



## COMPARATIVE EVALUATION OF THORACIC EPIDURAL VERSUS THORACIC PARAVERTEBRAL BLOCK FOR POST THORACOTOMY PAIN RELIEF WITH 0.25% BUPIVACAINE

### Anaesthesiology

**Dr.R.Mala**

M.D.D.A.,Assistant Professor,Institute of Anaesthesiology and Critical care,Madras Medical College, Chennai – 3

**Dr. G. Suresh Kumar**

M.D., Anaesthesiology, Chennai – 3

### ABSTRACT

Thoracic Epidural blockade is compared with thoracic paravertebral blockade with 0.25%Bupivacaine in patients undergoing thoracotomy for surgical procedures like closed mitral commissurotomy for mitral stenosis, resection of lung segment, pneumonectomy, surgical repair of oesophageal perforation etc. Post thoracotomy pain is of very severe nature which when not relieved could lead to postoperative pulmonary complications. Post thoracotomy analgesia provided by thoracic epidural block and thoracic paravertebral block is comparable but there is more incidence of hypotension in thoracic epidural blockade because of bilateral sympathetic blockade when compared to thoracic paravertebral blockade.

### KEYWORDS

Epidural blockade, Paravertebral Blockade,0.25% Bupivacaine, Analgesia, Hypotension.

### INTRODUCTION

Inadequate pain management in thoracotomy leads not only to discomfort but can lead to reduction of respiratory effort ,impairment of lung function and ultimately resulting in atelectasis and hypoxemia. It is a muscle splitting incision. Suboptimal pain management leads to reflex contraction of respiratory muscles, diaphragmatic dysfunction, decreased FRC, atelectasis, shunting and hypoxemia.Painful deep inspiatory effort before a forceful exhalation leads to ineffective cough, retention of secretions, airway closure, atelectasis which complicate into pneumonia.Good postoperative thoracotomy pain relief is important for chest physiotherapy, good expectoration and early ambulation.

Regional techniques of analgesia are advantageous because early ambulation is possible in them with less sedation.

Epidural blockade is one among this. It is unique because of its segmental nature of blockade.More extensive block result in profound sympathetic blockade and its effects on cardiovascular system.Cardiac sympathetic fibres arise from T1 to T4 and when these are blocked, severe hypotension results from decrease in cardiac contractility and bradycardia. Blockade of sympathetic fibres from T5 to L1 results in loss of vasomotor tone and consequent venodilation with venous pooling of blood and hypotension.

Contraindications to epidural blockade are patient refusal, coagulopathy, therapeutic anticoagulation, skin infection at the injection site, raised ICT, hypovolemia etc..Relative contraindications are uncooperative patients, preexisting neurological disorder, fixed cardiac output state,vertebral anomalies.

In Paravertebral Block , local anaesthetic is injected alongside the vertebral column near the emergence of spinal nerves producing unilateral somatic and sympathetic nerve blockade resulting in a unilateral epidural anaesthesia. Different levels can be used to obtain a band like unilateral segmental block at the desired levels without producing significant changes in haemodynamics.Here somatic block is associated with a unilateral sympathetic blockade by the distribution of the drug to the contiguous paravertebral levels above and below, intercostals space laterally and epidural space medially. Hypotension, pain at skin puncture site, inadvertent vascular puncture, pneumothorax are expected complications.Contraindications to this technique are patient refusal, local sepsis,tumour in paravertebral space etc.

The technical advantages of this technique over epidural technique are that it is easy to perform, availability of multiple techniques and space locations and catheter placements and its better safety over epidural block.Advantage with the consideration of patient factors are that it does not cause as much hypotension as thoracic epidural blockade and there is no risk of spinal haematoma.

### MATERIALS AND METHODS

This is a prospective randomized, controlled trial to compare the postoperative analgesia and side effects of thoracic epidural block and thoracic paravertebral block in adult patients undergoing surgeries involving thoracotomy.

**Study sample:** 50 ASA II and III patients undergoing elective thoracic surgeries involving thoracotomy under general anaesthesia.

**Period of study:** 2011-2012.

**Age of the patients:** 18-60 years weighing 35-65 kgs and height ranging from 145-168 cms. All the patients were thoroughly examined preoperatively.Informed written consent was obtained after the procedure was explained. For all patients age, weight and height were noted. Airway assessment was done.

**Exclusion criteria:** Patients with coagulation disorders neurological and mental illness, deformity of spinal column, patients with allergy to local anaesthetics. Visual Analogue Scale was explained to the patients.The patients were shown a 10cm long scale marked 0-10 on a blank paper and told that 0 represented "no pain" and 10 represented worst possible pain.

The materials used were 16G, 9 cm Tuohy needle with Hueber's tip, 18G epidural catheter, filter, Loss of resistance syringe- 5ml syringe,local anaesthetic preparation of 1.5% lignocaine with 1 in 2 lakh adrenaline, sterile drapes and Visual Analogue Scale. Each patient was randomly allocated into one of the two groups.

Effective concentrations of bupivacaine that would optimize post thoracotomy pain and minimize side effects were found to be 0.125% and 0.375%. So we used 0.25% Bupivacaine in this study.

**Group A:** Twenty-five patients in this group received 8 ml of 0.25% Bupivacaine as thoracic epidural block after the completion of the surgical procedure.

**Group B:** Twenty-five patients in this group received 8 ml of 0.25% Bupivacaine as paravertebral block after the completion of the surgical procedure.

Patient's heart rate, Blood pressure at the end of the surgical procedure were recorded as the baseline parameters for the subsequent haemodynamic measurements.

Visual Analogue Scale scoring was recorded 20 minutes after giving the local anaesthetic solution or after extubation, whichever was later. Hypotension was defined as 30% fall in the mean arterial pressure from baseline pressure. Procedure was considered a failure if there was unsatisfactory postoperative analgesia with a VAS Score greater than 4

at the first assessment at 20 minutes after giving the block or after extubation, whichever was later. These patients were given intravenous pentazocine 0.6mg/kg to relieve their pain and excluded from the study. In the postoperative period, blood pressure, pulse rate and respiratory rate were noted every 10 min for the initial one hour of the blockade; subsequently every half hourly for the next two hours and hourly for the next 3 hours.

The time from the injection of bupivacaine till VAS reached 0 was noted in minutes. Complete analgesia was defined as a VAS score not more than 0 and effective analgesia was defined as VAS score ranging from 0 to 4. All patients were given Inj Pentazocine 0.6 mgm/kg through an intravenous route as soon as the VAS score exceeded 4. Other complications like local anaesthetic toxicity were also noted. Hypotension was managed with I.V. fluids and incremental doses of Inj. Ephedrine 6 mg. Bradycardia was defined as fall in heart <55/min and was managed with Inj Atropine 0.6mg.

Results were expressed as mean and standard deviation. All statistical analysis were carried out using SPSS for windows version 15.0. The t-test was used in comparison of quantitative variants. Qualitative variants were compared using the chi-squared test or fisher's exact test. A 'p' value of less than 0.05 was considered statistically significant.

**OBSERVATION AND ANALYSIS**

In group A, the mean time to reach pain score of 0 by VAS is 43.04 minutes compared 42.61 minutes in group B. this data is not statistically significant by students t-test. This signifies that the time required for the onset of block (analgesia) is almost the same for thoracic epidural block and thoracic paravertebral block.

In group A, the duration of complete analgesia is 56.04 minutes compared to 59.96 minutes in group B. This data is not statistically significant.

In group A the mean duration of effective analgesia is 149.54 minutes compared to 154.48 minutes in group B. This data is not statistically significant. These signify that the duration of the block and the duration of analgesia provided by both thoracic epidural block and thoracic paravertebral block are almost similar.

**SYSTOLIC BLOOD PRESSURE**

The difference in mean systolic pressure between the two groups at 20min, 30min, and 40min after giving the block was statistically significant. Hence there is a significant decrease in systolic blood pressure with epidural block when compared to paravertebral block. Maximal decrease in systolic blood pressure was observed 30 min after the block. (Table – 1).

**TABLE-1 SYSTOLIC BLOOD PRESSURE**

	Group	N	Mean	S.D	P.value
Baseline SBP	A	24	121.8	9.563	0.307
	B	23	118.7	10.656	Not significant
10 min	A	24	119.8	10.444	0.699
	B	23	118.7	9.512	Not significant
20 min	A	24	<b>109.8</b>	<b>9.532</b>	<b>0.027</b>
	B	23	<b>115.5</b>	<b>9.807</b>	<b>significant</b>
30 min	A	24	<b>99.75</b>	<b>10.88</b>	<b>0.001</b>
	B	23	<b>111.2</b>	<b>10.996</b>	<b>significant</b>
40 min	A	24	<b>103.0</b>	<b>8.196</b>	<b>0.004</b>
	B	23	<b>111.3</b>	<b>10.66</b>	<b>significant</b>
50 min	A	24	109.0	9.160	0.102
	B	23	113.3	8.477	Not significant
60 min	A	24	113.9.11	8.164	0.333
	B	23	6.2	7.645	Not significant
90 min	A	24	117.4	8.241	0.315
	B	23	119.9	8.323	Not significant
120 min	A	24	118.4	6.858	0.143
	B	23	121.3	6.834	Not significant
150min	A	24	119.8	7.516	0.187
	B	23	122.9	8.251	Not significant
3HR	A	24	121.5	7.144	0.306
	B	23	123.7	7.411	Not significant
4HR	A	24	121.5	7.896	0.674
	B	23	122.6	8.680	Not significant

5HR	A	24	122.0	7.945	0.776
	B	23	122.7	7.747	Not significant
6HR	A	24	122.0	7.729	0.465
	B	23	123.7	8.826	not significant

**DIASTOLIC BLOOD PRESSURE**

The difference in mean diastolic pressure between the two groups at 20min, 30min, and 40min after giving the block was statistically significant. Hence there is a significant decrease in diastolic blood pressure with epidural block when compared to paravertebral block. Maximal decrease in diastolic blood pressure was observed 30 min after the block. (Table – 2).

**MEAN ARTERIAL PRESSURE**

The difference in mean arterial pressure between the two groups at 20min, 30min, and 40min after giving the block was statistically significant. Hence there is a significant decrease in mean arterial pressure with epidural block when compared to paravertebral block. Maximal decrease in mean arterial pressure was observed 30min after the block. (Table – 3).

Systolic, diastolic and mean arterial pressure measured at 10,20,30,40,50,60 minutes after injection of the drug showed a statistically significant reduction in both the groups. Group A showed a maximum reduction in systolic, diastolic and mean arterial pressure at about 30 minutes after the injection of the local anaesthetic.

After 60 minutes of injection of the drug, there was no statistically significant change in the blood pressure between the two groups.

**CONCLUSION**

This study concludes that both thoracic epidural block and thoracic paravertebral block provide comparable postoperative analgesia in patients undergoing elective surgeries involving thoracotomy, but the haemodynamic stability was better maintained in thoracic paravertebral block when compared to thoracic epidural block.

**TABLE-2 DIASTOLIC BLOOD PRESSURE**

	Group	N	Mean	S.D	P.value
Baseline DBP	A	24	80.75	8.420	0.160
	B	23	77.48	7.191	Not significant
10 min	A	24	79.33	7.976	0.180
	B	23	76.43	6.508	Not significant
20 min	A	24	<b>70.67</b>	<b>6.876</b>	<b>0.044</b>
	B	23	<b>74.78</b>	<b>6.721</b>	<b>significant</b>
30 min	A	24	<b>62.67</b>	<b>8.761</b>	<b>0.001</b>
	B	23	<b>72.22</b>	<b>7.880</b>	<b>significant</b>
40 min	A	24	<b>65.42</b>	<b>5.641</b>	<b>0.002</b>
	B	23	<b>71.96</b>	<b>7.486</b>	<b>significant</b>
50 min	A	24	70.50	6.666	0.117
	B	23	73.26	5.011	Not significant
60 min	A	24	74.13	6.188	0.475
	B	23	75.30	4.931	Not significant
90 min	A	24	77.00	5.641	0.284
	B	23	78.65	4.735	Not significant
120 min	A	24	78.21	5.595	0.432
	B	23	79.35	4.097	Not significant
150min	A	24	79.33	6.120	0.245
	B	23	81.22	4.709	Not significant
3HR	A	24	80.46	6.234	0.288
	B	23	82.09	3.813	Not significant
4HR	A	24	80.67	5.866	0.861
	B	23	80.96	5.389	Not significant
5HR	A	24	80.46	7.065	0.722
	B	23	79.83	4.745	Not significant
6HR	A	24	80.71	6.040	0.720
	B	23	81.30	5.252	not significant

**TABLE-3 MEAN ARTERIAL PRESSURE**

	Group	N	Mean	S.D	P.value
Baseline MAP	A	24	94.44	8.747	0.160
	B	23	91.25	8.284	Not significant
10 min	A	24	92.85	8.653	0.180
	B	23	90.54	7.299	Not significant

20 min	A	24	83.47	7.501	0.032
	B	23	88.36	7.619	significant
30 min	A	24	75.03	9.325	0.001
	B	23	85.22	8.770	significant
40 min	A	24	77.96	6.185	0.002
	B	23	85.09	8.374	significant
50 min	A	24	83.33	7.176	0.097
	B	23	86.61	5.978	Not significant
60 min	A	24	87.10	6.668	0.400
	B	23	88.94	5.683	Not significant
90 min	A	24	90.49	6.404	0.284
	B	23	92.41	5.725	Not significant
120 min	A	24	91.61	5.910	0.270
	B	23	93.36	4.752	Not significant
150 min	A	24	92.83	6.481	0.210
	B	23	95.12	5.778	Not significant
3HR	A	24	94.15	6.472	0.287
	B	23	95.97	4.959	Not significant
4HR	A	24	94.31	6.433	0.775
	B	23	94.84	6.323	Not significant
5HR	A	24	94.33	7.303	0.915
	B	23	94.13	5.524	Not significant
6HR	A	24	94.47	6.487	0.596
	B	23	95.46	6.238	not significant

28. Lonnqvist . A . et al , -Paravertebral blockade- failure rate and complications – Anaesthesia 1995; 50: 813-815.

## REFERENCES:

- Prithvi raj; text book of regional anaesthesia and acute pain management McGraw Hill.
- Richardson J, Lonnquist PA. Thoracic paravertebral block. Br J Anaesthesia 1998; 81:230-8.
- Entering the paravertebral space age again?. Editorial. Lonnquist P.A. Acta Anaesthesiol Scand 2001; 45:1-3.
- Eason MJ, Wyatt R: Paravertebral thoracic block- a reappraisal Anaesthesia 1979; 34: 638-42.
- Sabanathan S, Eng J, Means AJ. Alterations in expiratory mechanics following thoracotomy. J.R. Coll.Surg. Edinb 1990; 35: 144-50.
- Koehler RP, Keenan RJ. Management of post-thoracotomy pain: acute and chronic. Thoracic Surg Clin 2006; 16: 287-97.
- Otton P, Wilson E: The cardiocirculatory effects of upper thoracic S epidural analgesia. Can Anaesth Soc J 1966; 13: 541.
- Richardson J. Paravertebral anaesthesia and analgesia. Can J Anaesth 2004; 51:R1-6.
- A Naidoo Thoracic Paravertebral block – September 2008.
- Richardson J, Jones J, Atkinson R. The effect of thoracic paravertebral blockade on intercostalsomatosensory evoked potentials. Anaesth Analg 1998; 87: 373-6.
- Stoelting Pharmacology and physiology in anaesthesia practice
- Quality improvement guidelines for the treatment of acute pain and cancer pain. American pain society quality of care committee. JAMA 1995; 274: 1874-80.
- Vogt A, Stieger DS, Theurillat C, Curatolo M. Single-injection thoracic paravertebral block for postoperative pain treatment after thoracoscopic surgery. Br J Anaesth. 2005 Dec; 95(6) : Epub 2005 Sep 30.
- Manoj K, Karmakar, MD, Lester A.H, Critchley, MD, Anthony M – H. Ho, FCCP, Tony Gin, MD, Tak Wai Lee, MBBS and Anthony P.C. Yim, Continous Thoracic Paravertebral Infusion of Bupivacaine for Pain Management in patients with Multiple Fractured Ribs doi:10.1378/chest.123. 2.424 CHEST February 2003vol 123 no.2 424-431.
- Azad SC, Groh J, Beyer A, Schneck D, Dreher E, Peter K. Continous peridural analgesia vspat controlled intravenous analgesia for pain therapy after thoracotomy. Anaesthetist. 2000 Jan; 49(1) :9-17.
- Mehta Y, Arora D, Sharma KK, Mishra Y, Wasir H, Trehan N. Comparison of continous thoracic epidural and paravertebral block for postoperative analgesia after robotic-assisted coronary artery bypass surgery. Ann Card Anaesth 2008 Jul-Dec; 11(2):91-6.
- Dhole S, Mehta Y, Saxena H, Juneja R, Trehan N. Comparison of continuous thoracic epidural and paravertebral blocks for postoperative analgesia after minimally invasive direct coronary artery bypass surgery. J Cardiothorac Vas Anaesth . 2001 Jun; 15(3) :288-92.
- Casati A, Alessandrini P, Nuzz M, Tosi M, Iotti E, Ampolloni L, Bobbio A, Rpossini E, Fanelli G. A prospective , randomized , blinded comparison between continuous thoracic paravertebral and epidural infusion of 0.2% ropivacaine after lung resection surgery. Eur J Anaesthesiolo. 2006 Dec; 23(12): 999-1004. Epub 2006 Jul 7.
- Richardson J, Sabanathan S, Jones J, Shah RD, Cheema S, Mearns AJ. A prospective, randomized comparison of preoperative and continuous balanced epidural of paravertebral bupivacaine on post-thoracotomy pain, pulmonary function and stress responses. Br J Anaesth. 1999, Sep; 83(3):387-92.
- Joshi GP, Bonnet F, Shah R, Wilkinson RC, Camu F, Fischer B, Neugrebauer EA, Rawal N, Schug SA, Simanski C, Kehlet H. A systematic review of randomized trials evaluating regional techniques for post thoracotomy analgesia. Anaesth Analg. 2008 Sep; 107(3): 1026-40.
- Davies RG, Myles PS, Graham JM. A comparison of the analgesic efficacy and side effects of paravertebral vs epidural blockade for thoracotomy – a systematic review and meta analysis of randomized trials. Br J Anaesth. 2007 Nov; 99(5):768.
- T Santhosh Kumar, R. Rajendran. Comparison of Thoracic Epidural Versus Thoracic Paravertebral Block for post thoracotomy pain relief. Indian J Anaesthesia 2003 ; 47-(4).
- Ross R.A. et al – Post operative pain prevention by continous epidural infusion – Anaesthesia 1980; 35: 663-668.
- Conacher I.D. et al., Epidural Analgesia in post-thoracotomy patients: comparison of continuous paravertebral and extradural infusions of Bupivacaine for pain relief after thoracotomy. Br J Anaesth 1989; 62: 204-205.
- M.Mukherjee, A.Goswami Analgesia in post-thoracotomy patients ;comparison between thoracic epidural and thoracic paravertebral blocks. Anaesth Essays Res 2010, 4;2:75-80.
- Mathews P.J. et al , -Comparison of continuous paravertebral and extradural infusions of Bupivacaine for pain relief after thoracotomy. Br J Anaesth 1989; 62: 204-205.
- Pertunen, K, Nilson, E, Heinonen, J, Hirivisala, E.L., Salao J.A., and Kalso, E. – Extradural, paravertebral and intercostals nerve blocks for post-thoracotomy pain. Br J Anaesth 1995; 75:541-547.