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"Comparative Study Between Pec I And Pec Ii Blocks With Thoracic Paravertebral Blocks As Post-Operative Analgesia In Breast Surgeries"

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Abstract:

Background: *Breast surgery is a common procedure and is associated with an increased incidence of acute and chronic pain in almost 25-60% cases. Regional anaesthesia technique may improve post operative analgesia for patients undergoing breast surgeries.*

Aims and Ohbjectives*: This study is aimed to compare the efficacy and safety of a landmark guided PEC I and PEC II versus thoracic paravertebral block for post operative analgesia after breast surgeries.*

Materials and Methods*: The present study was conducted on 60 ASA grade I and II female patients with age between 18-65 years scheduled for unilateral breast surgeries. The patients were randomly allocated into two groups(n=30) according to the type of regional anaesthesia administered either group P for PECS block group or group T for thoracic paravertebral block group.*

Results*: The results demonstrated that PECS block caused hemodynamic stability, decreased the intensity of post-operative pain, reduced analgesic requirement, delayed requirement of rescue analgesia and decreased incidence of PONV. Therefore, PECS block can be considered as a safe and effective procedure for perioperative pain control in breast surgeries.*

Conclusion*: PECS blocks can produce excellent pain relief during the first 12 hours in the post operative period. They hold great promise due to their simplicity, easy to learn, relative lack of contraindications and complications with better hemodynamic stability. Also, it was associated with low pain scores and reduced total opioid consumption in the early postoperative period.*

Keywords*: Paravertebral block, pectoral nerve block I, pectoral nerve block II, analgesia*

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I. Introduction

Breast surgeries are generally considered as daycare surgeries in most health care setup with the advent of newer technologies and drugs all over the world. These surgeries like any other surgical intervention are associated with good amount of post-operative pain[1,2]. Thoracic paravertebral blocks (TPVB) and thoracic epidural which are considered standard for post-operative analgesia in breast surgeries are associated with good number complications and side effects which makes them unsuitable for day-care surgical procedures.[3,4] Pectoralis block (PEC) is a considerably new technique first described by Blanco for analgesia which was later modified it into PEC I and PEC-II blocks based on ultrasound imaging[5]. PEC block can be used to provide analgesia for chest injuries, inserting pacemakers, intercostal drain removal, upper limb fistula surgeries and breast surgeries.[6,7]

In order to give a perfect block, one must have a good knowledge of the anatomy of the area. Due to non-availability of ultrasound machine in many centres, we have tried to demonstrate our study based on landmarks so that it can be used in all setups for analgesia.

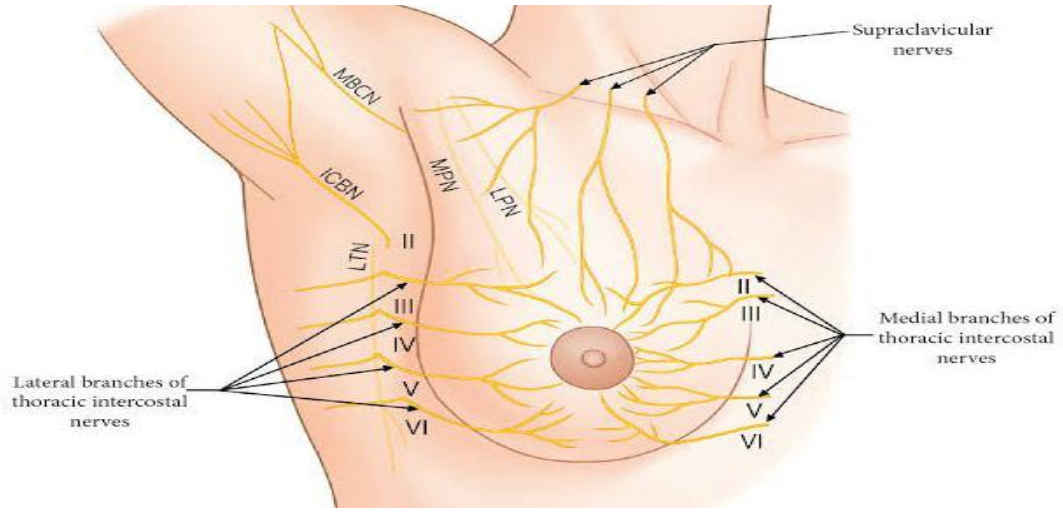


Fig: Diagrammatic representation of nerves innervating Female breast and axilla.

Relevant anatomy for PEC I block

Medial pectoral nerves (MPN) and lateral pectoral nerves (LPN) are purely motor nerves and they innervate the pectoral muscles after originating from brachial plexus. The MPN arises from C8 and T1 nerve roots, gives number of small branches before piercing the pectoralis minor muscle and supplies the deep part pectoralis major muscle and sternocostal fibres[8]. The LPN arises from the C5,6,7 nerve roots and runs alongside the pectoral branch of thoraco-acromial artery in between pectoralis major and minor muscle and supplies the pectoralis major. The LPN communicates with the MPL and carries proprioceptive and nociceptive fibers[9].

As there had been limited number of studies on this topic, we proposed to compare PECS block vs Thoracic paravertebral blocks.

II. Material And Methods

This prospective comparative double-blind study was carried out on patients of Department of Anaesthesia at Bokaro General Hospital, Bokaro Steel City, Jharkhand, India from Oct 2022- Oct 2023.

Study location: Bokaro General Hospital, Bokaro Steel City, Jharkhand-827004, India

Study Design: Prospective randomised comparative double-blind study

Duration of study: 12 months (Oct 2022- Oct 2023)

Study population: Female Patients posted for Unilateral Breast surgeries in Bokaro General Hospital, Bokaro Steel City

Sample size justification: For non-paired qualitative variables study

Sample size: 60 patients.

Sample size calculation: The total breast surgery in our hospital is about 150 per year,
Taking the α at 5% and desired power of study as 80%
Confidence level = 95%
Confidence interval = 5%
The sample size for the proposed study is approximately 60(n=30) in each group.

Study group: 60 patients were randomly divided equally into the PECS I ,PECSII block group (Group P) and Thoracic paravertebral blocks (GROUP T). A computer-generated code was used for randomisation.

Inclusion criteria:
1. Patients under ASA grade I and ASA grade II
2. Aged 18-65years.
3. Patients undergoing unilateral breast surgeries.
4. Patients giving consent for the surgery and the procedures.

Exclusion criteria:

1. Patients who refused to give consent
2. Previous history of local anaesthetics allergy
3. With procedure site infection
4. Deranged coagulation profile or pre-existing coagulopathy
5. ASA III/IV patients.

Procedure methodology:

After taking approval of ethical committee, 60 patients aged 18-65 years, belonging to ASA I and ASA II, scheduled to undergo breast surgery were enrolled in this study. All patients were counselled and explained about the procedure and a written informed consent was obtained. Exclusion criteria were patients who have undergone surgery for breast cancer previously (except biopsy), ASA status >II, any contraindication to regional anaesthesia, obesity BMI > 30 kg/m2 and pregnancy.

The patients were randomised using a computerised program (SPSS) and divided into two groups group T and group P of 30 each. Group T received thoracic paravertebral block (TPVB). Group P received PEC I and PEC II blocks (pectoral nerve blocks). 20 ml of 0.25% bupivacaine was used for both the blocks.

A thorough pre anaesthetic checkup was done and basic investigations like ECG, CBC, KFT, LFT, FBS were done. NPO orders for solid food was given for 6 hrs and clear fluids was allowed for 2 hrs prior to surgery. All patients were prescribed tab. Clonazepam 0.5 mg before bed time and early morning and tab. Pantoprazole 40 mg early morning.

Both blocks were performed blindly using LOR technique.

Technique for TPVB

Patient was placed in sitting position. Anatomical landmarks were identified with standard technique by palpating the most prominent cervical vertebra C7 and inferior angle of scapula as T7. The desired interspace was identified (T3-T4). surgical disinfection was done and a 22 G needle was inserted 2.5 cm lateral to midline after local infiltration to hit the transverse process. The needle was withdrawn slightly and walked over the transverse process to pierce the costotransverse ligament by LOR technique. 20 ml of 0.25 % bupivacaine was injected in increments after confirming negative aspiration.

Technique for PEC I and PEC II blocks

Patient was placed in supine position with ipsilateral limb in abduction. After cleaning area with antiseptics, a 22 G needle was inserted at the point where a horizontal line drawn from angle of louis and a vertical line drawn from middle of clavicle intersect. Advance the needle to feel the first LOR of pre pectoral fascia. Advance further to feel the second LOR to enter fascial plane between pectoralis major and minor. 10 ml of 0.25% was deposited after negative aspiration. The needle is further advanced to hit the rib then withdrawn by 1-2 mm to reach in between fascial plane of pectoralis minor and serratus anterior muscles and rest 10 ml of 0.25 % bupivacaine was injected after negative aspiration.

The adequate level of sensory block was checked by pin prick sensation and was confirmed up to T2 to T6 level.

Both groups received general anaesthesia using 2mg/kg propofol, fentanyl 1mcg/kg and vecuronium 0.1mg/kg for induction and O2, N2O and sevoflurane (1-2%) for maintenance. Inj. diclofenac 75mg IV was given prior to incision. Monitoring of SPO2, ECG, NIBP and ETCO2 was done in all the cases. All patients were reversed using inj. Neostigmine 0.05mg/kg and inj. Glycopyrrolate 0.01mg/kg.

All patients received inj. Diclofenac 75 gm IV every 12 hrs for postoperative analgesia. Patients with VAS score ≥4 received inj. Fentanyl 50 mcg IV as rescue analgesia to prevent breakthrough pain.

The following parameters were recorded

1. Duration of analgesia (time to first rescue analgesia after administration of block) and total analgesic requirement in form of rescue analgesia.
2. Postoperative pain scoring using VAS at 0,2,4,6,8,12,16 and 24 hrs.
3. Side effects like pneumothorax, hypotension, bradycardia, PONV were noted.
4. Surgeon's satisfaction was noted in form of fair, good, very good and excellent..

Statistical analysis:

All the data was selected randomly and was entered in to the Microsoft excel and tabulated, then the data will be analyzed with appropriate statistical tools "SPSS version 24". Data was presented as mean with standard deviation or proportions as appropriate. Mean, median, standard deviation and variance was calculated and following statistical significance tests were applied.

1. Student's paired T-test will be used as the statistical tool to test for significance of observed mean differences.
2. Statistical analysis would be done using "Chi – square Test".
3. Time to ASA grading and Rescue Analgesia was assessed by using "Wilcoxon Signed rank test".

Statistical methods would be used to find the significance of homogeneity of study characteristics between the two groups of patients. Finally the calculated values were compared with the tabulated values at a particular degree of freedom and the level of significance was determined.

Their inference will be as follows-
P > 0.05 statistically insignificant
P < 0.05 statistically significant
P < 0.01 statistically highly significant
P < 0.001 statistically very highly significant

III. Observation & Results

Table no 01: Comparison of Demographic Parameters between two groups:

	Group T	Group P	P – value
Age (yrs)	48.8 ± 10.72 (23-65)	48.56 ± 13.43 (18-64)	0.857
ASA I II	 15 15	 14 16	 0.796
Weight (kg)	74.83 ± 7.47 60-90	75.70 ± 8.35 60-90	0.948

Demographic parameters and ASA grading were found to be not significant in both the groups.

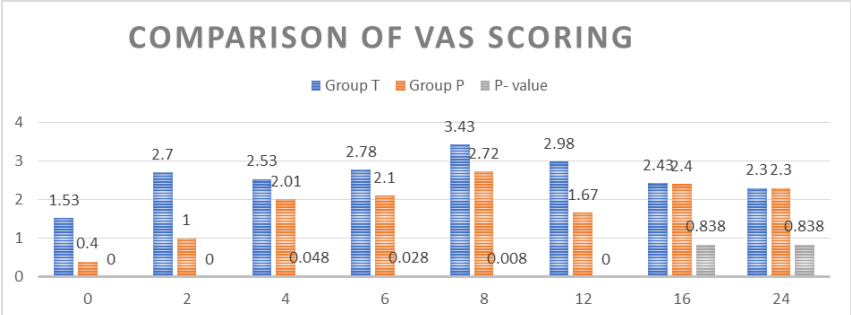
Table no 02 : Comparison between groups according to type of surgery:

Type of surgery	Group T	Group P	P- value
Modified radical mastectomy	14 (46.75)	15(50.0 %)	0.943
Lumpectomy	7 (23.3 %)	8 (26.7 %)	
Simple mastectomy	9 (30 %)	7 (23.3 %)	
Duration of surgery (min) mean ±SD	95.83 ± 17.59	96.50 ± 15.13	0.784

Hence, Group - T is statistically not significant or comparable with Group – P. For, test of significance, here we used "Paired | t | – Test"

Table no 03 : Comparison of VAS scoring in both groups :

Time (hrs)	Group T	Group P	P- value
0	1.53 ± 0.82	0.40 ± 0.50	<0.001
2	2.70 ± 1.22	1.00 ± 0.74	<0.001
4	2.53 ± 0.82	2.01 ± 1.16	0.048
6	2.78 ± 1.00	2.10 ± 1.06	0.028
8	3.43 ± 0.56	2.72 ± 1.27	0.008
12	2.98 ± 0.67	1.67 ± 1.53	<0.001
16	2.43 ± 0.48	2.40 ± 0.75	0.838
24	2.30 ± 0.47	2.3 ± 0.76	0.838

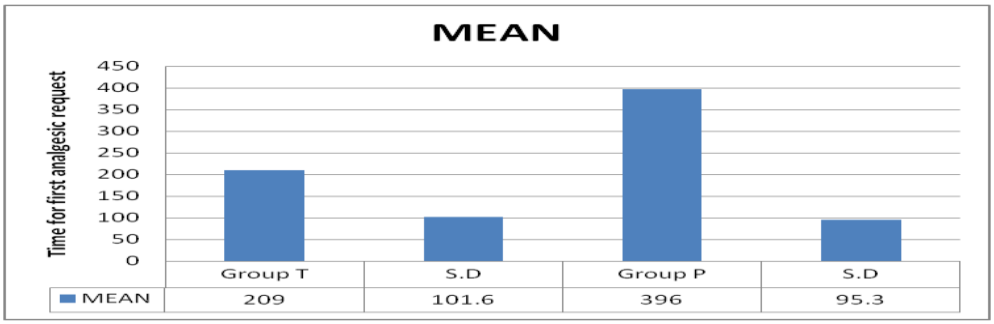


Graph 01: Time duration in x axis(in hrs) and VAS scoring in y axis, Comparing VAS scoring in both the Groups. Shows significant pain relief in Group P as compared to Group T with having lesser VAS score.

Table no 04 : Time for 1st analgesic request and total fentanyl consumption as rescue analgesia:

	Group T	Group P	P- value
Time (min) Mean ± SD Range	209.0 ± 101.6 120-360	396 ± 95.3 240- 480	<0.001
Fentanyl (µg/kg) Mean ± SD	1.67± 0.27	1.03± 0.23	< 0.001

Group - T patients request early for rescue analgesia as compared to Group P. Hence, Group P is statistically significant as compared with Group – T. For, test of significance, here we used "Paired | t | – Test"



Graph 02: Showing Time taken for giving first rescue analgesia in both the Groups. Group P have better patient satisfaction and requires less rescue analgesia.

Table no 05: Comparison of Surgeon Satisfaction in both groups:

	Group T	Group P	P- value
Fair	16	4	<0.001
Good	14	7	
Very good	0	9	
Excellent	0	10	

In this table, Group P patients have better surgeon satisfaction as compared to Group T and is statistically significant with P value<0.001.

Table 6 : Comparison of Side effects in both groups:

	Group T	Group P	P- value
Pneumothorax No Yes	 30 (100 %) 0	 30 (100 %) 0	1.000
Hypotension No Yes	 27 (90.0 %) 3 (10.0 %)	 30 (100 %) 0	0.076
Bradycardia No Yes	 27(90.0 %) 3 (10.0 %)	 30 (100 %) 0	0.076
Nausea No Yes	 27 (90.0 %) 3 (10.0 %)	 27 (90.0 %) 3 (10.0 %)	1.000
Vomiting No Yes	 28 (93.3 %) 2 (6.7 %)	 29 (96.7 %) 1 (3.35 %)	0.896

IV. Discussion

Opioids have been used for ages to control the post operative pain in breast surgeries, however they are associated with serious adverse effects such as respiratory depression. Thoracic epidural analgesia and thoracic paravertebral block were used to manage the post operative pain in breast surgeries. However, they provide excellent analgesia, they are not easy to perform, have many contraindications and complications. Recently, chest wall blocks have been emphasized as simple, innovative RA technique, placed in the context of multimodal approach. Concomitant use of regional blocks can not only help to minimize pain, but also helps to improve pulmonary function and reduce narcotic requirement during the perioperative period[10]. The present study compares the efficacy of PEC I and PEC II blocks with TPVB for postoperative analgesia, complications in patients undergoing breast surgeries. Regarding postoperative analgesia there was significant prolongation of duration in patients receiving PEC blocks. The mean duration was 396±95.3 min in PECS group and 209.0±101.6 min in TPVB group. The results of Wahba and Kamal[11] are consistent with our results. They found that time to

first analgesic request was significantly longer in PECS group than in TPVB group. They concluded that PECS II block favours mastectomy and axillary clearance, since medial and lateral pectoral and thoracodorsal nerves are involved but TPVB does not. Study of Kulhari et al[15] 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.

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. After 12 hrs the difference was not significant due to wear down of LA effect. Supporting to our results, Kulhari et al[15] 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 ($P < 0.0001$). Similar results were observed by Wahba and Kamal[11] 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 ($P < 0.001$). Eldeen[13] also found that VAS was significantly decreased in PECS group throughout surgery and first 24 h postoperative when compared to thoracic spinal in breast surgery. Bashandy[12] and Abbas and Yuki et al[16] 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. Postoperative total fentanyl consumption in first 24 hrs was less in PECS group (1.03±0.23) as compared to TPVB group (1.67±0.27) with P value <0.001 in our study. Wahab et al[11] , Bashandy et al[12] and Kulhari et al[15] also demonstrated that total morphine consumption was less in PECS group.

Regarding hypotension and bradycardia, the results of the current study showed that hypotension occurred in 3 patients in TPVB group and no one in PECS group while, there were 3 patients in TPVB developed bradycardia and non in PECS group. This incidence of hypotension and bradycardia was correlated with bilateral sympathetic block in TPVB. Kulhari et al[15]. compared PECS with TPVB in MRM patients and reported that one patient in the TPVB group developed intraoperative hypotension. Similarly, Wahba and Kamal[11] showed that one patient in TPVB group developed hypotension, which presumably due to epidural spread of local anaesthetic. There were no other complications that were significant in both groups. Therefore, PECS block is considered to be a technique that almost devoid of predicted complication. In terms of 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 hydro dissection produced by PECS block between pectoralis major and pectoralis minor which facilitate intraoperative dissection in MRM.

Finally, we recommend that future studies are needed using larger volume, higher concentration or using local anaesthetic 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 anaesthetic technique in patients undergoing breast surgeries.

V. Conclusion

PEC I and II blocks can produce excellent analgesia during the first postoperative 12 hours. Due to the simplicity of performing the block in terms of safety, ease to perform and lack of contraindications and complications. It doesn't affect hemodynamic stability. It also provides low pain scores and less fentanyl consumption in unilateral breast surgeries. The block doesn't need a particular positioning for performing the block. Surgeons' satisfaction was better probably due to hydro dissection between fascial layers of pectoralis major and minor muscles.

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