COMPARATIVE EFFICACY OF ROPIVACAINE WITH OR WITHOUT HYALURONIDASE FOR SINGLE LEVEL THORACIC PARAVERTEBRAL BLOCK IN UNILATERAL BREAST SURGERIES

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ABSTRACT

BACKGROUND

Paravertebral block is an established analgesic technique for pain after breast surgeries. Hyaluronidase, when combined with local anaesthetic may promote better quality of analgesia when given in the single injection technique. We aimed to compare efficacy of Ropivacaine alone or Ropivacaine with Hyaluronidase for single level injection thoracic paravertebral block in unilateral breast surgeries.

METHODS

This prospective controlled study was conducted after institutional ethical committee approval and patient consent in 100 female patients belonging to ASA I and II physical status, posted for elective unilateral breast surgeries. Patients were randomized to two groups of 50 each, to receive ultrasound guided thoracic paravertebral block at T4-T5 level in lateral position; Group RS to receive Ropivacaine (0.75%) 19 ml and Normal saline, 1 ml and Group RH to receive Ropivacaine (0.75%) 19 ml and Hyaluronidase, 1 ml (1500 IU). Standard general anaesthesia protocol was followed with endotracheal intubation. Patients were assessed intraoperatively and post-operatively at 15 min, 30 min, hourly for first two hours and at 4, 6, 12, and 24 h after extubation. Sample size was based on assumption of 20% improvement in quality of blockade in group RH. This calculation assumed the use of student's test, type I error of 0.05, and a power of 80%. Postoperative pain was assessed using Visual Analog Scale (VAS) at rest and at coughing. Haemodynamics, oxygen saturation, peak expiratory flow rate, the dose of rescue analgesics were assessed. Duration of analgesia and quality of analgesia was noted along with adverse effects if any.

RESULTS

All patients were comparable with baseline characteristics. The time for first rescue analgesic and total tramadol consumption in 24 hours were comparable between the groups. The mean VAS scores were less in the RH group compared to RS group between 4 to 24-hour period though not significant statistically.

CONCLUSIONS

The overall duration of analgesia and consumption of tramadol were equal in both the groups, but the mean VAS scores were less in the RH group compared to RS group between 4 to 24 hour period.

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BACKGROUND

Anaesthesiologist as a perioperative physician plays an important role in pain management perioperatively. The inadequate management of pain has an adverse physiologic effect that contribute to significant morbidity and mortality resulting in delay of patient recovery and return to daily activities. In addition, the patient has dissatisfaction with surgical experience and may have adverse psychological consequences. A multimodal approach for treatment of acute postoperative pain can improve health related quality of life (HQRL).[1]

Breast surgeries form a major proportion of general surgical and oncosurgical procedures and the pain associated is being managed by nonsteroidal anti-inflammatory drugs (NSAIDS), systemic opioids and epidural analgesia. Newer methods or modalities are being explored for a better and effective pain relief. In this study we use a newer modality of analgesia i.e., paravertebral block (PVB) using ultrasound guidance for administering Inj. Ropivacaine which has a similar clinical profile to bupivacaine and lesser cardiovascular or central nervous system toxicity.[2]

Also here in this study we use Inj. Hyaluronidase a hydrolytic enzyme considered as spreading factor facilitating the spread of local anaesthetic solutions by hydrolysing the interstitial barrier.[3,4] It has been shown to produce reliable blockade with better spread and therefore better quality of block when used with local anaesthetics in ophthalmic procedures,[5] plastic surgeries.[6] and orthopaedic procedures[7]

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in different concentrations. There are no studies that have been reported on usage of Inj. Hyaluronidase along with Inj. Ropivacaine for paravertebral blocks.

Hence this study was being undertaken comparing 2 groups of patients, one receiving Inj. Ropivacaine 0.75% alone and the other Inj. Ropivacaine 0.75% along with Inj. Hyaluronidase 1500 IU for paravertebral block under ultrasound guidance for unilateral breast surgeries under general anaesthesia. The patients were assessed for haemodynamics, peak expiratory flow rate, oxygen saturation, quality of analgesia, duration of analgesia and total tramadol consumption.

Aims and Objectives

To compare the efficacy of Inj. Ropivacaine 0.75% and Inj. Ropivacaine 0.75% with Inj. Hyaluronidase 1500 IU in ultrasound guided paravertebral block for unilateral breast surgeries performed under general anaesthesia with respect to-

- Quality of postoperative analgesia.
- Duration of Postoperative analgesia.
- Need for rescue analgesic.
- Total dose of tramadol consumption in 24 hrs.
- Adverse effects if any.

METHODS

The study was conducted prospectively on 100 female patients between 15 to 60 years of age scheduled to undergo unilateral breast surgeries at VIMS Hospital Bellary. The patients were selected by applying the following inclusion and exclusion criteria.

Inclusion Criteria

a) Female patients.
b) American society of anaesthesiologists (ASA) - physical status I and II.
c) Age- 15 to 60 years of age.
d) Patients posted for elective unilateral breast surgeries under general anaesthesia.

Exclusion Criteria

a) Patients refusal for the procedure.
b) Bilateral breast surgeries.
c) ASA III and above.
d) Patients with significant coagulopathies.
e) Thoracic wall and chest wall deformities.
f) Infection at the block site.
g) Patients with significant respiratory diseases or cardiac diseases.
h) Patients with known allergy to amide local anaesthetics and hyaluronidase.

Methods of Collection of Data

After obtaining clearance from institutional ethical committee, a written informed consent during a detailed pre-anaesthetic check-up was taken from each patient and visual analogue scoring for pain was explained in detail in the pre-operative clinic. The study was conducted between January 2015 to July 2016 at VIMS hospital Bellary.

Patients who satisfied the inclusion criteria received Tab. Diazepam 10 mg and Tab. Ranitidine 150 mg as a premedication on the previous night of the surgery. Routine nil per oral (NPO) protocols were followed. On the day of surgery, after routine pre-anaesthetic drill and machine check, patients were shifted to the operation theatre and standard ASA monitors were attached and basal readings were noted. A peripheral line preferably on the dorsum of the non-dominant hand was secured using a large bore (18G) IV cannula. Patients were given incremental doses of iv midazolam (up to a maximum dose of 0.06 mg/kg) in the block room before block placement to decrease anxiety and discomfort during the procedure while maintaining a meaningful patient contact. Fentanyl (2 mcg/kg) was given as pre-emptive analgesic for block placement. The paravertebral space identification was done with the patient in lateral decubitus with operative site non-dependant, relevant anatomical landmarks were identified and marked with a sterile skin marker (Figure 1). Similarly, points corresponding to 2.5 cm lateral to the upper border of spinous processes of the T3 to T6 vertebrae were marked as needle insertion sites, and the space between the T4-T5 level was infiltrated with 5 mL of 2% lignocaine. Paravertebral block was administered under ultrasound guidance by in- plane approach with patients in lateral decubitus position to expose their upper thoracic region. After skin disinfection, linear array transducer of 6- 13MHz frequency (Sonosite™, Bothwell, WA, USA) (Figure 2 and Figure 3) kept in sterile sleeve, was placed in an axial (transverse) plane on the rib at the selected thoracic level, just lateral to the spinous process. Machine was optimised for imaging capability by selecting the appropriate depth of field (within 2–3 cm), focus range and gain. The transverse process and rib were visualised as a hyperechoic line with acoustic shadowing below it (Figure 4). Thoracic paravertebral space (TPVS) localisation was done by moving the transducer caudally into the intercostal space between adjacent ribs. The transverse process was visualised on the medial side as a hyperechoic convex line with acoustic shadowing beneath. The TPVS and the adjoining intercostal space could be visualised as a wedge-shaped hypoechoic layer demarcated by the hyperechoic lines of the pleura below and the internal intercostal membrane above. After ultrasound-guided identification of paravertebral space (in plane approach), 0.75% ropivacaine 19 ml + 1 ml (1500 IU) inj. hyaluronidase was injected in Group RH patients and 0.75% ropivacaine 19 ml + 1 ml normal saline was injected in Group RS patient using 18-gauge Touhy tip epidural needle. The operator was blinded to the drug administered. Local anaesthetic deposition translated as an anterior displacement of the parietal pleura on the ultrasound image. Vascular puncture was ruled out by aspiration before administration of the drug. Pneumothorax was ruled out using ultrasound after administration of the block.

Standard general anaesthesia protocol which included premedication with Inj. Atropine 0.02 mg/kg, Inj. Midazolam 0.03 mg/kg, Inj. ondansetron 0.15 mg/kg and Inj. fentanyl 2 µg/kg bolus was initiated 15 minutes prior to induction. Patients were pre-oxygenated for 3 minutes and induced with Inj. propofol 2 mg/kg and Inj. succinylcholine 2 mg/kg for endotracheal intubation with endotracheal tube appropriate for each patient. After confirmation of the tube, maintenance of anaesthesia was by nitrous oxide: oxygen mixture (66%: 33%) and sevoflurane inhalation (1%).Patients were put on IPPV with a tidal volume of 8 ml/kg and a respiratory rate of 12 breaths per minute and titrated later to keep ETCO2 in the eucapnoeic range. Muscle relaxation was continued by bolus dose (0.08 mg/kg) followed by maintenance doses of vecuronium (0.03 mg/kg). At the end of the procedure patients were successfully reversed and extubated using Inj. neostigmine (0.05 mg/kg) and Inj. Atropine (0.02 mg/kg) IV. Patient monitoring was continued in the post anaesthesia care unit.

Patients were allocated into two groups of 50 each using block randomization technique.

Group RS: Paravertebral block with 0.75% Ropivacaine 19 ml + 1 ml normal saline.

Group RH: Paravertebral block with 0.75% Ropivacaine 19 ml +1500 IU Hyaluronidase (1 ml).

Assessment consisted of-

1) Assessment of post-operative analgesia with respect to quality and duration.
2) Need for supplemental of analgesics post operatively.
3) Side effects, such as nausea, vomiting, hypotension, vascular puncture, pneumothorax, intra thecal injection, contralateral spread of local anaesthetics or allergic reactions if any etc.,
4) Post-operative haemodynamic variables, oxygenation saturation, peak expiratory flow rate will be assessed.

Figure 1. Markings for Thoracic Paravertebral Block

Figure 2. Ultrasound Device (Sonosite™, Bothwell, WA, USA)

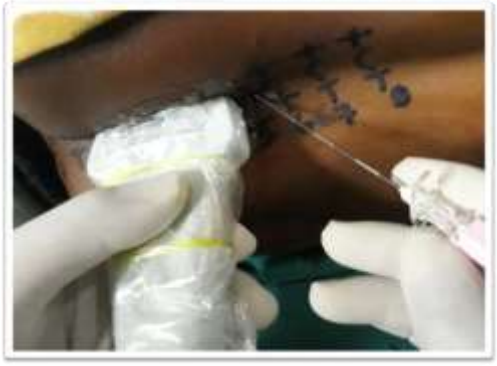

Figure 3. Procedure of Paravertebral Block

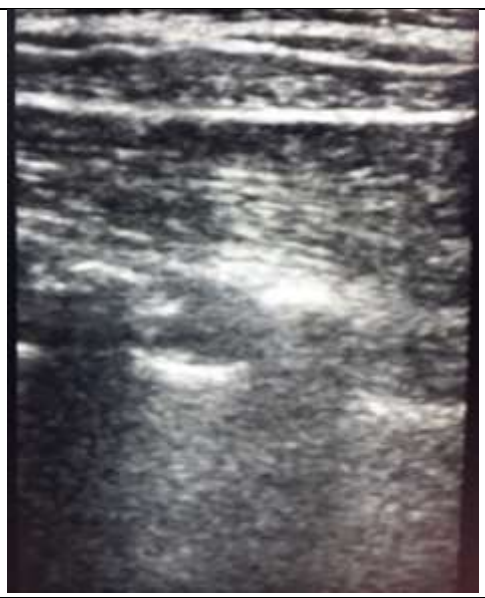

Figure 4. Ultrasound Image of Thoracic Paravertebral Block

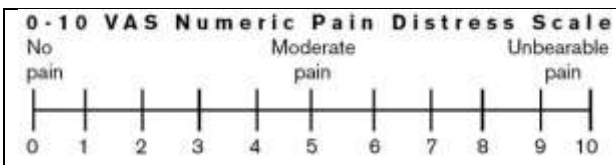

Figure 5. Visual Analogue Scale for Pain[8]

In this study pain was assessed using visual analogue scale (VAS) (Fig. 5) at Rest and Coughing. VAS for pain is an unidimensional measure of pain intensity and is simple, adaptable to wide range of population.

VAS score for pain is a reliable tool to assess pain intensity in post-surgical patients.

A horizontal VAS line 100 mm in length, anchored by 2 verbal descriptors one for each extreme, ''no pain'' (score of 0) and "worst imaginable pain'' (score of 100) was used. Patient was asked to place a line perpendicular to the VAS line at the point that represents their pain intensity. Using a ruler, the score was determined by me by measuring the distance in mm on the 100 mm line between 'no pain' and the patient mark. For postoperative pain assessment as Excellent, Good, Average and Poor the following cut off points on the pain VAS has been used:

Excellent- VAS 0, Good- VAS 1 to 3, Average- VAS 4 to 7, Poor - VAS 7 to 10.

Recordings were taken at Rest and at Coughing. Assessment of pain was done using VAS at Rest and at Coughing at intervals of 15 min, 30 min, 60 min, 120 min, 240 min, 360 min, 720 min, 1440 min postoperatively.

Rescue Analgesic

When the rest pain was assessed by visual analogue scale and the score being 4 or more rescue analgesic Inj. Tramadol 50 mg IV given and was not repeated less than 4 hours. All postoperative assessments were made by an investigator blinded to the study group.

Outcome Measures

1) Quality of post-operative
2) Duration of analgesia
3) Time for first rescue analgesic and total tramadol consumption in 24 hours
4) Side effects.

Quality of Postoperative Analgesia

Quality of post-operative analgesia was assessed by visual analogue score for pain at rest. Patients having VAS of 0 at rest was considered to have excellent analgesia, 1-3 as good, 4-7 as average, 7- 10 as poor.

Duration of Analgesia

Time duration from administration of paravertebral block to reach a VAS for pain at rest more than or equal to 4. At this point first dose of rescue analgesic was given.

Tramadol Consumption

24-hour tramadol consumption in milligram was noted in both the groups.

Side Effects

Side effects due to ropivacaine and complications related to paravertebral block like nausea, vomiting, hypotension, vascular puncture, bilateral spread, pneumothorax, intrathecal injection were noted. Side effects due to hyaluronidase like allergic reaction were also noted.

Haemodynamics

Haemodynamics like systolic blood pressure, diastolic blood pressure, oxygen saturation were noted. Also peak expiratory flow rate were also noted.

Statistical Methods

Data entry was done using MS Excel 2007 software. Data was analysed using statistical package for social sciences (SPSS) version 16.0 computer software. Various statistical parameters such as percentage, proportion, mean, median, standard deviation, and tests including Independent t-test were used as applicable. For all the tests a "P" value of less than or equal to 0.05 was considered statistically significant. The sample size was calculated after assuming an improvement in duration and quality of blockade by 20% in group B as compared to group A based on previous studies. With an alpha value of 0.05 and a power of 80%, a sample size of 100 i.e., 50 in each group was arrived at. (Group A: n=50, Group B: n=50).

RESULTS

100 adult female patients of ASA physical status I and II undergoing unilateral breast surgeries under paravertebral block under ultrasound guidance followed by general anaesthesia were studied and results analysed.

Demographics

ASA	Group RS	Group RH	Total
I	37 (74%)	33 (66%)	70 (70%)
II	13 (26%)	17 (34%)	30 (30%)
Table 1. ASA-PS			
Chi square value-0.762, P value-0.383			

All the patients posted were adult female patients and belonged to ASA-PS I and II. Out of 100 patients 70 were ASA-PS I of which 37 and 33 were in Group RS and Group RH respectively. Of the 30 belonging to ASA-PS II 13 were in Group RS and 17 were in Group RH with no significant differences between two groups. (Table No. 1)

Basal Characteristics	Group RS	Group RH	p Value*
	Mean ± SD	Mean ± SD	
Age (years)	56.22±8.37	59.46±7.58	0.045
weight (kgs)	35.68±14.37	38.88±14.7	0.273
Table 2. Demographic Characteristics			
* Independent T Test.			

The mean age of the patients in this study was 56.22±8.37 years in Group RS and 59.46±7.58 years in Group RH. Mean weight of the patients in Group RS was 35.68±14.37 and in Group RH was 38.88±14.7 and was comparable. (Table No. 2 and Fig. No. 6)

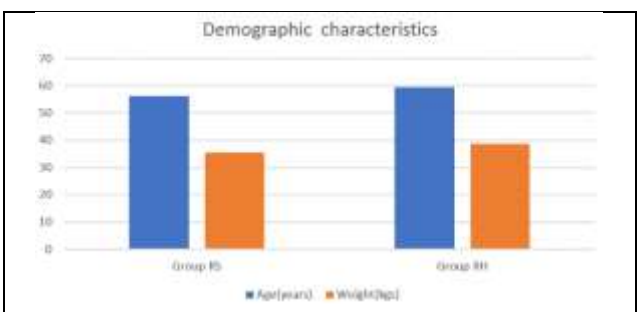

Figure 6. Demographic Characteristics of Patients

Duration of The Surgical Procedure

The mean duration of surgical procedure i.e., from the start of induction of anaesthesia till the extubation of the patient in Group RS lasted for 83.8±28.7 minutes and 88.5±23.11 minutes in Group RH.

Duration of Surgery (min)	Group RS	Group RH
Mean ± SD	83.8 ± 28.7	88.5± 23.11
Table 3. Comparison of Duration of Surgery		

Comparison of VAS scores

VAS Score at Rest

Time Interval	Group RS (N=50)	Group RH (N=50)	p Value*
	Mean ± SD	Mean ± SD	
15 min	00 ± 00	00 ± 00	--
30 min	00 ± 00	00 ± 00	--
1 hour	00 ± 00	00 ± 00	--
2 hours	00 ± 00	00 ± 00	--
4 hours	0.8 ± 1.05	0.32 ± 0.74	0.009
6 hours	1.92 ± 1.07	0.88 ± 1.12	6.68
12 hours	2.54 ± 0.61	1.48 ± 1.2	1.73
24 hours	2.6 ± 0.61	2.18 ± 0.94	0.009
Table 4. Comparison of VAS at Rest			
*Independent T test.			

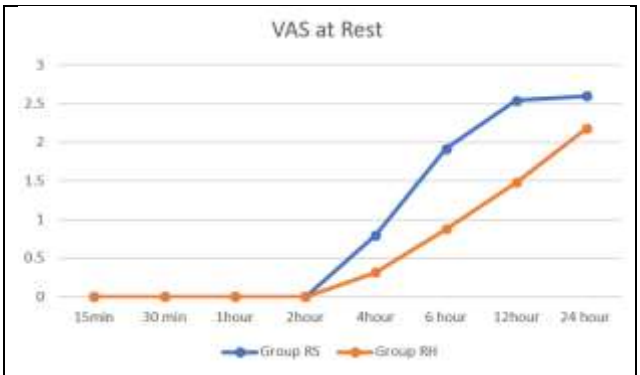

Figure 7. VAS Scores at Rest

The VAS scores for pain at rest was assessed postoperatively after extubation of the patient at 15th min, 30th min, 1st hour, 2nd hour, 4th hour, 6th hour, 12th hour, and 24th hour. VAS score was less in Group RH compared to Group RS but there was no statistically significant difference between the two groups. (Table 4 and Fig. 7)

VAS at Cough

Time Interval	Group RS (N=50) (Mean ± SD)	Group RH (N=50) Mean ± SD	p Value*
15 min	00 ± 00	00 ± 00	--
30 min	00 ± 00	00 ± 00	--
1 hour	00 ± 00	00 ± 00	--
2 hours	0.08 ± 0.4	00 ± 00	0.156
4 hours	0.96 ± 1.06	0.36 ± 0.85	0.002
6 hours	2.20 ± 0.88	1.36 ± 1.12	6.637
12 hours	2.66 ± 0.48	2.42 ± 0.81	0.075
24 hours	2.78 ± 0.0.42	2.8 ± 0.57	0.842
Table 5. Comparison of VAS on Cough			
*Independent T test.			

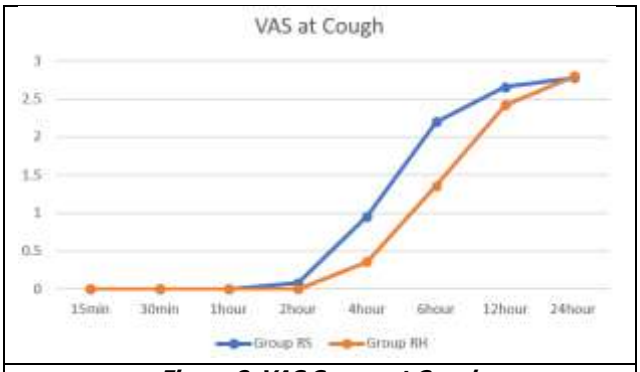

Figure 8. VAS Scores at Cough

VAS scores were assessed for pain at cough at similar intervals as above. There was no statistical or clinical difference between the two groups at all times except at 4th hour where Group RH having better VAS Scores compared to Group RS. (Table 5 and Figure 8)

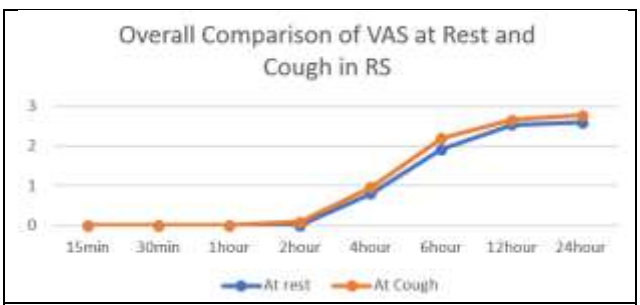

Figure 9. Overall Comparison of VAS at Rest and Cough in RS Group

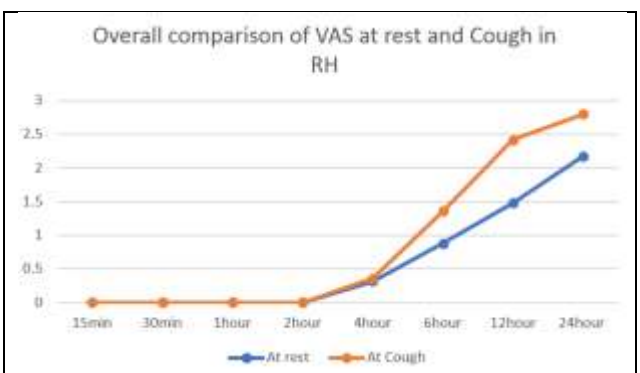

Figure 10. Overall Comparison of VAS at Rest and Cough in RH Group

In both the groups the patients remained pain free for 2 to 4 hours both at rest and at coughing. Patients in Group RH had slightly better dynamic pain scores measured by VAS for pain at coughing. (Fig. 9 and 10)

Observation	Group RS (N=50)	Group RH (N=50)	p Value
Time of first rescue in mins (Median & Range)	600 (480 - 1440)	575 (480 - 1000)	0.218
Total Tramadol dose (mg) (mean ± SD)	54 ± 19.8	55 ± 15.2	0.777
Table 6. Comparison of Time for First Rescue Analgesic and Dose of Tramadol			

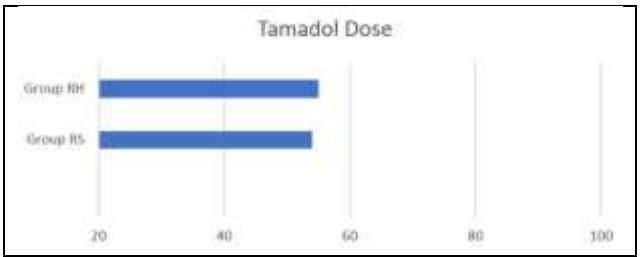

Figure 11. Comparison of Total Dose of Rescue Analgesic in First 24 hrs in Both Groups

Table 6 and Figure 11 shows both the groups were comparable in terms of time at which the first dose of tramadol was given. As shown in the table the median duration of analgesia (first rescue analgesia) in Group RS being 600 min with range being 480-1440 min. Similarly, in Group RH it was 575 min with the range of 480-1000 min.

Also, there is no significant difference between the total tramadol consumption in 24 hours between the two groups, Group RS has 54 mg and Group RH has 55 mg.

Haemodynamic Variables

Parameters	Group RS (N=50)	Group RH (N=50)	p Value*
	Mean ± SD	Mean ± SD	
SBP (mmHg)	118.0 ± 12.77	118.6 ± 11.25	0.80
DBP (mmHg)	72.4 ± 9.38	73.8 ± 8.3	0.43
HR (beats/min)	82.38 ± 9.08	81.44 ± 9.26	0.61
SPO2	99.48 ± 0.68	99.36 ± 0.72	0.39
PEFR (L/min)	346.2 ± 34.92	361.6 ± 35.76	0.03

Table 7. Comparison of Basal Haemodynamic Variables Including PEFR

*Independent T test

Haemodynamic variables included measuring of the heart rate/pulse rate, NIBP, oxygen saturation and PEFR as shown in table 7. All parameters (Table 8, 9, 10, and 11) were measured during the same time intervals as used for pain assessment. Haemodynamic variables were comparable between both the groups with no statistically significant differences.

Time Interval	Systolic Blood Pressure			Diastolic Blood Pressure		
	Group RS (N=50)	Group RH (N=50)	p Value*	Group RS (N=50)	Group RH (N=50)	p Value*
	Mean ± SD	Mean ± SD		Mean ± SD	Mean ± SD	
15 min	125.0 ± 10.9	129.0 ± 10.09	0.059	82.0 ± 7.55	84.0 ± 7.28	0.18
30 min	118.0 ± 12.45	118.4 ± 10.17	0.86	79.4 ± 7.39	74.8 ± 7.62	0.002
1 hour	110.0 ± 10.7	114.0 ± 8.57	0.041	73.2 ± 8.43	69.8 ± 7.69	0.616
2 hours	109.4 ± 10.18	112.2 ± 9.95	0.167	71.2 ± 6.59	70.0 ± 7.82	0.33
4 hours	110.4 ± 10.87	116.8 ± 8.67	0.001	70.0 ± 7.82	73.2 ± 5.51	0.02
6 hours	110.8 ± 12.09	114.2 ± 10.31	0.133	70.2 ± 7.69	71.8 ± 7.19	0.285
12 hours	110.6 ± 9.77	109.8 ± 8.2	0.658	69.4 ± 8.18	70.8 ± 6.65	0.35
24 hours	110.8 ± 10.06	117.4 ± 9.21	9.173	68.6 ± 8.8	74.4 ± 6.11	2.3

Table 8. Comparison of Systolic and Diastolic Blood Pressure

Time Interval	Pulse Rate		
	Group RS (N=50)	Group RH (N=50)	p Value*
	Mean ± SD	Mean ± SD	
15 min	109.1 ± 11.32	101.36.0 ± 7.1	8.67
30 min	100.1 ± 8.22	98.68 ± 5.63	0.31
1 hour	90.64 ± 9.94	93.16 ± 5.79	0.12
2 hours	88.0 ± 8.11	88.7 ± 4.94	0.6
4 hours	85.0 ± 7.3	85.6 ± 5.6	0.64
6 hours	82.72 ± 8.42	84.76 ± 5.31	0.15
12 hours	82.92 ± 8.02	83.14 ± 5.91	0.87
24 hours	85.32 ± 11.56	84.06 ± 5.39	0.48

Table 9. Comparison of Pulse Rate

Time Interval	SPO_2		
	Group RS (N=50)	Group RH (N=50)	p Value*
	Mean ± SD	Mean ± SD	
15 min	96.48 ± 1.11	97.36 ± 1.24	3.15
30 min	96.98 ± 1.25	97.1 ± 1.28	0.64
1 hour	96.76 ± 1.38	97.26 ± 1.06	0.045
2 hours	96.86 ± 1.23	97.16 ± 1.11	0.203
4 hours	97.6 ± 1.23	97.54 ± 1.23	0.808
6 hours	97.92 ± 1.16	97.34 ± 1.1	0.012
12 hours	98.24 ± 1.29	97.66 ± 0.98	0.012
24 hours	98.76 ± 1.1	98.2 ± 0.88	0.005

Table 10. Comparison of SpO_2

Time Interval	PEFR		
	Group RS (N=50)	Group RH (N=50)	p Value*
	Mean ± SD	Mean ± SD	
15 min	287.2 ± 23.82	291.8 ± 20.86	0.306
30 min	295.8 ± 26.12	301.6 ± 20.04	0.216
1 hour	303.0 ± 29.78	307.4 ± 27.02	0.441
2 hours	310.2 ± 30.67	314.6 ± 27.57	0.452
4 hours	314.4 ± 28.86	319.54 ± 28.52	0.386
6 hours	322.6 ± 27.39	325.0 ± 31.18	0.684
12 hours	334.0 ± 33.01	345.0 ± 33.57	0.102
24 hours	345.6 ± 34.35	359.4 ± 37.22	0.057

Table 11. Comparison of PEFR

DISCUSSION

Breast surgery is a common procedure performed in women. Many women who undergo breast surgery suffer from ill-defined pain syndromes. Following breast surgery, moderate or severe pain may increase the duration of hospital stay, delay in returning to normal activities and increase in associated costs. Breast surgeries form one of the major surgeries performed in any institution.

Among the 100 patients satisfying the inclusion criteria majority were modified radical mastectomy (42%), wide local excision (15%), simple excision (7%), excision biopsy (24%), lumpectomy (5%), breast conservation surgery (1%), mastectomy (3%), mastectomy with axillary clearance (1%), toilet mastectomy (2%). General anaesthesia was given to all patients in this study as we wanted to negate the bias in assessment of pain scores when surgeries are done under regional anaesthesia techniques like the epidural anaesthesia, intercostal nerve block. By choosing general anaesthesia we could assess the pain scores to determine the quality of analgesia even from the 15th minute after extubating the patient. Hyaluronidase is known to reduce the onset time of the local anaesthetic blockade when used in ophthalmic surgeries.

Volume of drug used in our study was 20 ml of 0.75% Ropivacaine which was similar to the volume used by Renes Steven H et al[8] where the authors suggested use of 20ml of 0.75 Ropivacaine for thoracic paravertebral block.

In our study we used 18G Touhy tip epidural needle for better visualization under ultrasound guidance and appropriate administration of drug in paravertebral space (PVS) where a similar needle was used by Das S et al[9] for PVB by landmark technique.

Hyaluronidase is known as the spreading factor. As noted by G.A.Dempsey et al[10] at concentration of 50 IU/ml it improved the quality of successful peribulbar blockade. H.E.Schulenburg et al[11] using Hyaluronidase at 15 IU/ml caused a significant (2.4 fold) reduction in local anaesthetic volume required for Sub Tenons anaesthesia. Nathan et al[12] concluded that addition of Hyaluronidase 100 IU/ml hastened the absorption of lidocaine and bupivacaine from the peribulbar space. These studies prompted us to use Hyaluronidase in Paravertebral block. In our study we found that dynamic VAS scores at cough were lesser in Group RH when compared to Group RS though not statistically significant between both the Groups. This could be attributed to the better spread of the local anaesthetic in the PVS and improved quality of pain intensity scores. Reduction of dynamic pain scores indicates the potency and success of effective successful blockade. In Group RH we used 19 ml of 0.75% Ropivacaine with hyaluronidase (1500 IU) reconstituted to 1ml by using normal saline. The dilution of Hyaluronidase used in our study was 75 IU/ml which was lesser than Koh et al[13] who used 100 IU/ml of hyaluronidase as an adjuvant to ropivacaine in axillary brachial plexus block.

Quality of Post-Operative Analgesia

Significant number of patients in Group RH had excellent analgesia with VAS of less than three. This can be attributed to the effective nerve blockade by addition of hyaluronidase. Time for first rescue Analgesia: In our study we did not find any statistical significance between both the groups in terms of time for first rescue which was in contrast to that seen by Keeler et al[14] who used hyaluronidase as an additive to axillary brachial plexus nerve block and found significant reduction of duration. This could be attributed to the differences in mechanism of action, the anatomical differences in the vascularity between the two groups. The PVS is relatively less vascular compared to the axillary brachial plexus.

The total tramadol consumption in both groups was not differing significantly in our study indicating better satisfaction scores due to reliable and adequate blockade of the pain and improvement in the dynamic pain intensity scores (54 ± 19.8 mg vs 55 ± 15.2 mg, p value-0.777). There are no studies till date on the use of hyaluronidase in the PVB block which assessed the dynamic pain scores and opioid requirement.

The patients in our study did not experience any severe complications due to the PVB procedure. There were no allergic reactions due to Ropivacaine or due to Hyaluronidase. The nausea and vomiting observed in 4 patients from each of the groups can be attributed to tramadol consumption.

Limitations

1) The better spread of local anaesthetic as hypothesized as the reason for better distribution of the local anaesthetic in the PVB leading to better pain intensity relief of dynamic VAS scores on coughing could not be visually substantiated. A large-scale Radiographic study using hyaluronidase with radio opaque dyes would have clearly explained our study.
2) Improvement in the onset of blockade by addition of Hyaluronidase as studied by KOH et al[14] could not be assessed with use of subjective pain scores.

Future Scope of The Study

As there are very fewer studies on use of hyaluronidase in PVB, more multicentric randomised controlled trials and meta analyses are required before reaching a common consensus for its use in clinical practice.

Summary

Our study is a randomized controlled, prospective study done on 100 patients of American Society of Anesthesiologist physical status I and II of female sex of 15-60 years of age who underwent lower abdominal surgery under general anaesthesia. It was done to compare Inj. Ropivacaine 0.75% alone or Ropivacaine 0.75% with Hyaluronidase when used in ultrasound guided PVB block with respect to quality and duration of analgesia in patients undergoing unilateral breast surgeries under general anaesthesia. 100 patients were considered and were randomly allotted to two groups by block randomization. Groups received ultrasound guided PVB before GA and underwent extubation after surgical procedure and were monitored for pain using Visual Analogue Scale for Pain at rest and cough at 15th, 30th minute and 1st, 2nd, 4th, 6th, 12th and 24th hour postoperatively. Patients were also monitored for haemodynamics, time for first rescue analgesic, and any side effects.

We found that there was an marginal improvement in the pain intensity scores but statistically not significant as

assessed by VAS for pain at rest and at coughing at all the time intervals in the Hyaluronidase group expect at 24 hours but the tramadol consumption in both the groups was same. As a result, further studies need to be done on the use of Hyaluronidase as an adjuvant with local anaesthetics in PVB as it can increase the spread of the local anaesthetic.

CONCLUSIONS

Addition of hyaluronidase to ropivacaine for paravertebral block produces marginal reduction (but statistically insignificant) in the pain intensity scores as assessed by visual analog score both at rest as well as at coughing without any increase in the incidence of the complications.

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