Original Research Article

Indian Journal of Anesthesia and Analgesia
Volume 7 Number 5, September – October 2020
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.7520.33

Thoracic Epidural Anaesthesia for Upper Abdominal Surgery

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How to cite this article:
Chandrashekar E. Thoracic Epidural Anesthesia for Upper Abdominal Surgery. Indian J Anesth Analg. 2020;7(5):1101–1105.

Abstract

Background: Thoracic epidural anaesthesia (TEA) has many benefits over general anaesthesia in major abdominal surgeries including avoidance of endo tracheal intubation.

Aims: To evaluate the feasibility of TEA for various upper abdominal surgeries using 0.5% bupivacaine.

Patients and Methods: This was a clinical study of 50 selected patients undergoing elective upper abdominal surgery under TEA conducted at hospitals attached to JJM Medical college Davangere for a period of 3 years. All thoracic epidural anaesthesia was performed under aseptic conditions at T 8/9 interspinous space using a size 18G Tuohy needle and catheter inserted at appropriate level. A test dose of 3 ml 2% lignocaine with adrenaline was used in all patients ,after which a single dose of 10 ml 0.5% bupivacaine was injected steadly at a rate 0.5 ml per sec.

The operative conditions was assessed on basis of sedation and analgesia requirement, as well as response to mesentric traction. Surgeons opinion with regard to muscle relaxation was taken. The pulse rate, blood pressure and oxygen saturation were monitored throughout the procedure and recorded. Information obtained included age, gender, ASA status, diagnosis and type of surgery performed. Data analysis was performed under guidance of statician.

Results: 50 patients under went major abdominal surgeries. The mean age was 35.3 +_ 9.4 yrs (20-50), with male to female ratio of 1:1. Onset of analgesia was of 17.4 +_2.1 min (15-22), 88% of patients had Grade 1 analgesia, 68% of patients had good muscle relaxation, hemodynamic changes was significant with 6 patients having bradycardia and was treated with Ing atropine.

Conclusion: Thoracic epidural anaesthesia for upper abdominal surgeries provide good analgesia and muscle relaxation with minimal amount of drug used . Hemodynamic changes are significant. Post operative complications were minimal and was managed satisfactorily.

Keywords: Thoracic epidural; Abdominal surgeries.

Introduction

Major abdominal surgeries induces profound physiological changes in the perioperative period characterized by increase in sympathoadrenal and other neuroendocrine activity and also increased cytokine production. As epidural anaesthesia 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 has been suggested that conducting surgery under epidural anaesthesia may reduce perioperative morbidity and mortality compared with general anaesthesia.[1]

Dawkins and Steal reported that ideal conditions for upper abdominal surgery can be obtained by instilling the local anaesthetic agents into epidural

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space at midpoint of nerve supply to the site of operation.[2]

Although lumbar spinal and epidural blockade are often preferred by the anaesthetist, primarily because of technically less difficult needle placement and decreased possibility of dural puncture and neural injury, thoracic epidural anaesthesia provides selective blockade of surgical site, with diminished requirement of local anaesthetic and opioid requirement. In addition thoracic epidural anaesthesia provides pain relief and sympatholysis of such magnitude that allow patient to cough, breath deeply, drink and mobilize which can contribute to enhanced post operative outcomes such as improved respiratory function, reduction in ileus and protein sparing.[3]

This clinical study is therefore undertaken to evaluate the usefulness of employing thoracic epidural anaesthesia for various upper abdominal surgeries using 0.5% bupivacaine.

Patients and Methods

This clinical study was conducted in Department of Anaesthesiology in association with Department of Surgery at Chigateri Hospital and Bapuji Hospital attached to JJM Medical college Davangere for a period of 3 years. Clearance was obtained from hospital ethical committee and informed consent was obtained from all the patients. 50 patients coming for elective abdominal surgery were selected based on following inclusion criteria. ASA 1 and 2, Age group 20–50 yrs of either sex. Patients belonging to ASA 3 and 4, emergency surgeries, hemodynamically unstable patients and patients with coagulation defects were excluded.

All the cases were conducted in major O.T. Anaesthesia workstation, drugs, monitors, emergency resuscitation equipments were checked and kept ready before each case. Thoracic epidural anaesthesia was performed under aseptic conditions at T 8–9 level interspinous space using 18 G Tuohy needle and catheter was inserted as appropriate to surgical procedure. A test dose of 3 ml of lignocaine with adrenaline was used in all patients after which a loading dose of 10 ml 0.5 % bupivacaine was injected steadly at a rate of 0.5 ml per sec for all patients.

Pulse, blood pressure, ECG, respiratory rate and oxygen saturation was recorded before the start of the procedure and every 5 min, 10 min, 15 min, 30 min, 45 min and thereafter at an interval of 15 min till the patient was shifted out of recovery. If bradycardia occurred at anytime (<50 beats per min) then 0.6mg of injection atropine was given.If hypotension occurred then it was treated appropriately with intravenous fluids and vasopressors (mephenteramine 5mg increments). Following parameters were monitored.

1. Time of onset of analgesia in min.
2. Quality of analgesia.
3. Assesment of motor blockade.
4. Duration of analgesia.
5. Intra operative complications.
6. Post operative complications.

Quality of analgesia and motor blockade were measured using grades as depicted in the Table 1. Thoracic epidural was considered inadequate or failed if patient was uncomfortable during surgical manipulation warranting deep sedation and/or conversion to general anaesthesia. Data analysis was done under the guidance of statistician.

Table 1: Grading for quality of analgesia and motor blockade

Quality of analgesia:	
Grade 1:	Analgesia was complete and sedatives were Administered only to relieve apprehension.
Grade 2:	Analgesia was inadequate or patchy and supplementation Was needed with narcotics or ketamine or N2O /halothane.
Grade 3:	Analgesia was very poor and the technique was changed Over to general anaesthesia.
Assesment of motor blockade RAM Test	
100% power	Able to rise from supine to sitting position with hands Behind head.
80% power	can sit only with arms extended.
60% power	can lift only head and scapulae off bed.
40% power	can lift only shoulders off bed.
20% power	An increase in abdominal muscle tension can be felt During effort. no other response.

Results

Thoracic epidural anaesthesia was performed on 50 patients coming for major abdominal surgeries. The mean age was 35.3 +_9.4 yrs. There was equal distribution of males and females (1:1) Table 2. Majority of the surgeries performed were cholecystectomy (44%), GJ vagatomy (28%), epigastric hernia (16%), followed by hemicolectomy, hydatid cyst and pseudopancreatic cyst performed on 1 patient each (4%). Table 3.

The mean onset of sensory analgesia in our study was 17.4+_2.1 min with range 15–22 min. Most of the patient had sensory blockade from

Table 2: Demographic data and ASA

Category		Value
Age		
	Mean (years)	35.3
	Range	20 – 50
Gender		
	Male n(%)	25 (50)
	Female n(%)	25 (50)
Height (cm)		
	Male	170.6
	Female	159.3
ASA status n(%)		
	ASA 1	40(80%)
	ASA 2	10(20%)

Table 3: Types of surgical procedure

Surgical procedure	Frequency	Percentage
Cholecystectomy	22	44
Epigastric hernia	8	16
GJ vagotomy	14	28
Hemicolectomy	2	4
Hydatid cyst liver	2	4
Pseudopancreatic cyst	2	4

Table 4: Intraoperative profile of the patients

Category	Value
Onset of analgesia	17.4 +_2.1 min
Quaility of analgesia	
Grade 1	44(88%)
Grade 2	4(8%)
Grade 3	2(4%)
Degree of motor blockade	
Grade 1	35(70%)
Grade 2	13(26%)
Grade3	2(4%)
Intra operative complications	
Hypotension	10(20%)
Bradycardia	6(12%)
Shivering	5(10%)
Nausea and Vomiting	8(16%)
Post operative complications	
Backache	2(4%)
Nausea and Vomiting	4(8%)
PDPH	Nil
Neurological sequelae	Nil

T4–L1 segments. 88% of the patient had grade 1 analgesia, 8% grade 2 and 2 patients had grade 3 analgesia which were considered as failure and converted to general anaesthesia. Degree of motor blockade was assessed using RAM test and also surgeons opinion. In our study 68% of the patient had good muscle relaxation. Mean duration of analgesia was 127.2 +_9.5 min. Intra operative and post operative complications are represented in table 4. 10 patinents had hypotension which was managed with inj ephedrine 5mg intermitant bolus and 6 patients had bradycardia requiring one dose of atropine.

Discussion

Thoracic epidural anaesthesia though introduced 50 yrs ago is less preferred compared to lumbar epidural because of perceived technical difficulty, probability of dural puncture and neural injury and incidence of intra operative and post operative complications. So the present study of thoracic epidural anaesthesia for elective upper abdominal surgeries was under taken to evaluate the effectiveness of TEA with regard to onset of analgesia, level of blockade, quality and duration of sensory analgesia, degree of motor blockade, hemodynamic changes and intra operative and post operative complications. Similar studies have been conducted for both elective and emergency upper abdominal surgeries.[4,5]

Dawkins and Steal[2] have reported that ideal conditions for upper abdominal surgery can be obtained by injecting the local anaesthetic at the mid part of nerve supply to the abdominal wall. This corelates with the T8–9 interspace selected in our study. Here the spines are less angulated compared to mid thoracic level and mid line approach can be used with less technical difficulty.[6] Small volume of local anaesthetics are needed if center of block is close to operation site. Dose requirement for lumbar and mid thoracic differ by a ratio of 3:2, so a thoracic block will require 30% less drug than a lumbar block. Sakura and colleagues[7] have used 10 cc of 2% lignocaine to achieve a block upto T3 for upper abdominal surgery. In our study we have used 10 cc of 0.5% bupivacaine to obtain required analgesia.

Time of onset was noted as the interval between the drug injection to development of upper level of sensory block. In our study onset of analgesia had a range of 15–22 min with mean duration of 17.4+_2.1 min. Bromage[8] in his study found that average time required for complete spread of analgesia using 0.5% bupivacaine was 19 min. Morrison et al[9] during a study found mean onset time for bupivacaine was 18+_10 min . Thus onset of analgesia was comparable with similar studies done by other authors.

In our study 88% of patients had grade 1 analgesia where sedation was given only to relieve apprehension, 8% of patients had grade 2 analgesia where supplementation was given and 4% had

grade 3 analgesia and was converted to general anaesthesia. In a study conducted by Giebler RM[10] there was 0.7% incidence of failed block. Thus occurance of failed block are less and most of the patients have good analgesia during thoracic epidural anaesthesia.The degree of motor blockade was assessed by RAM test and by taking surgeons opinion during surjery. In our study 68% of the patients had good relaxation with RAM score of 20% power, other 32% of patients had poor muscle relaxation. Our study using RAM test correlates with surgeons opinion taken during the procedure where 70% of the patients had grade 1 relaxation and remaining 30% had grade 2 and 3 relaxation.

In our study a constant volume (10 cc) of 0.5% bupivacaine was injected at T8–9 interspace for all patients . The upper level of blockade had a range from T1–T6 with 62% of patients having block at T3–4 level. T he lower level of blockade had a range from T12–L2 with 80 % of cases having the block at T12 and L1 segments. Few cases where expected levels were not reached can be explained by factors influencing the level of blockade.[11] A total duration of 127.2+_9.8 min of analgesia was achieved in our study.

Though it is commonly held assumption that thoracic epidural catheterization is technically more difficult than lumbar,in our study the incidence of technical complication was less and comparable to the results done by Giebler RM.[10] Thus our data shows dural perforation (4%), bleeding (nil), difficulty in threading catheter (8%) occurs less frequently with thoracic epidural anaesthesia. Other intraoperative complications were hypotension (20%) and bradycardia (12%) which responded appropriately with inj ephedrine and inj atropine. This can be explained by higher level of block (upto T1) which occurred in these patients. Mac lean and colleagues[12] also found 15 – 20% fall in MAP during high thoracic block.In the presence of inhibition of cardiac sympathetic fibres, enhanced vagal tone like traction on bowel and decrease in central venous return can cause sudden onset of bradycardia and cardiac arrest. 10% of the patient had shivering as a result of due to sympathetectomy induced vasodilatation. In another study shivering like tremors was shown to occur in 30% of the patients with epidural anaesthesia.[13] These patients were treated with inj Tramadol. 16% of the patients had intraoperative nausea and vomiting and were managed with inj ondansetrone.

Post operative complications were minimal. In our study though 2 cases had dural puncture there was no incidence of PDPH. In a similar study done by Scherer R[14] despite 6 documented dural puncture in the thoracic region there was no incidence of PDPH. This can be explained by decrease in CSF pressure in thoracic region compared to lumbar region.There was no incidence of epidural hematoma , infection or neurological complication in our study. Giebler RM[10] in there study of 4185 patients undergoing thoracic epidural anaesthesia, 3.6% had neurological complication involving peripheral nerve palsy due to positioning, radicular pain during catheterization, however severe and permanent neurological complication was only 0.07%. De Leon Casosola and associates[15] have calculated a overall risk of 0.07% for thoracic epidural anaesthesia. Thus our study confirms the generally low overall incidence of neurological complications with thoracic epidural anaesthesia.

Conclusion

Relaxation with minimal amount of drug used. Hemodynamic changes are significant. Perioperative complications were minimal and was managed satisfactorily. None of the patients had respiratory or cardiac arrest. There were no incidence of post operative neurological complication. Thus we conclude that thoracic epidural anaesthesia is an excellent alternative technique for upper abdominal surgeries.

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