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Comparison of USG Guided PECS Block (I & II) and Erector Spinae Block for Postoperative Analgesia in Breast Surgeries Using 0.2% Ropivacaine

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Abstract: *Postoperative pain is both distressing and detrimental for the patient. Both PEC (I & II) and ESP blocks seem potentially safer and effective nerve blocks for postoperative analgesia. This study was done to compare the intraoperative hemodynamic parameters, postoperative pain scores (VAS), total analgesic consumption and time of first rescue analgesic dose between the groups. PECS provides more beneficial outcomes in patients with breast surgeries in contrast to ESP.*

Material and methods - *Thirty-four female patients(ASA I, II), aged between 18 and 60 years, scheduled for breast surgery were studied in this randomized double-blinding protocol, conducted in a tertiary care hospital in Lucknow over a period of one year. Patients were randomly divided into one of the two groups PEC- I & II (Group A) and Erector Spinae (Group B) with the usage of 0.2% Ropivacaine. Intraoperative hemodynamic and postoperative VAS score, time of first rescue analgesia, total opioid consumption and patient satisfaction score were analyzed. The statistical analysis was done using SPSS (Statistical Package for Social Sciences) Version 21.0 Statistical Analysis Software.*

Results

Among hemodynamic parameters "preoperatively" and "before shifting from OT" suggest that RR and SBP were statistically different in "preoperatively" and "before shifting from OT" measurements in the ESP group patients as compared with PECS group patients. The mean VAS score values in PECS and ESP group patients at 4 hours was 0.125 ± 0.48 and 0.706 ± 0.98 respectively. The total analgesic consumption in the patients of PECS was lesser than in the ESP group (p-value<0.0001). The total time required for first rescue dose was significantly lesser in ESP group patients in contrast to PEC group. Patients' satisfaction rate was higher in PEC group patients (82.5%) in contrast to ESP group patients (23%) (p < 0.05).

Conclusion

USG guided PECS block (I & II) is better as compared to Erector spinae plane block in view of postoperative analgesia, opioid related complications and overall patients' satisfaction in breast surgeries using 0.2% Ropivacaine.

Keywords: *Erector spinae, PEC (I & II), breast surgery, analgesia.*

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I. Introduction

Pain management is one of the most essential component yet the most challenging role of an Anaesthesiologist as part of the care of surgical patients[1-4].

Both benign and malignant breast masses are increasingly approaching hospitals for surgical removal. Patients post-mastectomy and breast reconstruction can suffer from acute nociceptive pain and chronic neuropathic pain syndromes.

Ultrasound guided Pectoral nerve block (I & II) is a newer block which aims at blocking nerves supplying chest wall and axilla with minimal side effects[5,6,].

In this block, local anesthetic was deposited between the pectoralis major and pectoralis minor muscles (PEC I) providing analgesia to the lateral and medial pectoral nerves of chest wall and between the serratus anterior and pectoralis minor muscles (PEC II).

The Erector spinae plane (ESP) block is a paraspinal fascial plane block that involves the injection of local anesthetic deep in the erector spinae muscle and superficial to the tips of the thoracic transverse processes. ESP block provides the provision of both somatic and visceral analgesia. The mechanism of the analgesic action is result from diffusion of local anesthetic anteriorly to the ventral and dorsal rami of spinal nerves.

Both PECS and ESP blocks seem potentially safer and effective nerve blocks for postoperative analgesia, yet, since ESP is relatively novel technique, thus, it has limited entries in literature and in clinical

anesthetic practice. Hence we aimed to compare the efficacy of PECS block with Erector spinae plane block for postoperative analgesia in breast surgeries.

II. Material and methods

After approval for the study from the Institutional Ethical Committee was obtained, 34 female patients of ASA I & II, age between 18-60 years, scheduled to undergo breast surgery in VPIMS Lucknow were enrolled for the study. Out of which seventeen patients of (Group A) received PECS block (I & II) and seventeen patients (Group B) received ESP block.

Exclusion criteria-Patient refusal, patients with pre-existing respiratory diseases such as obstructive pulmonary disease, co-existing cardiovascular diseases, infection at the injection site, severe obesity (body mass index >35 kg/m2), surgery duration of more than 4 hours and allergy to local anaesthetic drugs.

A thorough preoperative evaluation of each patient was done. All routine biochemical, hematological and radiological investigations were done. Patients were explained in detail about the procedure and VAS (Visual analog scale) score and a written informed consent was taken.

Patients were pre-oxygenated on arrival to the operating room after attachment of monitoring equipment. Balanced general anaesthesia was given with IV fentanyl 2mcg/kg, IV propofol 2mg/kg and IV vecuronium 0.1mg/kg (endotracheal tube). Anaesthesia was maintained on oxygen- nitrous (50%:50% mixture) with isoflurane maintaining minimum alveolar concentration (MAC) at 0.8-1.1.

After induction of anaesthesia, both group A and B patients received USG guided PECS I &II block (10 ml of 0.2% ropivacaine in each) and ESP block with 20 ml 0.2% ropivacaine respectively.

Intraoperative analgesia was provided with IV paracetamol 1gm and if the variability in heart rate and blood pressure was still more that 20% of the baseline values, IV fentanyl was given in boluses of 0.5mcg/kg. After completion of the surgery, neuromuscular blockade was reversed with IV neostigmine 0.05mg/kg and IV glycopyrolate 0.01mg/kg and patient was carefully extubated. After complete recovery, hemodynamic parameters of the patients were recorded before shifting from the OT.

Postoperatively, the patients were evaluated by an independent blinded investigator. Arrival at the post anaesthesia care unit was taken as time 0; the patients were subsequently assessed at 1h, 4h, 8h, 12h and 24h for pain and PONV. The time of first rescue analgesic administration (TOFRA), total analgesic dose consumption over 24 hours after the surgery and VAS was recorded at these intervals.

Rescue analgesia with Inj. tramadol 1mg/kg IV was given each time VAS was >=4.0. The time of first rescue analgesic administration with tramadol and total analgesic dose consumption was recorded over 24 hours. We have compared the patients" satisfaction score between the groups using 3 point scoring system: highly satisfied (HS), moderately satisfied (MS) and poorly satisfied (PS).

The scale used for nausea and vomiting includes: 1-no nausea or vomiting, 2-only nausea but no vomiting, 3-single episode of vomiting or persistent nausea and 4- two or more episodes of vomiting or severe retching. Patients with a score of 3 or more received 0.1 mg/kg of ondansetron IV as rescue antiemetic.

The statistical analysis was done using SPSS (Statistical Package for Social Sciences) Version 21.0 Statistical Analysis Software. The values were represented in Number (%) and Mean±SD.

III. Observation and Results

The study was conducted over a period of 12 months. Initially 34 patients were recruited in the study (17 patients in each group).

Diagnosis	**PECS**	**ESP**
DUCTAL CA	3	3
FIBROADENOMA	11	9
PAPILLARY CA	3	5
Total	17	17

Table 1. Depicting the diagnosis of patients in PECS and ESP groups

These results indicate that Fibroadenoma is the most frequent cause for the surgical intervention in the recruited patients. The chi-square statistic is 0.7. The p-value is 0.704688. The result is not significant at $p < .05$.

	HR	**RR**	**SpO2**	**SBP**	**DBP**	**MAP**
Pre-ESP	86.65	14.41	99.29	129.82	79.59	96.33
PreSD	14.82	1.28	0.85	9.11	8.05	7.81
Post-ESP	90.29	17.65	99.00	138.65	82.65	101.31
Post-SD	12.06	1.84	0.79	12.09	9.40	9.72
Ttest	0.44	**< 0.05**	0.30	**< 0.05**	0.32	0.11
	HR	**RR**	**SpO2**	**SBP**	**DBP**	**MAP**

Pre-PECS	82.06	15.71	98.94	127.06	79.82	95.57
Pre-SD	13.14	1.99	0.66	2.25	8.06	5.32
Post-PECS	86.18	15.24	99.4	127.29	80.65	96.20
Post-SD	12.30	1.20	0.79	6.74	8.31	7.14
	0.353	0.412	0.08	0.893	0.771	0.774

Table-2: Intra and Intergroup comparison of the hemodynamic parameters.

	Preoperative					
Measurement	**HR**	**RR**	**SpO2**	**SBP**	**DBP**	**MAP**
Mean (PECS)	81.7	15.6	98.9	127.1	79.6	95.4
Mean (ESP)	86.6	14.4	99.3	129.8	79.6	96.3
SD (PECS)	13.1	2.0	0.7	2.2	8.1	5.3
SD (ESP)	14.8	1.3	0.8	9.1	8.1	7.8
P-value	0.347	**0.032**	0.186	0.240	0.933	0.741
	Before Shifting from OT					
Measurement	**HR**	**RR**	**SpO2**	**SBP**	**DBP**	**MAP**
Mean (PECS)	86.0	15.2	99.6	126.9	79.3	95.2
Mean (ESP)	90.3	17.6	99.0	138.6	82.6	101.3
SD (PECS)	12.3	1.2	0.5	6.7	8.3	7.1
SD (ESP)	12.1	1.8	0.8	12.1	9.4	9.7
P-value	0.332	**< 0.05**	0.08	**0.002**	0.516	0.091

Table- 2a -Intergroup comparison of the hemodynamic parameters.

Pair wise comparison of all five hemodynamic parameters "preoperatively" and "before shifting from OT" suggest that RR and SBP were statistically different in "preoperatively" and "before shifting from OT" measurements in the ESP group patients as compared with PECS group patients with the p-value < 0.05 at 95% confidence intervals. Thus, all other hemodynamic parameters in both groups were comparable except SBP & RR, which in both intra and intergroup comparisons revealed statistical significance in females of the ESP group.

	Post-Operative Pain Scores					
		1 hour	**4 hour**	**8 hour**	**12 hour**	**24 hour**
PECS	**Mean**	0.125	0.125	0.313	0.500	0.563
	SD	0.485	0.485	0.996	0.874	0.874
ESP	**Mean**	0.353	0.706	2.000	3.765	4.000
	SD	0.786	0.985	1.732	1.480	1.696
	p-value	0.3029	**0.0372**	**0.0027**	**< 0.05**	**< 0.05**

Table 3: Intergroup Comparison of Pain (VAS Score) at different time intervals.

Comparative analysis of the VAS score revealed that patients in the ESP group possess relatively higher VAS scores in contrast to that of PECS group. The mean VAS score values in PECS and ESP group patients at 4 hours was 0.125 ± 0.48 and 0.706 ± 0.98 respectively. Taken together, these results indicate that PECS provides more beneficial outcomes in patients with breast surgeries in contrast to ESP.

		TAC
PECS	**Mean**	103.125
PECS	**SD**	12.12678125
ESP	**Mean**	152.9411765
ESP	**SD**	51.44957554
	T-test	**< 0.05**

Table 4: Intergroup Comparison of Total Analgesic Consumption (TAC).

Our results indicate that the mean value of the total analgesic consumption in the patients of PECS and ESP group was 103.12 ± 12.13 and 152.9 ± 51.4(mean ± SD) respectively (Table 4) (p-value<0.0001). Therefore our results indicate that the overall requirement of total analgesic consumption is comparatively lower in the PECS group, in contrast to that of ESP, indicating better analgesic efficacy of PECS block.

		TOFRD
PECS	**Mean**	1376.25
PECS	**SD**	231.8912017
ESP	**Mean**	529.4117647
ESP	**SD**	147.3291633
	T-test	**<0.05**

Table 5: Intergroup Comparison of the time to first rescue dose (TOFRD)

The total time required for First Rescue dose was significantly lesser in ESP group patients in contrast to PECS patients, with almost 2.5 fold differences (mean PECS value=1376.25 ± 231.89 minutes and mean ESP value= 529.41 ± 147.32 minutes) p-value < 0.05. These observations are also in synchrony with the observations of TAC and VAS scores indicating better efficacy of PECS block than ESP.

PONV	PECS	ESP
Absent	16	12
Present	1	5
Total	17	17

Table 6: Intergroup Comparison of PONV

The symptoms of nausea and vomiting were minimal in PECS groups (5.8%; 1 patient out of 17), whereas in the case of ESP group the incidence rate was 29.4 % (5 patients out of 17). The chi-square statistic is 3.5656. The p-value is 0.05899. The result is not significant at $p < .05$. Therefore, the intergroup comparison of PONV was not found to be statistically significant.

PSS	PECS	ESP
HIGHLY SATISFIED	14	4
MODERATE SATISFIED	2	6
POORLY SATISFIED	1	7
Total	17	17

Table 7: Intergroup Comparison of patient's satisfaction score(PSS)

Our results indicate that satisfaction rate was higher in PECS group patients (82.5%) were highly satisfied, in contrast, ESP group patients i.e. 23%. The chi-square statistic is 12.0556. The p-value is 0.002411. The result is significant at $p < 0.05$. Patient satisfaction scores were found to be statistically significant.

IV. Discussion

Postoperative pain is both distressing and detrimental for the patient. Due to the increasing trend of breast surgeries in routine elective surgeries, management of postoperative pain has become a challenging task for anesthesiologists. Wall in 1988, first time described the pre-emptive analgesia as intervention preceding surgery for the purpose of preventing or decreasing postsurgical pain by preventing central sensitization[7,8].

The best pain management strategy would be to anesthetize the nerves in a particular surgical area so as to block the nociception for better effective pain relief. Therefore, regional nerve blocks especially interfascial plane blocks have come up as extremely promising and potential alternatives for postoperative pain management. A widely practiced strategy for postoperative pain management is multimodal (or 'balanced') analgesia in which a combination of opioid and non-opioid analgesic drugs that act at different sites within the central and peripheral nervous systems in an effort to minimize opioid use, therefore decreases opioid-related side effects. Good postoperative pain control is important to facilitate rehabilitation and may also decrease the likelihood of developing chronic pain. Women who undergo breast surgery experience chest wall, breast, or scar pain (11–57%), phantom breast pain (13–24%), and arm and shoulder pain (12–51%)9,10. The extent of acute postoperative pain and the number of doses of postoperative analgesics were the best predictors of persistent pain in both the breast area and the ipsilateral arm[11].

The principle of Pectoral nerve block (Pecs I & II) as described by Blanco[6,7], is the deposition of the drug into two muscle planes, PEC-I between pectoralis major and minor muscle which provide analgesia to the chest wall and PEC- II between pectoralis minor and serratus anterior muscle which extends analgesia to the axillary area[12].

In 2016, Forero et al[13] described a novel interfascial plane block, the erector spinae plane (ESP) block. A huge number of case reports have been published on ESP and its successful analgesic properties; the number of clinical trials is yet limited.

According to this study, ESP block is suggested to cover a larger surgical area with a wide spread of local anesthetic agents. In our study, we have observed a significant reduction in the time of rescue analgesia in PECS group patients in contrast to that of ESP group patients. Also, we have observed reduced pain scores in PECS group postoperative. PECS is a simple and fast-acting block. It is performed while the patients are in the supine position. So, it has the advantage of easy positioning under general anesthesia.

In the current study, we performed ultrasound-guided PECS and ESP blocks under general anesthesia to eliminate the stress effect of awake patients in sitting position. All hemodynamic parameters in both groups were comparable except SBP & RR, which in both intra and intergroup comparisons revealed statistical significance in females of the ESP group.

The frequency of postoperative nausea and vomiting showed no significant difference in both groups.

Hence, even though, in our study, we observed PECS block (I & II) as a better block for postoperative analgesia in breast surgeries than ESP block.

V. Conclusion

In this study we concluded that USG guided PECS block (I & II) is better choice in view of postoperative analgesia, opioid related complications and overall patients satisfaction as compared to Erector spinae plane block in breast surgeries using 0.2% ropivacaine.

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