



Original Research Article

The efficacy of thoracic epidural anesthesia for breast surgeries

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ABSTRACT

Background: Thoracic epidural anesthesia provides selective blockade for the surgical site, with diminished requirements of opioids and local anaesthetics. If the efficacy of the same is better or equivalent to general anesthesia, the adverse effects with the later can be avoided. Hence this study was conducted to know the effectiveness of thoracic epidural anesthesia in breast surgeries using 1.5% lignocaine with adrenaline.

Materials and Methods: This prospective cross-sectional study was conducted in the department of Anaesthesiology in association with the Department of Surgery at Raja Muthaiah Medical College and Hospital, Chidambaram from January 2013 to June 2014. Adult female patients aged between 18-60 years belonging to ASA class I, class II and class III undergoing breast surgeries were included in the study. Patients with bleeding diathesis and local infections were excluded from the study. A total of thirty cases were included in the study and efficacy of epidural anaesthesia was determined by monitoring vitals in the peri-operative period. Results were analysed using Statistical package for Social Sciences (SPSS) version 17.

Results: Heart rate, blood pressure (both systolic and diastolic) and mean arterial pressure were significantly different with respect to time. Mean duration of rescue analgesia was found to be 127.33±27.62 minutes. Also 10%, 23.3%, 13.3% and 6.7% of cases reported bradycardia, shivering, hypotension and nausea during the intra operative period whereas 10% of cases reported backache and nausea, each during the post-operative period.

Conclusion: Thoracic epidural anesthesia for breast surgeries provides good analgesia with minimal amount of drugs without significant complications.

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1. Introduction

Major surgery induces profound physiological changes in the peri-operative period, characterized by increase in sympathoadrenal and other neuroendocrine activity and also an increased cytokine production. As epidural anesthesia can attenuate this “stress response” to surgery, improve the quality of postoperative analgesia in comparison with systemic opioids and hasten recovery of gut function, it had been suggested that conducting surgery under epidural anesthesia may reduce peri-operative morbidity and mortality compared with general anaesthetic alone.¹

All segments from the spinal canal from the base of the skull to sacral hiatus are available for epidural injection and epidural analgesia can be adapted to almost any type of surgery below chin,² Dawkins and Steel³ reported that ideal conditions for any thoracic surgery can be obtained by instilling the local anaesthetic agents into the epidural space at the midpoint of nerve supply to the site of operation.

Thoracic epidural anesthesia was introduced fifty years ago to provide anaesthesia to awake unintubated patients during intra-thoracic surgical procedures.⁴ Subsequently, thoracic epidural anaesthesia and analgesia have been utilized in the intra-operative and post operative anaesthetic management of patients undergoing thoracic

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and upper abdominal surgery.^{4,5} Moreover thoracic epidural anesthesia provides selective blockade for the surgical site, with diminished requirements of opioids and local anaesthetics. In addition, thoracic epidural anesthesia provides pain relief and sympatholysis of such magnitude that allows patient to cough, breathe deeply, drink and mobilize which can contribute to enhanced post operative outcomes such as improved respiratory function, reduction in ileus and protein sparing.⁶ Hence this study was conducted to know the effectiveness of thoracic epidural anesthesia in breast surgeries using 1.5% lignocaine with adrenaline.

2. Materials and Methods

This Prospective cross sectional study was conducted in the department of Anaesthesiology in association with department of Surgery at Raja Muthaiah Medical College and Hospital, Chidambaram from January 2013 to June 2014. Adult female patients aged between 18-60 years belongs to ASA class I, class II and class III undergoing breast surgeries were included in the study. Patients with bleeding diathesis and local infections were excluded from the study. A total of thirty cases were included in the study.

All study participants were assessed for general physical examination including airway assessment, spine and systemic examination was done to confirm the previously mentioned inclusion and exclusion criteria. Investigations (including blood and imaging techniques) were done to assess the ASA class also.

All the patients were advised to remain nil per oral after midnight and were given tab Diazepam 10mg orally the night before surgery and 5 mg 2 hours before surgery. On the day of surgery in the anaesthetic room, an 18 gauge i.v. cannula was inserted and the patients was preloaded with 500 ml Ringer Lactate solution over a period of 15 to 20 min. Basal vital parameter like pulse rate, blood pressure, ECG, respiration, oxygen saturation were recorded. Primary outcome to assess the effectiveness of thoracic epidural anesthesia in breast surgeries using 1.5% lignocaine with adrenaline was done using the parameters like level of blockade, duration of analgesia, time of rescue analgesia, hematological parameters and complications.

2.1. Procedure

The patient was positioned in lateral or sitting position with the help of an assistant, under aseptic precaution, the back was prepared with 5% Povidone iodine solution, spirit and the area was draped. The inferior angle of scapula which corresponds to T7 spine was palpated and the space above which is T6 – T7 was located. The skin was infiltrated with 2ml of 2% Lignocaine and after 60 – 90 seconds, a Tuohy needle 18G or 16G was introduced by paramedian approach in T6 – T7 space and advanced obliquely at 45 degrees to the

skin till the needle was steady in the interspinous ligament.

The stylet was removed and a 5cc dry glass syringe with an air column of 3cc was attached firmly to the hub of the needle. This unit was carefully advanced with 45 degree angle and constant pressure applied on the plunger of the syringe (loss of resistance technique). As long as the needle point was in the ligaments there was relative or absolute resistance to injection but as the point emerged from the ligamentum flavum onto the thoracic epidural space, resistance suddenly disappeared.

After confirmation of loss of resistance in air, 18G or 16G epidural catheter was threaded through the epidural needle into the epidural space in cephalad direction upto about 4 to 5 cm. The epidural needle was steadily pulled out without disturbing the catheter. The catheter was well secured with plaster and patient was positioned. After identifying the epidural space test dose of 3 ml of 2% Lignocaine with adrenaline was administered after negative aspiration for blood or Cerebrospinal Fluid (CSF). The patient was observed for 5 minutes to ensure that the injection was not into the subarachnoid space or epidural vessels. Once it was made sure that the catheter is safely secured in the epidural space and 15cc of 1.5% Lignocaine with 15 mg of epinephrine was injected through the catheter and observed for the response. Results were analyzed using Statistical package for Social Sciences (SPSS) version 17.

3. Results

In the present study the mean age of the study participants was found to be 41.50 ± 13.69 years. Majority of the study participants (36.7%) belongs to age group between 41-50 years followed by 33.3%, 26.7% and 3.3% of participants belongs to age group 18-30 years, 31-40 years and 51-60 years, respectively. Mean weight of them was found to be 59.96 ± 11.32 kgs and 60% and 40% of the participants belongs to more than 60 kgs and less than or equal to 60 kgs, respectively. Also there were 46.7%, 40% and 13.3% of cases belongs to ASA class I, class II and class III, respectively. (Table 1)

Table 1: Clinical profile and analgesic properties

Variables	Frequency	Percentage
Age groups		
18-30 years	10	33.3
31-40 years	08	26.7
41-50 years	11	36.7
51-60 years	01	03.3
Weight		
≤ 60 kgs	12	40.0
> 60 kgs	18	60.0
ASA		
Class I	14	46.7
Class II	12	40.0
Class III	04	13.3

The overall mean onset of sensory analgesia in our study was 10.26 ± 2.58 minutes with range of 6-16 minutes and the lower level of blockade was reported as T10, T12 and L1 and L2 in 16.7%, 26.7%, 33.3% and 23.3% of cases, respectively. Similarly the upper level of blockade was reported as T1, T2 and T3 in 26.7%, 56.7% and 16.7% of cases, respectively. (Table 2)

Table 2: Proportion of cases with different analgesic properties

Variables	Frequency	Percentage
Onset of sensory analgesia		
6 minutes	5	16.67
8 minutes	6	20.00
10 minutes	6	20.00
12 minutes	9	30.00
14 minutes	1	03.33
16 minutes	3	10.00
Lower level of Blockade		
T10	05	16.7
T12	08	26.7
L1	10	33.3
L2	07	23.3
Upper level of Blockade		
T1	08	26.7
T2	17	56.7
T3	05	16.7

Mean pulse rate of the study participants at different time intervals are shown in the Figure 1 and the average pulse rate was reported as 81.8 ± 8.9 beats/minute. The difference in mean pulse rate with respect to time intervals was found to be statistically significant ($p < 0.000$).

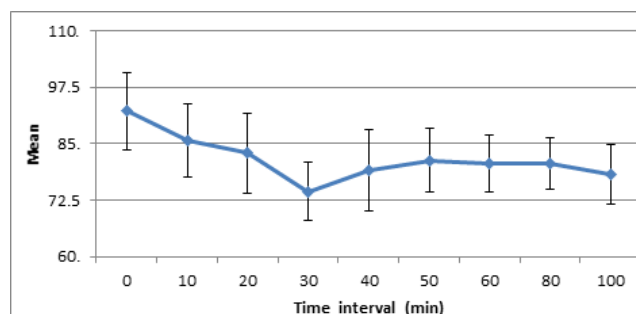


Fig. 1: Pulse rate at different time intervals

Mean systolic and diastolic blood pressure at different time intervals are shown in table 3 and its difference with respect to time was found to be statistically significant.

Mean arterial pressure of study participants at different time intervals are shown in the Figure 2 and the average mean arterial pressure was reported as 84.1 ± 5.9 mm Hg. The difference in mean arterial pressure with respect to time intervals was found to be statistically significant ($p < 0.000$).

Mean SpO₂ of the study participants at different time intervals are shown in the Figure 3 and the average SpO₂

Table 3: Meansystolic and diastolic blood pressure

Parameters	Mean	SD	P value
Systolic Blood Pressure			
000 minutes	116.60	11.02	0.000*
010 minutes	103.73	10.11	
020 minutes	105.53	08.51	
030 minutes	102.80	04.60	
040 minutes	106.87	08.46	
050 minutes	107.47	06.26	
060 minutes	111.72	07.58	
080 minutes	112.53	07.83	
100 minutes	113.80	07.57	
Average minutes	108.47	09.26	-
Diastolic Blood Pressure			
000 minutes	73.93	5.62	0.004*
010 minutes	69.40	6.22	
020 minutes	70.20	6.29	
030 minutes	72.80	4.80	
040 minutes	70.47	5.82	
050 minutes	73.60	5.74	
060 minutes	72.72	4.04	
080 minutes	73.68	5.26	
100 minutes	75.40	5.25	
Average minutes	72.22	5.71	-

*Significant

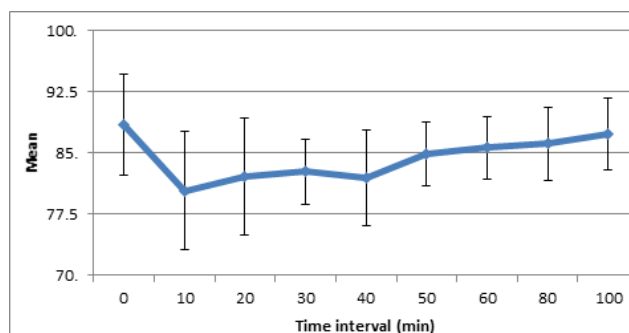


Fig. 2: Mean arterial pressure at different time intervals

was reported as 98.0 ± 0.9 . The difference in mean SpO₂ with respect to time intervals was found to be statistically significant ($p < 0.000$).

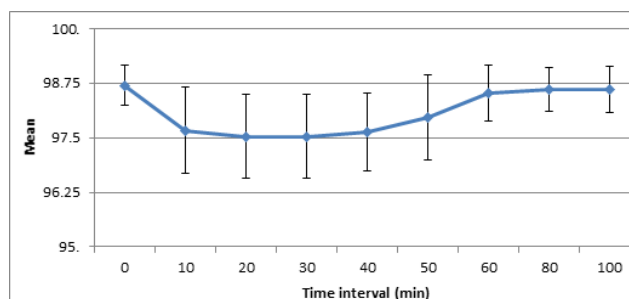


Fig. 3: Mean SpO₂ at different time intervals

Mean duration of surgery was reported as 92.33 ± 31.42 minutes with 20%, 13.3% and 66.7% of cases underwent surgery for duration of ≤ 60 minutes, 61-80 minutes and 81-100 minutes, respectively. Mean duration of rescue analgesia was found to be 127.33 ± 27.62 minutes with 6.7%, 23.3%, 36.7% and 33.3% of cases reported with duration of rescue analgesia as ≤ 80 minutes, 81-110 minutes, 111-140 minutes and 141-170 minutes, respectively. On assessing the complications 10%, 23.3%, 13.3% and 6.7% of cases reported bradycardia, shivering, hypotension and nausea during the intra operative period whereas 10% of cases reported backache and nausea, each during the post operative period. (Table 4)

Table 4: Duration of rescue analgesia and complications

Parameter	Frequency	Percentage
Duration of surgery		
≤ 60 minutes	6	20.0
61-80 minutes	4	13.3
81-100 minutes	20	66.7
Duration for rescue analgesia		
≤ 80 minutes	02	06.7
81-110 minutes	07	23.3
111-140 minutes	11	36.7
141-170 minutes	10	33.3
Intra operative complications		
Bradycardia	3	10.00
Shivering	7	23.33
Hypotension	4	13.33
Nausea	2	06.67
Post Operative Complication		
Backache	3	10.00
Nausea	3	10.00

4. Discussion

The present study of thoracic epidural anesthesia for breast surgeries using 1.5% of lignocaine with adrenaline was conducted among 30 adult female patients undergoing various breast surgeries. The time of onset of sensory block was noted as the interval between the drug injections to the development of upper level of sensory block. In the present study, the mean duration for onset of analgesia was found to be 10.26 ± 2.58 minutes which was comparable with similar studies done by Kilichan et al,⁷ Bromage et al.² and Niemi et al.⁸ which reported 12 ± 8 minutes, 19 minutes and 9.1 ± 8.2 minutes, respectively.

In our study there was no incidence of hypoxia as assessed by pulse oximeter, no respiratory depression or paradoxical breathing. Sakura et al.⁹ have shown that thoracic epidural anesthesia does not impair the ventilatory response to progressive isocapnic hypoxemia. Thus thoracic epidural anesthesia can be used in patients with COPD who are dependent on hypoxic drive for ventilation. Tenling et al.¹⁰ observed similar findings with reduction of VC and

FEV1 only by an insignificant 10% from baseline. Thoracic epidural anesthesia reduces the cardiac output, reduces systemic vascular resistance and fall in blood pressure due to a larger number of vasoconstrictor fibres are blocked, level of blockade is close to cardiac sympathetics so any overshoot may cause block of cardiac acceleratory fibres (T1-T4), and splanchnic nerves T6-L1 is blocked resulting in decreased catecholamine secretion from adrenal medulla and venous pooling in splanchnic circulation.¹¹

In our study, the level of sensory blockade was from T1 – L2, which was evidentially comparable to similar studies done by Nygard et al.¹² and Olausson et al.¹³ where they reported the level of sensory block as T2-T1 and T2-T12, respectively. In the presence of inhibition of cardiac sympathetic fibres which usually originate from T1 – T4 and decrease in central venous return can eventually cause sudden onset of bradycardia and cardiac arrest.¹⁴

Nygard et al.¹² observed a decrease of 8 per minute from that of pre operative heart rate at the end of 20 minutes. Similarly Olausson et al.¹³ observed a decrease of 9 per min from that of pre operative reading. Both the studies correlate to our finding of a decrease of 11 per minute from the pre operative reading which is found to be very significant. In our study majority of the cases had a fall in blood pressure. The average mean arterial pressure pre-operatively was 88.40 ± 6.20 mmHg which declined gradually to reach a minimum level of 82.10 ± 7.10 mmHg at 30 minutes. Later on the mean arterial pressure began to rise and at 120 minutes it reaches to 86.10 ± 4.49 mmHg which was slightly less than the preoperative level. Similar changes were observed in systolic and diastolic blood pressure.

Pre-operatively systolic blood pressure was 116.60 ± 11.02 , which then declined to 105.53 ± 8.51 at 20 minutes and reached 113.80 ± 7.57 at 120 minutes. Diastolic blood pressure had a preoperative value of 73.93 ± 5.62 which showed a decline to 70.20 ± 6.29 at 20 minutes and gradually increased to 73.68 ± 5.26 at 120 minutes which was slightly less than pre operative value. Nygard et al.¹² observed a decrease of 9 mmHg in mean arterial pressure at the end of 20 minutes from the pre operative reading. Similarly Olausson et al.¹³ observed a decrease of 7 mmHg in mean arterial pressure. Hence both the studies correlate with our significant finding of a decrease of 6 mmHg in mean arterial pressure.

Intra-operative complications were hypotension (13%), bradycardia (10%) shivering (23%) and nausea (8%). This is comparable with the study done by Lynch et al.¹⁵ reported nausea of 6% of cases during the post-operative period. There was no incidence of epidural hematoma, infection, neurological complications in our study. Similar results were obtained by Lynch et al.¹⁵ in their study of neurological complication in 4185 patients undergoing thoracic epidural catheterization. Their incidence of 3.6% of neurological complication involved peripheral nerve palsy

due to positioning, radicular pain during catheter insertion, however severe and permanent neurological complications of thoracic epidural catheterization was only 0.07%. Thus our study confirms the generally low over all incidence of neurological lesions with thoracic epidural catheterization.

5. Conclusion

Thoracic epidural anesthesia for breast surgeries provides good analgesia with minimal amount of drugs. With significant hemodynamic changes, peri-operative complications were minimal and no respiratory or cardiac arrest was noted. There was no incidence of post operative neurological complications. Thus we conclude that thoracic epidural anesthesia is an attractive option for breast surgeries.

6. Source of Funding

None.

7. Conflict of Interest

The authors declare that there is no conflict of interest.

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References

1. Buggy DJ, Smith G. Epidural anaesthesia and analgesia: better outcome after major surgery? *BMJ*. 1999;319(7209):530–1. doi:10.1136/bmj.319.7209.530.
2. Bromage RP. Epidural Analgesia. Philadelphia; 1978.
3. Dawkins CJM, Steel GC. Thoracic epidural block for upper abdominal surgery. *Anaesthesia*. 1971;26:41–9.
4. Stanton H. High thoracic epidural with sufentanyl for post - thoracotomy pain. *Reg Anesth*. 1988;13:62–6.
5. Zwarts SJ. The effect of continuous epidural analgesia with sufentanyl and bupivacaine during and after thoracic surgery on the plasma cortisol concentration and pain relief. *Reg Anesth*. 1989;14:183–7.
6. Waurick R, Aken H. Update in thoracic epidural anaesthesia. *Best Pract Res Clin Anaesthesiol*. 2005;19(2):201–13.

doi:10.1016/j.bpa.2004.12.001.

7. Kilickan L, Solak M, Bayindir O. Thoracic epidural anesthesia preserves myocardial function during intra-operative and postoperative period in coronary artery bypass grafting operation. *J Cardiovasc Surg (Torino)*. 2005;46:559–67.
8. Niemi G, Breivik H. Epinephrine markedly improves thoracic epidural analgesia produced by small-dose infusion of ropivacaine, fentanyl, and epinephrine after major thoracic or abdominal surgery: a randomized, double-blind crossover study with and without epinephrine. *Anesth Analg*. 2002;94:1598–1605.
9. Sakura S, Saito Y, Kosaka Y. The effects of epidural anesthesia on ventilatory response to hypercapnia and hypoxia in elderly patients. *Anesth Analg*. 1996;82:306–11.
10. Tyagi A, Seelan S, Sethi AK, Mohta M. Role of thoracic epidural block in improving post-operative outcome for septic patients: a preliminary report. *Eur J Anaesthesiol*. 2011;28(4):291–7. doi:10.1097/eja.0b013e3283416691.
11. Caputo M, Alwair H, Rogers CA, Pike K, Cohen A, Monk C, et al. Thoracic Epidural Anesthesia Improves Early Outcomes in Patients Undergoing Off-pump Coronary Artery Bypass Surgery. *Anesthesiology*. 2011;114(2):380–90. doi:10.1097/aln.0b013e318201f571.
12. Nygård E, Kofoed KF, Freiberg J, Holm S, Aldershvile J, Eliassen K, et al. Effects of High Thoracic Epidural Analgesia on Myocardial Blood Flow in Patients With Ischemic Heart Disease. *Circulation*. 2005;111:2165–70. doi:10.1161/01.cir.0000163551.33812.1a.
13. Olsson K, Magnusdottir H, Lurje L, Wennerblom B, Emanuelsson H, Ricksten SE. Anti-Ischemic and Anti-Anginal Effects of Thoracic Epidural Anesthesia Versus Those of Conventional Medical Therapy in the Treatment of Severe Refractory Unstable Angina Pectoris. *Circulation*. 1997;96(7):2178–82. doi:10.1161/01.cir.96.7.2178.
14. Hogan QH, Stadnicka A, Kampine JP. Effects of epidural anesthesia on splanchnic capacitance. *Adv Pharmacol*. 1994;31:471–83.
15. Lynch EP, Welch KJ, Carabuena JM, Eberlein TJ. Thoracic Epidural Anesthesia Improves Outcome After Breast Surgery. *Ann Surg*. 1995;222(5):663–9. doi:10.1097/00000658-199511000-00009.

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