ORIGINAL RESEARCH

Comparative evaluation of dexamethasone and dexmedetomidine as adjuvants for bupivacaine in ultrasound guided PEC blocks in patients undergoing modified radical mastectomy under general anaesthesia: A prospective randomized control trial

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ABSTRACT

Background: The most common surgical procedure for breast cancer is modified radical mastectomy (MRM), associated with severe acute postoperative pain. With the advent of ultrasonography regional anaesthesia techniques have developed considerably. Present study was aimed to compare dexamethasone and dexmedetomidine as adjuvants for Bupivacaine in ultrasound guided PEC blocks in patients undergoing Modified Radical Mastectomy under General anaesthesia at a tertiary hospital. Material and Methods: Present study was single-center, prospective, clinical study, conducted in patients aged between 18 – 65 years, belonging to ASA Grade l and ll, underwent Modified Radical Mastectomy under General anaesthesia, followed by ultrasound guided PEC blocks. 60 patients were randomly distributed in two groups (30 patients each) by random chit method as group A (Bupivacaine with Dexamethasone) & group B (Bupivacaine with Dexmedetomidine). Results: In present study, 60 patients were divided in group A (n=30) & group B (n=30). General characteristics such as age (years), ASA (I/II), weight (kg), height (cm), BMI (kg/m2), mean duration of surgery (min), baseline heart rate & baseline MAP were comparable among both groups & difference was not statistically significant. In present study, group B (dexmedetomidine) had prolonged duration of analgesia, late requirement of rescue analgesia as compared to group A (dexamethasone), and difference was statistically significant. The VAS pain score was lower in patients of group A as compared to patients in group B up to at 6th postoperative hour and this difference in pain score was statistically significant. Increased incidence of postoperative nausea and vomiting was noted in group B as compared to group A, difference was not statistically significant (p-0.407). Conclusion: Dexmedetomidine has advantages over dexamethasone regarding longer duration of the block and lesser rescue analgesic requirement

Keywords – PECS block, modified radical mastectomy, postoperative analgesia, dexamethasone, dexmedetomidine

INTRODUCTION

The most common surgical procedure for breast cancer is modified radical mastectomy (MRM), which removes a generous amount of skin and entire breast with axillary evacuation.[1] Nearly 60% of breast surgery patients experience severe acute postoperative pain. Most of the pain originates from the axillary component of the surgery.[2]

Peripheral nerve blocks (PNB) technology combined with general anesthesia (GA) can reduce persistent

incision and visceral pain, reduce opioid usage, shorten hospital stay, and reduce the recurrence rate of some cancers compared to GA, consistent with the concept of enhanced recovery after surgery (ERAS) advocated by modern medicine.[3,4]

Different agents have been combined with local anesthetics (LA) over the years to prolong the duration of action, with varying degrees of success. Analgesic adjuvants include opioids, epinephrine, sodium bicarbonate, magnesium sulfate, dexamethasone, ketorolac, ketamine, neostigmine, midazolam, cortisol, and α2-adrenergic receptor (α2-AR) agonists.[5,6,7]

With the advent of ultrasonography regional anaesthesia techniques have developed considerably. They help to improve postoperative analgesia with decreased hospital stay and improved patient satisfaction. Present study was aimed to compare dexamethasone and dexmedetomidine as adjuvants for Bupivacaine in ultrasound guided PEC blocks in patients undergoing Modified Radical Mastectomy under General anaesthesia at a tertiary hospital.

MATERIAL AND METHODS

Present study was single-center, prospective, clinical study, conducted in department of anaesthesiology, at VTSM PCC medical college & hospital, Kalburgi (585105), India. Study duration was of 6 months (April 2020 to October 2020). Study approval was obtained from institutional ethical committee.

INCLUSION CRITERIA

1. Patients aged between 18 – 65 years, belonging to ASA Grade l and ll, underwent Modified Radical Mastectomy under General anaesthesia, followed by ultrasound guided PEC blocks, willing to participate in present study

EXCLUSION CRITERIA

- Patients refusal
- Patients belonging to ASA physical status 3 or more
- Any contraindication to study drugs Bupivacaine, Dexamethasone and Dexmedetomidine administration.
- Patients with psychiatric and neurovascular disorders.

Study was explained to patients in local language & written consent was taken for participation & study. All the patients were selected from the pre anesthetic clinic of VTSM PCC Kalburgi branch of Kidwai Memorial Institute of Oncology, BangalorePatients details such as name, age, sex, weight and history will be obtained during pre-anesthetic evaluation. All required parameters are obtained intraooperative and postoperative period. The general physical examination, airway examination and systemic examination were conducted and noted on predesigned study proforma.

All patients received premedication as tablet Pantoprazole 40 mg HS & Tab Alprazolam 0.5 mg HS. Just before induction of general anaesthesia, all patients received Inj midazolam 0.02mg/kg ,Inj Fentanyl 1 mcg/kg followed by Pre-oxygenation for 3 min. Induction was done with Inj propofol 1-2 mg /kg &InjSuxamethonium 1.5mg/kg. Anaesthesia was maintained with Vecuronium 0.02 mg/kg (every 30-40 min); Isoflurane (0.8 – 1.0 MAC) & Nitrous Oxide 60 % with Oxygen. Reversal was done with Inj Neostigmine 0.05mg/kg &Inj Glycopyrrolate 0.01mg/kg iv. In operation theatre all patients were monitored using multipara monitors for ECG, Spo2, Systolic Blood Pressure, Diastolic Blood Pressure & Mean Arterial Pressure preoperatively, throughout surgery & postoperatively.

All the patients enrolled for the study were explained about the procedure and were taught about the assessment of pain by using the VAS (Visual analogue scale) pain score, and proper written and informed consent was taken. The procedure was performed by an experienced anaesthetist trained in ultrasound guided regional block, not involved in any analysis or data collection.

60 patients were randomly distributed in two groups (30 patients each) by random chit method.

- Group A: Bupivacaine 0.25% 10cc in PEC I block and 20cc in PEC II block with Dexamethasone 0.1 mg/kg
- Group B: Bupivacaine 0.25% 10cc in PEC I block and 20cc in PEC II block with Dexmedetomidine 1 mcg/kg

Pecs block was performed immediately after induction of anesthesia and about 15 minutes before skin incision, with 100 mm 21 G needle (SonoPlex Stim cannula, Pajunk®, Geisingen, Germany), using linear array US probe of high frequency (5–12 MHz) (Sonosite, Inc., Bothwell, WA) with an imaging depth of 4–6 cm.

All the patients were transferred to post-operative care unit (PACU) for further monitoring and followed up for 24 hours. In the postoperative period VAS pain score was noted at 0, 2, 6, 12 and 24 hours. All the patients received infusion Paracetamol 1 gm 8 hourly as per standard protocol. IV tramadol 50 mg was given as rescue analgesia when VAS>4 and the time for first rescue analgesic was noted and the total analgesic consumption was recorded at the end of post-operative 24 hours. Side effects, if any, in the postoperative 24 hrs were noted.

Data was collected and compiled using Microsoft Excel, analysed using SPSS 23.0 version. Frequency, percentage, means and standard deviations (SD) was calculated for the continuous variables, while ratios and proportions were calculated for the categorical variables. Difference of proportions between qualitative variables were tested using chi- square test or Fisher exact test as applicable. P value less than 0.5 was considered as statistically significant.

RESULTS

In present study, 60 patients were divided in group A (n=30) & group B (n=30). General characteristics such as age (years), ASA (I/II), weight (kg), height (cm), BMI (kg/m^2), mean duration of surgery (min), baseline heart rate & baseline MAP were comparable among both groups & difference was not statistically significant.

Table 1: General characteristics

Characteristics	Group - A (n=30)	Group - B (n=30)	p value
Age (year)	47.5± 8.6	48.1±9.3	0.62
ASA (I/II)	22/8	23/7	0.65
Weight (kg)	55.8 ± 6.5	57.0 ± 7.5	0.84
Height (cm)	157.9 ± 5.0	157.2 ± 5.4	0.74
BMI (kg/m^2)	22.9±2.8	22.9±3.3	0.82
Mean duration of surgery (min)	114.2±21.5	113.5±17.7	0.53
Baseline HR	85.9 ± 6.8	87.4 ± 7.1	0.84
Baseline MAP (mmHg)	88.2 ± 8.2	87.6 ± 7.4	0.74

In present study, group B (dexmedetomidine) had prolonged duration of analgesia, late requirement of rescue analgesia as compared to group A (dexamethasone), and difference was statistically significant. Also, rescue analgesia was required earlier (in terms of 2 hours period) in group A (dexamethasone) as compared to group B (dexmedetomidine) and difference was statistically significant.

Table 2: Post-operative analgesia

Characteristics of block	Group - A (n=30)	Group - B (n=30)	p value
Duration of analgesia (hrs.)	6.96 ± 2.68	11.16 ± 3.13	< 0.001
Total tramadol consumption (mg)	97.93 ± 39.31	72.50 ± 22.61	0.04
Time for first rescue analgesic (minutes)	471.3 ± 189.5	834.2 ± 307.5	0.032
Rescue Analgesia required			< 0.001
After 6 hrs.	10	5	
After 8 hrs.	14	11	
After 10 hrs.	6	10	
After 12 hrs.	0	4	

The VAS pain score was lower in patients of group A as compared to patients in group B up to at 6th postoperative hour and this difference in pain score was statistically significant. Beyond the 6th post-operative hour, however, the pain scores were comparable between 2 groups and median VAS was 2 for both groups.

Table 3: Comparison of VAS between group P and group E.

VAS (Hours)	Group - A (n=30) Mean ± SD	Group - B (n=30) Mean ± SD	P value
0	1.30 ± 0.95	2.70 ± 1.82	0.002
2	1.50 ± 1.11	2.70 ± 1.97	0.020
6	1.77 ± 1.07	3.03 ± 2.09	0.029
12	2.10 ± 1.21	2.30 ± 1.92	0.970
24	1.77 ± 1.10	1.97 ± 1.59	0.771

Increased incidence of postoperative nausea and vomiting was noted in group B as compared to group A, difference was not statistically significant (p-0.407). During the study there were no complications such as vessel puncture, nerve injury, hematoma, hemothorax were noted.

Table 4: Frequency of postoperative nausea and vomiting

PONV	Group - A (n=30)	Group - B (n=30)	p-value
No	23 (76.7%)	16 (53.3%)	0.407
Mild	5 (16.7%)	9 (30%)	
Moderate	2 (6.7%)	5 (16.7%)	

DISCUSSION

Modified radical mastectomy is associated with moderate-to-severe acute postoperative pain; failure to provide adequate acute pain control is associated with increased opioid requirements, poor quality of recovery, and chronic postsurgical pain.[8,9] Post-mastectomy pain managed by opioids alone often leads to side effects such as nausea and vomiting. Inadequate control of pain may later develop into chronic pain syndrome (paraesthesias, phantom breast pain and intercostobrachial neuralgia) in 25%–40% of the patients. [8,9]

Pectoral (PEC) I block anesthetizes the lateral and medial pectoral nerves. In contrast, PEC II

anesthetizes the medial and lateral pectoral nerves, the anterolateral branch of the intercostal nerve from T2-T8/9, and the nerve to the serratus anterior, also known as the long thoracic nerve.[10,11]

Uncontrolled acute postoperative pain is one of the risk factors for chronic pain.[12]The ultrasound-guided pectoral type-2 (Pecs II) block is a fascial plane block that was first described in 2012 for superficial surgery of the anterolateral chest wall and has rapidly gained popularity in breast surgery due to its relative simplicity, safety and perceived efficacy.[13,14]

Dexmedetomidine is a selective α2 agonist with 8 times more affinity for α2 adrenergic receptors compared to clonidine and possesses all the properties of α2 agonist without respiratory depression. The intravenous, intramuscular, intrathecal, epidural, and perineural use of this agent enhances analgesic effects.[15,16]

Dexamethasone is a highly selective long-acting glucocorticoid with a higher potency and prolonged analgesia up to 48 hours. The action of dexamethasone is due to its vasoconstriction effects, which decrease the local anesthetic absorption. In addition, it inhibits the potassium channels on its nociceptive C-fiber and blocks the release of various inflammatory mediators.[17]

Several randomized control trials (RCTs) have studied the use of perineural dexamethasone as an adjuvant to peripheral nerve block to improve analgesia provided by local anaesthetic alone. Perineural dexamethasone, as an adjuvant to peripheral nerve block, has been associated with faster onset of anaesthesia, longer duration of anaesthesia/analgesia, decreased postoperative pain intensity and decreased postoperative analgesia requirements compared with local anaesthetic alone.

In study by Ahmed H *et al.*,[19] postoperative analgesia duration was significantly longer in the Dex group compared with the ESPB group (P = 0.029) but not in the dexamethasone group. Intraoperative fentanyl and postoperative morphine consumption were significantly lower in the Dex group than in the ESPB group. VAS scores were significantly lower in the Dex group than in the ESPB group at rest and movement. VAS scores of the Dexamethasone group were similar to that of the ESPB group at rest and movement. As an adjuvant to levobupivacaine, dexmedetomidine reduces pain at rest and with movement, reduces intraoperative fentanyl and postoperative morphine consumption, and prolongs the analgesia duration. It is superior to dexamethasone in pain reduction and duration of analgesia.

Sahu L *et al.*,[20] noted that addition of dexmedetomidine (50mcg) and dexamethasone (8mg) to 0.5% bupivacaine ensured a faster onset and prolonged duration of the sensory and motor blocks. Additionally, dexmedetomidine resulted in more prolonged postoperative analgesia, a lower mean visual analog scale score in the first 24 hours, and lesser opioid consumption in 24 hours than dexamethasone.

Hypotension, bradycardia as well as sedation is some of the commonly known side effects with dexmedetomidine, although it is mostly reported with higher doses when used in the regional anaesthesia.[21] In our study no such side effects were reported in any patients in both the groups.

CONCLUSION

PECS block is an effective technique in reducing post-operative pain in patients undergoing modified radical mastectomy. Dexmedetomidine has advantages over dexamethasone regarding longer duration of the block and lesser rescue analgesic requirement. Further studies should be carried out to study dexamethasone and dexmedetomidine as adjuvants for Bupivacaine in ultrasound guided PEC blocks in patients undergoing Modified Radical Mastectomy under General anaesthesia.

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