

Evaluation of Flumazenil's Impact on Recovery and Bispectral Index Post Sevoflurane/Fentanyl General Anesthesia at a Tertiary Care Hospital

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ABSTRACT

Background: Total intravenous anaesthesia, which involves the use of propofol in conjunction with an opioid, has gained significant popularity as an anaesthetic method. The present study was conducted to evaluate flumazenil's impact on recovery and bispectral index post sevoflurane/fentanyl general anesthesia at a tertiary care hospital.

Materials & Methods: A total of 60 patients were enrolled. All the subjects belonged to the age range of 30 to 60 years. A total of two study groups were formed with 30 patients in each group- Flumazenil group and control group. After arrival in the operating room, hemodynamic variables and BIS were continuously measured using a patient monitoring instrument. All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software.

Results: Spontaneous breathing among patients of the Flumazenil group and control group was 5.5 mins and 6.9 mins respectively. Eye opening on verbal command among patients of the Flumazenil group and control group was 6.1 mins and 7.9 mins respectively. Significant better results were obtained among patients of the Flumazenil group. While monitoring and comparing the mean BIS values among two study groups at different time intervals, it was seen that Flumazenil group demonstrated better results.

Conclusion: Administering flumazenil to unpremedicated patients undergoing anesthesia with sevoflurane and fentanyl may facilitate a quicker recovery from anesthesia. This effect could be attributed to flumazenil's ability to counteract the effects of sevoflurane or the action of endogenous benzodiazepines.

Key words: Bispectral index, Flumazenil, Fentanyl.

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INTRODUCTION

Total intravenous anaesthesia, which involves the use of propofol in conjunction with an opioid, has gained significant popularity as an anaesthetic method. This approach facilitates the independent adjustment of various anaesthetic components. It is widely recognized that the anaesthetic efficacy of propofol is significantly improved when an opioid is also administered.¹

The bispectral index (BIS) has been suggested as a tool for assessing the impact of anaesthetics on cerebral activity. Numerous studies have indicated a strong correlation between BIS values and the blood concentration of propofol. However, it has been observed that during propofol anaesthesia, increasing doses of alfentanil or the supplementary use of nitrous oxide do not influence the BIS readings.^{2,3}

However, in instances where intraoperative use of a bispectral index (BIS) monitoring device did not significantly alter the titration of the anesthetic drugs during the maintenance period, investigators have failed to find meaningful differences in the

patients' recovery profiles following general anesthesia. Most of the previous studies evaluating the impact of BIS monitoring on recovery from general anesthesia have involved young healthy patients who received muscle relaxants during surgery.⁴⁻⁶ Hence; the present study was conducted to evaluate flumazenil's impact on recovery and bispectral index post sevoflurane/fentanyl general anesthesia at a tertiary care hospital.

MATERIALS & METHODS

A total of 60 patients participated in the study, all of whom were aged between 30 and 60 years. Only those individuals who were scheduled for surgical procedures within a few hours were included, and none received premedication.

The participants were divided into two study groups, each consisting of 30 patients: the Flumazenil group and the control group. Upon arrival in the operating room, hemodynamic parameters and the Bispectral Index (BIS) were continuously

monitored using a patient monitoring device. Prior to the induction of anesthesia, glycopyrrolate was administered intravenously. The anesthetic induction involved the use of thiopental sodium (4 mg/kg), fentanyl (2 µg/kg), rocuronium (0.6 mg/kg), and sevoflurane (2-4 vol%). The BIS was maintained at approximately 40 throughout the surgical procedure. At the conclusion of the operation, sevoflurane and nitrous oxide were discontinued, and

either flumazenil or normal saline was administered intravenously, while oxygen supply was increased and hyperventilation was applied. The patient was subsequently discharged from the recovery room and transferred to the ward in accordance with standard protocols. All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software.

Table 1: Outcome variables

Time (mins) from administration	Flumazenil group	Control group	p-value
Spontaneous breathing	5.5	6.9	0.010*
Eye opening on verbal command	6.1	7.9	0.003*
Extubation	7.9	9.1	0.000*

*: Significant

Table 2: BIS score

BIS Score	Flumazenil group	Control group	p-value
Baseline	43.5	42.1	0.234
2 mins	45.6	44.2	0.843
4 mins	53.2	45.1	0.000*
6 mins	67.3	45.4	0.001*
10 mins	83.4	55.3	0.000*
18 mins	89.9	66.5	0.030*

*: Significant

RESULTS

The mean age of Flumazenil group and control group was 43.5 years and 45.1 years respectively. Majority proportion of patients of both the study groups was males. Spontaneous breathing among patients of the Flumazenil group and control group was 5.5 mins and 6.9 mins respectively.

Eye opening on verbal command among patients of the Flumazenil group and control group was 6.1 mins and 7.9 mins respectively. Significant better results were obtained among patients of the Flumazenil group. While monitoring and comparing the mean BIS values among two study groups at different time intervals, it was seen that Flumazenil group demonstrated better results.

DISCUSSION

General anaesthesia requires multiple agent administration to achieve unconsciousness (hypnotics), muscle relaxation, analgesia and haemodynamic control. Many anaesthesiologists rely on clinical signs alone to guide anaesthetic management. BIS is a scale derived from the measurement of cerebral electrical activity in anaesthetized patients so that the level of anaesthesia and drug delivery can be optimized.⁷⁻⁹

Hence; the present study was conducted to evaluate flumazenil's impact on recovery and bispectral index post sevoflurane/fentanyl general anesthesia at a tertiary care hospital.

Kim YJ et al, in a similar study assessed the impact of flumazenil on recovery from anesthesia and the bispectral index after sevoflurane/ fentanyl general anesthesia in unpremedicated

patients. Forty-five healthy unpremedicated patients were randomly allocated to either flumazenil or a control groups. Each patient received either a single dose of 0.3 mg of flumazenil (n = 24) or placebo (n = 21). After drug administration, various recovery parameters and bispectral index (BIS) values in the flumazenil and control groups were compared. Mean time to spontaneous respiration, eye opening on verbal command, hand squeezing on verbal command, extubation and time to date of birth recollection were significantly shorter in the flumazenil group than in the control group. The BIS value was significantly higher in flumazenil group than in the control group beginning 6 min after flumazenil administration. Administration of a single dose of 0.3 mg of flumazenil to healthy, unpremedicated patients at the end of sevoflurane/fentanyl anesthesia without benzodiazepines resulted in earlier emergence from anesthesia and an increase in the BIS value.¹⁰

Liang P et al detected the effect of GABA receptors on the hypnotic action of volatile anesthetics by evaluation of the effect of intravenous flumazenil on sevoflurane minimum alveolar anesthetic concentration-awake (MAC-Awake) and emergence mental status. Firstly, 49 healthy patients, aged 20-40 years scheduled for elective surgeries, were randomly assigned to two groups, a flumazenil group (n=24) and a saline group (n=25). The flumazenil group received 0.006 mg/Kg IV, and the control group received the same volume of saline 20 min before induction. The flumazenil group and the control group were compared with regard to MAC-Awake (anesthetic concentration achieving 50% probability of eye opening in response to a verbal command). In

present study; mask inhalation was used to measure the MAC-Awake by up-and-down method. The second steps, 60 patients undergoing lower abdomen surgeries were randomly divided into two groups, a experimental group (n=30) and a saline group (n=30). All patients were anesthetized with sevoflurane/sulfentanyl. The experimental group received flumazenil at 0.006 mg/Kg IV, and the control group received the same volume of saline at the end of surgery. The MAC-Awake was 0.65% in the control group and 0.82% in the flumazenil group (p=0.34). After extubation, the recovery time and time to extubation showed no difference between the flumazenil group and the saline group (p>0.05). But the 10 min and 15 min MMSE scores after extubation were better in the flumazenil group than those in the saline group (p<0.05). There was no difference for MMSE scores after 30 min between two groups. They found that an IV flumazenil (0.006 mg/Kg) has no effect on sevoflurane MAC-Awake in humans.¹¹

CONCLUSION

Administering flumazenil to unpremedicated patients undergoing anesthesia with sevoflurane and fentanyl may facilitate a quicker recovery from anesthesia. This effect could be attributed to flumazenil's ability to counteract the effects of sevoflurane or the action of endogenous benzodiazepines.

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