

A randomised comparative study on intraoperative bispectral index monitoring vs. conventional monitoring on awakening time, extubation time and early postoperative recovery from general anaesthesia using desflurane as inhalational anaesthetic during maintenance of anaesthesia in morbidly obese patients undergoing laparoscopic sleeve gastrectomy surgery

Krishna Murthy TK.¹, Vinay Kumar PV.^{2,*}

¹Associate Professor, ²Assistant Professor, Dept. of Anaesthesia, Sri Sidhartha Medical College, Tumkur, Karnataka, India

***Corresponding Author:**

Email: drvinay81@gmail.com

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Abstract

Introduction: In India incidence of obesity is in increasing trend. Anaesthetising morbidly obese patients is challenge to anaesthesiologist. Due to alteration in pharmacokinetics and pharmacodynamics in obese patients, drug dosing in these patients is different from patients with normal body mass index. This has led to lot of confusion in titration of anaesthetic drugs perioperatively. Any method which helps in perioperative drug titration may help in optimal intraoperative maintenance of anaesthesia, early awakening at the end of surgery and early postoperative recovery. We hypothesize that intraoperative Bispectral index (BIS) monitoring allows optimal titration of anaesthetic drugs intraoperatively and decrease awakening time, early postoperative recovery from general anaesthesia in morbidly obese patients undergoing laparoscopic laparoscopic sleeve gastrectomy surgery.

Materials and Methods: Two groups of 40 patients each were anaesthetized with the use of BIS monitoring in BIS- GROUP and in NON-BIS GROUP patients were anaesthetized without the using BIS monitoring. The hemodynamic parameters heart rate (HR) and mean arterial pressure (MAP) were recorded before induction, after induction at 1 minute (min), 3min, and 5min, after incision at 1min, 5min, 10min, 15min, 30min, 45min, 60min, and 70min were recorded. Awakening time (time to eye opening to verbal command) recorded every minute, time to extubation at 1min, 5 min, 15 min were recorded and time to achieve Modified Aldrete score ≥ 9 were recorded.

Results: Mean awakening time, time to extubate and Modified Aldrete score ≥ 9 were significantly shorter in the BIS group as compared to the NON-BIS group ($P < 0.05$). There were no statistical differences in intraoperative mean HR and mean MBP in both groups (P value > 0.05).

Conclusion: Without compromising the hemodynamic stability BIS monitoring was effective in early awakening, associated with early postoperative recovery in morbidly obese patients undergoing laparoscopic laparoscopic sleeve gastrectomy surgery.

Keywords: Morbid obesity, Bispectral index, Recovery.

Introduction

Obesity itself is a concern for anaesthesiologist, usually associated with co-morbid conditions like hypertension, diabetes and accelerated atherosclerosis. Potential anaesthesia concerns in morbidly obese patients include patient positioning, difficult mask ventilation, intubation, perioperatively more frequent respiratory and cardiovascular events and altered pharmacokinetics and pharmacodynamics leading to delayed awakening and recovery from general anaesthesia.¹⁻³

Electroencephalographic monitors like bispectral index have shown better titration of anesthesia drugs during general anaesthesia.^{4,5} Bispectral index (BIS) monitoring has been proven to be effective in optimizing anaesthesia level, probably help in rapid awakening, shorten recovery time and reduce anaesthetic drug consumption.^{6,7} It would be advantage if BIS monitoring helps in more rapid awakening (emergence), early extubation and early postoperative recovery from general anaesthesia in morbidly obese patients. The aim of this randomized comparative study was to investigate the effect of intraoperative conventional monitoring plus BIS monitoring on

awakening time, extubation time and postoperative recovery vs. conventional monitoring which includes heart rate, arterial blood pressure, electrocardiogram, oxygen saturation, temperature end tidal carbon dioxide and urine output in morbidly obese patients undergoing laparoscopic gastric mini bypass under general anaesthesia using desflurane inhalational anaesthetic during maintenance of anaesthesia.

Materials and Methods

After the ethical and scientific committee approval study was done on total 80 patients. Informed written consent was taken from each patient. Patients were randomized into two groups of 40 patients each by giving serial number, patients getting odd number were considered in B-GROUP, where patients anaesthetized with the use of BIS monitoring and patients getting even number were considered in C-GROUP, where patients were anaesthetized with only conventional monitors. Inclusion criteria include morbidly obese patients electively scheduled for laparoscopic sleeve gastrectomy surgery, adult patients of either gender aged 20-40 years and ASA II patients. Exclusion

criteria include patients with history of neurological dysfunction and patients using psychotropic drugs.

As all the patients were considered full stomach, premedicated with pantoprazole 40mg orally on the night before surgery, and metechlopramide 10mg orally one hours before surgery with sips of water. On the day of surgery patient in preoperating room baseline vitals were recorded, all patients were preloaded with one litre Ringer lactate. Preoxygenated for 3 min with 100% oxygen. Induction with injection xylocord 1.5mg/kg, injection fentanyl 2µ/kg and injection propofol 1.5-2mg/kg intravenously and intravenous rocuronium 0.9 mg/kg, was administered to facilitate tracheal intubation and neuromuscular blockade. Maintenance of anaesthesia with 40% oxygen mixed with air to maintain an end-tidal carbon dioxide concentration of 35-40mmHg. Intraoperative conventional monitoring was done with pulse oximetry, non-invasive blood pressure, electrocardiogram, end-tidal carbondioxide, nasopharyngeal temperature probe. In B-GROUP along with conventional monitoring BIS monitoring (BISA-2000 software 2.21, Aspect Medical Systems) was initiated at induction and smoothing time was 30 seconds. Desflurane 6% in 2 liters/minute fresh gas flow mixed in air and oxygen was administered to all patients after endotracheal intubation, desflurane concentration was titrated by anaesthesiologist dependening on haemodynamic status [HR and MBP] in C-GROUP and B-GROUP desflurane concentration titrated to achieve a target BIS in the range of 40-60. Intravenous one gram paracetamol was given to all patients of both groups after induction of anesthesia and local infiltration with bupivacaine 0.25% was given to all skin incisions. Rocuronium 0.15mg/kg neuromuscular blockade was maintained to a single twitch of train of four. After the procedure Desflurane was discontinued and fresh gas flows were increased to 10litres/min. Neuromuscular blockade was reversed with neostigmine 0.05mg/kg and glycopyrrolate 0.015mg/kg intravenously. A verbal command to open eyes was given every minute. After a train-of -four ratio 0.9 patients were extubate. Time from discontinuation of Desflurane to awakening times (eye opening on verbal commands), time to extubation and time to achieve aldrete score ≥ 9 were recorded. After extubation patients were transferred to post anaesthetic care unit (PACU). Postoperative pain was treated with intravenous tramadol, fentanyl and ketorolac (multimodal analgesia).

The sample size of 80 was enough to maintain the power of study at least 80%. All the continuous variables were assessed for the normality using SHAPIRO-WILK'S TEST. If the variables were normally distributed, they were expressed as Mean \pm SD, otherwise Median (interquartile range). All the categorical variables were expressed either as percentage or proportions. Comparison of normally distributed continuous variables was done by either independent sample t-test or ANOVA based on the number of groups. Comparison of non-normally distributed continuous variables was being done by MANN-WHITNEY U TEST or KRUSKAL-WALLI'S H Test. Comparison of categorical variables was done by either CHI-SQUARE Test or FISHERS-EXACT Test based on the number of observations. Data entry was done in MS-EXCEL spread sheet. Data validation and analysis was carried out by SPSS VERSION 11.0. All the p-values <0.05 were considered as statistically significant.

Results

There was no statistically significant difference between B-Group and C-BIS Group in terms of age, sex, body weight and duration of surgery.

The mean HR and MAP was calculated for B and C groups at base line, induction, intubation at 1min, 3min and 5min, at incision 1min, 5 min, 10 min, 15 min, 30 min, 45 min, 60 min, 75 min, at closure, at extubation 1 min, 5min, 15min. At all times there was no statistically significant difference between two groups in terms of mean HR and mean MAP. The mean HR was calculated for B and C group and was found to be 77.8 \pm 3.39 and 79.1 \pm 3.4. There was no statistically significant difference between two groups (p=0.095). The mean MAP for B and C group was found to be 94.5 \pm 3.5 and 95.8 \pm 4.2. There was no statistically significant difference between two groups (P=0.136).

The mean awakening time (11.38 \pm 2.807 vs. 14.92 \pm 3.885, p value=0.000), mean extubation time (15.90 \pm 2.863vs19.28 \pm 4.120, p value=0.000) and mean time to achieve Modified Aldrete score were (31.60 \pm 3.862vs40.80 \pm 4.681, p value=0.000) found to be statistically significant. There was a statistically significant difference between the two groups in awakening time (p value =0.000), extubation time (p value=0.000) and Modified Aldrete score ≥ 9 (p value =0.000)

Table 1: Showing awakening time, extubation time and time to achieve aldrete score ≥ 9 in min.

	Group	N	Mean	Std. Deviation	P-value
Awakening Time	BIS	40	11.38	2.807	0.000
	Non BIS	40	14.92	3.885	
Extubation Time	BIS	40	15.90	2.863	0.000
	Non BIS	40	19.28	4.120	
Time to achive modified aldrete score ≥ 9	BIS	40	31.60	3.862	0.000
	Non BIS	40	40.80	4.681	

Discussion

In our study we found that there were no statistical differences in intraoperative mean MBP and mean HR in both groups at all times. There were statistically significant difference in awakening time, extubation time and time to achieve modified aldrete score ≥ 9 . The present study had demonstrated that use of BIS monitoring led to early postoperative recovery of morbidly obese patients undergoing laparoscopic sleeve gastrectomy. The results were comparable to those reported in other studies that assessed titration of propofol⁹ Desflurane or sevoflurane¹⁰ by using BIS monitoring. Song et al¹¹ had concluded that BIS monitoring allows reduction in intraoperative anesthetic consumption and appears to decrease emergence time and recovery times. Heavner et al¹² had demonstrated that BIS monitoring had improved recovery profiles in elderly patients anesthetized by desflurane and nitrous oxide. BOZTUG et al¹³ studied bispectral index monitoring in patients posted for craniotomy found to be beneficial in terms of anaesthetic requirement. White et al¹⁴ found that Auditory Evoked Potential and bispectral index (BIS) monitoring can decrease the end-tidal Desflurane concentration during maintenance of anesthesia. Use of cerebral monitors to minimize the intraoperative anesthetic drug consumption and improve the recovery process had raised concerns regarding deleterious effects of increased autonomic activity¹⁵. However, in our study, intraoperative hemodynamic variables were not statistically significant. Limitations of our study were we did not consider pediatric patients, Blinding was not done, and age group is limited to 25-50 years.

Conclusions

The use of bispectral index monitoring was effective in reducing the awakening time, extubation time and led to early postoperative recovery in morbidly obese patients posted for elective laparoscopic sleeve gastrectomy without compromising the hemodynamics.

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