Original Research Article

A comparative study to evaluate thoracic epidural anaesthesia (TEA) and general anaesthesia (GA) for MRM surgeries

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Abstract

Background: General anaesthesia is still the preferred technique amongst many practitioners for oncologic breast surgeries. However the TEA technique has a lot of advantages over the conventional GA technique. **Aim:** We attempted to evaluate the two techniques of anaesthesia for MRM surgeries. **Materials and method:** Sixty ASA I-II patients undergoing MRM were randomly assigned to two study groups of 30 patients each. In the TEA group(group T), an epidural catheter was inserted at T7-T8 level, and 8-10 ml of 0.5% bupivacaine was titrated and administered.GA (group G) was induced with 2mg/kg of propofol and was maintained with Isoflurane ,intermittent inj. Vecuronium and 70% N2O in oxygen. The authors evaluated the adequacy of anesthesia, surgical condition, post anesthetic recovery, post anesthetic analgesia and patients' satisfaction. **Results:** The intra operative haemodynamics was comparable inbetween the two groups. The incidence of nausea and vomiting was significantly lower in the TEA group (16.5% in group T and 39.6% in group G , P = 0.02).The mean immediate VAS score wasalso lower in TEA group (group T =2.4 , group G =5.8,P = 0.001).Aldrete recovery score was 9/10 in 1st hr in a significant proportion in the TEA group (89.1% in group T v/s 59.4% in groupG , P = 0.003).Patient satisfaction was significantly higher. The surgeons were however satisfied with both the methods. **Conclusion:** Use of thoracic epidural technique as a sole anaesthetic technique for MRM surgeries provides adequate operating conditions, better side effect profile, betterpain management and patient satisfaction.

Key words: MRM, thoracic epidural, general anesthesia, breast carcinoma

Introduction

Incidence of breast carcinoma is on a rising trend. Usually, breast oncology surgeries like Modified Radical Mastectomy (MRM), are done under general anaesthesia. Surgical stress has a lot of adverse effects on the coagulation and cardiovascular system of body[1]. Hence the control of surgical stress response is of prime importance. This can be done by general anaesthesia or regional anaesthesia or a combination of both. However, recently there has been growing interest amongst practitioners towards regional anaesthesia for MRM surgeries. The reason for the changing preference is better intraoperative stability and less postoperative complications. Many types of regional anaesthesia for breast surgeries have been practiced, viz. thoracic paravertebral blocks, field blocks, brachial plexus blocks, intercostal blocks, cervical epidural anaesthesia, pecs block, thoracic epidural block etc. However, not all types of regional anaesthesia may be efficient for extensive procedures like Modified Radical Mastectomy (MRM). Combination of general anaesthesia along with thoracic epidural anaesthesia is a well-known entity for MRM surgeries. Exclusive thoracic epidural anaesthesia for MRM surgeries isstill not frequently used.

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Hence we intend to compare thoracic epidural anaesthesia (TEA) and general anaesthesia (GA) for extensive breast surgeries like MRM.

Materials and Method

This prospective randomized study was conducted at Department of Anesthesia and Critical Care, at Patna Medical College and Hospital, Patna. The study was approved by the institutional research and ethical committee. The study was conducted between February 2019 and January 2020. An informed and written consent was taken from the participating subjects prior to the commencement of the study.

60 adult women who satisfied the inclusion and exclusion criteria were selected for the study. The patients were divided into two equal groups by use of random number tables. Group T comprised of 30 patients who were given thoracic epidural anaesthesia (TEA) for the surgery. Group G comprised of 30 patients who underwent general anaesthesia (GA) for the surgery. Women adult patients, ASA status 1 and 2 between age of 25 to 65 years who were scheduled for modified radical mastectomy were selected for the study. The exclusion criteria for the epidural group consisted of skin infection at the epidural injection site , coagulopathy , severe anatomic abnormality of the spine , known allergy to bupivacaine and lignocaine , and platelet count <100,000 /cu mm. Tab. Diazepam 2 mg, Tab. Ranitidine 150 mg and Tab. Metoclopramide 10 mg was administered the night before surgery. On arrival in the OT, monitors were attached and baseline readings of pulse rate and blood pressure taken. Then an 18 G IV catheter was secured and Ringer Lactate solution infused @ 4 ml/kg/hr before anaesthesia. For the TEA group (group T), after the aseptic precautions, 18 G Tuohy needle was inserted in $T_7 - T_8$ interspace, in sitting position and epidural space was identified by loss of resistance to saline technique. An epidural

catheter was measured and inserted approximately 5 cm inside the epidural space. Titrated dose of 8-10 ml of 0.5% plain bupivacaine was injected through the catheter. After confirmation of analgesia from the lower border of clavicle to the inferior costal margin, the surgery was started. Supplemental oxygen @ 5 lpm was administered via facemask. Patient was sedated with inj. Midazolam 2mg and supplementary doses whenever the patient required. If patient experienced pain during axillary clearance, inj. Ketamine @0.2-0.4 mg/kg was given. Top up doses of bupivacaine (1/2 to 2/3 of initial dose) was given if required. The epidural catheter was removed at the end of surgery. In the event of failure of thoracic epidural anaesthesia patients were administered general anaesthesia. All patients in the general anaesthesia group (group G) were premedicated with inj. midazolam 2 mg, inj. butorphanol 1 mg, inj. glycopyrrolate 20 mcg/kg, inj. ondansetron 4 mg. Patients were induced with inj. propofol 2 mg/kg. Tracheal intubation under direct laryngoscopy was facilitated by inj. vecuronium 0.1mg/kg. Anaesthesia wasmaintained by Isoflurane in combination with N_2O:O_2 @ 3:1.Inj.Vecuronium was given intermittently as and when required. In the end, the patient was reversed with inj. neostigmine @ 50-80 mcg/kg and inj. glycopyrrolate @ 20mcg/kg. Postoperatively, pain was controlled by Diclofenac (iv or oral), Paracetamol (i.v. or oral) and Tramadol as rescue analgesic. Patient monitoring in both the cases included noninvasive blood pressure monitoring, oxygen saturation, heart rate, respiratory rate and ECG. Intraoperativehypotension and hypertension was considered as ± 20% from the baseline blood pressure level. Bradycardia and tachycardia was considered ± 20% from the baseline heart rate readings. Hypotension was treated with 5 mg ephedrine IV and bradycardia was treated with 0.3-0.6 mg IV atropine. Intra operatively the haemodynamic parameters were recorded and length of surgery was noted. The surgeon was asked to evaluate the operating conditions as satisfied or not satisfied. Length of stay in the post- operative recovery room was also noted. Quality of post-operative analgesia was noted by VAS scale every 8 hours for the first 24 hours. Incidences of other side effects such as shivering, nausea and vomiting etc. were noted. The post- operative Aldrete score was recorded in 1 hr and 2 hr after discontinuation of anaesthesia. Aldrete Score of 9/10 was considered satisfactory for discharge from PACU. At the time of discharge from the recovery room, patients were asked to rate their satisfaction with the anaesthetic technique as satisfied or not satisfied. The mean observation of the quantitative data was analyzed by students' unpaired 'T' test. For the qualitative data Chi-square test or Fisher's exact test as appropriate was applied. The Stata version 8 software was used for statistical calculations. P-values <0.05 were considered statistically significant.

Results

There was no difference in the demographic data in both the group. (Table 1) The blood loss was within acceptable limits and none of them required transfusion of blood or blood products. There was no statistically significant difference in the haemodynamic parameters of the two groups. Even though there was no significant difference between the two groups, still the incidence of hypertension and tachycardia was higher in Group G, whereas hypotension and bradycardia was more noticed in the thoracic epidural group (group T, Table: 2).

Table 1: Demographic variable

Variable	Group T (Mean±SD)	Group G (Mean±SD)
Age (yr)	52.8±12.11	51.28±9.5
Height (cm)	155.04±4.9	152.38±4.9
Duration of surgery (min)	110.02±3.2	112.41±3.9
Baseline SBP(mm hg)	122.10±9.94	121.07±9.35
Baseline DBP (mm Hg)	74.53±5.5	75.33±4.4

Table 2: Intra operative haemodynamics

Parameter	Group T	Group G
Hypotension	4 (13.3%)	1 (3.3%)
Hypertension	0 (0%)	5 (16.6%)
Bradycardia	5 (16.6%)	2 (6.6%)
Tachycardia	1 (3.3%)	4 (13.3%)

Table 3: Comparison of post-operative parameters

Parameters	Group T	Group G
Nausea and vomiting*	5 (16.5%)	12 (39.6%)
Shivering	2 (6.6%)	1 (3.3%)
Respiratory distress	0	0
Dural puncture	0	0
Hypotension	6 (19.8%)	4 (13.2%)
Bradycardia	5 (16.5%)	2 (6.6%)
Post op Aldrete Score @ 1hr (> 9/10)*	27 (89.1%)	18 (59.4%)
Post op Aldrete Score @ 2 hr (>9/10)	29 (95.7%)	25 (82.5%)

Post-operative complications were few in the thoracic epidural group as compared to the general anaesthetic group. The post op Aldrete score was significantly higher in the TEA group (Group T) @ 1 hour after discontinuation of anaesthesia, whereas @ 2 hr it was not significantly different in both the groups. (Table: 3) The pain score (mean VAS score) varies significantly in the immediate post-operative period. At 8, 16 and 24 hours post operation the values were not significantly different in both the groups. (Table 4) Surgeon satisfaction were not statistically significant in the groups. However the surgeons who rated the epidural group was higher. (Table 5) There was statistically significant difference in both the groups when patient satisfactionwas compared. The patients undergoingthoracic epidural analgesia were more satisfied.

Table 4: Comparison of mean VAS scores post operatively

Post operative time	Group T	Group G
Immediate post op*	2.4	5.8
8 hour post op	4.6	5.2
16 hour post op	3.8	4.1
24 hour post op	3.1	3.8

Table 5: Surgeon satisfaction		
Group	**Satisfied**	**Not satisfied**
TEA group (T)	29 (95.7%)	1 (3.3%)
GA group (G)	28 (92.4%)	2 (6.6%)

Table 6: Patient satisfaction		
Group	**Satisfied**	**Not satisfied**
TEA group (T)	27 (89.1%)	3 (9.9%)
GA group (G)	16 (52.8%)	14 (46.2%)

Discussion

Inspite of the advances in regional anaesthesia, many practitioners still prefer general anaesthesia for oncologic breast surgeries like MRM. Even though there are case reports of comparison of MRM under TEA, comparative analysis of both the technique is scarce. This study is a humble attempt to compare two techniques of anaesthesia i.e. general anaesthesia and thoracic epidural anaesthesia as sole techniques for MRM surgeries.

We found that the TEA technique has got many advantages, primarily in terms of better intraoperative haemodynamics, and a better post-operative recovery profile. Stress is a normal response of the body whenever any insult like surgery is done to it. It has many adverse effect on the coagulation system of the body , enhancing the procoagulatory state of the body[1]. This may also lead to plaque instability, making the individual prone to acute coronary syndromes in response to surgery[2,3]. The temporary segmental sympathetic block in a thoracic epidural is quite effective in handling the increased stress response of the body[4]. This segmental sympathetic block is believed to be compensated by increased sympathetic activity in the unblocked segments[5]. In addition the stress response is further reduced by avoidance of the need to intubate thepatient. Intubation usually done in the cases of general anaesthesia causes a lot of pain and stress response to the patients due to the stimulation of the laryngeal and tracheal mechanoreceptors.

The benefits of decrease in stress response is supplemented by the myocardial and haemodynamic stability offered by thoracic epidural anaesthesia. The thoracic epidural technique increases the repolarization and prolongs refractoriness of the myocardium. It thus offers a protection against arrhythmias, particularly of ventricular origin[6]. Studies have shown that TEA maintains the myocardial oxygen demand /supply ratio along with maintenance of the coronary perfusion pressures even in the ischaemic myocardial tissue[7]. Thus selective sympathectomy in TEA and the potential to dilate the constricted coronary vessels and reduction of the cardiac workload as well as optimization of the myocardial oxygen delivery have a positive impact on the cardiovascular status[8].

TEA provided adequate intraoperative anaesthesia, maintaining the haemodynamic stability as well. The patients were sedated with Midazolam for increasing their comfort. Few patients (i.e. 9/30 patients) needed supplemental doses of ketamine during axillary clearance. If given in appropriate titrated doses, TEA do not show significant detoriation of haemodynamic and respiratory parameters. The hypotension seen in our study population were easily managed with bolus doses of ephedrine. Even though TEA decreases the thoracic component of ventilation, still adequate ventilation is maintained if the diaphragm is functioning properly[9]. TEA also preserves the ventilatory drive to hypercapnia and did not impair the elements of hypoxic drive as well[10]. We did not encounter any respiratory problems in response to TEA. The post-operative recovery profile was significantly better in the TEA group with lesser incidence of post-operative nausea and vomiting and lesser pain. Our finding is consistent with other studies[11,12,13]. The lower incidence of nausea and vomiting in regional anaesthesia as compared to general anaesthesia has been well documented[14].

There was significantly less pain in the immediate post-operative group after TEA. The post-operative analgesia and opioid sparing effect can also be demonstrated in post-operative period by administering local anaesthetic through the epidural route[15]. However in our study we took out the catheter after completion of surgery as we were more concerned to compare the intraoperative event management by the two techniques. Hence we did not find significant difference in the pain scores in post-operative period. The TEA may also be of value to control the scar pain and phantom pain[16]. The significantly faster recovery scores in thoracic epidural anaesthesia in comparison to the general anaesthetic technique has also been well established in other studies[11,13,17]. Faster recovery profile aids early discharge and ultimately in reduction in the cost of healthcare. The patients were moresatisfied with the TEA technique and the surgeons were also happy with the operating conditions provided by the TEA technique. The benefits of the TEA technique may also be extended to the patients with co morbid diseases like hypertension, COPD, coronary artery disease etc. As many patients have such associated co morbidities, TEA definitely has an important role to play in the management of such cases.

Few limitations of our study were a small sample size, and patients were of ASA grades 1 and II. So the effect of the technique in sicker patients remains under evaluated. As the breast surgeries does not need motor block, adequate sensory anaesthesia and analgesia with potentially lesser side effects could have been achieved with ropivacaine instead of bupivacaine. Also, a longer follow up period and post discharge follow up of the patients may uncover the effect of TEA on the scar pain and phantom pain.

Conclusion

The thoracic epidural technique is a better alternative to general anaesthesia for the MRM surgeries. TEA avoids many problems of general anaesthesia viz. nausea and vomiting, delayed post-operative recovery etc. and has the advantage of better post-operative pain management. However meticulous dosing of TEA and proper asepsis is a prime requirement of the success of TEA technique.

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