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RESEARCH ARTICLE

DEXMEDETOMIDINE IN PARAVERTEBRAL BLOCK FOR BREAST CANCER SURGERIES- A WAY TOWARDS OPIOID FREE ANAESTHESIA

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Abstract

Introduction: Breast cancer is one of the leading causes of cancer morbidity and mortality in women across the world. One concerning problem that affects breast cancer patients after surgery is pain. Regional anesthesia may reduce cancer propagation by attenuation of the surgical stress response, reduced opioid usage and by the direct protective action of local anaesthetics on cancer cells migration. Therefore regional anesthesia should be considered for all breast cancer surgeries.

Aim: The present study was conducted to compare the efficacy of Dexmedetomidine and Fentanyl as an adjunct to 0.5% Ropivacaine in thoracic paravertebral block, along with general anesthesia, in modified radical mastectomy surgeries.

Methods: A total of forty patients were included in the study. All patients received the paravertebral block at 3 levels from T2-T4 with 15 ml of drug solution. Perioperative vitals and any complications were recorded. Postoperative pain was assessed using Numeric Rating Scale (NRS).

Results: Statistics did not reveal any significant difference in the degree of intraoperative analgesia, postoperative pain, nausea and vomiting among the two study groups.

Conclusion: Among the two drugs, dexmedetomidine offers better hemodynamic stability and hence can be used in place of fentanyl for opioid free anaesthesia management.

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Introduction:-

The treatment of breast cancer ranges from lumpectomy to mastectomy, along with axillary lymph node clearance. Breast cancer surgeries are usually done under general anesthesia. Suboptimal management of perioperative pain can lead to post-mastectomy pain syndrome and phantom pain.^[1] Pain is a major stress, triggering neuroendocrine, immune and inflammatory responses. Regional anaesthesia produces better analgesia, attenuates the surgical stress response and may reduce cancer progression.^[2] So, regional anaesthesia has become an integral part of the balanced anaesthesia approach in breast cancer surgeries.

Regional anesthesia for breast surgeries ranges from epidural anesthesia, paravertebral block to fascial plane blocks such as Pectoral nerve blocks (PECS1, PECS2), Serratus plane block and Erector spinae plane block. In Thoracic paravertebral block (TPVB), local anesthetic is injected alongside the thoracic vertebra, close to where the spinal

nerves emerge from the intervertebral foramen. Thoracic paravertebral block for breast cancer surgery has been shown to reduce the risk of recurrence and metastasis.^[3]

The present study aims to compare the efficacy of Dexmedetomidine and Fentanyl as adjuvants to Ropivacaine in thoracic paravertebral block for breast surgeries done under general anesthesia with I-gel. Intraoperative analgesic efficacy, postoperative analgesia and complications were compared between the two groups.

Methods:-

This prospective study was conducted from May 2018 to June 2019 in the Department of Anesthesiology, after approval from the institutional ethical committee of our Institute. Eligible patients were all non-pregnant females with unilateral breast carcinoma between age group 25 to 65 years, belonging to ASA grade 1 or 2. A total of forty patients were proposed to be included in the study. Patients with comorbidities like uncontrolled diabetes and hypertension as well as recurrent carcinomas were excluded from the study. Participants were explained about the anaesthetic procedure and informed consent was taken.

Participants were randomly allocated to one of the two groups by a chit system (Group D or Group F). All patients included in the study were evaluated clinically by a detailed history and physical evaluation. Complete blood count, Chest X-ray, ECG and vitals were noted. All patients were premedicated with oral Alprazolam 0.25mg, oral Ranitidine 150mg and oral Metoclopramide 10mg on the night before surgery and on the morning of surgery. All the patients were kept fasting for solid foods for 6 hours and for clear liquids for 2 hours. Before arriving at the operating theatre, intravenous access was established using an 18-gauge peripheral venous cannula. Patients were preloaded with 500ml of Lactated Ringer solution over 10 to 15 minutes. Patients' baseline non-invasive blood pressure, pulse rate, O₂ saturation were noted and continuous ECG monitoring was instituted.

Patient was placed in sitting position with the neck and back flexed, her hands resting over opposite shoulders. The skin was cleaned and draped. Sonosite's M Turbo high-frequency linear ultrasound probe (6-13 Hz) was used to localize the paravertebral space. An oblique sagittal plane approach was used. Ribs were identified with the pleura lying deep to the ribs. Then the probe was maneuvered medially, looking for the transition of the ribs (roundish outline) to the transverse processes (rectangular outline). The paravertebral space was identified as the triangular space between costo-transverse ligament superiorly, pleura inferiorly and transverse process of vertebrae medially. The probe was slightly rotated anticlockwise while fixing the cranial end of the probe. The skin at the site of needle insertion was infiltrated with 2 ml of 2% Lignocaine with 1:200,000 Adrenaline. A 22-gauge Quincke spinal needle was inserted in plane with the ultrasound probe. The needle path was visualised and a pop was felt once the costotransverse ligament was breached. After negative aspiration, 5 ml of the local anaesthetic was delivered slowly by repeated aspiration and injection in real time ultrasound guidance. The echogenic pleura could be seen moving downwards away from the needle.

Group D (Dexmedetomidine) received paravertebral Block using 3 injections of 5 ml each of 0.5% Ropivacaine from T2-T4 (5ml per segment) along with 0.5mcg/kg of Dexmedetomidine as adjunct while Group F (Fentanyl) received paravertebral Block using 3 injections of 5 ml volume each of 0.5% Ropivacaine with 1 mcg/ml of Fentanyl as adjunct. Sensory level of the block was assessed and then GA was induced after approximately 15 minutes.

Injection Midazolam 30mcg/kg was given intravenously. Patients were induced with 1% Propofol 2mg/kg and Vecuronium 0.1mg/kg intravenously. After mask ventilation for 3 minutes, the appropriate sized I-Gel was inserted. Anesthesia was maintained using Isoflurane with Oxygen: Nitrous oxide mixture and intermittent doses of Vecuronium. Ondansetron 0.1mg/kg was given intravenously as antiemetic. No intravenous opioid analgesics were given unless there was a sustained increase in heart rate by more than 20%. In such cases, Fentanyl 1mcg/kg and Paracetamol 15mg/kg was given intravenously and those cases were considered as block failure. Heart Rate (HR), Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), Mean Arterial Pressure (MAP), Oxygen saturation (SpO₂), End Tidal CO₂ (ETCO₂) were recorded intraoperatively every 5 minutes. The duration of surgery was also noted. All patients were reversed with Neostigmine 0.04mg/kg and Glycopyrrolate 0.01mg/kg intravenously.

Postoperative pain was assessed using Numeric Rating Scale (NRS) at 1, 3, 6, 12 and 24 hours from the time of block. Incidences of change in blood pressure, heart rate, nausea and vomiting were noted. Hypotension was defined

as a decrease in mean arterial pressure 20% below the baseline or < 60 mmHg that persisted for more than 30 seconds. In case of NRS score more than 3, injection Paracetamol 15mg/kg was given intravenously.

Statistical Analysis:-

The observation in both the groups were compared statistically using student 't' test and analysed using Statistical Package for Social Science (SPSS). The critical value of 'p', indicating the probability of significant difference was taken as <0.05 for comparison.

Results:-

Out of the 40 patients, 1 patient required intraoperative rescue analgesia in the group receiving Dexmedetomidine (Group D), while 2 patients required intraoperative rescue analgesia in the group that received Fentanyl (Group F). All these 3 cases were considered as failure of block and were excluded from our study. Only 19 patients from Group D and 18 patients from Group F were included in the study.

Both the study groups were matched in terms of age, weight and duration of analgesia. There was a significant drop in heart rate and blood pressure in the group receiving Dexmedetomidine at 20 minutes intraoperatively. At all other time intervals, the heart rate and blood pressure between the two groups were comparable. Postoperatively also, the dexmedetomidine receiving group encountered significant drop in heart rate ($p < 0.05$) at 6 and 12 hours as well as drop in mean blood pressure ($p = 0.003$) at 12 hours postoperatively.

The average duration of analgesia was 12.63 ± 5.62 hours for Group D, and 9.83 ± 4.80 hours for Group F. The difference in the post-operative NRS score was statistically insignificant between the group receiving Dexmedetomidine and that receiving Fentanyl (Table 1). The mean duration of analgesia in the groups was not statistically significant. The difference between the incidence of postoperative nausea and vomiting was also insignificant between the two groups (Table 2).

In Group D, 2 out of 19 patients (10.52%) had postoperative nausea and vomiting. In Group F, 3 out of 18 patients (16.66%) had postoperative nausea and vomiting. Both were statistically insignificant.

We had defined hypotension as a decrease in mean arterial pressure 20% below the baseline or < 60 mmHg that persisted for more than 30 seconds. In group D, only 1 out of 19 patients (5.26%) had hypotensive episodes postoperatively. No patient in Group F had intraoperative or post operative hypotension.

Discussion:-

Thoracic Paravertebral block is a safe and effective technique for postoperative analgesia. However current literature is insufficient to prove the efficacy of one adjuvant drug over the other in breast surgeries. Evidence is accumulating in favour of opioid free anaesthesia for cancer surgeries as it may decrease the rate of cancer recurrence and prolong survival.

Dexmedetomidine, is a highly selective α_2A agonist that selectively inhibits the release of norepinephrine and causes analgesia by central as well as peripheral mechanisms in addition to causing sedation. Perineural administration of dexmedetomidine, as in the paravertebral block along with local anaesthetic prolongs the duration of analgesia by both central as well as peripheral mechanisms. Centrally it inhibits the sympathetic outflow and peripherally it decreases the release of norepinephrine at the nerve ending. The purpose of our study was to evaluate and compare the effect and side effects of two adjuvants, a non opioid dexmedetomidine and fentanyl, a strong opioid, in terms of duration of post operative analgesia as well as the quality of analgesia.

Postoperative pain was assessed using Numeric Rating Scale (NRS). The NRS score between the Group D and Group F were comparable postoperatively and was statistically insignificant. Our results are comparable to a study by Ahmed et al.^[4] who studied the same adjuvants with bupivacaine in continuous paravertebral block for renal surgeries. They found that the time for request of first analgesia was 9.80 ± 4.50 hours in fentanyl group and 10.80 ± 5.22 hours in dexmedetomidine group.

Breast surgeries are frequently associated with postoperative nausea and vomiting especially in patients below 50 years whose tumors have positive Estrogen receptors^(5,6). Although we did not do ER sensitivity testing in our

study, we compared the incidence of PONV in both our groups. In our study, patients in both the groups were given Ondansetron 0.1mg/kg intravenously as an antiemetic intraoperatively and there was no significant difference in the two groups as was found in other studies as well^[7].

Dexmedetomidine may be associated with bradycardia and hypotension because of the postsynaptic activation of central α_2 -adrenoceptors, leading to decreased sympathetic activity. Hassan et al. did a prospective randomized double-blinded study on forty patients scheduled for thoracic surgery comparing bupivacaine with fentanyl and dexmedetomidine as adjuvants in thoracic paravertebral block and found six patients developed hypotension and two patients developed bradycardia in those given dexmedetomidine^[8].

In our study, the dexmedetomidine group showed significant fall in heart rate and blood pressure at around 20 minutes intraoperatively corresponding to the duration of action of dexmed. At all other time intervals, the patients receiving dexmedetomidine were hemodynamically more stable intraoperatively and postoperatively. The finding was similar to the prospective study by Mohta M et al^[9].

Conclusion:-

From the current study we can conclude that dexmedetomidine provides as good intra and post operative analgesia as fentanyl, when used as an adjunct to ropivacaine in thoracic paravertebral block, along with general anesthesia for breast surgeries. And among the two drugs, dexmedetomidine offers better hemodynamic stability.

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