Original Research Article

# Efficacy of dexmedetomidine as an adjuvant with ropivacaine in paravertebral block in surgery for breast cancer

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## Abstract

**Background:** Effective postoperative pain control is an essential component of the care of the surgical patient. A paravertebral block (PVB) for breast surgery has increasing popularity and considered a technique of choice for anesthesia and postoperative analgesia during breast surgery. Various local and regional anaesthetic techniques evaluated to reduce post-operative pain after breast surgery, thoracic PVB appears promising due to reduction in post-operative pain, decreased opioid consumption with reduction in PONV, drowsiness, risk of respiratory depression and cost saving. The present study was aimed to evaluate efficacy of dexmedetomidine as an adjuvant with ropivacaine in paravertebral block in surgery for breast cancer. **Material and Methods:** Fifty patients undergoing breast surgery were randomly divided into two groups, Group PR and PRD. Group PR received 0.5% ropivacaine (0.3 ml/kg) with 1 ml normal saline while Group PRD received same amount of ropivacaine with dexmedetomidine (1 mcg/ml) for thoracic paravertebral block. The groups were observed for efficacy of block, hemodynamic parameters at different time interval, onset of sensory blockade, duration of post-operative analgesia and intra and post-operative complications**. Results:** Dexmedetomidine used as an adjuvant with ropivacaine in TPVB provides good intra operatively and post operatively analgesia and reduces post operative analgesic consumption. No complications of technique and hemodynamic variations or any adverse effects due to dexmedetomidine had occurred. **Conclusion:** TPVB with ropivacaine plus dexmedetomidine as adjuvant can be a better choice to give good analgesia with intra operative hemodynamaic stability without complications and side effects for breast surgeries.
**Keywords:** Thoracic paravertebral block, Dexmedetomidine, Ropivacaine.

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## INTRODUCTION

Effective postoperative pain control is an essential component of the care includes patient comfort, earlier mobilization, fewer pulmonary and cardiac complications, a reduced risk of deep vein thrombosis, faster recovery with less likelihood of the development of neuropathic pain, and reduced cost of care. Good analgesia can reduce the deleterious effect of surgery.[1] The treatment of postoperative pain includes various agents (opioid vs. nonopioid), routes (oral, intravenous, neuraxial, regional) and modes (patient controlled vs. "as needed"), although traditionally the mainstay is opioid based, increasingly more evidence exists to support a multimodal approach with the intent to reduce opioid side effects (such as nausea and ileus) and improve pain scores.[2] Breast cancer is the most common cancer and it requires surgery, is associated with nausea, vomiting, postoperative pain and chronic pain. Therefore, effective postoperative pain management after breast cancer surgery is necessary.[3] Thoracic paravertebral block

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(PVB) is used for pain relief after thoracotomy and mastectomy. It appears promising due to reduction in post-operative pain, decreased opioid consumption with reduction in PONV, drowsiness, risk of respiratory depression and cost saving, decrease in the incidence of chronic post-surgical pain and improvement in subcutaneous oxygenation in the wound site thus possibly reducing infection risk and improving wound healing.[4] A paravertebral block (PVB) for breast surgery has increasing popularity and considered a technique of choice for anesthesia and postoperative analgesia have two common variations; first is a single site injection that involves larger volume at one paravertebral space, and second is a multiple site injection in which 3-4 cm $^3$ volume is injected into multiple levels. The single site technique provides unilateral anesthesia for 4-5 dermatomes, which may not be sufficient to cover all relevant dermatomes[3]. We have considered thoracic paravertebral block at T1, T3 and T5 level on the same side of surgery. Objectives of our study were to compare efficacy of thoracic paravertebral block in breast surgeries, to observe hemodynamic parameters at different time level, onset time of sensory block, to compare duration of analgesic effect of thoracic paravertebral block with local anaesthetic agent i.e. inj. Ropivacine and Ropivacaine with dexmedetomidine, time of first analgesic requirement (i.e. to observe the effect on postoperative analgesia), to observe total post operative analgesic consumption in 24 hrs, to observe the effect on the sedation level of the patients and to observe the side effects

## MATERIAL AND METHODS

After approval from Institutional Ethics Committee-Human between September 2017 to June 2019, fifty patients of ASA I, II, III of female genders, aged 18–60 years, scheduled for breast cancer surgeries were enrolled for this prospective, randomized, double blind control study in PDU Medical College, Rajkot. Written informed consent was taken from all the patients for anaesthesia as well as enrolment in the study. Fifty patients were divided into two groups of twenty five patients each. Group PR patients received Inj. Ropivacaine 0.5% (0.3ml/kg) with normal saline 1ml whereas Group PRD received Inj. Ropivacaine 0.5% (0.3ml/kg) with Dexmedetomidine (1 mcg/kg). Benefits and likely complications of the technique used were explained to the patients and their caretakers in understandable language. All patients underwent a thorough pre-anaesthetic check-up which included history taking, general examination, systemic examination and local neurological examination. Routine investigations were carried out for all patients. All patients were taught about pain scale regarding numerical rating scale during pre-operative visit. Patients with cardiovascular, renal and respiratory co morbidities, patient's refusal, local infection, altered coagulation profile, known case of allergy to local anaesthetics and dexmedetomidine were excluded.

The day before the surgery, procedure was explained and kept Nil by Mouth after 10 pm. On the day of surgery, IV line was secured and Inj. Dextrose Normal Saline (DNS) was started. Standard monitors like Electro Cardio Gram (ECG) leads, Non-Invasive Blood Pressure (NIBP) cuff, and pulse oximeter were applied and baseline parameters like Pulse Rate (PR), Systolic, Diastolic and Mean Blood Pressure (SBP, DBP, MBP respectively), SpO2, and pain score were recorded. Premedication given:Inj. Glycopyrolate (0.2mg) iv, Inj.Fentanyl
1 mcg/kg iv, Inj. Ranitidine (50 mg) iv, Inj.Ondensetron (0.02ml/kg)iv

Identical looking syringes filled with local anaesthetic mixture were prepared by a resident doctor not directly or indirectly involved in the study. Patients were randomly allocated into two groups using a computer generated random number and concealed by sealed opaque envelopes. The anaesthesiologist giving block and accessing parameters were blinded to the drugs given in TPVB. Before giving general anaesthesia, thoracic paravertebral block was given by loss of resistance technique at T1, T3 and T5 level. Drug and dosage was given as per group PR and PRD. Under aseptic precautions TPVB at the level of T1, T3 and T5 on the side of operation is given. The patient was given sitting position with head and neck in flexed position. Spinous process of T1, T3 and T5 vertebra located and a point marked 2.5 cm lateral to it. Following LA infiltration of the skin and subcutaneous tissue, with the help of 18 G Tuohy needle, bevel facing upwards and using LOR technique, needle advanced perpendicularly upto 4-5 cm until it hits the transverse process, further advanced for 5-10 mm past transverse process in cephalad direction till the LOR is appreciated. Following negative aspiration test for blood/CSF, a test dose of 3 ml of 1.5% lignocaine with adrenaline injected. Five minutes later, local anesthetic drug along with adjuvants as per group division above will be given. Sensory block was assessed bilaterally by pin prick method every 5 minutes to note the extent of block and for development of parasthesia on opposite side. If no parasthesia in any of the desired dermatomes it was considered as a failed block. After giving block, general anesthesia provided with preoxygenation with 100% oxygen for 3 min. induction with Sodium thiopentone 3-5mg/kg and tracheal intubation facilitated by inj. Succinylcholine 1.5-2mg/kg by intravenous route. Anaesthesia maintained using

controlled ventilation with isoflurane and O2 : N2O in the ratio of 30:60. Neuromuscular blockade was achieved with vecuronium. Vital parameters like HR, NIBP-systolic, diastolic and mean, ETCO2, SpO2 and ECG were monitored throughout the procedure.

For intraoperative analgesia, fentanyl 1 mcg/kg was administered in premedication. All patients received iv tramadol 1 mg/kg whenever patient complained of pain or VAS more than 4 in postoperative pain relief. Parameters recorded were onset time of sensory block, intraoperative heamodynamic stability, time to first analgesic request, postoperative tramadol consumption over 24 hours, sedation scores.

Sedation score assessed at 30 min, 2 hr, 4 hr, 6 hr, 8 hr postoperatively using Ramsay Sedation Score.

RSS 1 = agitated, restless; 2 =cooperative, tranquil; 3 = responds to verbal command while sleeping; 4 = brisk response to glabellar tap or loud voice while sleeping; 5 = sluggish response to glabellar tap or loud voice; 6 = no response to glabellar tap or loud voice. Visual Analogue Scale is a simple tool which measures the subjective pain of the patient at a given time. The data were expressed as mean ± standard deviation (SD). For demographic data, haemodynamic parameters, onset and duration of sensory blockade and duration of analgesia unpaired t-test was applied. *P*-value was considered highly significant if <0.001.

## OBSERVATION AND RESULTS

The demographic profiles in both the groups were comparable. [Table 1] Mean age (years) in Group PR (47.8±4.94) and Group PRD (50.84±6.36) is comparable and statistically not significant (P value > 0.005). Weight(kg) in Group PR (55±14.14) and Group PRD (56.6±21.21) is comparable and statistically not significant (P value > 0.005). Mean surgical duration (min) in Group PR (119.2±28.28) and Group PRD (120.8±28.28) is not statistically significant ( P > 0.005). The mean time of onset of sensory block was higher in group PR as compared to group PRD and was statistically significant [Table 2]. The mean duration of total analgesia was significantly higher in group PRD than group PR. [Table 3]. There is statistically significant difference in requirement of tramadol, it is higher in group PR as compared to group PRD [Table 4]. Patient's satisfaction score was higher in group PRD compared to group PR [Table 5]. In group PR, 2 out of 25 patient developed nausea vomiting post operatively whereas in group PRD no patient complaint about the same, which is statistically not significant. In group PRD, 2 out of 25 patient developed hypotension intraoperatively whereas in group PR no cases of hypotension found , which is statistically not significant.

**Table 1:** The demographic profile (age, weight, ASA grade), duration of surgery were comparable for both the groups.

| | Group PR | Group PRD | P value |
|---|---|---|---|
| Age (yr) | 47.8±4.94 | 50.84±6.36 | 0.06 |
| Weight (kg) | 55±14.14 | 56.6±21.21 | 0.75 |
| Duration of surgery (min) | 119.2±28.28 | 120.8±28.28 | 0.84 |
| ASA grade (1/2/3) | 10:8:7 | 10:10:5 | |
| | In percentage | In percentage | |
| | 40%,32%,28% | 40%,40%,20% | |

**Table 2:** Onset time of sensory block in both groups.

| | Group PR | Group PRD | STUDENT t –test | P value | Inference |
|---|---|---|---|---|---|
| Onset of Sensory block (in Minutes) | 4.76 ± 0.707 | 3.4±0.70 | 6.8348 | 0.0001 | HS |

**Table 3:** Total duration of analgesia in both groups

| | Group PR | Group PRD | STUDENT t –test | P value | Inference |
|---|---|---|---|---|---|
| Total duration of analgesia (min) | 433.6 ±98.99 | 944 ± 608.11 | 4.142 | 0.0001 | HS |

**Table 4:** Total consumption of tramadol (mg/kg) in 24 hr (post operatively)

| | GROUP PR | GROUP PRD | STUDENT t-test | P value | Inference |
|---|---|---|---|---|---|
| Total consumption of tramadol (mg/kg) | 2.84 ± 0 | 0.88 ±0.707 | 13.861 | 0.0001 | HS |

**Table 5:** Patient satisfaction score

| | Group PR | Group PRD |
|---|---|---|
| Good | 7 (28 %) | 21 (84 %) |
| Average | 14 (56 %) | 3 (12 %) |
| Poor | 4 (16 %) | 1 (4 %) |

## DISCUSSION

Thoracic paravertebral block (TPVB) is a successful alternative to general anaesthesia for breast cancer surgery includes a prolonged postoperative pain relief, potential for early discharge, and reduction in postoperative opioid consumption and hence postoperative nausea and vomiting (PONV). It shortens the duration of hospital stay and hence cost constraints. The most commonly used drugs for PVB are bupivacaine, lignocaine, levobupivacaine, ropivacaine, and combination of these drugs. Various adjuvants were added to local anesthetics in TPVBs such as opioids, epinephrine, dexamethasone,
magnesium, clonidine, etc to achieve quick, dense, and prolonged block, but the results are either inconclusive or associated with side effects.[5] Dexmedetomidine is a highly selective α-2-adrenergic receptor agonist. In clinically effective doses lacks respiratory depression, but maintains its analgesic properties that may make it useful and safe adjunct. The proposed mechanisms for the action of α2-adrenoceptor agonist in peripheral nerve blockades are centrally mediated analgesia, α2B-adrenoceptor mediated vasoconstrictive effects, attenuation of the inflammatory response, and direct action on a peripheral nerve. Thus, present study was done to evaluate efficacy of dexmedetomidine as an adjuvant with ropivacaine in thoracic paravertebral block for breast cancer surgery. In our study, both groups were demographically comparable and there was no any statistical significant difference between the two groups. Onset of sensory block was faster in group PRD as compared to group PR which was statistically significant, suggesting that addition of dexmedetomidine has fasten the onset time of sensory block.[6,7,8] Dexmedetomidine being selective$\alpha_2$-agonist leads to postsynaptic activation of $\alpha_2$ adrenoceptors in the central nervous system (CNS) inhibits sympathetic activity and thus decreases blood pressure and heart rate. In our study the heart rate, systolic and diastolic blood pressure was reduced till 10 mins of induction in group PR and for 20 min in group PRD, but it was statistically non-significant. [8,9,10,11] The mean blood pressure was significantly decrease in group PRD after 20 mins of induction than group PR.[11,12,13] It suggests that the systemic absorption and consequently cardiovascular effects of dexmedetomidine starts as early as 20 mins of blocks. We did not find any significant difference in the sedation score of both the groups. It suggests that dexmedetomidine in the dose of 1ug/kg , if used as adjuvant to local anesthetic agents doesn't cause significant sedation. The VAS Score was consistently high in group PR even after giving analgesic in comparison to group PRD.[14.15,16] In our study the mean duration of total analgesia was significantly higher in group PRD compared to group PR (p value 0.0001).[8,14,16] There is statistically significant difference in requirement of tramadol in postoperative period which is higher in group PR as compared to group PRD.[6,14,16] Satisfaction of the patients in post operative period usually depends on good post operative analgesia and overall well being. TPVB provide satisfactory analgesia in both group but patients of group PRD feels better than in group PR. In Group PR 2 patients developed nausea, vomiting post operatively whereas in group PRD 2 patients developed hypotension intra operatively, which is statistically not significant.[6,17]

## CONCLUSION

TPVB with ropivacaine plus dexmedetomidine as adjuvant can be better choice to give good analgesia with intra operative hemodynamic stability without complications and side effects for breast cancer surgery.

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