

EFFICACY OF DEXMEDETOMIDINE AS AN ADJUVANT TO ROPIVACAINE IN THE ULTRASOUND-GUIDED PECTORAL NERVE BLOCK FOR POST MODIFIED RADICAL MASTECTOMY ANALGESIA: A PROSPECTIVE RANDOMIZED DOUBLE-BLIND STUDY

Anaesthesiology

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ABSTRACT

Background and Aims: Majority of patients undergoing modified radical mastectomy experience severe acute postoperative pain. Pectoral nerve block (Pecs) using local anesthetic agent is a novel analgesic technique for breast surgeries. The present study evaluates the effect of incorporation of dexmedetomidine as an adjuvant to ropivacaine on duration of analgesia and postoperative morphine consumption. **Material and Methods:** Sixty female patients with American Society of Anesthesiologist status I and II posted for modified radical mastectomy were enrolled and randomized into two equal groups. Group R (n = 30) received ultrasound guided Pecs block with 20 ml of 0.5% ropivacaine. Group RD (n = 30 patients) received ultrasound guided Pecs block with 20 ml of ropivacaine 0.5% and dexmedetomidine 0.5 µ/kg body weight. Statistical analysis was done by using Unpaired t-test and Chi-square test **Results:** Total duration of analgesia (in minutes) was significantly higher in Group RD as compared to Group R (465.2 ± 10.42 in Group RD and 311.3 ± 16.35 in Group R) ($P = 0.000$). We observed significantly lesser consumption of morphine in Group RD as compared to Group R (13.86 ± 1.8 in Group RD and 23.5 ± 1.7 in Group R) ($P = 0.000$). None of the patients reported any adverse effects. **Conclusion:** Dexmedetomidine 0.5 µ/kg added as an adjuvant to 0.5% ropivacaine for ultrasound guided Pecs block prolongs the duration of analgesia and reduces postoperative morphine consumption.

KEYWORDS

Pectoral nerve block, dexmedetomidine, ropivacaine, ultrasound

INTRODUCTION

Majority of patients undergoing modified radical mastectomy for the management of carcinoma breast complain of severe postoperative pain, nausea and vomiting^[1,2]. Insufficient management of postoperative pain may cause various chronic pain syndrome like persistent paraesthesias, intercostobrachial neuralgia and phantom breast pain in about 25–40% of the patients^[3]. Adequate perioperative management of pain prevents sensitization of nociceptor and reduces incidence of chronic pain syndromes^[4]. Regional analgesia techniques alleviate acute postoperative pain and decreases the occurrence of associated complications^[5,6].

Various regional analgesic techniques like local wound infiltration, thoracic epidural analgesia, intercostal nerve block, and thoracic paravertebral block have been successfully employed to attenuate the adverse effects associated with general anaesthesia and opioids^[7,8]. US-guided pectoral nerve blocks (Pecs I and 2) bestow safe and effective analgesia in breast surgery^[9].

Dexmedetomidine is a potent alpha-2 adrenergic receptor agonist, which demonstrates about eight times more affinity toward alpha-2 adrenoceptors as compared to clonidine^[10]. Dexmedetomidine, when used as an adjuvant in perineural blocks confers better anaesthesia and analgesia^[11]. In our study, we evaluated the effect of dexmedetomidine as an adjuvant to ropivacaine in ultra-sound pec block in terms of total duration of analgesia and postoperative morphine consumption after modified radical mastectomy surgery.

MATERIALS AND METHODS

After obtaining hospital ethical committee approval, this prospective randomized double-blind study was conducted on 60 female American Society of Anesthesiologists (ASA) status I and II patients aged 25 and above, who were scheduled to undergo modified radical mastectomy (MRM) under general anaesthesia. Patients were randomized into two equal groups of 30 each using sealed envelope technique.

Group R (n = 30) received US-guided Pecs block with 30 ml of 0.5% ropivacaine. Group RD (n = 30) received US-guided Pecs block with 30 ml of 0.5% ropivacaine and dexmedetomidine 0.5 µ/kg body weight (bwt). In this 30 ml, Pecs I site received 10 ml and Pecs II site received 20 ml. Informed written consent was obtained from all the participants after explaining the pecs block and visual analogue scale (VAS).

Patients with injection site infection, anticoagulant therapy, abnormal coagulation profile, hypersensitivity to LA and morphine, obese patients with a body mass index (BMI) >35 kg/m² and pregnant patients were excluded from the study. Patients were kept nil orally for 6 h before the surgery. Upon shifting to OT, IV line was secured and routine monitors (ECG, pulse oximetry, noninvasive blood pressure) were connected. Glycopyrrolate and midazolam were intravenously administered as premedication. Patients in both the groups, were given GA and were induced with iv propofol 2 mg/kg and fentanyl 2 µg/kg. They were intubated with appropriately sized endotracheal tube after giving vecuronium 0.1 mg/kg. Oxygen, nitrous oxide, and isoflurane were used to maintain anaesthesia. Ultrasound guided pec block was performed using high frequency linear probe (GE voluson i) after surgery was done and meticulous aseptic precautions were followed throughout the procedure. After reversing the neuromuscular blockade with iv neostigmine 0.05 mg/kg, and atropine 0.02 mg/kg, patients were extubated. In our study, the primary outcome measured were total duration of analgesia and total morphine consumption. The intensity of postoperative pain was assessed using the VAS at post-anaesthetic care unit (PACU), at 1, 3, 6, 9, 12, 18, and 24 h. When VAS was more than 4, the patients were injected with morphine (4 mg IV). Blood pressure and HR were recorded hourly, for the first 6 h postoperatively as secondary outcome measures.

All the patients received IV paracetamol (15 mg/kg) every 8 h, as postoperative analgesia. Adverse effects like postoperative nausea and vomiting were recorded, if present were managed by iv ondansetron 0.1 mg/kg.

Based on the previous studies and literature review, we calculated the sample size and we recruited 60 patients, with error of 0.05 and statistical power of 80%. We utilized statistical package SPSS Version 20.0 (Armonk, NY: IBM Corp) for the analysis of data.

Demographic data, total duration of analgesia, total morphine consumption, VAS, and hemodynamic parameters were analyzed using independent t-test. Sex and ASA grades were analyzed using Chi-square test. P value <0.05 was considered as statistically significant.

RESULTS

Sixty female patients were recruited in this present study and they were

allocated into two equal groups of 30 each. There were no statistical differences between the two groups in terms of demographic data ($P > 0.05$). Duration of analgesia (in minutes) was significantly longer in Group RD as compared to Group R (465.2 ± 10.42 in Group RD and 311.3 ± 16.35 in Group R, $P = 0.00001$) [Table 1]. Total consumption of morphine (in milligrams) was significantly more in Group R as compared to Group RD (23.50 ± 1.74 in Group R and 13.86 ± 1.8 in Group RD, $P = 0.00001$).

Group RD recorded persistently lower VAS scores as compared to Group R. [Table 1]

Table 1: Visual Analog Score Observed At Different Time Intervals

Time interval in h	Group R	Group RD	P value
1 h	2.42±0.5	2.39±0.49	0.79
3 h	2.35±0.48	2.32±0.47	0.78
6 h	3.16±0.91	2.32±0.47	0.000
9 h	3.5±0.97	2.66±0.75	0.005
12 h	2.73±0.82	2.70±0.79	0.752
18 h	2.8±0.96	2.76±0.85	0.886
24 h	2.86±1	2.83±0.91	0.891

$P < 0.05$ (significant), $P > 0.05$ (not significant).

Pertaining to MAP and HR, there were no statistically significant differences between both groups, which were recorded up on arrival in the PACU and every hour thereafter for the first 6 h with P-value more than 0.05 (Figures 1 and 2).

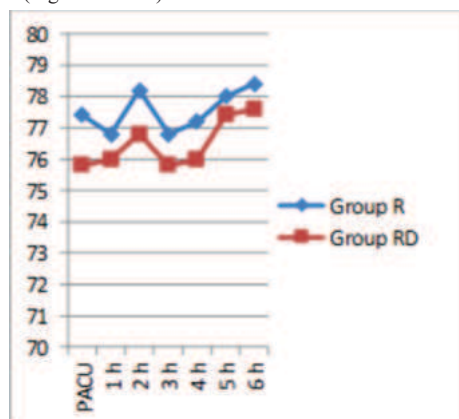


Figure 1. Mean Arterial Pressure Between The Two Groups.

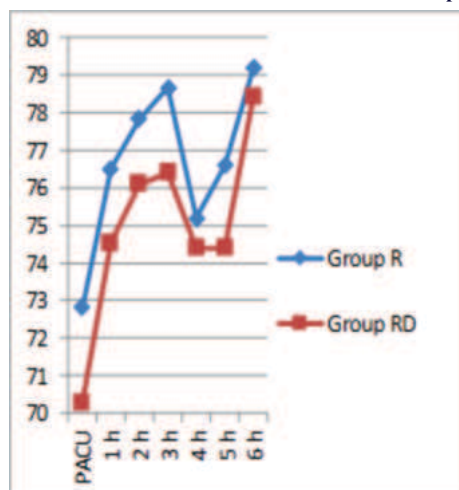


Figure 2. Heart Rate Between The Two Groups.

DISCUSSION

Modified radical mastectomy is associated with severe postoperative pain. Several techniques like thoracic epidural and PVBs have been employed to achieve analgesia^[2,12]. But both of these techniques pose risk of serious complications like pneumothorax, total spinal anesthesia, and intravascular injection. In 2011, Blanco et al. came up with a novel technique of blocks: Pecs I and Pecs II^[9], which revolutionized the postoperative analgesia in modified radical mastectomy.

In our study, we compared 0.5% ropivacaine with 0.5% ropivacaine and dexmedetomidine 0.5 µg/kg in Pecs block. Statistically highly significant increase in total duration of analgesia (in minutes) in Group RD (465.2 ± 10.42) as compared to Group R (311.3 ± 16.35) ($P = 0.00001$) was observed. Total postoperative morphine consumption in mg was also statistically significantly lower in Group RD as compared to Group R (14.8 ± 2.4 in Group RD and 21.6 ± 3.1 in Group R) ($P = 0.000$). Group RD recorded persistently lower VAS scores as compared to Group R. Our results are matching with Haramritpal et al.^[13] who did a randomized controlled study comparing the effect of ropivacaine alone and ropivacaine with dexmedetomidine on the total duration of analgesia and postoperative morphine consumption. They concluded that, dexmedetomidine 1 µg/kg added to 0.25% ropivacaine for Pecs block increases the duration of analgesia and decreases postoperative morphine consumption. Our study results are matching with Bakr et al. who did a randomized study on the effect of adding dexmedetomidine to bupivacaine in US modified pec block, which resulted in superior analgesia and better stress response control without serious adverse effects^[14]. In addition, this current study agrees with the study done by Elsayed mohamed Abdelzaam et al.^[15] who studied the effect of adding dexmedetomidine 0.5 µg/kg to bupivacaine in US guided serratus plane block, which resulted in prolonged duration of analgesia and lesser opioid consumption. Limitations of our study study are that we failed to assess the effect of Pecs block on chronic postoperative pain and metastasis or recurrence of breast carcinoma.

CONCLUSION

The addition of dexmedetomidine as an adjuvant to ropivacaine in ultrasound-guided pectoral nerve block after modified radical mastectomy increases the duration of analgesia and reduces total morphine consumption postoperatively.

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