European Journal of Molecular & Clinical Medicine (EJMCM)
ISSN: 2515-8260 Volume 10, Issue 01, 2023

EVALUATION OF EFFICACY OF COMBINED ULTRASOUND GUIDED PECTORAL NERVE BLOCK TYPE 2 WITH ROPIVACAINE AND GENERAL ANAESTHESIA OVER PLAIN GENERAL ANAESTHESIA IN CANCER RELATED BREAST SURGERIES

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ABSTRACT

INTRODUCTION

Breast cancer is the most common cancer among the woman and is on rise. Surgery is one of main stays of treatment of breast cancer. Pectoral nerve block type 2 is an extension of type 1 that requires additional injection of local anaesthetic between pectoralis minor and serratus anterior muscle.

MATERIALS AND METHODS

This Prospective Randomized Controlled study wad conducted between January and June 2020. 60 Patients undergoing Mastectomy under General Anaesthesia with an ASA of I or II were taken. In Group P, 0.4ml/kg of the drug is deposited above the serratus anterior muscle.

OBSERVATIONS AND RESULTS

The difference in baseline mean systolic and diastolic blood pressures of two groups was statistically not significant. Time of first rescue analgesia is significantly higher in group P (5.89±2.25 hours) than group C (2.08±0.7 hours). Pains scores are significantly higher in group C compared to group P at all times after surgery from 2 to 18 hours postoperatively. The patients who received block used significantly less morphine than the control population. None of the patients in group P experienced block related complications.

DISCUSSION

The perioperative anaesthetic care for those undergoing mastectomy surgery is general anaesthesia with a multimodal approach for analgesics such as opioids, paracetamol and NSAIDs. In our study postoperative Pains scores are significantly higher in group C compared to group P at all times after surgery, similar to other studies.

CONCLUSION

Our study will certainly support the fast-evolving thinking in the field of perioperative medicine, regional anaesthesia and pain management. The results of our study is supportive, in proving, the two-level PECS block is safe, effective, reliable, easy to perform, decreases morphine consumption, improves postoperative pain, provides patient satisfaction, in breast cancer related surgery, thereby, achieving the primary outcome.

KEYWORDS Pectoral Nerve Block; Mastectomy; Ropivacaine; Breast Cancer

INTRODUCTION

Breast cancer is the most common cancer among the woman and is on rise[1]. India along with U.S.A and China account for one-third of the global breast cancer burden. Surgery is one of main stays of treatment of breast cancer.

The process of cutting tissue, traction and tissue injury leads to the stimulation of free nerve endings and specific nociceptors leading to intra operative and postoperative pain. Thus, adequate control of pain in perioperative period is essential for good outcome as well as it is one of the factors which reduce the hospital stay.

The standard anaesthesia care for patient undergoing breast surgery is general anaesthesia with multimodal analgesia. Despite the improved efficiency in surgical treatment of breast cancer, peri-mastectomy pain syndrome remains a persistent challenging concern.

Advances in anaesthesia in the previous two decades have given rise to regional anaesthesia techniques such as thoracic epidural and paravertebral block for these patients.[2]

Pectoral nerve block type 1 is accomplished by injecting local anaesthetic in between pectoralis major and pectoralis minor muscles, pectoral nerve block type 2 is an extension of type 1 that requires additional injection of local anaesthetic between pectoralis minor and serratus anterior muscle.

Ropivacaine is a long-acting amide local anaesthetic agent and first produced as a pure S-enantiomer. It is one of a group of local anaesthetic drugs, the pipecoloxylidides which are chiral drugs. Ropivacaine is less lipophilic than bupivacaine. The reduced lipophilicity is associated with decreased potential for central nervous system toxicity and cardiotoxicity.

This study was initiated to provide further evidence to the efficacy and safety of this recently introduced technique towards pain management in breast surgeries. Our aim was to study the potential advantages of pectoralis nerve block for providing analgesia in intra and postoperative mastectomy surgery period by assessing reduction in pain, improved analgesia in the axilla and upper limb and for reduced

morphine consumption, besides being less invasive, easier and safer to perform as it is done under ultrasound guidance.

MATERIALS AND METHODS

STUDY DURATION: January 2020 – June 2020.

STUDY DESIGN: Prospective Randomized Controlled study.

ETHICAL CONSIDERATION: Hospital ethics committee clearance was obtained for this study. Informed written consent was taken from all the patients after explaining the procedure, risks and benefits. Patients who denied participation in study were treated by routine protocol of anaesthesia.

INCLUSION CRITERIA:

1. Patients aged between 18yrs and 65yrs.

2. Physical status ASA grade I and ASA grade II.

3. Scheduled for cancer related breast surgeries with axillary clearance under GA.

EXCLUSION CRITERIA:

1. ASA III and IV.

3. Patients on long term analgesic therapy/ Chronic opioid use.

4. Patients with BMI > 35 (At the time of enrolment).

SAMPLING METHOD: Simple random sampling method was used to allocate patients randomly into 2 equal groups of 30 each by using computer generated random number table.

GROUP P: Patient receiving pectoral nerve block type 2

GROUP C: Control Group

Patient was preoxygenated with 100% Oxygen for 5 mins. General anaesthesia is induced with Inj. Fentanyl 2 µg/kg, Propofol 2.0-2.5 mg/kg IV followed by Atracurium 0.5 mg/kg to facilitate orotracheal intubation. The trachea is intubated with a cuffed oral endotracheal tube of appropriate size, lubricated with lidocaine jelly 2%. Anaesthesia will be maintained with 60% air + 40% oxygen with inhalational agents, Sevoflurane or Desflurane to maintain the depth of anaesthesia. Intermittent boluses of Atracurium will be used to achieve muscle relaxation. Minute ventilation is adjusted to maintain normocapnia (end tidal carbon dioxide [EtCO2] between 35 and 45 mm Hg) and EtCO2 is monitored. Ventilatory parameters were set to maintain normocarbia. Depth anaesthesia was maintained at a MAC of 1.

GROUP P - TECHNIQUE OF BLOCK

The patient is positioned supine, and the ultrasound machine is placed such that maximum ergonomic comfort is obtained for the person performing the block. It is advised to do a scout scan of the chest wall and breast to identify the structures. The probe was positioned under the outer third of the clavicle. The axillary artery and the axillary vein are identified, the probe is moved medially to locate the Pectoralis major (PM) and Pectoralis minor (Pm). The thoracoacromial artery pulsation is identified. The second, third and fourth rib are also identified along the pleura which is identified as a hyper-echoic thin line

that slides with respiration. Using the in-plane technique, keeping the tip of the needle in view, the needle is advanced to the tissue plane between the Pectoralis minor and the Serratus anterior (PECS 11). Two to three ml of the saline is first deposited, noting the spread in the correct interfacial plane which is confirmed with easy separation of the two muscle layers and the pleura moving downwards. Then 0.4ml/kg of the drug is deposited above the serratus anterior muscle.

IMAGE 1 – POSITIONING OF THE PROBE FOR BLOCK

Keeping the needle and the probe in the same position the needle is then slowly brought out, with continuous visualization of the tip and shaft into the tissue plane between the Pectoralis major and minor. Two to three ml of saline is infiltrated to confirm the position and separation of the two muscle layers. Then 0.2ml/kg of the drug is deposited between the two muscle layers.[3]

Any increases in heart rate and blood pressure to more than 20% of the baseline was treated as a pain response after the patient was under adequate plane of anaesthesia. All patients remained hemodynamically stable. Intraoperative vitals were monitored on an interval of 5, 10,15, 30, 45, 60, 90, 120, 160 and 180 minutes. After completion of surgery, neuromuscular blockade was reversed with neostigmine 0.05mg/kg and glycopyrrolate 0.01mg/kg and patients were extubated once the criteria for extubation were met. Total morphine and fentanyl consumption was also recorded. Pain score was documented against Numeric Rating Scale every 2 hours for the initial 24 hours and every 6 hours for the next 24 hours till discharge.

OBSERVATIONS AND RESULTS

Data entered into Microsoft Excel, and analysis was done using IBM SPSS statistics 21.0. Results on continuous measurements presented on Mean ± SD and association between two groups were tested using Student t-test (two-tailed, independent). The effects on categorical measures (such as age group, ASA grades etc.) shown in percentages and associations were tested using the chi-square test.

Significance assessed at a probability of a 5% level. If the probability value is less than 5% ($p<0.05$), there is evidence to reject the null hypothesis, the two means are significantly different at the significance level reported by the p-value, and if the probability value is more than 5% ($p>0.05$), null hypothesis will be accepted to say two means are not different.

The baseline mean heart rate was 78.32 ± 14.74 bpm in group P and 81.93± 18.13 bpm in group C. The mean heart rate was maintained throughout the surgery in both the groups. None of the patients developed bradycardia (HR<50 bpm). The mean heart rate at 180 mins was 77.11 ± 12.97 in group P and 81.81 ± 17.96 in group C. The difference between the mean heart rate of two groups was statistically not significant at all the respective intervals. ($p>0.05$).

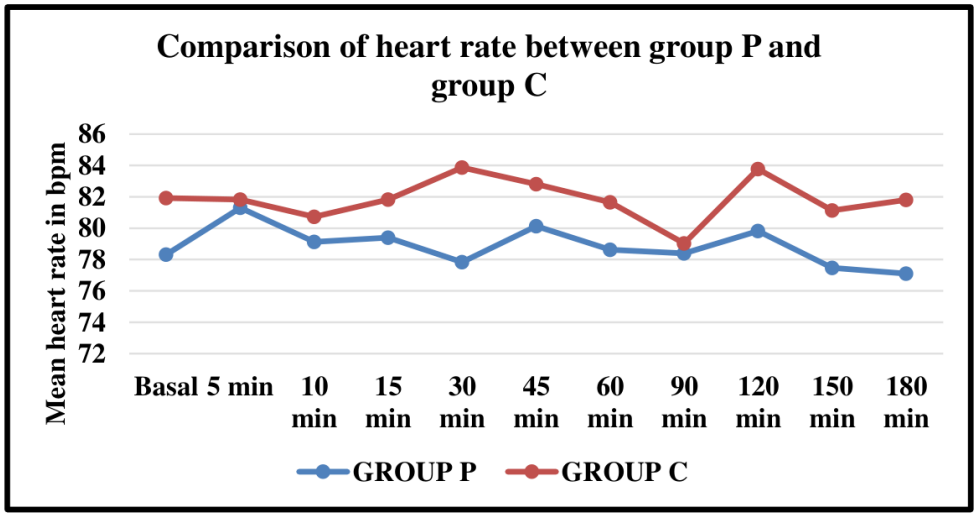

IMAGE 2 – COMPARISON OF HEART RATE BETWEEN GROUPS

The difference in baseline mean systolic blood pressures of two groups was statistically not significant (121.00 ± 12.54 mm Hg and 123.23 ± 13.05 mm Hg in group P and group C respectively; $p>0.05$). The mean SBP of both groups was well maintained throughout the surgery. None of the patients developed hypotension (SBP<90 mm Hg). There was no statistically significant difference in mean systolic blood pressure of the two groups at all respective intervals. ($p > 0.05$).

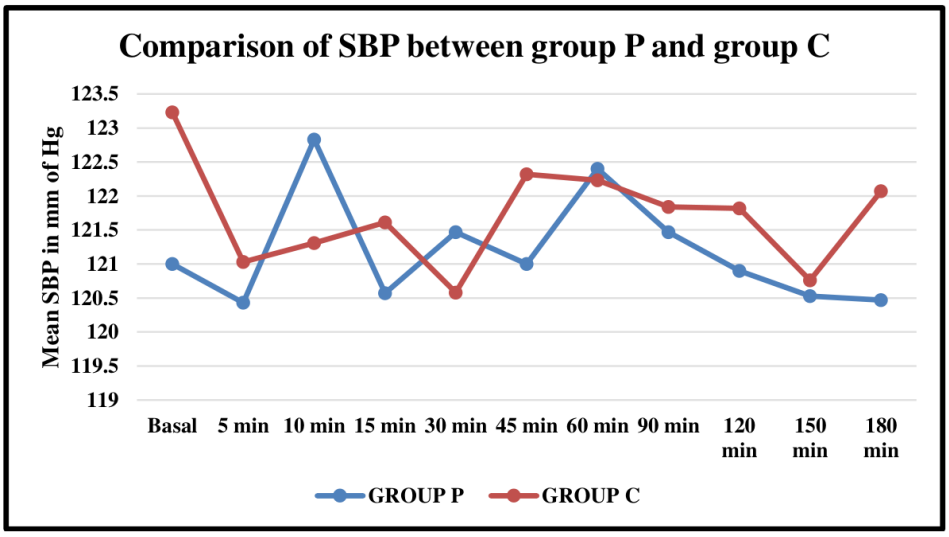

IMAGE 3 – COMPARISON OF SYSTOLIC BLOOD PRESSURE BETWEEN GROUPS

The difference in baseline mean diastolic blood pressures of two groups was statistically not significant (66.72 ± 9.69 mm Hg and 63.28 ± 8.50 mm Hg in group P and group C respectively; p>0.05).The difference at 180 minutes in mean diastolic blood pressures of two groups was statistically not significant (67.62 ± 10.33 mm Hg and 64.56 ± 8.63 mm Hg in group P and group C respectively; p>0.05). There was no statistically significant difference in mean diastolic blood pressure of the two groups at all respective intervals (p>0.05).

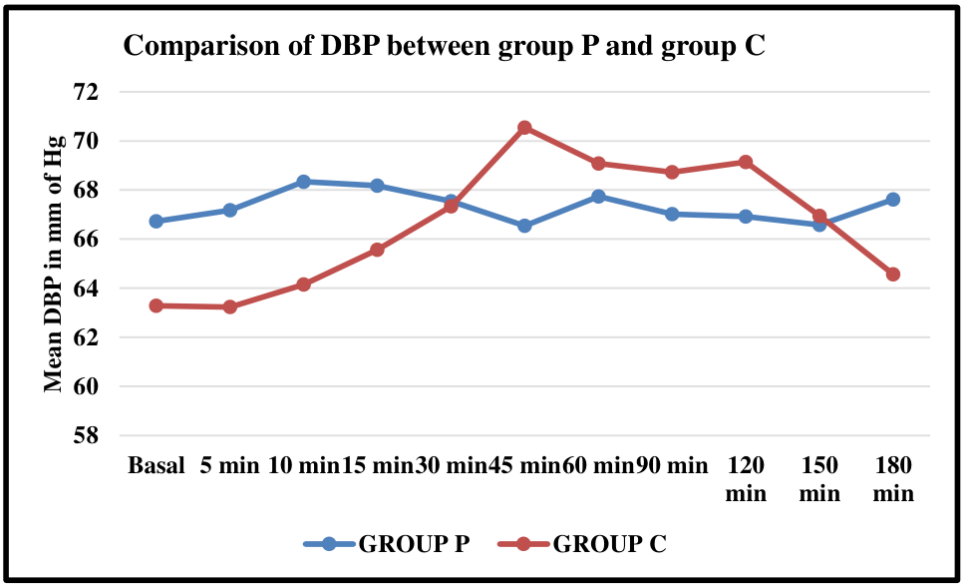

IMAGE 4 – COMPARISON OF DIASTOLIC BLOOD PRESSURE BETWEEN GROUPS

Time of first rescue analgesia is significantly higher in group P (5.89±2.25 hours) than group C (2.08±0.7 hours). Pains scores are significantly higher in group C compared to group P at all times after

surgery from 2hours to 18 hours postoperatively. ($p < 0.05$). During surgery and postoperative period the patients who received block used significantly less morphine than the control population ($p < 0.05$). Morphine consumption in group P is 2.91 ± 1.11 milligram and in group C is 5.83 ± 1.59 milligram. The difference in mean morphine consumption is significant between group P and group C ($p<0.05$).

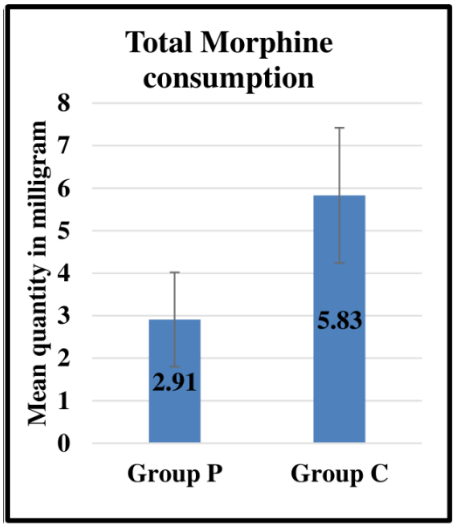

IMAGE 5 – TOTAL MORPHINE CONSUMPTION BETWEEN GROUPS

Mean arm abduction score was significantly higher in group C compared to group P at any given point of time from 2 hours to 16 hours post-operatively. ($p<0.05$; S)

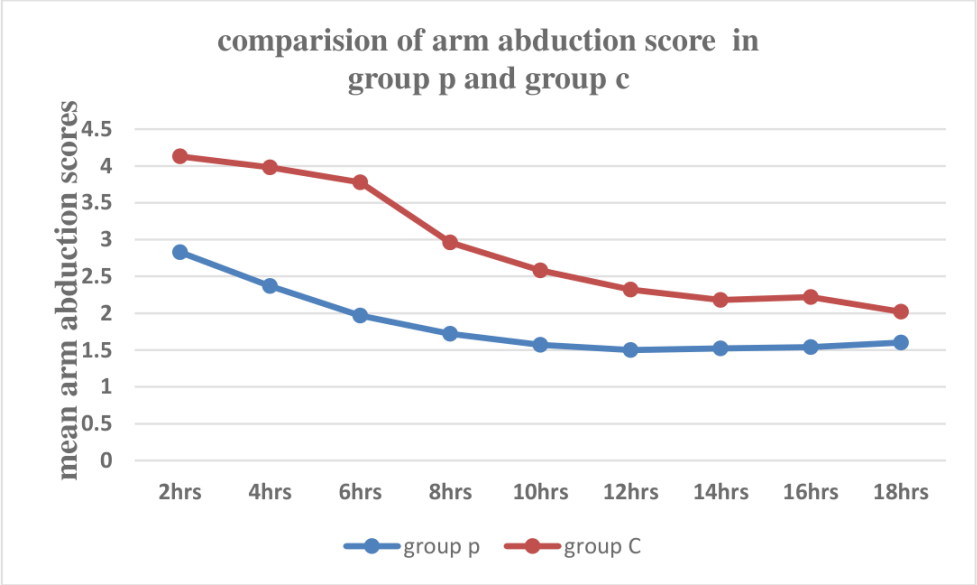

IMAGE 6 – COMPARISON OF ARM ABDUCTION SCORES BETWEEN GROUPS

None of the patients in group P has experienced block related complications. In group C out of 30 patients 3 (10%) of the patients experienced nausea and vomiting and only one patient (3.33%) had pruritus. None of the patients in both the groups had hematoma, pneumothorax and artery puncture. The difference in occurrence of nausea and vomiting and pruritus between the groups was not significant statistically. ($p>0.05$; NS)

DISCUSSION

Interfascial plane blocks have emerged over the last decade, with promising evidence for safer, effective and satisfying outcomes. Use of ultrasound in regional anaesthesia and cadaveric studies, several new blocks have emerged, one of which is PECS block. With emphasis on enhanced recovery protocols, the shift in the perioperative care is to provide opioid-free analgesia, minimally invasive surgical techniques, earlier mobility, and lower levels of intravenous fluid administration. Furthermore, advocation of regional anaesthesia, along with multimodal analgesia to reduce the potential chronic pain state and possible cancer recurrence.

The use of the well-established paravertebral block for perioperative pain management after thoracic and breast surgery, are sparsely used due to several genuine reasons, such as, operator skill, time consuming, potential occurrence of pneumothorax, sparing areas of innervation by brachial plexus.

In spite of improved efficiency in surgical treatment of breast cancer[4], peri-mastectomy pain remains a persistent challenge. The perioperative anaesthetic care for those undergoing mastectomy surgery is general anaesthesia with a multimodal approach for analgesics such as opioids, paracetamol and NSAIDs[5].

In recent years, there is growing evidence that larger doses of opioids suppress body's natural killers

cells (NK) leading increase in cancer recurrence 17 and thoracic paravertebral block (TPVB), the then accepted 'gold standard' adjuvant regional anaesthesia has inadequate analgesia with high rate of serious complications.[6,7,8]

During the procedure our patients were allowed to receive extra doses of morphine or fentanyl based on changes in heart rate and blood pressure once adequate depth of anaesthesia was achieved with a MAC of 1.0.and post operatively if NRS >3/10.

The study shows that the mean morphine dose given to test group was significantly lesser than control group ($P= 0.0001$). Similar results were obtained by Wang et al[9] of PECS block versus GA which reported overall statistically significant decrease in intra-op fentanyl consumption in PECS group ($P<.0001$).

Doo-Hwan Kim et al[10] did A Prospective Randomized Controlled Study to study Efficacy of Pectoral Nerve Block Type II for Breast-Conserving Surgery and Sentinel Lymph Node Biopsy He concluded that Opioid requirement was lower in the PECS II than in the control group (43.8 ± 28.5 μg versus 77.0 ± 41.9 μg, P<0.001).

Time of first rescue analgesia is significantly higher in group P (5.89±2.25 hours) than group C (2.08±0.7 hours) (p>0.0001). Mary Thomas et al[11] Intraoperative pectoral nerve block (Pec) for breast cancer surgery: A randomized controlled trial stated that the mean time to first request for analgesia and mean dose of paracetamol required was 353.93 ± 135.03 min and 2.71 ± 0.462.71 g in Group A and 27.17 ± 18.08 min and 3.53 ± 1.074 g in Group B [P = 0.002]. Significantly more patients in Group A had mild pain scores compared to Group B.

In our study postoperative Pains scores are significantly higher in group C compared to group P at all times after surgery from 2hours to 18 hours postoperatively. (p < 0.05). Doo-Hwan Kim et al[10] did A Prospective Randomized Controlled Study, Efficacy of Pectoral Nerve Block Type II for Breast-Conserving Surgery and Sentinel Lymph Node Biopsy, in which mean NRS value of the breast was significantly lower in the PECS II than in the control group at 0 (3.0 ± 1.5 versus 4.9 ± 1.6,) and 0.5 (3.6 ± 1.5 versus 5.1 ± 1.8,) hours after the procedure, Median NRS value of the breast was not statistically lower in the PECS II than in the control group starting 1 hour after surgery. Median NRS value of the axilla, however, was significantly lower in the PECS II than in the control group throughout the first 24 hours after surgery.

CONCLUSION

Our study will certainly support the fast-evolving thinking in the field of perioperative medicine, regional anaesthesia and pain management. The results of our study is supportive, in proving, the two-level PECS block is safe, effective, reliable, easy to perform, decreases morphine consumption, improves postoperative pain, provides patient satisfaction, in breast cancer related surgery, thereby, achieving the primary outcome. It should be considered as an adjuvant therapy multimodal analgesic technique to General anaesthesia. As with the secondary outcome, there were no reported cases with symptoms of chronic pain or cancer recurrence, during the stipulated time frame, therefore, no conclusive inference can be made but certainly can contribute to the evidence towards the same.

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