Comparison between thoracic epidural anaesthesia & general anaesthesia for open cholecystectomy in adult patients

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Abstract

Background & Objectives: This study was done to assess the feasibility of thoracic epidural anaesthesia in open cholecystectomy. Laproscopic cholecystectomy is the standard now a days but in developing countries open cholecystectomy is still commonly performed.

Methods: Our study was carried out on 60 adult, non-pregnant patients ASA grade I, II between 18 – 60 years of age for elective open cholecystectomy under thoracic epidural anaesthesia & general anaesthesia. Haemodynamic parameters(BP, heart rate), oxygenation were observed for 60 minutes. Sensory & motor blockade were observed in thoracic epidural group.

Results: In our study both group T and group G were statistically comparable in terms of their gender, mean age and mean weight**.** Base line pulse rate, SBP, DBP, MAP was comparable in both groups. However, there was significant statistical difference in the two groups in hemodynamic parameters in the study period but it was not clinically significant.

Interpretation & conclusions: Thoracic epidural anaesthesia can be used for open cholecystectomy in ASA 1, 2 patients. It provides hemodynamic stability, minimal respiratory distress (as per spo_2 values). General anaesthesia still remains the anaesthetic technique of choice for open cholecystectomy. However, an experienced anaesthetist can use thoracic epidural anaesthesia for open cholecystectomy.

Key words: Thoracic epidural, General anaesthesia, Open cholecystectomy

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Introduction

Open cholecystectomy is used where laparoscopic surgery has failed or is contraindicated. In developing countries, open cholecystectomy is still performed routinely. The costs of laparoscopic cholecystectomy, patient's economic conditions and lack of access to modern equipment are the driving factors.

There are many draw backs of general anaesthesia associated with open cholecystectomy like post-operative paralytic ileus, basal atelactasis, diaphragmatic dysfunction, pulmonary infection, longer hospital stay and increased perioperative morbidity and mortality.

Thoracic epidural anaesthesia provides selective blockade of the surgical site and advantages like preservation of spontaneous respiration, contracted intestine due to sympathetic blockade helps the surgeon, avoids intubation, reduced incidence of paralytic ileus, minimizes alteration in body physiology, reduces wound bleeding.

So the present study was undertaken to compare thoracic epidural anaesthesia and general anaesthesia for elective open – cholecystectomy in terms of: Hemodynamic stability. Epidural block characteristics.

Material & Methods

Our study was carried out on 60 adult, non-pregnant patients ASA grade I, II between 18 – 60 years of age and of either sex admitted to S.V.B.P. Hospital associated to L.L.R.M. Medical College, Meerut, Uttar pradesh, India for elective open cholecystectomy

Hemoglobin, total leucocyte count, differential leucocyte count, , platelet count, blood sugar, blood urea, serum creatinine, liver function tests were done in all patients. X-Ray chest and ECG was done in patients where indicated and in those over 40 yrs of age. Patients with any contraindication to epidural anaesthesia BMI>27 or <18, drug users or having allergy to study drugs were excluded from study.

Patients were given Tab Ranitidine 150mg and Tab Alprazolam 0.25 mg in the night before surgery. Informed consent was taken for study and patients were kept fasting for clear liquids 3 hrs prior to surgery.

The patients were divided into two groups

Group-T(received thoracic epidural anaesthesia, n = 30)

Group-G **(**received general anaesthesia, n = 30)

The patients baseline heart rate, systolic blood pressure, diastolic blood pressure; SpO_2 was recorded on multipara monitor (Philips) after shifting to operation theatre. Then peripheral cannulation was

done using 18 G. cannula. Subsequently, after fasting fluid replacement, we administered 3 ml kg^{-1} h^{-1} of lactated Ringer's solution throughout surgery. Additionally, blood loss was replaced with crystalloid at a 3:1 ratio or colloid at a 1:1 ratio.

In GROUP-T, an identification mark was made on the desired intervertebral space with the patient in lateral decubitus position. Under full aseptic precautions we infiltrated lignocaine 1%, 2 ml at T8-9 or T9-10 intervertebral space, With paramedian approach an 18 G Tuohy epidural needle(brand- portex) was inserted at a site 1-1.5 centimeters lateral to the spinous process of the cephalad vertebra of the interspace. Epidural space was recognized by "Loss of resistance". After negative aspiration, epidural catheter was inserted at least 3 cm inside the epidural space. A test dose of 2ml of Bupivacaine 0.5% with Adrenaline 1: 200,000 dilutions were given. Then 12 ml of Bupivacaine 0.5% was given via epidural route in an increment of 4ml every 5 minutes with the aim to achieve a T4-T12 level of sensory block. Few patients complained pain during the intraoperative period supplemented with IV Fentanyl in a dose of 0.5µg/kg. The epidural catheter was left for postoperative pain management.

In GROUP-G, paients were given midazolam 1mg, fentanyl 0.002 mg/kg intravenously. Induction was done with propofol (2 mg/kg) and vecuronium (0.1 mg/kg) was administered to facilitate tracheal intubation. Anaesthesia was maintained with isoflurane (0.6- 1 vol %) in 33% oxygen/66% N2O. Additional doses of vecuronium were administered for maintenance. Isoflurane administration was adjusted with the goal of maintaining arterial blood pressure within range of 20% of baseline.

At the end of surgery patients were reversed with neostigmine 0.05 mg/kg and glycopyrrolate 0.01 mg/kg.

Patients in both groups were given ondansetron (4 mg) and diclofenac (75 mg) intravenously before completion of surgery.

Observations were made at base line, at the time of surgical incision, then every 10 minutes for 1 hour for following parameters:

- Pulse rate
- Systolic blood pressure
- Diastolic blood pressure
- SpO_2
- Highest and lowest sensory level of blockade (pin prick in mid clavicular line)
- Motor blockade of lower limbs(Bromage scale)

Bromage scale for assessing motor blockade level:

0: No paralysis.
1: Inability to raise extended leg against gravity But able to flex knee
2: Unable to flex knee but able to flex feet
3: Unable to flex ankle

Statistical analysis

SPSS Software was used for statistical comparison. Gender distributions were compared by using Chi – square test. Other demographic data were compared using student's unpaired t test. Monitored and observed parameters were compared by using student's unpaired t test between the groups and by student's paired t test with in the groups.

Tabele 1: Demographic profile of patients

Sex	Group - T		Group - G		P value
	No	%	No	%	
Female	24	80	26	87	0.488
Male	6	20	4	13	

Table 2: Age, weight of patients

Age (Yrs)	Group-T		Group-G		P - value
	No.	%	No.	%	
18 – 30	2	7	5	17	
31 – 45	17	56	15	50	0.623
46– 60	11	37	10	33	
Age (Yrs) Mean±SD	41.93±8.74		40.73±10.03		
Weight (kg) Mean±SD	52.67±3.93		53.80±4.31		0.292

Table 3: Comparison in heart rate (per min) changes at different time intervals b/w two groups

Time (Minutes)	Group-T (Mean ± SD)	Group-G (Mean ± SD)	P value
Base line	85.40 ± 9.85	82.33 ± 8.01	0.191
At incision	82.46 ± 9.23	77.83 ± 8.03	0.043
10	80.23 ± 8.64	81.83 ± 8.74	0.479
20	80.46 ± 8.62	83.13 ± 11.59	0.316
30	80.43 ± 9.02	82.73 ± 10.67	0.371
40	79.96 ± 7.81	83.90 ± 8.63	0.069
50	79.66 ± 7.44	85.96 ± 9.18	0.005
60	80.00 ± 8.56	88.17 ± 8.48	0.001

Table 4: Comparison in diastolic blood pressure changes at different time intervals b/w two groups

Time (Minutes)	Group T (Mean±SD)	Group G (Mean±SD)	P value
Base line	75.57±8.47	75.90±4.42	0.849
At incision	72.60±8.12	70.96±8.59	0.452
10	70.23±6.56	82.60±9.38	<0.001
20	72.93±8.86	82.06±10.98	0.001
30	72.40±7.80	84.30±8.92	<0.001
40	71.90±7.66	86.03±8.13	<0.001
50	69.70±7.36	87.03±7.22	<0.001
60	72.63±7.73	88.23±6.25	<0.001

Table 5: Comparison in systolic blood pressure (mm Hg) changes at different time intervals b/w two groups

Time (Minutes)	Group T (Mean±SD)	Group G (Mean±SD)	P value
Base line	128.27±10.75	123.66±10.01	0.092
At incision	119.30±9.66	110.60±11.72	0.003
10	115.83±9.96	128.96±14.10	<0.001
20	115.10±9.49	132.10±14.03	<0.001
30	114.60±10.55	134.66±12.37	<0.001
40	117.50±8.25	134.66±11.62	<0.001
50	116.67±8.29	131.73±13.72	<0.001
60	116.00±9.45	130.06±13.17	<0.001

Table 6: Comparison in MAP (mm Hg) changes at different time intervals b/w two groups

Time (Minutes)	Group T (Mean±SD)	Group G (Mean±SD)	P value
Base line	97.40±1.54	97.60±1.56	0.620
At incision	95.67±1.18	99.90±0.30	<0.001
10	95.37±1.71	99.73±0.52	<0.001
20	95.43±2.09	99.60±0.67	<0.001
30	96.23±1.19	99.56±0.81	<0.001
40	96.70±1.05	99.53±0.86	<0.001
50	97.03±1.12	99.46±0.73	<0.001
60	96.23±1.19	99.53±0.68	<0.001

Table 7: Sensory block (highest, lowest levels) after 30 minutes of total epidural drug injection

Level	No	%
T 4 – T 11	3	10
T 4 – T 12	2	6.7
T 4 – L 1	1	3.3
T 5 – T 11	2	6.7
T 5 – T 12	18	60
T 5 – L1	4	13.3

Table 8: Comparison in oxygen saturation at different time intervals b/w two groups

Time (Minutes)	Group T (Mean±SD)	Group G (Mean±SD)	P value
Base line	97.40±1.54	97.60±1.56	0.620
At incision	95.67±1.18	99.90±0.30	<0.001
10	95.37±1.71	99.73±0.52	<0.001
20	95.43±2.09	99.60±0.67	<0.001
30	96.23±1.19	99.56±0.81	<0.001
40	96.70±1.05	99.53±0.86	<0.001
50	97.03±1.12	99.46±0.73	<0.001
60	96.23±1.19	99.53±0.68	<0.001

Results

In our study both group T and group G were statistically comparable in terms of their gender, mean age and mean weight.

Base line pulse rate was comparable in both groups. There was a significant difference in pulse rate at incision, 50 minutes and 60 minutes of time (p value < 0.05) and there was no difference in pulse rate at 10 minutes, 20minutes, 30minutes and 40minutes of time (p value > 0.05).

Base line systolic blood pressure was comparable in both groups .There was a significant difference in systolic blood pressure at incision, 10 minutes, 20 minutes, 30 minutes, 40 minutes, 50 minutes and 60 minutes (p value < 0.05) in both the groups.

Base line diastolic blood pressure was comparable in both groups (p value > 0.05). There was a significant difference in systolic blood pressure 10 minutes, 20 minutes, 30 minutes, 40 minutes, 50 minutes and 60 minutes (p value < 0.05) in both the groups.

Base line oxygen saturation was comparable in both groups. There was a significant difference in oxygen saturation at incision, 10 minutes, 20 minutes, 30 minutes, 40 minutes, 50 minutes and 60 minutes of

time (p value < 0.05) in both the groups. 10 patients in group T required oxygen supplementation (4 litres/min. via face mask).

In our study the target of achieving the sensory level of block was T4 – T12. The volume of local anaesthetic calculated as 1.5 ml per segment. So to block 9 segments 13.5 ml was required. Making the drug volume to next round figure we divided it into 2ml as test dose and rest 12 ml as 4ml increment dose every 3 minutes.

Highest and lowest level observed were T4 and L1. T5 – T12 level was seen in maximum no of patients (60%). T5 – L1, T5 – T11, T4 – T11, T4 – T12 and T4 – L1 level of block was seen in 13.3%, 6.7%, 10%, 6.7%, 3.3% of patients respectively

There was no paralysis observed in 83% of patients. In 17% patients there was a grade 1 motor block.

Discussion

Three patients planned for thoracic epidural anaesthesia complained pain after surgical incision. So we gave general anaesthesia to these patients.

The number of female patients was more because of the disease (cholecystitis and cholelithiasis) which is more in female population.

Kessler P[1] et al in a prospective, nonrandomized clinical study compared general anesthesia (GA), combined GA plus thoracic epidural anesthesia (TEA), and TEA alone in patients scheduled for off-pump coronary artery bypass grafting. Intraoperative heart rate decreased significantly with GA+TEA and TEA. There were no differences among groups in patients overall satisfaction. Authors concluded that all anesthetic techniques were equally safe from the clinician's standpoint.

Liem TH[2] et al studied two different anesthetic techniques in 54 patients undergoing coronary artery bypass grafting (CABG). In 27 patients, high thoracic epidural analgesia (TEA) with bupivacaine 0.375% plus sufentanil (5 micrograms/ml) was used in combination with general anesthesia in the other 27 patients, general anesthesia (GA) was used. After induction of epidural analgesia, heart rate and mean arterial pressure decreased. In conclusion, hemodynamic stability was more pronounced in the TEA than the GA group before and after CPB.

Kunstyr J[3] et al conducted a study on suitability of combined high-thoracic epidural anesthesia for pulmonary endarterectomy. This study has shown that combined epidural and general anesthesia is a suitable anesthetic option in patients who are selected for pulmonary endarterectomy. It provides hemodynamic stability. The results of our study for effect on hemodynamic parameters are in concurrence with the results of above mentioned studies.

Cadevila X[4] et al observed that thoracic or cervical epidural anesthesia show evidence of only slight respiratory motor blockade, *i.e.* approximately a 10% decrease of FEV_1 and VC and no increase in airway resistance.

Studies have shown that high thoracic epidural anaesthesia doesn't cause much change in respiratory dynamics. Intercostal nerves are affected more than phrenic nerve. Major complications related to thoracic epidural placement are not common in experienced hands.

Chakravarthy M[5] et al reported dural punctures & temporary neurological deficits as complications in an audit of 2113 patients undergoing cardiac surgery. R. Scherer, M.[6] et al also mentioned that thoracic epidural placement is a safe method without much high risks of catheter or drug related complications.

A study by Zahoor MU[7] et al showed that Epidural anaesthesia minimizes the incidence of PONV in patients undergoing open cholecystectomy.

GA McLeod, C[8] et al observed that selective sympathectomy using thoracic anaesthesia in patients reduce heart rate and improve cardiac function by reducing preload and afterload . Sympathectomy of thoracic epidural anaesthesia reduces the duration of postoperative ileus, improves bowel blood flow in patients undergoing major abdominal surgery. Carli F[9] et al stated that analgesia by epidural route improves mobilization & return of bowel functions. Rigg JR[10] have suggested that epidural anaesthesia with general anaesthesia in high risk patients undergoing abdominal surgery benefit in view of analgesia, reduction in respiratory complications.

The limitations of our study were that study period was of small duration & no blinding of study was done. The anaesthetist performing epidural anaesthesia had an experience of more than 7 years. We did not analyzed the effects of thoracic epidural on bowel functions in our study.

The authors conclude that thoracic epidural anaesthesia can be used for open cholecystectomy in adult patients. Bupivacaine 0.5% (12 ml incremental dose) provides adequate motor block for this surgery. There is minimal change in haemodynamic parameters & respiratory function in terms of oxygenation is also maintained. Further studies are needed to assess the effect of thoracic epidural anaesthesia regarding long term benefits in patients undergoing open cholecystectomy.

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