



# THORACIC EPIDURAL ANALGESIA; OPTIMAL TECHNIQUE FOR POSTOPERATIVE PAIN RELIEF IN THORACOTOMY PATIENTS

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## INTRODUCTION

Thoracotomy is a major surgical procedure indicated for the management of chest wall tumors, bronchogenic carcinoma, empyema thoracic, bullous lung disease, blunt or penetrating chest trauma and oesophageal diseases to name a few.<sup>1</sup> It is considered to be among most painful surgeries and requires optimal pain relief post operatively. Breathing movements increases the post thoracotomy pain. To promote coughing, deep breathing and early mobilization after thoracotomy it is important to keep patient pain free.<sup>2</sup> Many different methods of pain management can be used based on individual patient characteristics including thoracic epidural analgesia, intercostal nerve block, paravertebral block, IV narcotics, intrathecal and or NSAIDS<sup>3</sup> This study was conducted to determine if thoracic epidural analgesia with bupivacaine is better than

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**ABSTRACT... Objectives:** The aim of this study is to determine whether thoracic epidural analgesia with bupivacaine is better than intravenous narcotic analgesia for pain relief in thoracotomy patients. **Study design:** Prospective randomized study. **Setting:** Department of Thoracic Surgery, Ojha Institute of Chest Diseases and Dow University of Health Sciences. **Period:** May 2014- Nov 2015. **Methods:** 144 patients were allocated randomly into 2 Groups. Group A received thoracic epidural analgesia with bupivacaine and Group B received intravenous narcotic analgesia with tramadol. Pain was monitored in both groups using the VAS pain scale every hour for the first 6 hours and then at 20, 24, 30, and 48 hours postoperatively. **Results:** It was observed that Group A patients experienced less pain at rest, coughing and on movements as compared to patients in Group B throughout the monitoring from first hour to 48 hours postoperatively. There was no significant difference between the groups in respiratory rate, O<sub>2</sub> saturation, adverse effects and performance status on day one and day two postoperatively. The mean hospital stay after operation was 7 days in both groups. **Conclusions:** Optimal pain relief after thoracotomy improves patient recovery and satisfaction. We determined that thoracic epidural analgesia with bupivacaine is better than intravenous narcotic analgesia for pain relief in thoracotomy patients.

**Key words:** Epidural analgesia, post thoracotomy pain, post- operative analgesia, regional analgesia, bupivacaine

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intravenous tramadol for post thoracotomy pain relief.

## METHODOLOGY

144 patients, between the ages of 14 and 70 years, whether male or female, who were undergoing elective posterolateral thoracotomy with ASA I-III were included in the study. After informed written consent, patients were allocated alternatively into 2 separate groups. Group A included patients who received thoracic epidural analgesia with Bupivacaine and Group B included those patients who received intravenous opioid analgesia with Tramadol. Patients who had known renal, hepatic or cardiac disease or allergy to Bupivacaine or Tramadol were excluded from the study.

Before General Anesthesia, an epidural catheter was inserted at the level between 5th and 8th

thoracic spine in all Group A patients. Standard anesthesia was administered; patients received Nalbuphine 0.06 mg/kg at induction and thereafter no additional opioids were given. Anesthesia was maintained with 50% nitrous oxide and 1-3 % Isoflorane in O<sub>2</sub> and all the patients received one lung anesthesia.

For post-operative pain relief, patients were given analgesics according to allocated group. A bolus dose of 0.25% Bupivacaine was given to Group A patients preoperatively before closing the wound. Immediately postoperatively in recovery room patient was given 0.25% Bupivacaine as a continuous infusion for next 48 hours via an infusion pump.

Dose of Bupivacaine was adjusted according to the height of the patient.

150 -160 cm-----8ml bolus and 4ml/hour continuous infusion

161 -180 cm-----10ml bolus and 6ml/hour continuous infusion

>181 cm -----12 ml bolus and 8ml/hour continuous infusion

A bolus dose of 100mg IV Tramadol was given to Group B patients preoperatively before closing the wound. Immediately postoperatively in recovery room patient was given 400mg Tramadol as a continuous infusion for next 48 hours via an infusion pump.

Patients were monitored every hour for the first 6 hours and then at 20, 24, 30, and 48 hours postoperatively. They were asked to assess the

intensity of pain at rest, when coughing and on movement using a visual analogue scale/pain rating scale (VAS). Adverse effects of both drugs were assessed on the 1st and 2nd post-operative day specially hypotension, headache, nausea, vomiting, dizziness, drowsiness, respiratory depression and/or any allergic reactions. Every patient was catheterized at the start of surgery to measure the urine output per and post operatively. All patients were given intravenous fluids until the first postoperative morning. During and after surgery blood loss was measured and any loss more than 500 ml was replaced by blood. O<sub>2</sub> saturation was monitored continuously by pulse oximetry, until the morning of 5<sup>th</sup> postoperative day

## RESULTS

Out of 144 patients, 137 completed the study; 7 patients who were withdrawn from study included 3 patients in which epidural catheterization were unsuccessful, 1 patient who developed persistent hypotension, 2 patients developed severe nausea and vomiting with tramadol while 1 patient refused epidural due to severe headache. Both the groups were comparable for patient's data (Table-I and Figure-1). There were 67 patients in Group A including 36 males and 31 females and 70 patients in Group B including 37 males and 33 females. The mean age of patients was 37-39 in both groups. Most common procedure performed in Group A patients was decortication, excision of hydatid cyst or mediastinal tumor removal. In Group B, the most common procedures were decortication, lobectomy or mediastinal tumor excision.

	Group A(epidural bupivacaine)	Group B(Intravenous tramadol infusion)
No of patients	67	70
Age in years	23-70 ( mean 37)	25-69 (mean 39)
Sex	36M/31F	37M/33F
Height in cms	146-185 (mean 153)	148-189 (mean 156)
Weight in kgs	42-90kg (mean 56)	46-93kg (mean 54)
ASA class I,II,III	17/39/11	19/41/10
Duration of anesthesia in min	130-300 min ( mean 210)	120-240 min ( mean 205)
Duration of surgery in min	110-280 min ( mean 180)	100-220 min ( mean 162)
Side of operation Right/left	43/24	47/23
Post-operative hospital stay	05-12 days(mean 6.5)	05-13 days(Mean 7 )

Table-I. Patient's characteristics and operation data

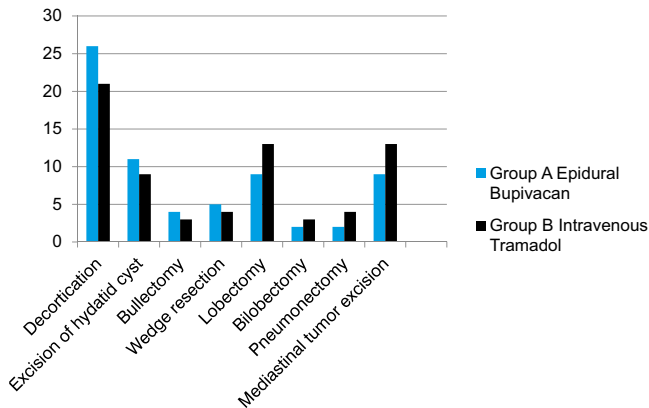


Figure-1. Surgical procedures performed in group A and group B

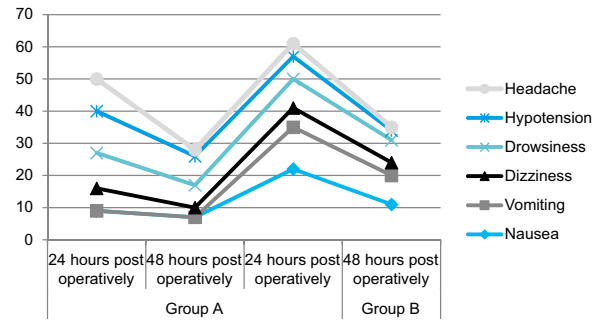


Figure-2. Frequency of adverse effects at 24 and 48 hours post-operatively

At rest, coughing and on movements, it was observed that the patients in group A (epidural bupivacaine) experienced less pain (lower visual analogue score/pain rating scale) as compared to group B (Intravenous tramadol infusion) throughout the monitoring from first hour to 48 hours postoperatively. (Table-II). There was no significant difference between the groups in respiratory rate, O2 saturation, adverse effects and performance status on day one and day two postoperatively (figure-2). The mean hospital stay after operation was 7 days in both groups.

	Time in hours											
	1	2	3	4	5	6	20	24	30	48		
VAS% at Rest												
Group A	7-8	6-8	6-5	6-5	5-4	4-3	4-3	2-1	0-1	0-1		
Group B	8-9	8-9	7-8	6-7	6-7	5-4	5-4	4-3	4-3	2-1		
VAS% at Coughing												
Group A	8-9	7-8	7-6	7-6	6-5	5-4	4-3	4-3	3-2	2-1		
Group B	8-9	8-9	7-8	7-8	7-8	6-5	6-5	5-4	5-4	3-2		
VAS% at Movement												
Group A	8-9	8-9	7-6	7-6	6-5	5-4	4-3	4-3	3-2	2-1		
Group B	8-9	8-9	7-8	7-8	7-8	6-5	6-5	5-4	4-5	3-2		

Table-II. Visual analogue scale VAS/Pain rating scale for pain intensity of group A (epidural bupivacaine) and Group B (Intravenous tramadol infusion)

DISCUSSION

Thoracotomy is required in patients having thoracic surgical diseases.<sup>1</sup> Post thoracotomy pain can be severe and cause delayed recovery, longer hospital stays, stasis of secretions, and lung atelectasis. It has also been shown to reduce patient satisfaction. Earlier studies demonstrated that up to 50% of the patients reported post-operative residual pain after 12 months of operation and 25% of patients experienced some form of pain even 4 years post operatively.<sup>4</sup> Effective pain relief after surgery reduces morbidity, improve outcome and hasten postoperative recovery.

Many different methods have been devised in an attempt to provide optimal analgesia and relieve post thoracotomy pain. Some of these include thoracic epidural analgesia, intercostal nerve block, paravertebral nerve block, intrathecal and or intravenous opioid analgesia.<sup>5</sup> Every method has its own merits and limitations. Intercostal nerve block with bupivacaine injected between injected in the intercostal space near the upper border of lower rib but this technique has limited effectiveness. Intercostal nerve blocks are relatively easier to perform but the anesthetic effect is short lived. Multiple catheters maybe needed to achieve optimal pain relief, hence this technique is not popular.<sup>5</sup> Paravertebral block with bupivacaine may be given as infusion by a catheter or as a single dose. Sabanathan et al demonstrated in his study that paravertebral block was superior to other methods of pain relief

in post thoracotomy patients.<sup>6</sup>

The “gold standard” treatment for pain after major thoracic surgery is epidural analgesia and is used at thoracic surgery centres of many hospitals worldwide. A survey conducted at Australian hospitals on post thoracotomy analgesic techniques showed that 79% of patients preferred thoracic epidural blockade.<sup>7</sup> Senturk et al conducted a study to compare the effects of preoperative and postoperative thoracic epidural analgesia and intravenous opioid patient controlled analgesia on thoracotomy pain and concluded that thoracic epidural analgesia was associated with a decrease in both acute and chronic pain.<sup>8</sup> This is similar to the results of our study where we concluded that thoracic epidural analgesia improves pain outcome.<sup>8</sup>

In a study by Gottschalk, they reported that women patients reported pain more frequently than their male counterparts.<sup>4</sup> We did not observe any such finding in our study and both genders reported the incidence of pain and its severity similarly.

In our study, patients in Group B received Intravenous analgesia with tramadol. Historically, the intravenous route has been the most commonly used because it is the cheapest, easiest and most comfortable for patients.<sup>9</sup> Although intravenous opioid infusions can control post-thoracotomy pain density, they have certain unavoidable side effects which makes this technique less desirable when compared to other safer techniques. Common side effects include nausea, vomiting, sweating, dizziness, tiredness, other undesirable common side effects after thoracotomy decrease cough reflex and respiratory depression. Another problem with opioid analgesia, specially patient controlled analgesia is the lack of effectiveness immediately after thoracotomy may not able to use device properly as they are drowsy.<sup>9</sup>

Despite its advantages, epidural analgesia is not entirely a safe procedure. The complications of epidural catheterization are neurological injury, paraplegia and dural puncture. Epidural

analgesia management mostly require ICU or high dependency unit care. Sometimes epidural catheterization fails due to poor technique or difficult spinal anatomy and in cases of coagulopathy, local sepsis, neurological disorders and deformed thoracic spine anatomy it is contraindicated.<sup>11,12</sup>

## CONCLUSION

Optimal pain relief after thoracotomy improves patient recovery and satisfaction. Several techniques have been devised to adequately manage post thoracotomy pain and the choice of method depends on the patient’s preference and other factors. In our study, we determined that thoracic epidural analgesia with bupivacaine is better than intravenous narcotic analgesia for pain relief in thoracotomy patients and it also decreases length of hospital stay and led to improved patient outcome

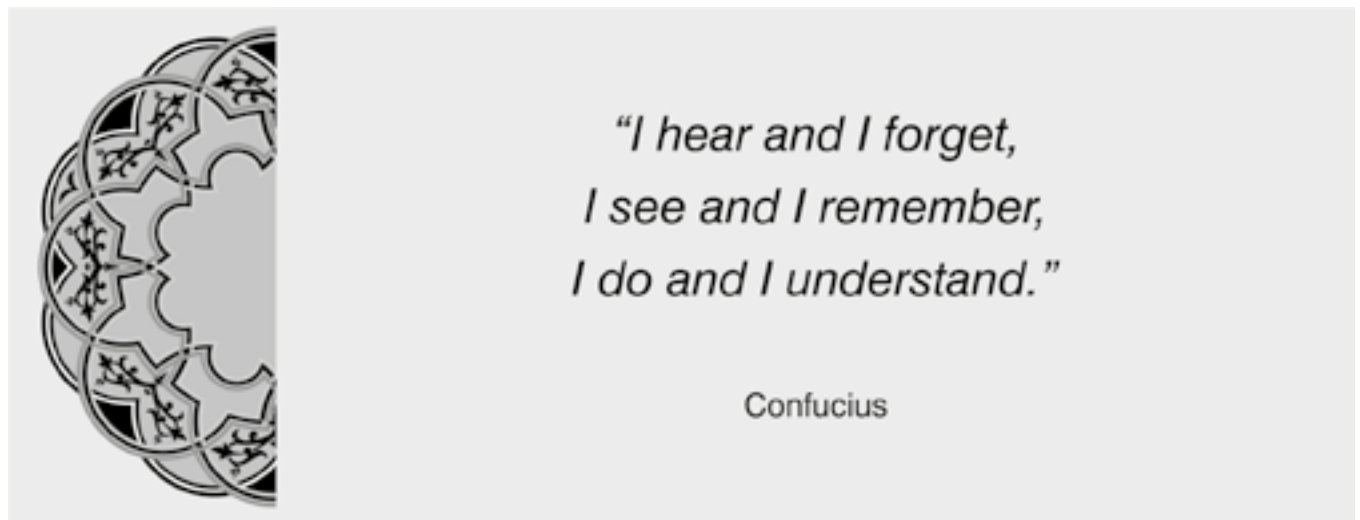
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**AUTHORSHIP AND CONTRIBUTION DECLARATION**

Sr. #	Author-s Full Name	Contribution to the paper	Author=s Signature
1	Dr. Niaz Hussain Soomro	Conception and design, Critical revision of the article for important intellectual content	
2	Dr. Hamid Mehmood	Revision of manuscript, Statistical expertise.	
3	Dr. M. Aleemuddin	Data collection	
4	Dr. Aneeqa Ahsan Zafar	Drafting of manuscript	
5	Dr. Sadaf Siddiqui	Method selection and questionnaire.	