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Original Research Article

Thoracic Epidural Anaesthesia for Breast Surgery using Dexmedetomidine and Ropivacaine: A Clinical Comparison to General Anaesthesia

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Abstract

Background: Although thoracic epidural anaesthesia has advantages such as better hemodynamics, quicker recovery, fewer postoperative respiratory problems, and effective analgesia, general anaesthesia remains the old standard method for many breast surgeries. In this research, the effectiveness of traditional general anaesthesia and thoracic epidural anaesthesia using dexmedetomidine and ropivacaine (0.5%) for breast surgery will be compared. (MRM).

Methods: From February 2022 to January 2023 at Nalanda Medical College and Hospital, Patna, Bihar, two groups of 40 consenting ASA Grades I and II patients who were posted for MRM were created. In Group (TEA), a 5 cm epidural catheter was threaded during a thoracic epidural in the T4–T8 intervertebral region. To reach the necessary height, injections of ropivacaine 0.5% and dexmedetomidine 1 microgram/kg were administered via the catheter. Patients in Group (GA) received Glycopyrrolate (0.2 mg), Fentanyl (2 microgram/kg), and Midazolam (0.05 mg/kg) as premedications before being administered Inj. Propofol (2 mg/kg). Vecuronium was used for the intubation and thereafter to keep the patient relaxed. Isoflurane 0.4–0.6% in IPPV and N_20:O_2 at a 60:40 ratio are used to maintain anaesthesia. At the end of the operation, the patients received an infusion of ondansetron (4 mg) and diclofenac (75 mg), followed by a reversal with neostigmine (0.5 mg/kg) and 20 micrograms of glycopyrrolate. Both groups utilised Ringer's Lactate as a maintenance fluid. During surgery, both groups had their pulse, NIBP, ECG, SpO_2, and respiration monitored.

Results: Anaesthesia suitability, surgical condition, bleeding, post-anesthesia recovery, adverse effects during the perioperative phase, and general patient satisfaction were all evaluated.

Conclusion: A thoracic epidural with 0.5% ropivacaine in addition to dexmedetomidine produced a positive postoperative outcome. There were no serious negative effects recorded.

Keywords: Thoracic Epidural, Ropivacaine, Dexmedetomidine, General Anaesthesia, Breast Surgery.

Introduction

Greater public knowledge of breast cancer and early diagnosis of the disease have led to an increase in surgical interventions like lumpectomies, breast conservation therapy, modified radical mastectomy, etc. Stress from surgery and mental health issues may lead to hypercoagulability and changes in the circulatory system [1-8]. This can be lessened with the aid of general anaesthetic techniques like thoracic epidural anaesthesia (TEA) as well as regional anaesthesia techniques like paravertebral blocks, intercostal blocks, field blocks, pec 1 and pec 2 blocks. Greater intraoperative and postoperative analgesia, rapid recovery, fewer postoperative respiratory complications, and better hemodynamic stability are all benefits of regional anaesthesia techniques [4-14]. But TEA, which is frequently used for many breast operations with or without GA, has a number of benefits over the majority of the regional anaesthetic techniques mentioned above. However, patients' intra-operative consciousness and awareness during surgical operations under regional anaesthesia still represent a serious drawback. Dexmedetomidine hydrochloride is a [Alpha-2] agonist with calming, analgesic, and anxiolytic properties [15-19]. It is widely used as an adjuvant to local anaesthetics in different blocks, for sedation in ICUs, to provide monitored anaesthesia treatment during various medical and surgical operations, and for sedation in other settings. Dexmedetomidine's efficacy as a TEA adjuvant to ropivacaine for breast surgery was evaluated in this research [15–20].

Materials and Methods

Our sample size was determined to be 17 between February 2022 and January 2023 at Nalanda Medical College and Hospital, Patna, Bihar, based on a hypothesised difference of 15, a confidence level of 90%, and an 80% power. For the TEA and GA groups, which each had 20 patients, the 40 female patients with ASA Grades I–II who were between the ages of 25 and 60 were selected. After obtaining their written informed consent, the randomization was conducted using a card draw. All central neuraxial block contraindications were taken into account as exclusion factors, including medication allergies.

The night before surgery, patients in both groups were directed to take Tab. Ranitidine (150 mg) and Tab. Lorazepam (2 mg), and they were also told to refrain from drinking alcohol after midnight. The day before surgery, a Ringer's Lactate drip and an intravenous line with an 18G cannula were begun. Monitors were installed, and baseline readings were recorded.

Injections of 0.2 mg of glycopyrrolate, 0.05 mg/kg of midazolam, and 2 micrograms/kg of fentanyl were given to Group GA patients. Propofol 2 mg/kg was injected into the subjects to cause anaesthesia. The infusion of vecuronium (0.1 mg/kg) made intubating the oropharynx simpler. The cuff was inflated and the tube was fastened after the tube was carefully positioned. Anesthesia was sustained with a tidal volume of 500 mL, a rate of 14 breaths per minute, and an isoflurane concentration of 0.4 to 0.8%. Patients were given vecuronium in 1 mg increments throughout operation to maintain their tranquilly. It was only Ringer's Lactate that was used for upkeep. Towards the end of the procedure, patients were given IV injections of ondansetron 4 mg steadily and diclofenac 75 mg in infusion. By injecting neostigmine (0.05 mg/kg) and glycopyrrolate (0.02 microgram), residual paralysis was healed. The patients were extubated once it was clear that the neuromuscular block had fully rectified.

The epidural space was located in the TEA Group using an 18G Tuohy needle in the T4-T8 intervertebral space using the LOR technique and saline while the patient was

seated, and a 5 cm epidural catheter was then threaded. Negative aspiration and the injection of 3 mL of intravenous lignocaine 2% with adrenaline both served as confirmation that the epidural catheter was properly positioned. Patients were made supine once the catheter had been fixed. Ropivacaine 0.5% was administered into the epidural area in increments of 1 mL along with 1 microgram/kg of dexmedetomidine. After the block from the infraclavicular fossa above to the subcostal edge below was confirmed, the procedure could begin. Oxygen was given to the patients through Hudson's face mask at a flow rate of 6 L/min. For coloading and maintenance, patients received Ringer's Lactate solution at a rate of 8 mL/kg/hr.

Both groups experienced continuous monitoring of the heart rate, noninvasive blood pressure, ECG, oxygen saturation, and breathing during the intraoperative period. The outcomes were recorded. A rise or decline in blood pressure of ±20% or more from baseline was used to define hypertension and hypotension, respectively. Hypotension was treated with 5 mg ephedrine IV doses. Bradycardia, which was described as a drop-in heart rate below 60 beats per minute, was treated with an intravenous injection of atropine 0.3 mg. Treatments for hypertension and tachycardia included the use of vasodilators as well as increasing the isoflurane content. A subjective assessment of the volume of blood lost and the norm of the surgical situation was developed from the operating surgeon's remarks. The postoperative discharge criteria were established using the Aldrete score at the first and second hour, and a score of 9/10 was considered adequate for exiting the post-anesthesia recovery room. The patient satisfaction score was calculated using the IOWA Satisfaction with Anaesthesia Scale (ISAS), a self-administered questionnaire for evaluating a Patient's satisfaction with monitored anaesthesia treatment received. During the postoperative phase, 75 mg of intramuscular diclofenac sodium was given to each group as a rescue analgesic.

Using the appropriate tables and the SPSS 17 software, statistical analysis was completed. $p \leq 0.05$ was regarded as significant when performing the chi square test and student's t test for qualitative and quantitative estimate of the significance test.

Results

The demographic parameters and baseline data for both groups were comparable (Table 1) and unremarkable. According to the operating doctors' assessment, there was higher surgical site bleeding in the GA group, but they still believed it was acceptable. Bradycardia was shown to be significantly more common (25%) in Group TEA during the perioperative time, whereas Hypertension was significantly more common (25%) in Group GA. The hemodynamics of neither group substantially differed from the other aside from these. (Table 2)

Table 1: Demographic Parameters (Mean ± SD)

Demographic Parameters	Group TEA	Group GA
Age (Yrs.)	50.8 ± 12.11	51.28 ± 9.5
Height (cms)	150.04 ± 4.9	152.38 ± 4.6
Duration of Surgery (min)	118.02 ± 3.2	115.41 ± 3.9
Baseline Systolic BP	124.10 ± 9.94	122.07 ± 9.35
Baseline Diastolic BP	76.53 ± 5.50	75.33 ± 4.4
Baseline Heart Rate	84 ± 4.48	83 ± 5.42

*$p \geq 0.05$

Table 2: Incidences of Intraoperative Haemodynamic Variations of Group TEA and GA

	Group TEA	Group GA
Hypotension	3 (15%)	1 (5%)
Hypertension	0 (0%)	5 (25%)*
Bradycardia	5 (25%)*	2 (10%)
Tachycardia	0 (0%)	4 (20%)

*$p \leq 0.05$

The GA group, in contrast to the TEA group, reported significantly more cases of nausea and vomiting (60%) as well as more frequent cases of shivering (10%) and respiratory pain (10%). In 25% of patients in the TEA Group, bradycardia was observed. Although the GA group commonly reported experiencing shivering, respiratory discomfort, and hypertension, these symptoms were not statistically significant. The Aldrete score in Group TEA (85%) was considerably higher than in the GA group (60%) in the first hour after the anaesthetics were stopped. After two hours, the TEA group had 100% more points than the GA group, which was 85%, but this difference was not numerically significant. (Table 3).

Table 3: Postoperative Observations

Parameter	Group TEA	Group GA
Nausea and Vomiting	3 (15%)*	12 (60%)*
Respiratory Distress/Discomfort	0	2 (10%)
Dural Puncture	0	0
Hypotension	2 (10%)	4 (20%)
Bradycardia	5 (25%)	2 (10%)
Shivering	1 (5%)	2 (10%)
Aldrete Score @ 1 hr (> 9/10)	17 (85%)*	12 (60%)*
Aldrete Score @2 hrs. (> 9/10)	20 (100%)	17 (85%)

*$p \leq 0.05$

The Group TEA had better postoperative pain control with a mean VAS score of (2.4 at 0 hours and 3.2 at 8 hours) compared to the Group GA (5.8 and 5.2 in the corresponding time). The reduction in VAS score in Group GA towards 16 and 24 hours may be attributable to the impact of the rescue analgesic used for pain control in the immediate postoperative period. The total number of rescue analgesics required in the TEA group was considerably lower than in the GA group. In the first twenty-four hours, the mean VAS score in the TEA group was significantly reduced (Table 4).

Table 4: Postoperative VAS Score (Mean)

Postop Time Interval	Group TEA	Group GA
At 0 hrs.	2.4*	5.8*
8 hrs.	3.2*	5.2*
16 hrs.	3.8	4.1
24 hrs.	4.1	3.8

*$p \leq 0.05$

The feedback from the surgeons was comparable in both groups with regard to bleeding and the standard of the surgical field (85% in the TEA group and 80% in the GA group reported being pleased). (Table 5).

Table 5: Surgeon's Observation

Group	Satisfied	Not Satisfied
TEA	17 (85%)	3 (15%)
GA	16 ((80%)	4 (20%)

90% of the TEA group and 80% of the GA group patients both seemed to be quite at ease and pleased with the techniques. The IOWA satisfaction score was not especially significant in either group because the patients in both groups were at ease (87.87% in the TEA group and 66.66% in the GA group). (Table 7).

Table 6: Patient's Opinion

Group	Satisfied	Not Satisfied
TEA	18 (90%)	2 (10%)
GA	16 (80%)	4 (20%)

Table 7: IOWA Satisfaction with Anaesthesia Scale (ISAS) Score

Group TEA	29/33 (87.87%)
Group GA	22/33 (66.66%)

Discussion

Although there have been advances in various regional techniques for breast surgery, general anaesthesia is still the preferred method by many doctors and patients. Since most surgical teams also use a thoracic epidural to relieve postoperative pain, an attempt was made to determine whether using this method alone would be feasible using a thoracic epidural with dexmedetomidine and ropivacaine [13,19,21,22]. It has been observed that using an epidural approach result in superior perioperative outcomes and haemodynamic stability. [4-14] Stress, whether it be psychological or physical, increases the procoagulable state, which causes symptoms like hypercoagulability. [1,2] Furthermore, acute coronary syndrome and plaque instability may result from this.[2,3,6,7] Thoracic epidural induces a selective chemical sympathectomy that results in segmental block that can dampen the stress response. The sympathetic overactivity of the unblocked segments compensates for this segmental obstruction. [4-7] Laryngoscopy and intubation are also avoided because they could worsen the risks associated with general anaesthesia and intubation and the stress reaction. TEA also increases the myocardium's repolarization refractoriness, preventing arrhythmia, and maintains the myocardial demand/supply ratio and coronary perfusion pressure in the ischaemic myocardium, optimising the myocardial oxygen delivery and lowering the cardiac work.[10-14,20,23] This is due to its beneficial effects on the respiratory system[9,8,10] and minimal change in ventilatory mechanics even in chronic The combination of TEA with ropivacaine and dexmedetomidine provides better anxiolysis, sedation, and analgesia. It also lengthens block duration while shortening the latency phase and lessens the need for additional sedatives and analgesics during axillary node clearance.[15-18,21] In this research, it was discovered that the hemodynamic and respiratory patterns had improved; these results were in line with those of A. Clemente *et al*. [8] The absence of sedative or analgesic supplementation in the TEA group in our research may have been due to Salgado PF *et al*.'s report of a synergistic effect of ropivacaine and dexmedetomidine in

epidural anaesthesia. However, we did observe some cases of hypotension and bradycardia, which were successfully treated with ephedrine and atropine. The patients in the TEA group experienced less postoperative nausea and vomiting, and Borgeat A *et al* [24] also reported decreased nausea and vomiting during epidural anaesthesia with ropivacaine plus an alpha-2 agonist, clonidine, in their trial. [24] The TEA group in our study experienced fewer cases of shivering, which can be related to the impact of dexmedetomidine. These results support the research of Grewal A,[15], Parnjape JS, and Maroof A. [19] Our patients experienced decreased discomfort after surgery, which may be related to the combined effects of dexmedetomidine and ropivacaine. Grewal A, Salgado PF, *et al*, and Paranjpe JS, among others.[16] With the catheter in place, this may have continued into the second postoperative day as well, but as it was not part of our study design, it was not evaluated.[15-18,21,22,25] In their research on alpha-2 agonists, Bajwa SJ *et al*.,[17] Martha V *et al*.,[18] Salgado PF *et al*., and Arunkumar S *et al*.[21] had shown the positive effects of dexmedetomidine when used in conjunction with ropivacaine for epidural anaesthesia.

Our study revealed related facts as well. Although it was outside the purview of this study and so could not be evaluated, TEA may have some positive effects on postoperative scar and phantom breast discomfort, according to Kroner K *et al*. [26] Due to the typical effects of dexmedetomidine, which cause conscious sedation and lack of respiratory depression, the speedier recovery pattern than GA group is also developed and documented. [11,15,16,21,23] Early recovery and discharge can lessen the workload for PACU carers and reduce the cost to the health system. Despite the fact that the patient satisfaction rate was not statistically significant, more patients (87.87%) were happy with the approach.[27] This might be because dexmedetomidine sedative, hypnotic, and analgesic effects were present during the surgery.[15,16] The addition of dexmedetomidine can extend the use of TEA to elderly patients with comorbidities due to its intrinsic properties of sedation, analgesia, least impact on the cardiorespiratory system in therapeutic dose, and its synergistic effect with ropivacaine, as has been studied by various authors. (Though it could not be studied as the study was on ASA I-II patients). [13-19]

Conclusion

Thoracic epidural anaesthesia with ropivacaine and dexmedetomidine is a safe and effective substitute for general anaesthesia as the only anaesthetic for breast surgery because it offers better cardiorespiratory stability, perioperative analgesia, and a reduced incidence of shivering, nausea, and vomiting.

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