



Anaesthesiology

COMPARISON OF POST OPERATIVE ANALGESIA AFTER PERIPHERAL NERVE STIMULATOR GUIDED PECTORAL NERVE BLOCK WITH ROPIVACAINE 0.25%/ROPIVACAINE 0.25% AND DEXAMETHASONE IN PATIENTS UNDERGOING MODIFIED RADICAL MASTECTOMY UNDER GENERAL ANAESTHESIA.

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ABSTRACT

Introduction: Acute post-operative pain is not only debilitating to the patient in post-operative period, but is an important risk factor for the development of persistent chronic pain after breast surgery, which lead to diminished health related quality of life therefore patient going through physical & psychosocial impairment. Thoracic epidural and paravertebral blocks are gold standard technique to achieve perioperative and postoperative analgesia but performance of these procedure varies according to anaesthesiologist comfort. As alternatives to these technique. The present study has been designed to use the peripheral nerve stimulator for PEC- I block with or without dexamethasone along with 0.25% ropivacaine to achieve analgesia for chest wall surgeries such as modified radical mastectomy, thoracotomies, Latissimus dorsi flaps, and other hemithorax surgeries. **Materials And Methods:** A Prospective and randomized Study was conducted in Department of Anaesthesiology, J.A. Group of Hospitals and G.R. Medical College, Gwalior (M.P.) among 90 patients of ASA grade I and II scheduled for breast cancer surgery. Patient were subsequently randomized into three groups of 30 each by the process of double blinded randomization by closed envelop technique. Grouping: 90 patients were randomly divided into 3 groups: Group RD (n=30) -10 ml of 0.25% ropivacaine with 4 mg (1ml) dexamethasone followed by general anaesthesia. Group RA (n=30) -10 ml of 0.25% ropivacaine with 1ml normal saline followed by general anaesthesia. Group GA (n=30) -11 ml of normal saline followed by General anaesthesia. **Results:** Baseline mean systolic blood pressure was 127±9.5 mm of Hg in group RD, 127.1±8.2 mm of Hg in group RA, and 128±6.9 mm of Hg in group GA. Statistically highly significant differences (p<0.001) were observed in mean systolic blood pressure between all three groups. Baseline mean diastolic blood pressure was 79.9±8 mm of Hg in group RD, 81.4±6.6 mm of Hg in group RA, and 82.2±6.3 mm of Hg in group GA. Statistically highly significant differences (p<0.001) was observed in mean diastolic blood pressure between all three groups. As ANOVA P value is < 0.001. Applying TUKEY HSD (honest significant differences) between group RD and group GA and group RA and group GA were found statistically significant differences (p> 0.05) at all time interval except 20,330,690 min. for mean diastolic pressure. **Conclusion:** Intra and post operatively hemodynamic stability are maintained in pecs block because site of Pecs block is far away from sympathetic supply. Time to 1st rescue analgesia is prolonged when Dexamethasone combined to ropivacaine as an adjuvant compared ropivacaine and normal saline. Incidence of post operative nausea vomiting are less when dexamethasone added to ropivacaine compare to ropivacaine and mock block.

KEYWORDS : Post Operative Analgesia, Peripheral Nerve Stimulator , Pectoral Nerve Block Ropivacaine, Dexamethasone, Radical Mastectomy

INTRODUCTION

Acute post-operative pain is not only debilitating to the patient in post-operative period, but is an important risk factor for the development of persistent chronic pain after breast surgery, which lead to diminished health related quality of life therefore patient going through physical & psychosocial impairment. There is no specific definition of postmastectomy chronic pain „International association for study of pain defined as chronic pain in the axilla, anterior aspect of the thorax, and/ or upper half of the arm, beginning after mastectomy or quadrantectomy and persisting for 3 months after surgery.²

Regional anaesthesia like thoracic paravertebral block either single shot or continuous infusion has become an ideal addition to general anaesthesia for providing analgesia after breast cancer surgery.³ Thoracic paravertebral block is beneficial not only for providing intraoperative and post operative analgesia but also work as a sole anesthetic technique to perform various procedure.⁴

General anaesthesia is associated with 50% incidence of nausea and vomiting after breast cancer surgery, and also with more postoperative pain associated with these complication lead to extended post anesthesia care unit stays with prolonged hospital admission. In compare to general anaesthesia, regional anaesthesia technique provides excellent analgesia with low incidence of nausea and vomiting, reduced requirement of intraoperative analgesic supplements and also decrease the requirement of first rescue analgesic in postoperative period.⁵

Thoracic epidural and paravertebral blocks are gold standard technique to achieve perioperative and postoperative analgesia but performance of these procedure varies according to anaesthesiologist

comfort. As alternatives to these technique. R.Blanco designed a novel pectoral nerve block that target median and lateral pectoral nerve in interfascial plane in between pectoralis major and minor. The aim of this novel technique is to block the axilla and intercostal nerve for various chest wall surgeries like wide local excision and several breast surgeries.⁶ Pecs block is a sole regional anaesthetic technique that aims to decreased need for analgesic supplements, provide better analgesia, hemodynamic stability in perioperative and postoperative period and reduced PONV and post anesthesia care unit stay.⁷

The present study has been designed to use the peripheral nerve stimulator for PEC- I block with or without dexamethasone along with 0.25% ropivacaine to achieve analgesia for chest wall surgeries such as modified radical mastectomy, thoracotomies, Latissimus dorsi flaps, and other hemithorax surgeries

MATERIALS AND METHODS

A Prospective and randomized Study was conducted in Department of Anaesthesiology, J.A. Group of Hospitals and G.R. Medical College, Gwalior (M.P.) among 90 patients of ASA grade I and II scheduled for breast cancer surgery.

Inclusion Criteria:

- 90 patients of ASA grade I and II.
- Non-pregnant females of age group - 20-60 yr

Exclusion Criteria:

- Following patients were not included in the study
- History of allergy or sensitivity or any other reaction to local anaesthetic of amide type.
- History of significant neurological, psychiatric or neuromuscular

disorder.

- Cardiac disease
- Patient with elevated AST, ALT values.
- Parturient and lactating women
- History of bleeding disorder

Patient were subsequently randomized into three groups of 30 each by the process of double blinded randomization by closed envelop technique.

Grouping: 90 patients were randomly divided into 3 groups:

1. Group RD (n=30) -10 ml of 0.25% ropivacaine with 4 mg(1ml) dexamethasone followed by general anaesthesia
2. Group RA (n=30) -10 ml of 0.25% ropivacaine with 1ml normal saline followed by general anaesthesia
3. Group GA (n=30) -11 ml of normal saline followed by General anaesthesia

Materials Used:

1. Disposable syringes 10cc, 5cc
2. 50mm Insulated needle for peripheral nerve stimulator
3. Inj. Ropivacaine hydrochloride 0.25%
4. Injection dexamethasone 4mg
5. Nerve stimulator

Preparation Of The Patient:

After patient's arrival in the operating room 18G IV cannula secured in the forearm contralateral to operating side, RL solution started @ 10-15 drops/min and Injection Glycopyrolate 0.2 mg half hour before surgery premedication was given I/V. Standard monitoring was used throughout the procedure including NIBP, HR, pulse oximeter.

Position:

Patients was placed in supine position with the head turned to contra lateral side and the ipsilateral arm slightly abducted.

Procedure

The site of the injection is intersection point of line drawn from the angle of Louis and the anterior axillary line. After infiltration skin with 2% lignocaine, insulated nerve stimulator needle(50mm) with syringe filled with local anesthetic agent and attached to the extension tubing is inserted perpendicular to the skin. The peripheral nerve stimulators (PNS) are set at 1.0–1.5 mA current, 1 Hz frequency and 0.1ms duration. The needle is turned slowly advanced till the pectoralis muscle contractions is observe, with a current threshold of 0.3–0.5 mA. Exact needle location is confirmed by persistence contraction of pectoralis muscle indicate that needle located at target site. Then slowly injected the study drug in increments with repetitive negative aspirations.

The patient observed for 20 min after performing the block then sensory level of block was assessed with pin prick sensation in each side from T1-T8. Total no. of dermatomes that having less pain to pin prick sensation compared with opposite side, if the pin prick sensation is not decreased in any segment up to 20 minute it was considered as block failure and patient was excluded from analysis.

General anaesthesia was given in all three group after performing Pecs I block, using propofol iv 1.5 mg/kg, fentanyl 2mcg/kg, and atracurium 0.25mg/kg. Anaesthesia maintained with N₂O + O₂ (67:33) and isoflurane (0.8%-1%) at the end Neuro muscular blocker was reversed by neostigmine 0.05mg/kg with glycopyrolate 0.01mg/kg.

Outcome Measure And Data Collection

All baseline, intraoperative and postoperative measurement were evaluated by an independent observer who was blinded to treatment allocation. Pain intensity post operatively was assessed using a single 11- point NRS scale (in which 0 indicate no pain and 10 indicate worst pain imaginable). NRS score was assessed at rest and at 90degree abduction on the site of surgery. The HR and MAP also assessed at same time. On pain assessment, if NRS score was ≥ 4 1st rescue analgesic (diclofenac 75mg) was given, time to first rescue analgesic was noted. Thereafter diclofenac was given every 12 hours. Pain was again reassessed 1 hour after giving injection diclofenac, still NRS was ≥ 4 then injection tramadol 1mg/kg given. Time to this 2nd rescue analgesic noted. After half an hour of 2nd rescue analgesic if patient still had NRS ≥ 4 then additional tramadol was given to maximum of 100mg in 6 hours or a total of 400mg in 24 hours.

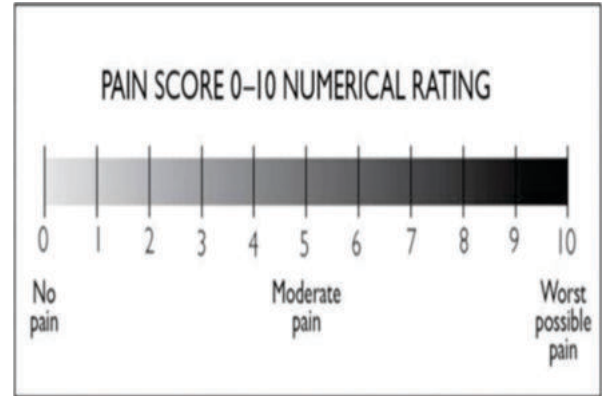
Complications and side effect associated with the PECS I block and

with analgesics, such as nausea ,vomiting, pneumothorax, hematoma and respiratory depression were noted. Vital signs (e.g., oxygen saturation, blood pressure, heart rate) were measured during the first 24 hours postoperatively. Differences in mean blood pressure and pulse rate from before and after the incision were observed.

Primary study outcome was the difference in 24-hour postoperative tramadol consumption in all three study groups and Secondary outcomes included the NRS score for breast pain. changes in vital signs at incision, tramadol requirements according pain, side effects of analgesics (nausea, vomiting, pruritus, respiratory depression, heamatoma).

Numerical Rating Scale- Instructions For Patients-

"kindly indicate the intensity of current, best, and worst pain levels over the past 24 hours on a scale of 0 (no pain) to 10 (worst pain imaginable)"^{40,41}



Statistical Analysis-

The observations recorded in all three group was tabulated and statistical analysis was carried out using ANOVA, paired t test and TUKEY HSD (Honest significant difference) test.

p value < 0.001- Statistically highly significant p value < 0.05 - Statistically significant

p value < 0.05 - Statistically insignificant

RESULTS:

Table: 1 Demographic Profile Of Study Participants

Demographic parameter	Group RA (n=30)	Group RD (n=30)	Group GA (n=30)	p value
Age (years)	49.1±7.8	49.2±7.2	47.8±7.9	0.742
Height (in cm)	157±4.1	158.2±3	157.5±2.1	0.321
Weight (in kgs)	57.1±3.7	56.9±3.6	57.1±3.8	0.983
BMI (Kg/m ²)	23.2±1.5	22.7±1.4	23.0±1.5	0.521

Table no.1 showing demographic profile of the patients in three groups according to age, height, weight and BMI.

Statistical analysis of Mean ±SD of age, height, weight and BMI were comparable in all three groups and statistically insignificant (**p> 0.05**) **Statistically significant p≤0.05** Statistically insignificant p≥0.05.

Table 2: ASA Grade Wise Distribution

ASA Grade	Group RA (n=30)	Group RD (n=30)	Group GA (n=30)	p value
ASA I	5	5	4	0.918
ASA II	25	25	26	

Table no.2 showing ASA grade wise distributions of patients in all three group.

Statistical analysis of Mean ±SD of ASA I and ASA II were comparable in all three groups and statistically insignificant (**p>0.05**)

Table 3: Duration Of Surgery (Mean±SD)

	Group RA (n=30)	Group RD (n=30)	Group GA (n=30)	p value
Duration of Surgery (Min)	119.5±8.9	120.1±7.6	116.2±11.5	0.233

Table no.3 showing duration of surgery in all three groups. Statistical analysis of Mean $\pm$ SD of duration of surgery were comparable in all three groups and statistically insignificant ($p>0.05$)

Table 4: Intergroup Statistical Analysis Of Systolic Blood Pressure (mm of Hg)

Time (Minutes)	Group RA Mean $\pm$ SD	Group RD Mean $\pm$ SD	Group GA Mean $\pm$ SD	F value	P value
pre induction	127.1 $\pm$ 8.2	127 $\pm$ 9.5	128 $\pm$ 6.9	0.124	0.883
30 min	120.5 $\pm$ 11.9	114.5 $\pm$ 8.3	127.5 $\pm$ 11.5	11.066	<0.001
60 min	122.5 $\pm$ 14.6	116.2 $\pm$ 10.3	127.5 $\pm$ 11.6	6.390	0.003
210 min	126 $\pm$ 7.7	122.7 $\pm$ 7.8	131.6 $\pm$ 6	11.768	<0.001
450 min	131.8 $\pm$ 7.1	127.4 $\pm$ 5.5	135.3 $\pm$ 7.4	10.415	<0.001
630min	133.7 $\pm$ 6.6	129.7 $\pm$ 7	133 $\pm$ 9.1	2.416	0.095
750 min	134.9 $\pm$ 8.1	130.9 $\pm$ 7.2	137.1 $\pm$ 6.3	5.540	0.005

Baseline mean systolic blood pressure was **127 $\pm$ 9.5** mm of Hg in group RD, **127.1 $\pm$ 8.2** mm of Hg in group RA, and **128 $\pm$ 6.9** mm of Hg in group GA. Statistically highly significant differences ($p<0.001$) were observed in mean systolic blood pressure between all three groups. As ANOVA P value is <0.001 . Applying TUKEY HSD (honest significant differences) between group RD and group GA and group RA and group GA were statistically significant ($p>0.05$) at all time interval except 60,570,630, and 750 min. However differences between group RA and RD were statistically significant at all time interval except 210,270,510 and 750 min interval, where it were statistically insignificant ($p>0.05$).

Table 5: Intergroup Statistical Analysis Of Diastolic Blood Pressure (mm of Hg)

Time (Minutes)	Group RA Mean $\pm$ SD	Group RD Mean $\pm$ SD	Group GA Mean $\pm$ SD	F value	P value
pre induction	81.4 $\pm$ 6.6	79.9 $\pm$ 8	82.2 $\pm$ 6.3	0.862	p.426
30 min	73.5 $\pm$ 7.7	69.9 $\pm$ 6.4	79.5 $\pm$ 7.6	13.466	<0.001
60 min	75.1 $\pm$ 9.7	70.4 $\pm$ 7.3	81.9 $\pm$ 8	14.406	<0.001
210 min	83 $\pm$ 4.4	76.4 $\pm$ 4.7	86.7 $\pm$ 6	31.538	<0.001
450 min	84.3 $\pm$ 6.2	79.9 $\pm$ 5.3	88.7 $\pm$ 6.6	16.010	<0.001
630min	83.2 $\pm$ 4.7	82.4 $\pm$ 5.3	87.9 $\pm$ 5.6	9.681	<0.001
750 min	86.3 $\pm$ 6.2	82.9 $\pm$ 4.9	89.6 $\pm$ 5.4	10.929	<0.001

Baseline mean diastolic blood pressure was **79.9 $\pm$ 8** mm of Hg in group RD, **81.4 $\pm$ 6.6** mm of Hg in group RA, and **82.2 $\pm$ 6.3** mm of Hg in group GA. Statistically highly significant differences ($p<0.001$) was observed in mean diastolic blood pressure between all three groups. As ANOVA P value is <0.001 . Applying TUKEY HSD (honest significant differences) between group RD and group GA and group RA and group GA were found statistically significant differences ($p>0.05$) at all time interval except 20,330,690 min. for mean diastolic pressure. However differences between group RA and RD were statistically significant at all time interval except 510,530,630,690 min interval, where it found statistically insignificant ($p>0.05$).

Table 6: Intergroup Statistical Analysis Of NRS Score Postoperatively

Time (Minutes)	Group RA Mean $\pm$ SD	Group RD Mean $\pm$ SD	Group GA Mean $\pm$ SD	F value	P value
0.5 hrs	2.2 $\pm$ 0.4	2 $\pm$ 0	2.8 $\pm$ 0.7	24.515	<0.001
1 hr	3.2 $\pm$ 0.5	2.8 $\pm$ 0.5	3.5 $\pm$ 0.5	14.217	<0.001
2 hrs	3.2 $\pm$ 0.4	3 $\pm$ 0.7	3.5 $\pm$ 0.5	6.668	0.002
4 hrs	3.2 $\pm$ 0.4	3 $\pm$ 0.6	3.6 $\pm$ 0.5	12.612	<0.001
8 hrs	3.4 $\pm$ 0.5	2.9 $\pm$ 0.5	3.7 $\pm$ 0.5	19.224	<0.001
16 hrs	3.6 $\pm$ 0.5	2.9 $\pm$ 0.8	3.8 $\pm$ 0.4	18.446	<0.001
24 hrs	3.5 $\pm$ 0.5	3 $\pm$ 0.6	3.8 $\pm$ 0.7	13.198	<0.001

Statistically highly significant differences ($p<0.001$) was observed in mean NRS score between all three groups. As ANOVA P value is <0.001 . Applying TUKEY HSD (honest significant differences) between group RD and group GA and group RA and group GA were statistically significant differences ($p>0.05$) at all time interval except 2 and 16 hours postoperatively statistically insignificant differences were observed for mean NRS score.

However differences between group RA and RD were statistically significant at all time interval except 0.5, 2 and 6 hours where statistically insignificant differences were observed ($p>0.05$).

Table 7: Intergroup Analysis Of Time Of Rescue Analgesia (Minute)

Parameter	Group RA (n-30)	Group RD (n-30)	Group GA (n-30)	F value	P value
TRA (min)	75.1 $\pm$ 6.8	83.9 $\pm$ 10.1	44.1 $\pm$ 8.5	177.051	<0.001

As ANOVA p value <0.001 . applying TUKEY HSD (Honest significant difference), Statistically highly significant differences ($p<0.001$) were observed in time to 1st rescue for analgesic postoperatively between RD and GA, RA and GA and RD and RA.

Table 8: Post Operative Complications

Complications	Group RA (n = 30)		Group RD (n = 30)		Group GA (n = 30)	
	No.	%	No.	%	No.	%
Nausea	10	33.3%	8	26.7%	18	60%
Vomiting	7	23.3%	6	20%	10	33.3%
Respiratory distress	0	0%	0	0%	0	0%
Pneumothorax	0	0%	0	0%	0	0%
Limb paraesthesia	0	0%	0	0%	0	0%
Hematoma	1	3.3	2	6.7%	1	3.3%

DISCUSSION

In our study shows duration of surgery in all three groups. Statistical analysis of Mean $\pm$ SD of duration of surgery were comparable in all three groups, where statistically insignificant ($P>0.05$). One of the greater advantage of pecs block over other conventional method (paravertebral block, thoracic epidural block) was that it has hemodynamic stability because it does not causes sympatholyses.

In our study we found that group RD has more hemodynamic stability compared to group RA & GA. Similarly group RA is more hemodynamic stable compared to group GA. It may be because of better pain control intraoperatively and postoperatively.

Our study is supported with observations of **Goel D, Kumar S et al⁸**. In their study they observed better hemodynamic stability in ultrasound guided pectoral nerve block in patients scheduled for modified radical mastectomy without any untoward effect on HR, SBP, DBP, and MAP in pecs group as compare to general anaesthesia alone.

In our study shows time to 1st rescue analgesic in all three group which was significantly higher in **group RD (83.9 $\pm$ 10.1 min)**, compare to group **RA (75.1 $\pm$ 6.8 min)** and group **GA (44.1 $\pm$ 8.5 min)**.

In our study pain free interval in postoperative period was significantly higher in dexamethasone group.

There are several hypothesis regarding mechanism of analgesic effect of steroids. Although exact mechanism is not well understood. Anti-inflammatory and immunosuppressive effect of corticosteroids induce their analgesic effect^(47,48)

Nuclear transcription modulator might be involved in analgesic action of steroids. Action of Local anaesthetic may be potentiate through the modulation of K^+ channel function in excitable cell⁴⁹.

Irrespective to whatever the mechanism of action of steroid there are several studies which have suggested that use of dexamethasone as an adjuvant to local anaesthetic potentiate analgesia of local anesthetic agent.

Our study is supported by observations of **Sirohiya P et al⁸**.They observed that Dexamethasone as an adjuvant to ropivacaine 0.375% significantly increases time to first rescue analgesic as compared to ropivacaine 0.375% alone ($P=0.03$) in postoperatively in serratus anterior plane block.

Table no. 17 shows intergroup statistical analysis of mean NRS score postoperatively at rest.

In our study we observed statistically highly significant differences ($P<0.001$) in NRS score in group RD compare to group and GA group. Our study is supported by **Altıparmak B, Korkmaz Toket M et al¹⁰**. In their study found median NRS scores were significantly lower in PECS group at the postoperative 60th min, 120th min, 12th hour and 24th hour ($p=0.024$, $p=0.018$, $p=0.021$ and $p=0.011$ respectively)

In one study **Gnanasekar N, kumar D et al¹¹** observed that NRS score were significantly lesser in group which received 0.25% ropivacaine and 8mg dexamethasone compared to group received 0.25%

ropivacaine with Normal saline.

Wahba s,kamal s et al¹² observed in their study that Numerical rating score (NRS) at rest was lower in Pecs group compared with PVB group at 1 h, 6 h and 12 h ($p < 0.001$) but at 18 h and 24 h it was lower in PVB group compared with Pecs group ($p = 0.008$ and < 0.001)

Our study is supported by study of **Kumar V, Sirohiya P et al⁹**. In their study they observed lower NRS score in group which received dexamethasone as an adjuvant to ropivacaine in serratus anterior plane block for modified radical mastectomy.

CONCLUSION

Dexamethasone when added to ropivacaine as an adjuvant prolongs duration of analgesia of Pecs block. Intraoperative fentanyl requirement and post operatively tramadol consumption are less when dexamethasone added to ropivacaine compared to ropivacaine and mock block. Intra and post operatively hemodynamic stability are maintained in pecs block because site of Pecs block is far away from sympathetic supply. Time to 1st rescue analgesia is prolonged when Dexamethasone combined to ropivacaine as an adjuvant compared to ropivacaine and normal saline. Incidence of post operative nausea vomiting are less when dexamethasone added to ropivacaine compared to ropivacaine and mock block.

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