

EFFECT OF EPIDURAL ANALGESIA ON GENERAL ANAESTHESIA IN LAPAROSCOPIC SURGERIES

Varaprasad Raghupatruni¹, Sudhansu Patro²

¹Professor, Department of Anaesthesiology, Maharaja Institute of Medical Sciences, Vizianagaram.

²Senior Resident, Department of Anaesthesiology, Icon Hospital, Visakhapatnam.

ABSTRACT

BACKGROUND

General Anaesthesia (GA) is the most frequently used technique for all laparoscopic surgeries. The aim is to study the attenuation of physiological changes that are associated with laparoscopic surgeries by regional (epidural) analgesia when combined with general anaesthesia to compare the intraoperative variables after administering general anaesthesia and combined general anaesthesia with regional analgesia (epidural) in patients undergoing laparoscopic abdominal surgeries. Our aim is to compare the requirement of anaesthetic drugs between patients receiving only general anaesthesia and those receiving general anaesthesia with epidural analgesia.

MATERIALS AND METHODS

One hundred patients posted for laparoscopic abdominal surgeries were enrolled in this randomised controlled trial. They were randomly selected to undergo general anaesthesia or combined general anaesthesia with regional analgesia. Monitoring was done for heart rate, blood pressure, end-tidal carbon dioxide and awareness during anaesthesia.

RESULTS

Cardiovascular stability (heart rate and mean arterial blood pressure) was satisfactory in the intraoperative period in both the groups. The anaesthetic and analgesic drugs required were significantly lower in the combined general anaesthesia-regional analgesia group as compared to patients receiving only general anaesthesia.

CONCLUSION

The combined general anaesthesia-regional analgesia group has the advantage of more cardiovascular stability, lower requirement of analgesics and general anaesthetic agents/drugs.

KEYWORDS

Thoracic Epidural, Combined Epidural General, Haemodynamic Stability, Laparoscopic Surgery, Pneumoperitoneum.

HOW TO CITE THIS ARTICLE: Raghupatruni V, Patro S. Effect of epidural analgesia on general anaesthesia in laparoscopic surgeries. J. Evid. Based Med. Healthc. 2017; 4(46), 2827-2830. DOI: 10.18410/jebmh/2017/560

BACKGROUND

Physiological changes seen in patients undergoing laparoscopic surgeries due to the increased intraabdominal pressure consequent to carbon dioxide insufflation, which compresses on the splanchnic vessels and inferior vena cava results in raised central venous pressure, pulmonary capillary wedge pressure and right and left side cardiac filling pressures. The compression effect on the arterial vasculature leads to increase in afterload, systemic vascular resistance and arterial pressure.^{1,2} These haemodynamics are magnified with steep anti-Trendelenburg positions. The patients' position may have significant effects on the haemodynamics due to carbon dioxide insufflation. Transoesophageal echocardiography monitoring has shown

reduction in left ventricular end-diastolic area on assumption of reverse Trendelenburg position indicating reduced venous return and significant reduction in left ventricular ejection fraction in patients with cardiovascular disease and dehydration.^{3,4}

Patients undergoing operations under general anaesthesia usually have a higher heart rate and increased mean arterial blood pressure. The requirement of large quantity of anaesthetic agents and drugs leads to delayed recovery of the patient from anaesthesia. Patient satisfaction and the ability to carry out prolonged surgeries without airway compromise are the main advantages of general anaesthesia. Neuraxial anaesthesia reduces anaesthetic requirement.⁵ Epidural lidocaine reduces minimal alveolar concentration of sevoflurane,⁶ thus reducing its requirement during general anaesthesia.

MATERIALS AND METHODS

This prospective randomised double blind study was conducted in Maharaja Institute of Medical Sciences, Vizianagaram, from February 2014 to August 2016 to compare the physiological changes and requirement of analgesics and anaesthetic drugs for general anaesthesia

Financial or Other, Competing Interest: None.

Submission 19-05-2017, Peer Review 23-05-2017,

Acceptance 06-06-2017, Published 08-06-2017.

Corresponding Author:

Dr. Varaprasad Raghupatruni,

Flat 304, Sai Mitra Arcade,

Behind Chanakya School, Cantonment,

Vizianagaram, Andhra Pradesh-535003.

E-mail: drrvaraprasad@gmail.com

DOI: 10.18410/jebmh/2017/560



compared with combined epidural general anaesthesia in patients undergoing laparoscopic surgeries.

After obtaining institutional ethical committee approval and taking informed written consent from the patients, 100 patients of either sex in the age group of 20 years-65 years and of average height and belonging to ASA grade I and II were randomly selected for this study. In Group A, 50 patients received only general anaesthesia, while in Group B, 50 patients received general anaesthesia combined with epidural analgesia. The preoperative clinical parameters in both the groups were statistically insignificant. The patients were randomly selected through sealed cover and the anaesthesiologist monitoring the patient was totally unaware of the technique.

The exclusion criteria were contraindications for regional anaesthesia, i.e. patient refusal, infection at the local site of epidural injection, emergency cases, patients above the age of 65 years or below 20 years and ASA more than III, etc. All the patients were preoperatively assessed the day before surgery. They were kept fasting overnight. Tablet midazolam 0.25 mg was given at bedtime.

Intravenous access was secured with 18 G cannula and transfusion started with Ringers lactate solution. Multi-monitor was attached to the patient and preoperative vital parameters were recorded. The epidural procedure was performed with an 18G Tuohy's needle; epidural space was confirmed by LOR technique, while patient was positioned in right lateral position. The epidural needle, i.e. Tuohy's needle was introduced at T6-T7 interspace for laparoscopic cholecystectomy, percutaneous nephrolithotomy, etc. while for other procedures like laparoscopic appendectomy, exploratory laparoscopy and laparoscopic ovarian cystectomy, the Tuohy's needle was introduced at L2-L3 or L3-L4 space. The patients receiving epidural analgesia received 8 mL (40 mg) for thoracic and 12 mL (60 mg) of 0.5% bupivacaine for lumbar epidural analgesia.

In both the groups, a standard technique of general anaesthesia was followed. Induction was done with midazolam (0.05 mg/kg), fentanyl (1 mcg/kg), thiopentone (5 mg/kg) and vecuronium (0.1 mg/kg) as intubating dose. Maintenance of general anaesthesia was done with nitrous oxide, oxygen, isoflurane and vecuronium. The percentage of isoflurane administered was on the basis of Bispectral Index Score (BIS) of 40-60. The heart rate, systolic blood pressure, diastolic blood pressure, mean arterial blood pressure, oxygen saturation and end-tidal carbon dioxide were monitored every five minutes for the first 15 minutes and subsequently every 15 minutes for 90 minutes in the intraoperative period. Hypotension and bradycardia was defined as heart rate less than 60 and mean arterial blood pressure less than 60 mmHg and treated accordingly. Residual effect of vecuronium was reversed with neostigmine (0.05 mg/kg) and glycopyrrolate (0.01 mg/kg) at the end of operation.

Statistical Analysis

The recorded data was analysed statistically using SPSS (version 17) and repeated data were analysed using

repeated measure Analysis of Variance (ANOVA). Multiple effective variants were analysed using simple linear regression test. Statistical significance was defined as $P < 0.05$.

RESULTS

One hundred patients with similar demographic features were enrolled in both the groups, each group of fifty. The preoperative clinical parameters in both the groups were statistically insignificant. The duration of surgery was similar in both the groups. The intraoperative parameters of heart rate and systolic and diastolic blood pressures were significantly lower in the patients who received combined epidural-general anaesthesia compared to those receiving only general anaesthesia. Nine patients in general anaesthesia group had tachycardia and raised systolic and diastolic blood pressures, which had to be treated with anti-hypertensives, whereas six patients had hypotension and three had bradycardia in the combined epidural-general anaesthesia group. The mean percentage of isoflurane, which was used during the procedure was significantly higher in the general anaesthesia group, who required 1.2% on an average compared to the combined general anaesthesia-regional anaesthesia (0.4%). The requirement of non-depolarising muscle relaxant vecuronium and opioid fentanyl were significantly less in the combined general anaesthesia-regional analgesia group as compared to patients receiving only general anaesthesia.

Demographic Variables	Group A (Only GA)	Group B (GA + Epidural)
Mean age (yrs.)	37.6	39.54
Sex (M/F)	28/22	26/24
Mean weight (in kgs)	59.42	60.98

Table 1. Demographic Data

Variables	Group A	Group B
Mean duration of surgery (in minutes)	67.5	62.67
Mean vecuronium (in mg)	11.00	8.00
Mean isoflurane (in %)	1.2	0.4
Mean fentanyl (mcg)	75	55

Table 2. Duration of Surgery and Drug Requirement

	Group A		Group B	
	Male	Female	Male	Female
Laparoscopic cholecystectomy	3	5	6	5
Laparoscopic appendectomy	3	2	3	3
PCNL	21	13	16	15
Exploratory laparoscopy	1	1	1	-
Laparoscopic ovarian cystectomy	-	1	-	1
Total	28	22	26	24

Table 3. Type of Surgery and Sex Distribution

	HR 0 mins	HR 5 mins	HR 10 mins	HR 15 mins	HR 30 mins	HR 45 mins	HR 60 mins	HR 75 mins	HR 90 mins
Group A (GA)	85.2	101.04	94.57	107.8	118.37	100.75	103.25	113.6	93
Group B	86.3	90.2	76	80.5	80.1	83.6	80.7	84.3	88
p value	-	0.036	0.045	0.034	0.024	0.032	0.033	0.027	0.04

Table 4. Mean Heart Rate

The 'p' values were significant, especially at 5 minutes, probably due to haemodynamic changes for laryngoscopy and intubation and subsequently after 15 minutes.

	SBP 0 mins	SBP 5 mins	SBP 10 mins	SBP 15 mins	SBP 30 mins	SBP 45 mins	SBP 60 mins	SBP 75 mins	SBP 90 mins
Group A	120	158	146	150	152	146	140	138	132
Group B	110	116	122	112	116	110	106	104	110
P value	-	0.023	0.032	0.023	0.022	0.032	0.032	0.038	0.042

Table 5. Mean Systolic Blood Pressure

	MDBP 0 mins	MDBP 5 mins	MDBP 10 mins	MDBP 15 mins	MDBP 30 mins	MDBP 45 mins	MDBP 60 mins	MDBP 75 mins	MDBP 90 mins
Group A	92	100	102	100	102	100	98	96	92
Group B	90	78	80	76	78	74	70	72	70
P value	-	0.043	0.043	0.036	0.043	0.035	0.037	0.037	0.036

Table 6. Mean Diastolic Blood Pressure

DISCUSSION

Neuraxial anaesthesia exhibits sedative properties that may reduce requirements for general anaesthesia.⁵ In a study conducted by Hodgson et al, lidocaine epidural anaesthesia reduces the Minimum Alveolar Concentration (MAC) of sevoflurane by approximately 50%. This MAC sparing is most likely caused by indirect central effects of spinal deafferentation and not to systemic effects of lidocaine or direct neural blockade. Thus, lower concentrations of volatile agents than those based on standard MAC values maybe adequate during combined epidural-general anaesthesia.² Our findings were similar. The requirement of isoflurane was significantly less compared to the only general anaesthesia group. Morley et al conducted a prospective, randomised controlled trial to establish the effect of epidural blockade on isoflurane requirements for equivalent intraoperative electroencephalographic (EEG) suppression.⁷

Endoh and Matsuda has concluded that a reduction in the incidence of postoperative thrombotic episodes and vascular graft occlusion is strongly suggested in patients with generalised vascular disease.⁸ Lo Presti et al reviewed the advantages and disadvantages of general and regional anaesthesia in bad clinical conditions. The purpose of the study was to evaluate the efficacy of blended anaesthesia (association of general anaesthesia with a regional technique) in 25 patients belonging to ASA classes II-III-IV, undergoing surgery for various diseases. General anaesthesia was provided by perfusion of propofol, after an epidural or subarachnoid continuous anaesthesia was started. Patients were either in spontaneous or controlled ventilation. There were no cases of hypotension or other important side effects and the majority of patients judged good anaesthetic technique in regard to lack of pain, exhaustion and recall of operation.⁹ Our study also yielded the same results in terms of bradycardia, hypotension, analgesia or recovery. Combining epidural analgesia with

general anaesthesia reduces the haemodynamic demand on the heart and provides more stable intraoperative haemodynamics.¹⁰⁻¹³

Steffek et al described a case of total spinal anaesthesia, which occurred after a 3 mL lignocaine test dose, which was administered through an epidural catheter. It was presumed that during placement, the epidural catheter had migrated to the spinal canal as a result of technical difficulties.¹⁴ Serious complications of an inadvertent dural puncture can be avoided or alleviated with 0.25% bupivacaine concentration if the epidural block is to be combined with general anaesthesia.¹⁵

Bradycardia and asystole can occur unexpectedly during neuraxial anaesthesia. Risk factors may include low baseline heart rate, first-degree heart block, beta blockers, male gender, high sensory level and duration of surgery.¹⁶ We did not encounter such complications as the dose of epidural injection was less, patients were below sixty five years age and of ASA grade I and II.

In a study by Fanello et al, combined epidural/general anaesthesia emphasised the cardiovascular effects of epidural block alone. The goal of the investigation was to evaluate the incidence of both hypotension and bradycardia during integrated epidural/general anaesthesia in a multicentric observational study. The incidence of clinical hypotension (systolic arterial blood pressure decrease by 30% or more from baseline) and bradycardia (heart rate <50 beats/min.) and other side effects have been evaluated in 1200 consecutive patients receiving integrated epidural/general anaesthesia. The time from induction of epidural anaesthesia to induction of general anaesthesia was considered as preoperative, while the time after general anaesthesia induction was considered as intraoperative. Preoperatively, hypotension developed in 85 patients (2.8%) and bradycardia in 54 patients (4.5%). Intraoperatively, hypotension was observed in 380 patients (31.6%) and

bradycardia in 153 patients (12.7%). Hypotension and bradycardia were not influenced by the type of the surgical procedure, the type of maintenance of general anaesthesia (inhalational versus total intravenous general anaesthesia) and the level of epidural block (lumbar versus thoracic), but they were more frequent in patients with ASA physical status II and III-IV compared to patients with ASA physical status I ($p < 0.05$). Prophylactic volume preload decreased the incidence of hypotension from 41.5% to 22.4% ($p < 0.0001$), while prophylactic atropine before epidural block did not affect the incidence of bradycardia. Patients receiving epidural clonidine showed an increased incidence of intraoperative bradycardia compared to those who did not receive it ($p < 0.0001$).^{17,18}

CONCLUSION

The combination of regional anaesthesia with general anaesthesia in laparoscopic surgeries has better cardiovascular stability, lower dosage of anaesthetic drugs and early postoperative recovery.

REFERENCES

- [1] Bardoczky GI, Engelman E, Levarlet M, et al. Ventilatory effects of pneumoperitoneum monitored with continuous spirometry. *Anaesthesia* 1993;48(4):309-311.
- [2] Fahy BG, Barnad GM, Nagke SE, et al. Changes in lung and chest wall properties with abdominal insufflation of carbon dioxide are immediately reversible. *Anaesthesia & Analgesia* 1996;82(3):501-505.
- [3] Schiller WR. The trendelenburg position. Surgical aspects. In: Martin JT, Warner MA, eds. *Positioning in anaesthesia and surgery*. 2nd edn. Philadelphia: WB Saunders 1987:117-126.
- [4] Murlidhar P. Physiology of pneumoperitoneum and anaesthesia in laparoscopic surgery. http://iages.in/pdf/c_67_70.pdf.
- [5] Eldor J. Combined spinal-epidural-general anaesthesia. *Med Hypotheses* 1995;45(1):86-90.
- [6] Hodgson PS, Liu SS, Gras TW. Does epidural anaesthesia have general anesthetic effects? A prospective, randomized, double-blind, placebo-controlled trial. *Anesthesiology* 1999;91(6):1687-1692.
- [7] Morley AP, Derrick J, Seed PT, et al. Isoflurane dosage for equivalent intraoperative electroencephalographic suppression in patients with and without epidural blockade. *Anesth Analg* 2002;95(5):1412-1418.
- [8] Endoh M, Matsuda A. Epidural administration of buprenorphine after combined spinal epidural anaesthesia. *Masui* 1996;45(11):1396-1399.
- [9] Lo Presti C, Vitalone V, Fusco G, et al. Intravenous anaesthesia with perfused propofol combined with loco-regional spinal anaesthesia. *Minerva Anestesiologica* 1993;59(4):179-185.
- [10] Baron JF, Coriat P, Mundler O, et al. Left ventricular global and regional function during lumbar epidural anaesthesia in patients with and without angina pectoris. Influence of volume loading. *Anesthesiology* 1987;66(5):621-627.
- [11] Diebel LN, Lange MP, Schneider F, et al. Cardiopulmonary complications after major surgery: a role for epidural analgesia? *Surgery* 1987;102(4):660-666.
- [12] Yeager MP, Glass DD, Neff RK, et al. Epidural anaesthesia and analgesia in high-risk surgical patients. *Anesthesiology* 1987;66(6):729-736.
- [13] Her C, Kizelshteyn G, Walker V, et al. Combined epidural and general anaesthesia for abdominal aortic surgery. *J Cardiothoracic Anesth* 1990;4(5):552-557.
- [14] Steffek M, Owczuk R, Szlyk-Augustyn M, et al. Total spinal anaesthesia as a complication of local anaesthetic test-dose administration through an epidural catheter. *Acta Anaesthesiologica Scandinavica* 2004;48(9):1211-1213.
- [15] Kumm M, Seeling W. Subarachnoid placement of a peridural catheter with high spinal anaesthesia. The advantage of 0.25% bupivacaine. *Reg Anaesth* 1991;14(3):56-59.
- [16] Lesser JB, Sanborn KV, Valskys R, et al. Severe bradycardia during spinal and epidural anaesthesia recorded by an anaesthesia information management system. *Anesthesiology* 2003;99(4):859-866.
- [17] Fanelli G, Casati A, Berti M, et al. Incidence of hypotension and bradycardia during integrated epidural/general anaesthesia. An epidemiologic observational study on 1200 consecutive patients. Italian study group on integrated anaesthesia. *Minerva Anestesiologica* 1998;64(7-8):313-319.
- [18] Borghi B, Casati A, Iuorio S, et al. Frequency of hypotension and bradycardia during general anaesthesia, epidural anaesthesia, or integrated epidural-general anaesthesia for total hip replacement. *J Clin Anesth* 2002;14(2):102-106.