a major problem which costs both in patient comfort and duration of hospital stay. Uncontrolled post-operative pain may produce a range of detrimental acute and chronic effects. Optimal pain relief and minimal side effects following surgery have a major impact on patient outcome, including patient satisfaction and earlier mobilization, as well as fulfilling the needs for streamlined surgical services with lower costs. **Aims and Objectives:** The aim of the study was to assess for the pain score during the first 24 h with time of the first request for rescue analgesic and total analgesic requirement and also to assess the patient's satisfaction for post-operative pain relief and consequences if any during the first 24 h. **Materials and Methods:** This prospective study was conducted in 60 patients of ASA status I or II considering for mastectomy categorized into two groups, the first group with 30 patients who received Bupivacaine drug and second group with 30 patients who received normal saline. In the PACU, each patient's VAS score and tramadol use were evaluated. The pectoral nerve block is a less invasive interfascial plane block used for post-operative pain relief in breast surgeries that involves deposition of local anesthetic between the pectoralis major and minor muscles, in addition to the serratus anterior and pectoralis minor muscles and the intercostal muscles, blocking the lateral branches of the intercostal nerves and the long thoracic nerve. **Results:** We found a significant difference in total rescue analgesia intake among control and PECS II block groups, in an initial 24 h of surgery. In the control group, mean VAS score and total rescue analgesia intake in 24 h were statistically significant greater ($P < 0.05$). **Conclusion:** We concluded that pectoral nerve block is an effective and easy technique for pain control and fast recovery in post-operative period following breast surgeries.

Key words: Mastectomy; Pectoral nerve block; Postoperative analgesia

INTRODUCTION

New procedures for blocking the pectoral nerves, Nervi intercostales 3–6, intercostobrachial nerves, along the extended thoracic nerve have been developed. They offered pain control for a number of anterior chest cavity operations, with mastectomy being the most popular. Surgery is straightforward and there is very little sedative needed before the operation in waiting room. The PECS-I block, according to Blanco, is a high-volume interfascial

block aimed at the lateral pectoral nerves that run between the pectoralis major and minor muscles.¹

The PECS-II block, according to Blanco et al., is a 2012 version of the PECS block. PECS II, like the PECS-I, focuses on the interfascial plane between the pectoralis major and minor muscles, including the interfascial plane between the pectoralis minor and serratus anterior muscle, in addition to blocking Nervi intercostales 3–6, intercostobrachial, and extended thoracic nerves.²

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In India, breast carcinoma is a worldwide epidemic. Among the Indian women, breast carcinoma is the most predominant malignancy, with age-adjusted rates of 25.8/lakh women and a death rate of 12.7/lakh women. Following palliative treatments, surgery is often the mainstay of therapy for various breast illnesses such as cancer.³

Pain remains a serious consequence of many breast diseases. Muscle and nerve injury during breast surgery caused sharp pain, which led to causalgia in the long term.

For better outcomes and patient satisfaction, it is necessary to conquer acute pain occurring postoperatively. As a result, regional techniques are considered the best options for reducing acute post-operative pain as well as the incidence of chronic discomfort after various breast surgeries.

Opiates are very strong and effective analgesics used for the management of both sharp and long-term pain. However, various intolerable side effects are associated with the opioid use such as nausea, vomiting, constipation, fear of dependence, and tolerance.

Long-term opioid therapy with dose increases can lead to opioid-induced hyperalgesia, a hypersensitive reaction to painful stimuli associated to opioid therapy that leads pain to be intensified rather than alleviated.⁴ The most common procedures in these situations are an intrathecal infusion with local anesthetics and a sympathetic block. As a result, developing strategies to obtaining the required analgesia with lesser side effects is essential.⁵

Regional nerve blockade is being used as part of multimodal analgesia is becoming more common. They give as a single shot or as a maintenance therapy through a catheter. The peripheral nerve block is a superior option for many upper and lower extremity procedures because it provides better pain control with a lesser amount of opioid and other analgesics requirement comparing to those who received intravenous opioid for various surgeries.⁶

Regional anesthesia techniques can provide better control of pain immediately after surgery and improves patient satisfaction. Blanco described the pectoral nerve block, a unique method for providing superior pain relief following the breast operation, in 2011. To block pectoral nerves, a local anesthetic is infiltrated between the pectoral major and minor muscles.

With less technical complexity and fewer problems, the PECS-II block is commonly given to alleviate pain following breast surgery. In this prospective and randomized trial, the therapeutic pain control effectiveness

of the regional nerve block in patients following the breast operation was assessed.⁷

Aims and objectives

The aim of the study was to assess for the pain score during the first 24 h with time of the first request for rescue analgesic and total analgesic requirement and also to assess the patient's satisfaction for postoperative pain relief and consequences if any during the first 24 h.

MATERIALS AND METHODS

This prospective, randomized, controlled, and double-blinded study was undertaken at the tertiary center from April 2020 to March 2021. The Institutional Ethics Committee approved it. The study included 60 adult female patients with an ASA Grade of I or II who were planned for breast surgery under general anesthetic. Sample size was

$$n = \left(\frac{Z_{\alpha/2} \cdot \sigma}{E} \right)^2$$

determined by the following formula;

Where n = Sample size, σ = Population standard deviation, E = Margin of error, Z = The value for the given confidence interval.

Patients who were not willing, coagulopathy, and local site infection as well as those with significant systemic disorders were not analyzed.

Patients who met the eligibility requirements were categorized into two groups of 30 patients each, using computer-assisted randomization software:

Group 1 ($n=30$) was the control group and received 30 ml of Normal Saline and standard analgesic regimen with intravenous Tramadol injection.

Group 2 ($n=30$) received the pectoral nerve block (PECS II) with 30 ml of 0.2% Bupivacaine, at the end of surgery, in addition to standard post-operative analgesic regimen.

The airway, the spine, and the block location were all examined thoroughly before to the anesthetic. The patients were informed about the procedure and provided their consent. They were taught about various pain assessment scale.

Vital parameters were documented and continually monitored with standard monitors attached. The intravenous line was put in place. A complete set of resuscitation equipment was kept ready.

On patients of both the groups, PECS II block was typically done at the finish of the surgery, with patient lying supine on an operating table and their head was in the opposite direction to block. A shoulder pillow placed at the backside and arm was abducted.

As shown in Figure 1 an anesthesiologist stood near the head end of the patient, while an ultrasound machine was kept near the patient's arm. After all aseptic precaution, a linear ultrasound probe with frequency (7–12 MHz) was placed at linea medioclavicularis and moved in that direction below the lateral third of the collarbone. At first, we identified an axillary artery and vein, after that ultrasound transducer was rotated in inferior-lateral direction until the pectoralis major, minor, and serratus anterior muscles were seen in one plane between the 3rd and 4th ribs. A Stimuplex needle was introduced from the mediolateral side in plain view of the ultrasound probe until it reached the interfascial plane between the pectoralis major and minor muscles. After making sure the needle reached in the right place, 0.25% Bupivacaine 10 ml was infiltrated. The transducer was attached to the second injection at the front of chest to check the location of the interfascial plane between the pectoralis minor and the serratus anterior muscle at the fourth rib on the anterior axillary line, and local anesthetic, 0.25% Bupivacaine 20 ml, was injected at the interfascial plane for the PECS II block. An anesthesiologist with experience in ultrasound-guided PECS blocks conducted all of these nerve blocks (PECS II).

Patients were moved to the post-anesthetic care facility after the surgical operation and the block were completed (PACU). At 0, 2, 4, 6, 8, 10, 12, 18, and 24 h following the PECS II block, the presence and degree of pain were measured using a visual analog scale. Intravenous Tramadol at an incremental dose of 15 mg was given as rescue analgesia or when the VAS value >4 or the patient still complained of pain after the post-operative analgesic regime was administered. At the conclusion of the period of 24 h, the time to the first dosage of rescue analgesic and total tramadol intake was recorded.

Any indicators of the technique's adverse effects, such as a local site abscess, hematoma, or local anesthetic toxicity, were identified and dealt with appropriately. The experiment finished after 24 h of nerve block.

Statistical analysis

Data were evaluated using statistical tests (ANOVA, Tukey's HSD test, and Chi-square test). $P < 0.05$ was considered statistically significant. Student's t-test was used for testing the significance of mean in both the groups. Qualitative data were analyzed using Chi-square test.

RESULTS

From Table 1 between the groups, demographic data such as age, height, and gender distribution were statistically insignificant.

From Table 2 in both groups, the age distribution was comparable and the difference in mean age was statistically Comparable. (Refer Chart 1)

From Table 3 it is shown that breast surgeries mainly in MRM patients received high % of PECS II block (83.3%) compare to control group (73.3%).

From Table 4 illustrates that Group 2 had a longer duration of analgesia than Group 1, with $P < 0.0001$ (statistically significant). Group 1 had a larger Tramadol demand than group 2, which was statistically significant ($P < 0.0001$). (Refer Chart 2 and 3)

From Table 5, the VAS score in Group 1 was higher than Group 2 at 0, 2, 4, 6, 8, 10, and 12 h with statistically significant difference ($P < 0.05$). The differences were statistically comparable at 18 and 24 h. (Refer chart 4).

From Table 6, the level of post-operative pain alleviation was measured using a 5-point patient satisfaction rating 24-h after surgery. There was a statistically significant difference in patient satisfaction scores across groups ($P < 0.0001$). Chart 5 shows that high satisfied group was present in Group 2 whereas no patient was high satisfied in Group 1.

Table 1: Demographic data

Variable	n	GROUP 1 (CONTROL)		GROUP 2 (PECS II)		P-value
		Mean	SD	Mean	SD	
Age (Years)	30	40.23	12.29	37.57	12.71	0.412
Height (cm)	30	156.9	5.2	157.7	5.9	0.59
Weight (kg)	30	54.1	7.4	57.3	10.8	0.18

Table 2: Comparison of the age group between two groups

	Groups		Total
	GROUP 1 (CONTROL)	GROUP 2 (PECS II)	
Age Group (years)			
20–30 years	8	11	19
30–40 years	8	7	15
40–50 years	9	7	16
50–60 years	5	5	10
Total	30	30	60
	100.0%	100.0%	100.0%

Table 3 : A comparison of the different type of procedure between both groups

Name of the procedure	Group		Total
	GROUP 1 (CONTROL)	GROUP 2 (PECS II)	
MRM			
Frequency	22	25	47
%	73.3	83.3	78.3
Excision of fibroadenoma			
Frequency	0	1	1
%	0.0	3.3	1.7
Right breast lumpectomy with axillary dissection lymph node biopsy			
Frequency	1	0	1
%	3.3	0.0	1.7
I&D			
Frequency	1	0	1
%	3.3	0.0	1.7
Mastectomy			
Frequency	0	1	1
%	0.0	3.3	1.7
MRM			
Frequency	0	1	1
%	0.0	3.3	1.7
Excision biopsy			
Frequency	5	0	5
%	16.7	0.0	8.3
Needle biopsy			
Frequency	0	1	1
%	0.0	3.3	1.7
I&D and drain placement			
Frequency	1	0	1
%	3.3	0.0	1.7
Wide lumpectomy			
Frequency	0	1	1
%	0.0	3.3	1.7
Total			
Frequency	30	30	30
%	100.0%	100.0%	100.0%

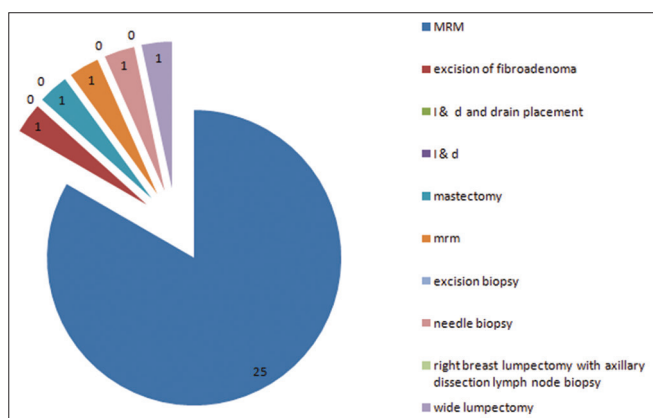
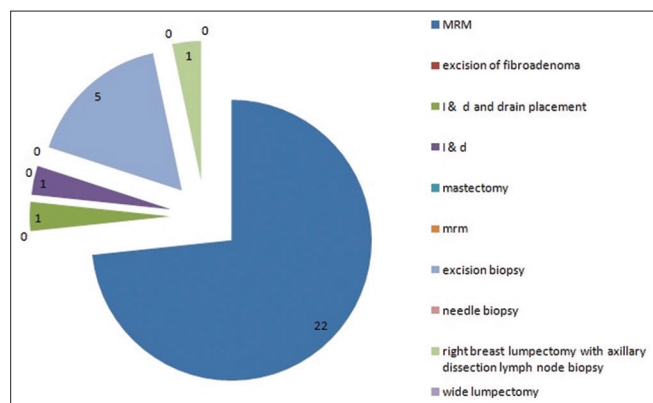


Table 4: Analgesic duration and total tramadol requirement

Variable	GROUP 1 (CONTROL)	GROUP 2 (PECS II)	P-value
Analgesic duration (hours)	5.46±20.07	11.15±3.40	<0.0001
Total tramadol Requirement (mg)	140±62.15	123.33±50.4	<0.0001

DISCUSSION

Breast diseases are very common in women of all age groups and pain associated with these diseases and along with pain associated with surgery are debilitating.⁸

The increasing demand for efficient post-operative pain relief and reduced hospital stay has magnified the role of anesthesia in breast surgeries. Both at rest and during physical therapy, these strategies have been found to be helpful and safe in managing pain. When compared to general anesthesia, these blocks have been linked to earlier discharge in patients following breast surgery. Regional treatments are also commonly used as part of a various pain control strategy that involves both pharmacological and non-pharmacological approaches.⁹

Table 5: VAS Score at between Group 1 and Group 2

VAS Score	N	GROUP 1 (CONTROL)		GROUP 2 (PECS II)		P-value
		Mean	SD	Mean	SD	
Immediately after surgery	30	0.00	0.00	0.00	0.00	1
After 2 h	30	0.97	0.81	0.10	0.31	<0.0001
After 4 h	30	2.53	1.17	0.60	0.97	<0.0001
After 6 h	30	2.83	1.09	1.30	1.09	<0.0001
After 8 h	30	3.20	1.45	1.57	0.94	<0.0001
After 10 h	30	3.23	1.19	1.33	1.09	<0.0001
After 12 h	30	2.90	1.09	1.37	1.13	<0.0001
After 18 h	30	3.10	1.06	1.60	1.16	0.01
After 24 h	30	2.43	0.77	1.50	0.90	0.026

Table 6: Patient satisfaction score

S. No.	Patient satisfaction scale	Group 1 (Control)	Group 2 (PECS II)
1.	Highly Dissatisfied	5 (16.7%)	0
2.	Dissatisfied	18 (60%)	1 (3.3%)
3.	Neither satisfied nor dissatisfied	6 (20%)	2 (6.7%)
4.	Satisfied	1 (3.3%)	11 (36.7%)
5.	Highly Satisfied	0	16 (53.3%)

Because the lengthy thoracic and thoracodorsal nerves are implicated, PECS II block favoring breast and axillary lymph node removal. The neural supply is divided into three groups: The lateral pectoral nerve (C5-7), which travels between the pectoralis major and minor muscles, and the medial pectoral nerve (C8-1) which runs beneath the pectoralis minor muscle and both supply those muscles; spinal nerves (T2-6) that run in a plane between intercostal muscle and supply lateral and anterior branches to supply thoracic cavity; and long thoracic nerve (C5-7) and thoracodorsal nerve (C6-8) that supply serratus anterior.

The goal of this research was to access the pain relief impact of the pectoral nerve block for perimastectomy pain reduction under general anesthesia.

In our study, those getting peripheral nerve blocks had a longer duration of analgesia. In a study similar to ours, Wahba and Kamal¹⁰ studied the analgesic outcome of the PECS II block for perimastectomy pain control in modified radical mastectomy surgery for cancer breast, using 30–40 ml of 0.25% Ropivacaine in both groups and found the duration of analgesia in PECS group to be 18.97±2.06 h and 13.93±3.02 h in the control group, which is comparable to analgesic duration in our study. Analgesic duration with Bupivacaine was 15.086.33 h, which was longer than ours, according to Fancellu et al., in 2020.

The two groups, PECS II and CONTROL, were compared in terms of visual analog scale at various intervals. In comparison to controls, pain reduction by PECS II block in breast surgery dramatically lowers the post-operative VAS pain score.



Figure 1: Ultrasound guided PECS II block

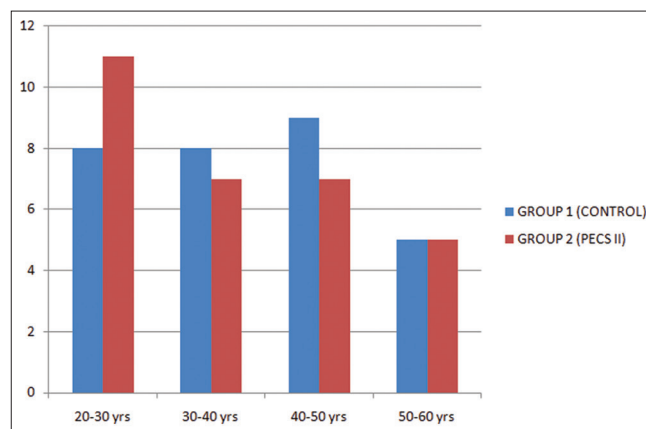


Chart 1: A comparison of the age group between two groups

VAS scores of patients undergoing PECS II block and controls were statistically comparable, which indicate that the two groups had similar analgesic efficacy. Martinsiv et al.,¹¹ found a similar result when comparing the pain control effect of PECS II block versus the control group for pain control in unilateral radical mastectomy for breast cancer, implying that regional block technique is better in providing long-term post-operative pain control.

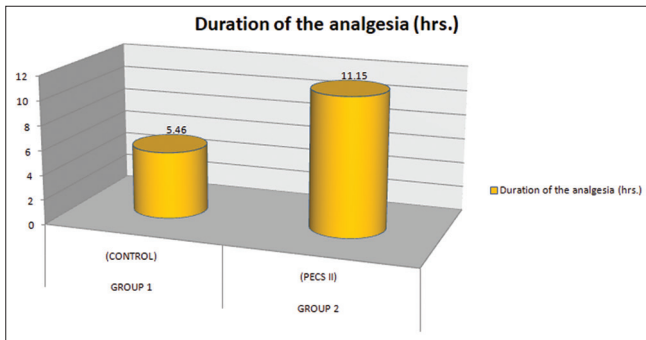


Chart 2: Duration of analgesia between both groups

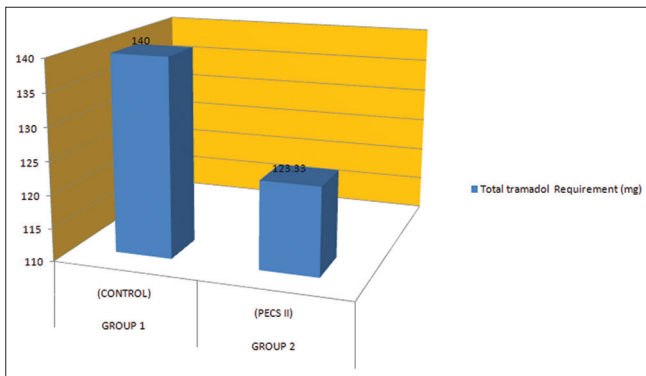


Chart 3: Comparison of the total tramadol requirement between two groups



Chart 4: Comparison of the visual analog scale score in relation to time interval between two groups

The time for the first dose of Tramadol in minutes was compared between the two groups. The mean-time for the first analgesic, that is, Tramadol, in patients with pectoral nerve blocks is 11.15 ± 3.40 h and for the control group is 5.46 ± 20.07 h. The pain relief effect of the PECS II block versus control group for improving patient outcomes in breast surgeries was compared by Arab *et al.*, and found that

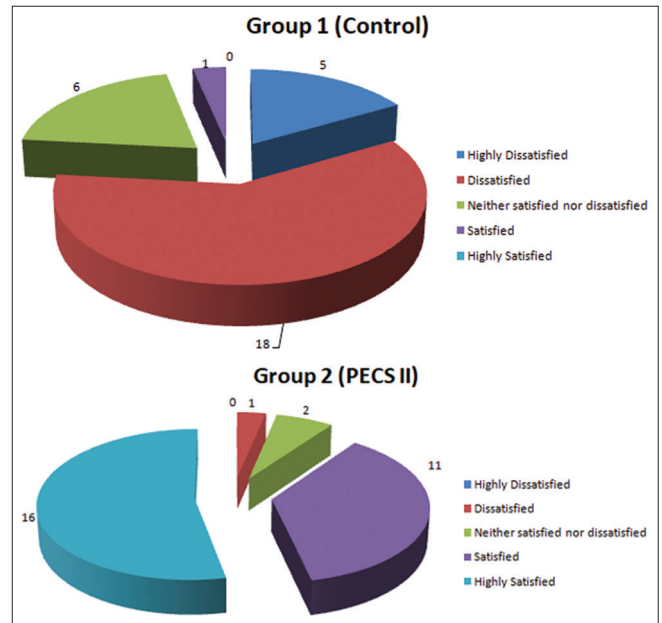


Chart 5: Comparison of the patient satisfaction scale between the two groups

PECS II is superior in providing prolonged post-operative pain reduction.

Patients' post-operative analgesia quality (excellent, good, or poor) was evaluated by Moon *et al.*,¹² in 2017 and found that the PECS II group's analgesia was considered excellent by 76.67%, good by 16.66%, and poor by 6.67%.

Limitations of the study

The present study has some limitations. The sample size was small. The post-operative pain, which is a subjective experience and can be difficult to quantify objectively and compare.

CONCLUSION

Pectoral nerve block (PECS II) is an effective and easy to perform technique for post-operative analgesia after breast surgery. Furthermore, it provides excellent comfort and pain relief during the first 24 h of post-operative period and is well accepted by the patients.

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REFERENCES

1. Blanco R. The pecs block: A novel technique for providing analgesia after breast surgery. *Anaesthesia*. 2011;66(9):847-848. <https://doi.org/10.1111/j.1365-2044.2011.06838.x>
2. Blanco R, Fajardo M and Maldonado TP. Ultrasound description of Pecs II (modified Pecs I): A novel approach to breast surgery. *Rev Esp Anesthesiol Reanim*. 2012;59(9):470-475. <https://doi.org/10.1016/j.redar.2012.07.003>
3. Malvia S, Bagadi SA, Dubey US and Saxena S. Epidemiology of breast cancer in Indian women. *Asia Pac J Clin Oncol*. 2017;13(4):289-295. <https://doi.org/10.1111/ajco.12661>
4. Garland EL. Pain processing in the human nervous system: A selective review of nociceptive and biobehavioral pathways. *Prim Care*. 2012;39(3):561-571. <https://doi.org/10.1016/j.pop.2012.06.013>
5. Satija A, Ahmed SM, Gupta R, Ahmed A, Rana SP, Singh SP, et al. Breast cancer pain management a review of current and novel therapies. *Indian J Med Res*. 2014;139(2):216-225.
6. Joshi G, Gandhi K, Shah N, Gadsden J and Corman SL. Peripheral nerve blocks in the management of postoperative pain: Challenges and opportunities. *J Clin Anesth*. 2016;35:524-529. <https://doi.org/10.1016/j.jclinane.2016.08.041>
7. Kim DH, Kim S, Kim CS, Lee S, Lee IG, Kim HJ, et al. 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;2018:4315931. <https://doi.org/10.1155/2018/4315931>
8. Figueroa JD, Pfeiffer RM, Brinton LA, Palakal MM, Degnim AC, Radisky D, et al. Standardized measures of lobular involution and subsequent breast cancer risk among women with benign breast disease: A nested case-control study. *Breast Cancer Res Treat*. 2016;159(1):163-172. <https://doi.org/10.1007/s10549-016-3908-7>
9. Coveney E, Weltz CR, Greengrass R, Iglehart JD, Leight GS, Steele SM, et al. Use of paravertebral block anesthesia in the surgical management of breast cancer: Experience in 156 cases. *Ann Surg*. 1998;227(4):496-501. <https://doi.org/10.1097/00000658-199804000-00008>
10. Wahba SS and Kamal SM. Analgesic efficacy and outcome of transversus-abdominis plane block versus low thoracic-epidural analgesia after laparotomy in ischemic heart disease patients. *J Anesth*. 2014;28(4):517-523. <https://doi.org/10.1007/s00540-013-1774-6>
11. Martsiniv VV, Loskutov AO, Strokhan MA, Pylypenko MM and Bondar VM. Efficacy of pectoral nerve block Type II versus thoracic paravertebral block for analgesia in breast cancer surgery. *Klin Onkol*. 2020;33(4):296-301. <https://doi.org/10.14735/amko2020296>
12. Moon EJ, Kim SB, Chung JY, Song JY and Yi JW. Pectoral nerve block (Pecs block with sedation for breast conserving surgery without general anesthesia. *Ann Surg Treat Res*. 2017;93(3):166-169. <https://doi.org/10.4174/ast.2017.93.3.166>

Authors Contribution:

MY- Concept and design of the study and prepared first draft of manuscript; **AD-** Interpreted the results, reviewed the literature, and manuscript preparation; **AKR-** Concept, coordination, statistical analysis, and interpretation; and **SKA-** Preparation of manuscript and revision of the manuscript

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