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Original Research Article

COMPARATIVE STUDY OF THE ANALGESIC EFFICACY AND DURATION OF ERECTOR SPINAE PLANE BLOCK OVER SERRATUS ANTERIOR PLANE BLOCK IN BREAST SURGERIES

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ABSTRACT

Background: Surgeries of the breast are among the most common operative procedure and numerous methods exist for management of perioperative pain, but achieving adequate perioperative analgesia during breast surgeries can be demanding. Present study was aimed to compare analgesic efficacy and duration of erector spinae plane block over serratus anterior plane block in breast surgeries.

Material and Methods: Present study was single-center, prospective, comparative study, conducted in patients of 18 to 60 years age group, The American Society of Anesthesiologists (ASA) 1 to 3, Unilateral female breast surgeries under GA. Patients were divided into two groups chosen as Group-A (erector spinae block) & Group-B (serratus anterior plane block).

Results: As per the study the demographic variables were comparable in both groups mean age in the GROUP- A was 50.54 years SD + 9.13 years and in the GROUP -B 48.72 years SD+14.71 years the p value was 0.61(more than 0.05 not significant). All were females in the study. The mean BMI in the GROUP - A was 26.09 kg/m2 SD + 5.04kg/m2 and in the GROUP -B kg/m2 27.54 SD + 5.43 kg/m2. The p value was 0.102(more than 0.05 not significant). The baseline hemodynamic were comparable in both the groups. At 30 minutes and 2 hours the pain score was 0 in all patients in both groups. The p value was 1 not significant. At mean the VAS pain score at 6 hours, 8 hours, 12 hours, 16 hours and at 24 hours in group A and group B were not significant. The mean duration for request of the rescue analgesic for the first time was also significantly lesser in the group B and the duration of analgesia was prolonged in Group-A.

Conclusion: Erector spinae plane block (ESPB) can provide better analgesia as compared to serratus anterior plane block in the first few hours following surgery and gives comparable pain relief.

Keywords: Erector spinae block, Serratus anterior plane block, Rescue analgesic, VAS score.

INTRODUCTION

Pain is an unpleasant sensory event that is experienced by someone as a result of any noxious stimuli.[1] Several options are available for the management of peri operative pain including systemic analgesics (opioid and non-opioid) and regional (neuraxial, and peripheral) techniques. Local anaesthetic instillation of wounds through subcutaneous planes also provides analgesia without much of side effects.[2]

Regional anaesthesia has been frequently used as a modality for the management of post operative pain in surgical patients.[3] Breast cancer is the second most common cancer among women in India, after

cancer of the cervix uteri. Surgeries of the breast are among the most common operative procedure and numerous methods exist for management of perioperative pain, But achieving adequate perioperative analgesia during breast surgeries can be demanding.[4]

The gold standard now is the thoracic paravertebral block (PVB) which provides effective analgesia with minimal hemodynamic changes but it can cause complications like pneumothorax, vascular puncture, hypotension, nerve damage and total spinal anaesthesia, even under ultrasound guidance.[5,6] Among PVBs, options are Ultrasound-guided serratus anterior plane block (SAPB) and erector spinae plane block (ESPB).[7] Present study was aimed to compare analgesic efficacy and duration of erector spinae plane block over serratus anterior plane block in breast surgeries.

MATERIAL AND METHODS

Present study was single-center, prospective, comparative study, conducted in department of Anaesthesiology, at Yenepoya Medical College & Hospital, Mangaluru, India. Study duration was from December 2020 to April 2022. Study was approved by institutional ethical committee.

Inclusion Criteria

- Patients of 18 to 60 years age group, The American Society of Anesthesiologists (ASA) 1 to 3, Unilateral female breast surgeries under GA, willing to participate in present study

Exclusion Criteria

- Patient inability to consent to the study
- Bilateral breast surgeries
- Psychiatric disorders
- Chronic neurological disease

Study was explained to participants in local language & written informed consent was taken. Thorough pre-anesthetic evaluation and routine investigations was carried out before taking up the patient for surgery. An informed and written consent was taken from the patients enrolled for the study and patients will be explained regarding the Visual Analogue Scale (VAS). Then the patients were divided into two groups chosen at random, using a table of random numbers:

- Group-A (erector spinae block): in this group, 39 patients were studied
- Group-B (serratus anterior plane block): In this group, 39 patients were studied

Premedication – Tab. Ranitidine 150mg at night before surgery and two hours prior to induction, Tab. Alprazolam 0.5mg at night before surgery. On arrival to the operating room, routine monitoring were done for Heart Rate, Non-invasive blood pressure, Electrocardiogram & Oxyhaemoglobin saturation.

A peripheral cannula was secured, intravenous infusion of Ringer Lactate will be started, intravenous Midazolam 1mg, intravenous Fentanyl 1.5mcg/kg was given. After pre-oxygenation with 100% oxygen for three minutes, the patient were induced with intravenous Propofol 2mg/kg and then endotracheal intubation facilitated by Vecuronium 0.1mg/kg will be done. Anaesthesia will be maintained with Isoflurane 1 MAC and Nitrous Oxide & Oxygen (70 :30).

After intubation, an ultrasound unit and high frequency (7-12MHz) linear array transducer is used and in obese patients we used curvilinear probe. The ultrasound transducer is prepared in a sterile manner. The patient is shifted to a lateral position in the erector spinae plane block or shifted to a supine position in a case of a serratus anterior plane block. T4 T5 vertebrae are identified by the anatomical landmark of a sternal angle in the case of erector spinae block. The skin is prepared by chlorhexidine gluconate 2% isopropyl alcohol 70%. Patient positioned in the lateral position and the linear transducer (SonoSite, Inc) is placed in a sterile cover. The T5 spinous process is identified and the transducer placed approximately 2-3 cm lateral to the midline in a longitudinal orientation to identify the hyperechoic line of the transverse process with its associated acoustic shadow. After identification of trapezius, rhomboid major, and erector spinae muscle groups superficial to the transverse process, a 22-gauge stimuplex needle is advanced in a craniocaudal direction. The needle tip is advanced until it was located in the interfascial plane deep to the erector spinae muscle group and superior to the transverse process. Once in position, Ropivacaine 0.2%, 20 ml is injected under ultrasound guidance. The correct needle-tip position is confirmed by the presence of linear spread between the transverse process and the erector spinae muscle group.

In serratus anterior plane block the patient in the supine position and the arm abducted to 90 degrees the skin is prepared. The probe was first placed in a sagittal position, the mid-axillary region of the thoracic cage. The fifth rib is identified in the mid-axillary line by counting ribs in an inferior and lateral direction. The latissimus dorsi (superficial and posterior), teres major (superior), and serratus muscles (deep and inferior) are identified overlying the fifth rib. The needle is advanced with an in-plane technique and 20 ml of 0.2%, ropivacaine is injected under continuous ultrasound guidance deep to the serratus anterior muscle.

At the end of the surgery, residual neuromuscular paralysis will be antagonized with Neostigmine 0.05mg/kg and Glycopyrrolate 0.1mg/kg. After the satisfactory recovery is achieved, the patient will be extubated and shifted to the post anaesthesia care unit.

Assessment of pain on arrival to the post anaesthesia care unit (time 0) was done by a 10 cm visual analogue scale (VAS); 0 – No pain & 10 – Worst imaginable pain. The pain was reassessed six, twelve, and twenty four hours post-surgery. Rescue analgesia with intravenous Morphine 2mgwas provided if VAS is more than 4. By assessing the VAS score we determined the duration of analgesia.

All data was analyzed using Statistical Package for the Social Sciences (SPSS) for Windows, Version 22.0. Continuous variables was expressed as mean ± SD. Percentages was used to express categorical variables. The independent test was applied to find out the difference between the two means. A p-value of <0.05 was considered as the criteria for statistical significance. Pain relief was assessed by using Visual Analogue Scale

RESULTS

A Cross-sectional comparative study was undertaken to compare the effect of analgesia with erector spinae block and serratus anterior plane block in the postoperative period using the visual analog scale in breast surgery patients. The mean age in the GROUP – A was 50. 54 ± 9.13 years and in the GROUP-B 48.72 ± 14.71 years the p value was 0.61 (not significant). All were females in the study. In the GROUP-A 82.05% belonged to ASA-I and in the GROUP -B 76.92% belonged to ASA –I, in the GROUP – A 17. 95% belonged to ASA – II 23.08% and in the GROUP -B belonged to ASA –II. The mean BMI in the GROUP – A was 26.09 ± 5.04 kg/m^2 and in the GROUP -B 27.54 ± 5.43 kg/m^2 the p value was 0.102 (not significant).

Table 1: General characteristics

Characteristics	GROUP - A	GROUP -B	P VALUE
Age group (in years)	50.54 ± 9.13	48.72 ± 14.71	0.61
Gender			
Females	39	39	1
Males	0	0	
ASA STATUS			
ASA 1	32 (82. 05 %)	30 (76. 92 %)	0.58
ASA 2	7 (17. 95 %)	9 (23. 08 %)	
ASA 3	0	0	
BMI (kg/m^2)	26.09 ± 5.04	27.54 ± 5.43	0.102

The baseline hemodynamics were comparable in both the groups.

Table 2: Baseline parameters and duration of surgery

Parameters	GROUP - A	GROUP -B	P VALUE
DBP	77.67 ± 14.87	76.28 ± 14.58	0.57
SBP	119.36 ± 20.53	120.45 ± 20.54	0.59
Heart Rate	72.67 ± 9.87	71.28 ± 9.58	0.59
Surgery Duration	102.67 ± 16.81	113.28 ± 9.45	0.79
Time duration to give the block	3.85 ± 0.74	3.69 ± 0.71	0. 28

At 30 minutes the pain score was 0 in all patients in both groups (not significant). At mean the VAS pain score at 2 hours in group A was 3.1 ± 1.45 and group B 2 ± 1.41. The p value was less than 0.001 significant. At mean the VAS pain score at 4 hours in group A was 3.93 ± 1.16 and group B 3.23 ± 1.33. The p value was 0.02 and significant. At mean the VAS pain score at 4 hours in group A was 4.93 ± 0.73 and group B 4.85 ± 0.74. The p value was 0.69 not significant. At mean the VAS pain score at 8 hours in group A was 5.13 ± 1.87 and group B 4.78 ± 1.27. The p value was 0.33 not significant. At mean the VAS pain score at 12 hours in group A was 5.38 ± 1.19 and group B 5.22 ± 0.96. The p value was 0.49 not significant. At mean the VAS pain score at 16 hours in group A was 7.7 ±1.49 and group B 7.3 ± 1.47. The p value 0.3 not significant. At mean the VAS pain score at 24 hours in group A was 7.7 ± 1.49 and group B 7.3 ± 1.47. The p value 0.3 not significant.

Table 3: Vas Score at Various Intervals

	GROUP A	GROUP B	P VALUE
VAS SCORE at 30 minutes	0	0	1
VAS SCORE AT 2 HOURS	3.10 ± 1.45	2.00 ± 1.41	0
VAS SCORE AT 4 HOURS	3.93 ± 1.16	3.23 ± 1.33	0.02
VAS SCORE AT 6 HOURS	4.93 ± 0.73	4.85 ± 0.74	0.69
VAS SCORE AT 8 HOURS	5.13 ± 1.87	4.78 ± 1.27	0.33
VAS SCORE AT 12 HOURS	5.38 ± 1.19	5.55 ± 0.96	0.49
VAS SCORE AT 16 HOURS	7.70 ± 1.49	7.30 ± 1.47	0.3
VAS SCORE AT 24 HOURS	7.70 ± 1.49	7.30 ± 1.47	0.3

The mean time to first rescue analgesic request in group A was 231 ± 44.65 minutes and group B 221.25 ± 42.80. The p value was 0.028 and significant.

Table 4: time to first rescue analgesic request

Time to first rescue analgesic request	Mean ± ST dev	
Mean group A	231 ± 44.65	
Mean group B	221.25 ± 42.80	
P value	0.028	Significant

7.69% in group A and 5.13% in group B had pain at injection site.

Table 5: complications

Complications	Group - A	Group – B
Pain at injection site	3 (7.69 %)	2 (5.13 %)
Nil	36 (92.31 %)	37 (94.87 %)

94.87% in GROUP A and in GROUP B 92.31% underwent MRM, 5.13% in GROUP A and in GROUP B 5.13% underwent BCS, in GROUP B 2.56% underwent mastectomy.

Table 6: Type of surgery done

Type of surgery done	Group - A	Group – B
MRM	37 (94.87 %)	36 (92.31 %)
BCS	2 (5.13 %)	2 (5.13 %)
Mastectomy	0	1

DISCUSSION

Poorly controlled pain is associated with a variety of detrimental acute as well as chronic effects**.** The gold standard now for post-operative pain control are the regional blocks that provides effective analgesia with minimal hemodynamic changes but it can cause complications like pneumothorax, vascular puncture, hypotension, nerve damage and total spinal anesthesia, even under ultrasound guidance. We now have some alternatives to this block which can be considered to be safe and gives comparable pain relief. Among these are Ultrasound-guided serratus anterior plane block (SAPB) and erector spinae plane block (ESPB).

As per the study the demographic variables were comparable in both groups mean age in the GROUP – A was 50.54 years SD ± 9.13 years and in the GROUP -B 48.72 years SD±14.71 years the p value was 0.61 (more than 0.05 not significant). Mohamed Elsayed Hassan et al,[8] study the age group 18 and 70 years old, mean age was 48.3 ± 9.9 years in SAPB, while mean age of 50.3 ± 11.8 years in ESPB, groups were comparable. Saurabh Sagar et al,[9] noted that the mean age in the ESBP group was 53.95 ± 4.796 years and in the SAPB group was 53.90 ± 4.064 years. All were females in the present study which is similar to the studies by Mohamed Elsayed Hassan et al,[8] and Saurabh Sagar et al.[9]

The mean BMI in the GROUP-A was 26.09 ± 5.04 kg/m^2 and in the GROUP B was 27.54 ± 5.43 kg/m^2 the p value was 0.102 (not significant). Saurabh Sagar et al,[9] noted the BMI was 25.53 ± 2.54 in the ESBP group and 24.89 ± 3.21 in the SAPB group. The baseline hemodynamics were comparable in both the groups, Mohamed Elsayed Hassan et al,[8] and Saurabh Sagar et al.,[9] also had similar findings.

The mean time to first rescue analgesic request in group A was 231 ± 44.65 minutes and group B 221.25 ± 42.80. The p value was 0.028 which was significant. Saurabh Sagar et al,[9] noted that the mean time to first rescue analgesic request in ESBP group was 416±68 minutes as compared to SAPB it was 343.5 ± 547 min.

Dylan T Finnerty et al,[10] noted that the mean time to first rescue analgesic request in recovery was 32. 6 (20.6) in ESP vs 12.7 (9.5) in SAP (P=0.003). The study by Rahimzadeh et al,[11] & Hassan Mohammed et al.,[12] also showed requirement of rescue analgesia was much better in those who received erector spinae plane block as compared to serratus anterior plane block.

At 30 minutes the pain score was 0 in all patients in both groups & the p value was 1 (not significant). Mohamed Elsayed Hassan et al. noted that the pain scores at 30 minutes were 2 (1-3) and 2 (1-2.5) minutes in the ESBP group and the SAPB group respectively p =0.313

VAS pain score at 2 hours in group A was 3.1 ± 1.45 and group B was 2 ± 1.41. The p value was less than 0.001 significant. Mohamed Elsayed Hassan et al,[8] noted that 2 (1.75-2.7) and 2.5 (1.5-2.5) minutes in the ESBP group and the SAPB group respectively p = 430 Saurabh Sagar et al,[9] noted that the 2nd Hour 0.75 ± 0.444 minutes in the ESBP group 1.20 ± 0.616 the SAPB group respectively p=0. 012. The study by Rahimzadeh et al,[11] & Hassan Mohammed et al,[12] also showed lesser pain scores at 2 hours similar to the study**.**

At mean the VAS pain score at 4 hours in group A was 3.93 ± 1.16 and group B was 3.23 ± 1.33, p value was 0.02 (significant). Mohamed Elsayed Hassan et al,[8] noted that in the ESBP group 2 (2-2.25) and 2 (1-2) in the SAPB group respectively p= 0.847. Saurabh Sagar et al,[9] noted that the 4th Hour 1.60±0.598 2.50 ± 0.688 the SAPB group respectively p <0.001*. The study by Rahimzadeh et al,[11] & Hassan Mohammed et al.,[12] also showed lesser pain scores at 4 hours similar to the study**.**

VAS pain score at 8 hours in group A was 5.13 ± 1.87 and group B was 4.78 ± 1.27, p value was 0.33 (not significant). Saurabh Sagar et al,[9] noted that the NRS 8th Hour 1.70 ± 0.657 & 2.35± 0.745 in the EASB & SAPB group respectively p 0.005. Difference was significant which is contrast to the present study.

At mean the VAS pain score at 12 hours in group A was 5.38 ± 1.19 and group B 5.22 ± 0.96, p value 0.49 (not significant). Saurabh Sagar et al,[9] noted that the NRS 8th Hour 1.60±0.681 and 2.25 ± 0.550 the SAPB group respectively, p value was 0.002 (significant) which is contrast to the present study. The study by Rahimzadeh et al,[11] & Hassan Mohammed et al,[12] also showed no difference in the pain scores at 12 hours similar to the study**.**

VAS pain score at 24 hours in group A was 7.7 ± 1.49 and group B was 7.3 ± 1.47. The p value 0.3 not significant. Saurabh Sagar et al,[9] noted that the pain

score at 24 hours in group A was 2.70 ± 0.733 and 2.65±0.7450 the SAPB group respectively. P value was 0.832. Significant which is contrast to the present study. 94.87% in GROUP A and in GROUP B 92.31% underwent MRM, 5.13% in GROUP A and in GROUP B 5.13% underwent BCS, in GROUP B 2.56% underwent mastectomy. In the study by Saurabh Sagar et al,[9] all patients underwent MRM. 7.69% in group A and 5.13% in group B had pain at injection site. Also, there were no complications related to the block, such as vascular puncture, hypotension, pleural puncture, pneumothorax, or local anaesthetic toxicity.

Because the blocks were performed under general anaesthesia, formal dermatomal evaluation of block function was not carried out. This suggests that some blocks might not have been entirely effective. However, standard clinical practice is consistent with the administration of these and other peripheral nerve blocks with ultrasound guidance during induction of general anaesthesia, so our findings should be applicable to broad practice. Further studies may be applied with a larger sample size to assess the analgesic effects of these blocks in breast surgeries.

CONCLUSION

Both serratus anterior plane block and erector spinae plane block are relatively safe with pretty minimal adverse effects which are negligible. As per the VAS scores post operatively statistically there was no significant differences in both the blocks and its analgesia even though erectors spinae block produced superior analgesia with the prolonged action. It is advisable to use these blocks in those patients who are planned for surgeries on an inpatient basis because of the prolonged anesthesia as compared to the serratus anterior block which is can be a better option for those who are undergoing surgeries on a daycare basis so that the effect of the drug wears off early and the patient can be discharged safely.

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REFERENCES

1. Reinders MF, Geertzen JH, Dijkstra PU. Complex regional pain syndrome type I: use of the International Association for the Study of Pain diagnostic criteria defined in 1994. The Clinical journal of pain. 2002 Jul 1;18(4):207-15.
2. Ingrande J, Brodsky JB, Lemmens HJ. Regional anesthesia and obesity. Current Opinion in Anesthesiology. 2009 Oct 1;22(5):683-6.
3. Sharma GN, Dave R, Sanadya J, Sharma P, Sharma K. Various types and management of breast cancer: an overview. Journal of advanced pharmaceutical technology & research. 2010 Apr 1;1(2):109.
4. Klein SM, Bergh A, Steele SM, Georgiade GS, Greengrass RA. Thoracic paravertebral block for breast surgery. Anesthesia & Analgesia. 2000 Jun 1;90(6):1402-5.
5. Naja ZM, El-Rajab M, Al-Tannir MA, Ziade FM, Tayara K, Younes F, Lönnqvist PA. Thoracic paravertebral block: influence of the number of injections. Regional Anesthesia & Pain Medicine. 2006 May 1;31(3):196-201.
6. J Zhang J, Chang CL, Lu CY, Chen HM, Wu SY. Paravertebral block in regional anesthesia with propofol sedation reduces locoregional recurrence in patients with breast cancer receiving breast conservative surgery compared with volatile inhalational without propofol in general anesthesia. Biomedicine & Pharmacotherapy. 2021 Oct 1; 142:111991.
7. Ahuja D, Kumar V, Gupta N, Bharati SJ, Garg R, Mishra S, Khan MA, Bhatnagar S. Comparison of the Efficacy of Ultrasound-Guided Serratus Anterior Plane Block Versus Erector Spinae Plane Block for Postoperative Analgesia After Modified Radical Mastectomy: A Randomised Controlled Trial. Turkish journal of anaesthesiology and reanimation. 2022 Dec 7;50(6):435-42.
8. Hassan ME, Wadod MAA. Serratus anterior plane block and erector spinae plane block in postoperative analgesia in thoracotomy: A randomised controlled study. Indian J Anaesth. 2022 Feb;66(2):119-125.
9. Sagar S, Loha S, Paswan A, Pratap A, Prakash S, Rath A. Modifiye Radikal Mastektomi Hastalarında Erektör Spina Plan Bloğu ve Serratus Anterior Plan Bloğunun Karşılaştırılması: Prospektif Randomize Çalışma. JARSS.;30(4):264-271.
10. Finnerty DT, McMahon A, McNamara JR, Hartigan SD, Griffin M, Buggy DJ. Comparing erector spinae plane block with serratus anterior plane block for minimally invasive thoracic surgery: a randomised clinical trial. Br J Anaesth. 2020 Nov;125(5):802-810.
11. Rahimzadeh P, Imani F, Faiz SH, Boroujeni BV. Impact of the ultrasound-guided serratus anterior plane block on post-mastectomy pain: a randomised clinical study. Turkish journal of anaesthesiology and reanimation. 2018 Sep;46(5):388.
12. Hassan ME, Wadod MAA. Serratus anterior plane block and erector spinae plane block in postoperative analgesia in thoracotomy: A randomised controlled study. Indian J Anaesth. 2022 Feb;66(2):119-125.