

# Efficacy of Ropivacaine in Ultrasound Guided Pectoralis Nerve Block 2 versus Serratus Anterior Plane Block for Post Operative Analgesia in Breast Surgeries: A Prospective, Comparative Study

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## ABSTRACT

**Background:** Breast surgeries can be associated with acute postoperative pain which if left untreated might lead to chronic pain therefore pre-emptive treatment post surgery can be favourable. The aim of our study was to evaluate the analgesic efficacy of PECS 2 compared to SAB to reduce post operative pain in breast surgeries done under general anaesthesia.

**Methods:** A total of 50 patients belonging to ASA 1 & 2 undergoing elective breast surgery were randomly assigned into two groups. Pectoralis nerve block 2 group received 25ml of 0.5% Ropivacaine and Serratus anterior plane block group received 25ml of 0.5% Ropivacaine under ultrasound guidance post induction. The primary outcome was to compare the duration of post operative analgesia with PECS 2 and SAB. Other outcome parameters observed were total rescue analgesic requirement, change in post operative hemodynamic parameters and complications if any.

**Results:** There was a significant difference in duration of post operative analgesia between two groups with Mean Duration of post operative Analgesia in PECS 2 being 510±32.6mins and SAB being 316±26.5mins (p=0.036). The VAS score as well as number of rescue analgesic requirement with PECS 2 was lesser when compared to SAB.

**Conclusion:** Ropivacaine in ultrasound guided PECS 2 block provided superior analgesic profile when compared to SAB.

## Introduction

Breast surgery is one of the most common procedure performed in female population [1]. A lot of fascial plane block techniques have evolved to provide superior analgesic efficacy in patients who

undergo breast surgeries. Among them Pectoralis nerve block 2 and Serratus anterior plane block are widely used [2].

Analgesia is achieved by the action of local anaesthetics on the nerves traversing within the plane and adjacent tissue [3].

Ropivacaine is one of the common long acting local anaesthetics used in regional anaesthesia [4]. It has

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decreased risk for CNS and cardiotoxicity, as well as a lesser incidence for motor block [5].

Limited studies have been undertaken in the past to assess the efficacy of post operative analgesia between the Pectoralis Nerve block and the Serratus anterior plane block.

In our study an effort has been made to compare duration of post operative analgesia using Ultrasound guided PECS 2 block versus SAB with Ropivacaine in patients undergoing Breast surgeries.

## Methods

Ethical committee approval was granted on June 24, 2022 by the Institutional Review Board (RMMCH-IEC / 55/2022). CTRI registration was also completed (CTRI / 2022 / 11/047510) and informed written consent was obtained from all patients undergoing surgery.

Female Patients enrolled in the study were between the ages of 20 and 45 years, and were classified as belonging to the American Society of Anaesthesiologists (ASA) class I or II planned for breast surgery.

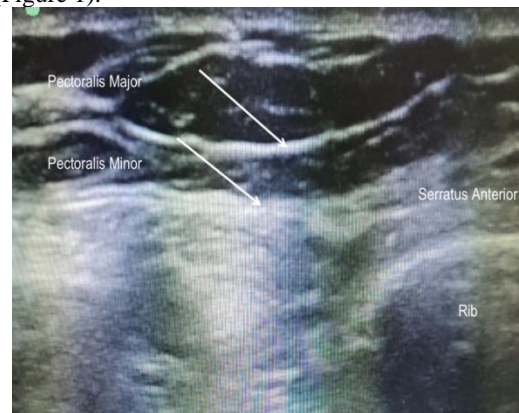
Patient with known hypersensitivity to local anaesthetic, bleeding disorder, uncontrolled Diabetes mellitus, severe renal & hepatic insufficiency, pregnant women, patients with epilepsy, morbidly obese patients and lack of consent were excluded from the study.

Patients were instructed on the Visual Analogue Scale (VAS) pain scale. The Visual Analogue Scale with a score from 0 to 10 indicating post-operative pain (0 = no pain; 10 = worst imaginable pain). Post-operative analgesia was measured from the time the block was administered until the time of the first request for rescue analgesic. Baseline Pre-operative Haemodynamic Status (BP / HR / SPO2) were recorded. Patients were randomly assigned to two groups (PECS 2 and SAB) with 25 subjects per group using single blinded, sealed envelope design. Patients in PECS2 received 25ml of 0.5% Ropivacaine and Group SAB received 25ml of 0.5% Ropivacaine.

A 6 hour nil by mouth regimen was followed for all patients. An 18G intravenous line was secured. Pulse oximeter, noninvasive blood pressure cuff and ECG electrodes were placed. All patients were pre-medicated with Injection Ondansetron 4mg IV and Injection Ranitidine 50mg IV. Patients were given General Anaesthesia, induction was done with Injection fentanyl 2 ug/kg and injection Propofol 1% 2mg/kg, intubated under Injection Atracurium 0.5mg/kg with appropriate size Endotracheal tube. Maintenance was with Oxygen, Nitrous Oxide, Sevoflurane and intermittent doses of Atracurium 0.1 mg/kg.

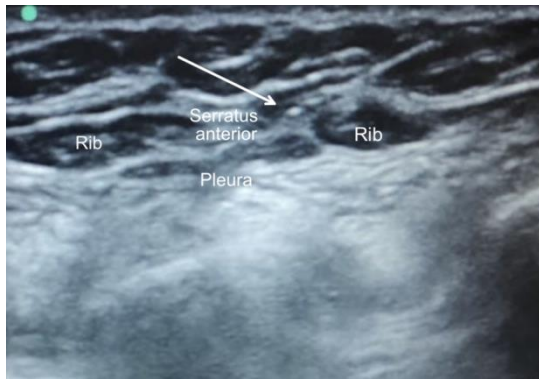
The skin over the breast and adjoining infra-clavicular and axillary region was disinfected and draped under strict aseptic precautions. A linear Ultrasound probe of high frequency was taken and covered with sterile dressing and a sterile conductivity gel was applied.

The PECS 2 block patients were placed supine on the operation table with their arms abducted. After sterile preparation an ultrasonic probe was positioned beneath the lateral third of the clavicle. Once the axillary artery and vein sites were established, the ultrasound probe was positioned inferolaterally until the serratus anterior and the pectoralis major and minor muscles were visible in a single plane at the level of the third and fourth ribs. A 23 gauge Quincke type spinal needle with a 10 cm extension was used to find the interfascial plane between the pectoralis major and minor muscles. An in-plane approach was employed and the ultrasonic probe was advanced from the medial to the lateral direction. The needle tip's position was confirmed by introducing 1-2 ml of normal saline after which 10 ml of 0.5% ropivacaine was then injected. Subsequently After moving the needle tip to the level of the interfascial plane between the serratus anterior and pectoralis minor muscles, 15ml more of 0.5% ropivacaine was injected above the muscle (Figure 1).



**Figure 1- shows the planes for deposition of local anaesthetic for Pectoralis nerve block 2**

The patients who received SAB were placed in lateral decubitus position and the Ultrasound linear probe was placed in upper part of mid clavicular line in sagittal plane. To pinpoint the location of the 5th rib, the ribs were counted along mid-axillary line. The mid-axillary line's 4-5 intercostal space was identified and the subcutaneous tissue, Latissimus dorsi, Serratus anterior, intercostal muscle, and pleura muscle were visualized. Using the in plane technique, a 23G Spinal needle attached to a 10cm extension was inserted into the fascial plane deep to Serratus anterior from cranial to caudal direction. The needle tip location was confirmed by injecting 1-2ml of saline as before and then the study drug was injected into the fascial plane (Figure 2).



**Figure 2-** shows the plane of deposition of local anaesthetic for Serratus anterior plane block

After completion of surgery the patient was reversed with injection Neostigmine 0.05 mg/kg along with injection Glycopyrrolate 0.01mg/kg and extubated when the patient was fully awake. Pain intensity was measured at 0,1,2,4,6,8,12,18 and 24 hours post surgery using VAS scoring. The patient was given rescue analgesic in the form of Injection Paracetamol 1g IV 6th hourly if the VAS score was more than 4/10. Number of doses of paracetamol administered was also calculated. Heart rate and mean arterial pressures are monitored at regular intervals in both the groups through out the intraoperative and postoperative period. Postoperative nausea and vomiting (PONV) was treated with injection ondansetron 4mg IV.

As per the previous study conducted by Abded Razek, et al [6] a total of 25 individuals per group were found to be the effective sample size based on the duration of analgesia by assuming an  $\alpha$  level of 0.3%, a significance

level of 99.7%, and a  $\beta$  error acceptable up to 20% with 80% study power. For qualitative data, the chi-square test or Fischer's exact test was employed as the significance test. The Mann Whitney U test and the Independent T test were employed as significant tests to determine the mean difference between two qualitative and quantitative variables, respectively. After making all the assumptions related to statistical tests, a p value of <0.05 was deemed statistically significant.

## Results

In accordance with the previously stated study protocol, fifty adult patients were enrolled for the study. Not a single patient was disqualified from the research. In terms of age, sex distribution, weight, height, ASA grade, and length of operation, both the SAB and PECS 2 groups were similar (Table 1). Duration of analgesia was prolonged in Group PECS 2 compared to Group SAB (510 +/- 32.6min vs 316 +/- 26.5min) (p=0.036) (Table 2). Mean VAS score was lower in group PECS 2 from 12 hours to 24 hours, at other interval there was no significant difference (Table 3). Total number of doses of rescue analgesia Distribution between two groups showed that PECS 2 group received lesser doses of rescue analgesic for a period of 24hrs (P=0.041\*) (Table 4). There was no significant difference in mean heart rate, SBP and DBP values when comparison between these two groups were done (Figure 3-5).

Hemodynamic instability was not noted in either of the groups. Nausea, vomiting, respiratory depression and shivering were also not noted in any of the patients among these groups.

**Table 1- Demographic details of the study participants**

Demographic characteristics	Group SAB	Group PECS 2	P value
Age	27 ± 5.4	28.6 ± 6.59	0.352
Weight	62.16 ± 8.63	62.96 ± 8.05	0.736
ASA (1:2)	22:3	23:2	0.12
Duration of surgery	50±12.31	51±13.6	0.451

**Table 2- Comparison of duration of post operative analgesia in two groups**

	Groups				P value
	SAB		PECS 2		
	Mean	SD	Mean	SD	
Duration of Post Op Analgesia (min)	316	26.5	510	32.6	0.036*

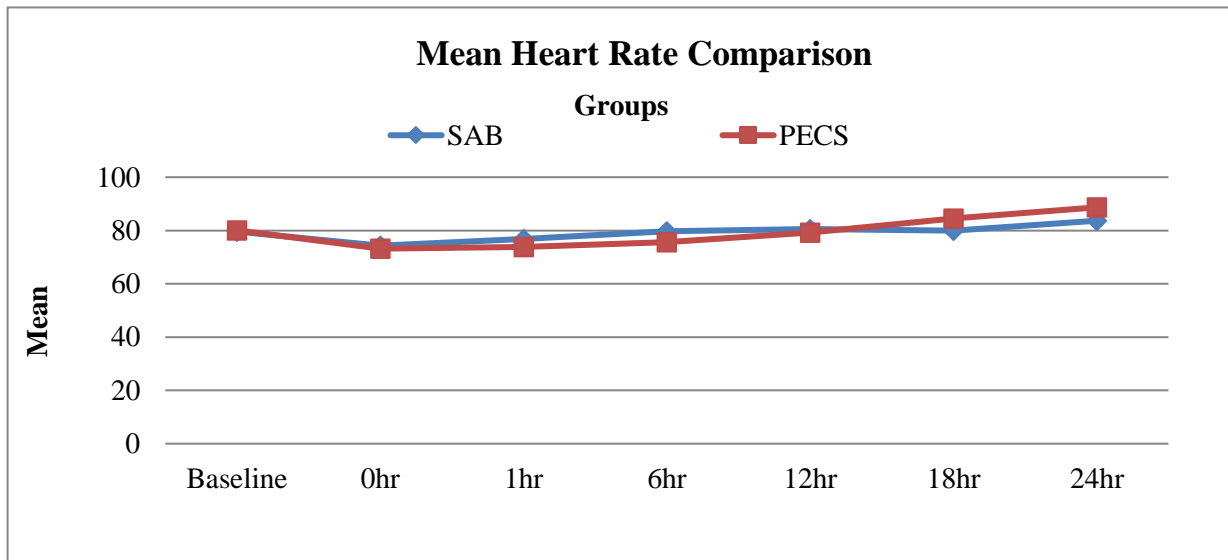
**Table 3- Comparison of Visual Analogue Scale in two groups**

VAS	Groups				P value
	SAB		PECS		
	Mean	SD	Mean	SD	
0 hour	0.16	0.37	0.08	0.28	0.394
1 hour	0.44	0.77	0.2	0.58	0.218
2 hours	0.57	0.82	0.26	0.72	0.188
4 hours	0.88	1.08	0.38	0.90	0.114
6 hours	1.08	1.14	0.44	1.16	0.067

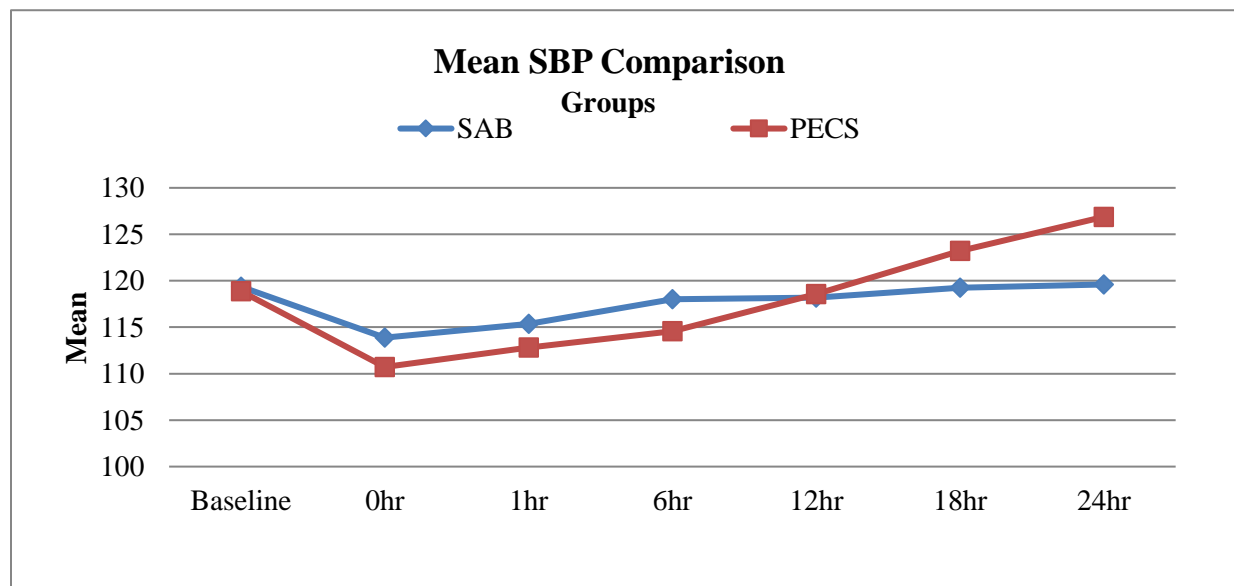
8 hours	2.34	1.21	1.02	1.24	0.062
12 hours	3.04	1.27	1.92	1.38	0.035*
18 hours	4.88	0.73	4.2	1.32	0.029*
24 hours	5.56	0.65	4.68	1.14	0.002*

**Table 4- Comparison of number of doses of rescue analgesic distribution in two groups**

		Groups			
		SAB		PECS	
		Count	%	Count	%
Number of doses rescue analgesia	0	0	0.00%	5	20.00%
	1	7	28.00%	12	48.00%
	2	12	48.00%	5	20.00%
	3	6	24.00%	3	12.00%



**Figure 3- Mean heart rate comparison**



**Figure 4- Mean SBP comparison**

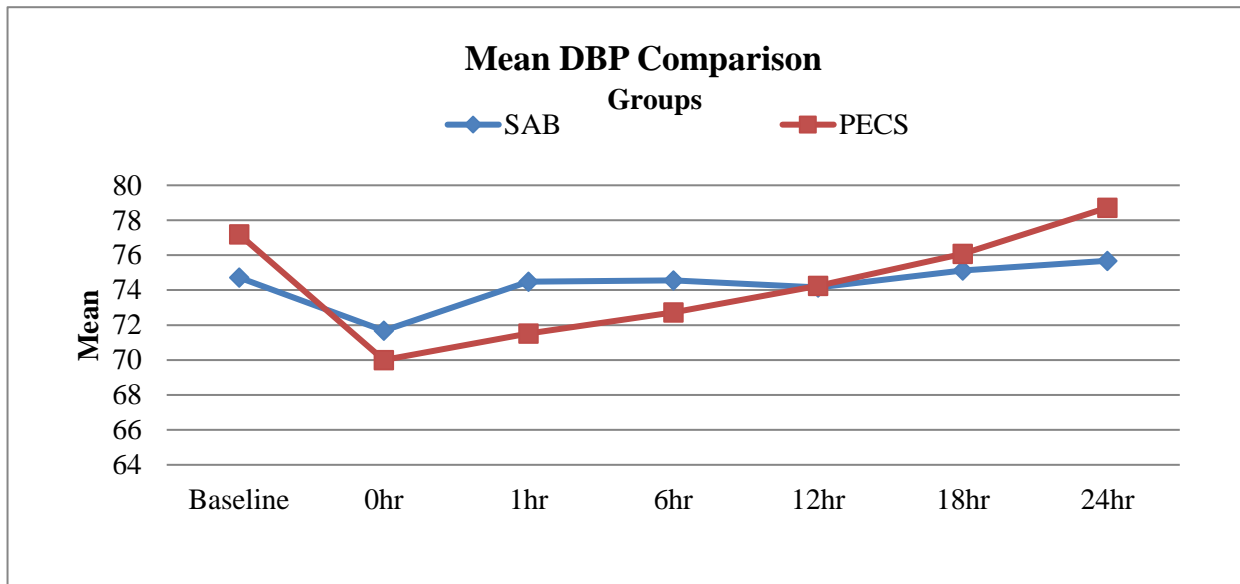


Figure 5- Mean DBP comparison

## Discussion

Ultrasound guided blocks like PECS 2 and SAB have been used as an adjunct to general anaesthesia to provide analgesia in the post operative period. The administration of local anaesthetic in these blocks has been studied extensively and has been found to provide superior quality of analgesia [3]. Ropivacaine is being widely used owing to its safety profile and has a superior pharmacokinetic profile. It has also been found to have higher convulsive threshold and almost negligible cardiovascular effects when compared to Bupivacaine [4]. We have compared the analgesic efficacy between PECS 2 and SAB using 0.5% Ropivacaine.

Our randomized study has shown that significant duration of post operative analgesia was achieved in patients who were administered USG guided PECS2 block when compared to SAB. Lot of studies are in favour of these fascial plane blocks.

Kazumi Kubodera et al, [7] compared the effects of Serratus anterior plane block (SAP block) and Pectoralis nerve block type 2 (PECS 2 block) for post-operative analgesia in breast cancer surgeries and found that, in contrast to SAP block, PECS 2 block prevented the development of short-term post-operative pain in breast cancer surgeries. Periodically, a Numerical Rating Scale (NRS) was recorded. The SAP group had a much higher median NRS score than the PECS 2 group did. This was consistent with our research, in which we performed brief procedures including benign lump excisions using these blocks.

In another randomized control study conducted by T.Fujii et al, [8] 80 women were included for the study to evaluate post mastectomy analgesia. They concluded that PECS 2 block reduced pain after mastectomy when

compared with SAP block ( $P=0.03$ ) and they also noted reduced morphine consumption in the first 24 hours post operatively ( $P=0.04$ ).

Ahmed Bakeer et al, [9] They found that PECS 2 block is superior to ESP block for post-operative pain management following breast cancer surgery when using bupivacaine. PECS 2 block also increased the duration of analgesia and decreased the need for morphine 24 hours following surgery, which was in accordance with our study.

There are studies to establish the superiority of SAB when compared to other techniques such as Thoracic Paravertebral block. In a Study conducted by Suman Arora et al, [10] When it came to post-operative analgesia following breast cancer surgery, it was discovered that the Serratus anterior plane block outperformed the thoracic paravertebral block. When comparing SAB block to TPVB, the first rescue analgesic was administered much later ( $p<0.001$ ). The SAB block also had lower overall diclofenac use in a 24-hour period. According to the results of our investigation, PECS 2 outperformed SAB.

Our study though was almost in correlation with the studies of Kazumi et al and T.Fujii et al but it was not in agreement with the study conducted by Ahmed H Bakeer et al, [11]. The study's findings revealed that SAP block and USG-guided PECS 2 can both significantly enhance patients' perioperative analgesia during MRM. Both methods decreased the amount of perioperative opioid requirement and pain intensity with no significant complications.

Our study has limitations we did not use this study for prolonged surgeries and in patients ASA grade III and above. Still further randomized studies are warranted to prove our observations. Another limitation is that a large

sample size is needed to prove our observation as there are limited clinical human trials.

## Conclusion

Our study concluded that use of 0.5% Ropivacaine in PECS 2 provided better post operative analgesia when compared to Serratus anterior plane block for breast surgeries when administered along with general anaesthesia for short duration breast surgeries.

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