

Effectiveness of Erector Spinae Plane Block for Post-Operative Analgesia in Breast Surgeries-A Randomized Control Study.

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Objectives: This study is aimed at testing the efficacy of ultra sound guided erector spinae plane block (ESPB) with 20ml of 0.2% ropivacaine providing postoperative analgesia in patients undergoing breast surgery. **Materials and Methods:** After seeking approval from the hospital ethics committee and obtaining written informed consent from participants, this single blinded prospective randomised control study was conducted on 60 patients posted for breast surgery under general anaesthesia. The recruited participants were randomly assigned into two equal groups B and C by closed envelope technique. Group B patients were given ultrasound-guided ESPB with 20 ml of 0.2% ropivacaine and Group C patients were given routine postoperative port site infiltration with 20 ml of 0.2% ropivacaine. Postoperative pain and need for rescue analgesics were noted. Chi-square test, independent sample t test, Mann Whitney U test was used for statistical analysis. **Results:** Pain score was lower in Group B patients up to 12h ($P < 0.007$). At 24h the pain scores between the two groups were comparable. The rescue analgesic requirement was also significantly less in group B compared to Group C (23.3% vs. 70%), and this difference was statistically significant ($P = 0.01$). On comparing the incidence of postoperative nausea and vomiting, there was no significant difference between the two groups. No adverse events were noted in both groups. **Conclusion:** Ultrasound-guided ESPB with 20ml of 0.2% ropivacaine is superior to local infiltration in providing postoperative analgesia in patients undergoing breast surgery. It also decreases postoperative tramadol requirement.

Key words: analgesia, breast surgery, pain, ropivacaine

Introduction

Adequate pain management after breast surgery is important for early recovery, early discharge and to avoid the development of chronic pain. Various regional techniques are used for postoperative pain management in breast surgeries are paravertebral block, thoracic epidural and local infiltration.^{1,2,3} Erector spinae plane block (ESPB) is popular because of its simplicity, ease of administration by ultrasound

and minimal complication rate.^{4,5} Our study is aimed at testing the efficacy of ESPB in decreasing pain in patients undergoing breast surgery. The primary objective was to determine the efficacy of ultrasound-guided erector spinae plane block and secondary objectives included a comparison of the numeric pain score, total analgesic requirement, incidence and severity of nausea and vomiting.

Materials and Methods

After getting hospital ethical committee approval (IEC-AIMS-2018-ANES-116) and written informed consent from patients posted for breast surgery, this single-blinded randomised control study was performed on 60 participants from September 2018 to March 2020. Inclusion criteria included ASA 1 and 2 female patients presenting for modified radical mastectomy between age group 18-65 years. Patients with psychiatric illness, morbidly obese, allergy to

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local anaesthetic and local infection were excluded.

All patients were fasting for 8 hours and premedicated with alprazolam 0.25mg and pantoprazole 40mg orally the night before and on the day of surgery. In the operating theatre, IV access was secured and baseline monitors (electrocardiogram, blood pressure, saturation probe) were connected. The recruited participants were assigned randomly into two equal groups B and C by closed envelope technique [Fig. 1]. Group B participants received ultrasound-guided ESPB with 0.2% ropivacaine 20mL and Group C participants received port site infiltration with 20mL of 0.2% ropivacaine.

Pre-operatively, Group B patients received pre induction ultrasound guided ESPB (Sonosite portable ultrasound machine, Bothell, WA, USA) by a single consultant anaesthetist, keeping the patient in sitting position at T5 level before. The probe was placed in the parasagittal plane, about 3cm lateral to the midline on the side of surgery. After local infiltration of the puncture site, an 18G, 55mm, blunt insulated nerve block needle (Contiplex D; B Braun, Germany) was passed in a cephalocaudal direction till the tip contacts the T5 transverse process. During needle advancement, hydro dissection was used to locate the needle tip. Ropivacaine 0.2% 20ml was injected below the erector spinae muscle and was confirmed by local anaesthetic spread. Pinprick was utilised to test the successfulness of the block. If no block was achieved within 30 minutes, patient were excluded from the study.

Standard anaesthesia protocol was followed in both groups. Patients were pre oxygenated with 100% oxygen, IV midazolam 1mg, glycopyrrolate 0.2mg and fentanyl 2-3µg/kg was given. Patients were induced with titrated dose of propofol 1.5-2.5mg/kg and appropriate size laryngeal mask airway (LMA) was inserted. Ventilation was assisted till the patient started to

breathe spontaneously and then they were maintained on spontaneous mode. Anaesthesia was maintained by O₂ in N₂O (1:2) and isoflurane 1-1.5%. All patients received IV paracetamol 1gm and ondansetron 4mg before the LMA was removed. Group C patients were given local infiltration with 20mL of 0.2% ropivacaine. When the patient was awake LMA was removed and shifted to post anaesthesia care unit (PACU).

Postoperative pain and vitals were assessed by an anaesthetist in charge of PACU, who was unaware of the study group using numerical pain scale 0–10 (0=no pain to 10=worst imaginable pain). Post-operatively pain was noted at 0, 2, 4, 8, 12 and 24 h. If the postoperative pain score was more than 4, rescue analgesia was provided with IV tramadol 50 mg along with IV ondansetron 4mg. The total analgesic requirement in 24 hours and any adverse events associated were noted. Postoperative nausea and vomiting were assessed using a numerical scale (no nausea-0, nausea present-1, nausea and vomiting present-2). Results were then statistically analysed.

Continuous variables are represented as mean±SD and categorical variables as percentage. For comparison of continuous variables among groups, independent sample t-test was used for parametric data and Mann Whitney U test for non-parametric data. To know the association of categorical data within groups, Chi-square test was applied. Data analysis was done using IBM SPSS 20.0 (SPSS Inc, Chicago, USA) and a *P*-value of <0.05 was considered as statistically significant.

Results Sixty participants were enrolled in this study. Distributions of age, height and weight among participants were similar. The intra-operative use of fentanyl was comparable between groups [Table 1].

Table.1 Demographic Data

Variables	Group B. Mean±SD	Group C. Mean±SD	P value
Age(years)	53.40±9.65	53.93±7.55	0.812
Height(cm)	151.77±9.68	155.27±7.50	0.123
Weight(kg)	58.70±9.45	63.10±11.49	0.111
Fentanyl consumption(µg)	142.67±12.58	151.00±12.96	0.014

Independent samples test, SD –standard deviation

There was a significant difference in pain scores between groups with the patients with erector spinae plane block having lower scores up to 12 h. At 24h the pain scales between groups were comparable with a *P* value of 0.073 [Table 2].

The requirement for rescue analgesic was less in group B compared to group C (23.3% vs. 70%), and this was statistically significant with *p* value of 0.01. In group B, 76.7% of the patients did

not consume any rescue analgesic and remaining 23.3% patients required only one dose (50mg) of tramadol. In group C 30%, 50%, 13.3%, 13.3% and 3.3% patients required 0, 1, 2, 3 and 4 doses of tramadol respectively [Table.3].

All patients were shifted to rooms from PACU at 3-4 hours and none of them were over sedated. No complications associated with the procedure were reported in both groups.

Table. 2 Post-operative numerical pain score

Pain score at hours	Group B Median(Range)	Group C Median(Range)	P value
0	1.00(0-3)	3.00(0-8)	<0.001
2	1.00(0-2)	3.00(0-7)	<0.001
4	1.00(0-3)	2.50(0-7)	<0.001
8	1.00(0-2)	2.00(0-7)	0.001
12	0.50(0-2)	2.00(0-4)	0.007
24	0.50(0-2)	1.00(0-4)	0.073

Mann Whitney test

Table3. Postoperative tramadol consumption

Variables	Group B n (%)	Group C n (%)	P value
Postoperative tramadol consumption	7(23.3)	21(70)	0.001
Total Dose of tramadol consumedn (%)			
0	23(76.7)	9(30)	0.05
50mg	7(23.3)	15(50)	
100mg	0(0)	4(13.3)	
150mg	0(0)	1(13.3)	
200mg	0(0)	1(3.3)	

Chi-square test

Comparison of postoperative nausea and vomiting between the two groups did not show any significant difference. [Table 4].

Table 4. Incidence of nausea and vomiting

Variable	Group Bn (%)			Group Cn (%)			P value
	0	1	2	0	1	2	
NV1	26(86.7)	2(6.7)	2(6.7)	19(63.3)	5(16.7)	6(20)	0.112
NV2	23(76.7)	5(16.7)	2(6.7)	18(60.0)	8(26.7)	4(13.3)	0.374
NV4	26(86.7)	3(10.0)	1(3.3)	24(80.0)	4(13.3)	2(6.7)	0.757
NV8	23(76.7)	7(23.3)	0(0.0)	17(56.7)	10(33.3)	3(10.0)	0.109
NV12	27(90.0)	2(6.7)	1(3.3)	25(83.3)	5(16.7)	0(0.0)	0.307
NV24	27(90.0)	2(6.7)	1(3.3)	26(86.7)	4(13.3)	0(0.0)	0.431

Chi-square test

Discussion

Reducing opioid consumption in the perioperative period is essential for enhanced recovery following surgery.⁶ Use of regional techniques can reduce postoperative opioid requirements. This randomised control study has demonstrated reduced pain scores and requirement of rescue analgesic, tramadol with preoperative use of ultrasound guided ESPB in patients undergoing breast surgery. There were no complications associated with the block. The ESPB is an easy block, which is not time-consuming and is well tolerated by patients.

Few case reports and studies have reported that blind or under ultrasound guided ESPB are effective in providing postoperative analgesia in breast surgeries.⁵⁻⁸ ESPB is considered relatively safe as needle insertion to pleura is minimised by the transverse process.⁹⁻¹¹ Blind blocks are associated with a high failure rate and penetrative injuries. Ultrasound-guided ESPB should be preferred over blind because of their effectiveness and safety profile.

USG-guided ESPB is a non-dermatomal field block which can be performed with the patient awake or under general anaesthesia in either sitting, lying on the side or in a prone position. In awake patient level of analgesia can be assessed by sensation to pain and temperature. Local anaesthetic is injected into the plane between the erector spinae muscle and tip of the transverse process [Fig.2]. The local anaesthetic can diffuse into the paravertebral space, blocking

the thoracic spinal nerves.⁴ Local anaesthetic can spread into the epidural space and can spread craniocaudally producing extensive block.¹² It also provides sensory block to the thoracic wall.¹³ Similar to our study, Singh *et al.*⁴ and Gurkanet *al.*⁵ demonstrated decreased consumption of rescue analgesic after a single preoperative injection of ultrasound-guided ESPB in breast surgeries. In both these studies, 0.5% bupivacaine was used. But in this study 0.2% ropivacaine was used as it is considered safer and is equally effective. High doses of opioid use results in sedation, nausea and vomiting. Consumption of tramadol was high in the control group, but it was not associated with increased postoperative nausea and vomiting. This could be explained by the use of antiemetic, ondansetron along with tramadol. In a case series of 5 patients by Nair *et al.*,⁸ use of ESPB resulted in decreased requirement of postoperative opioids and enhanced recovery from anaesthesia. Kimachiet *al.*,⁷ reported use of ultrasound-guided ESPB as a sole anaesthetic for providing anaesthesia for breast surgery in a high-risk patient. Hong *et al.*¹⁴ provided multimodal analgesia with multiple intermittent doses of ESPB through a catheter after total mastectomy and could reduce the intraoperative fentanyl consumption. Aksu *et al.*¹⁵ used ultrasound-guided bi-level block to provide adequate analgesia in breast surgery.

Erector spinae block is also found to be effective in providing analgesia for procedures other than

breast surgeries.¹⁶ EPSB was successfully used to provide postoperative analgesia after cholecystectomy,¹⁷ rib fractures,¹⁸ video-assisted thoracoscopic surgery,¹³ paediatric patients,¹⁹ lung lobectomies,²⁰ total hip replacement,²¹ herpes zoster pain²² chronic scapulothoracic pain²³ and in the treatment of abdominal cancer pain.²⁴ Bilateral ESPB is becoming a good alternative to paravertebral block and epidural analgesia in laparoscopic surgeries.²⁵

The study is limited by the fact that patients could not be blinded to the study and could have resulted in bias. Various additives like opioids and additives, reported to prolong the duration of analgesia produced by plane blocks could be studied further to see if there is an increased benefit associated with it.

Conclusion

Ultrasound-guided ESPB with 20ml of 0.2% ropivacaine is superior to local infiltration in providing postoperative analgesia in patients undergoing breast surgery. It also decreases postoperative tramadol requirement.

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