

BIS monitoring in a patient with history of awareness and a difficult airway

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Abstract

We describe a case where bispectral index (BIS) monitoring was used successfully to guide an inhaled induction technique for a difficult airway. The patient was a 34 years old male who had a previous history of awareness during anaesthesia. He was also morbidly obese with a Mallampatti score of III on preoperative examination.

Introduction

General anaesthesia should ensure amnesia and loss of consciousness. However, this is a state which is often ascertained subjectively by the anaesthetist based on observing the blunting of various physiologic responses.¹⁻³ BIS monitoring provides an interesting tool which gives the anaesthetist feedback on the effects of anaesthetics on

the brain and may help avoid this dreaded complication. BIS monitoring provides information to help determine the optimum level of anaesthetic for each patient. BIS has also been shown to improve patient care through reduced hypnotic drug use, faster wake-ups and monitoring for risk of awareness.^{4,5} The BIS monitor is a device that records and processes the EEG to calculate a single, dimensionless number, called the BIS Index and designed to help the anaesthesiologist adjust the dosage of anaesthetic drugs. The word BIS was probably chosen because calculation of the Index depends in part on bispectral analysis of the EEG. The recommended BIS ranges are 65-85 for sedation and 40-65 for general anaesthesia. Values below 40 reflect burst suppression, a pattern associated with deep anaesthesia. There is a low probability of explicit recall for BIS of 75 or less.^{6,7}

Patients who have a history of awareness under anaesthesia are especially anxious prior to a second general anaesthesia. Combined with this, a patient that has a difficult airway, traditionally requires a "safe" induction until the airway is secured. Current guidelines for patients who for any reason may have a poor Mallampatti score include an 'inhalation induction' with spontaneous ventilation until the airway can be visualized and secured.⁸ A relatively lighter plane of anaesthesia must be maintained in order for spontaneous ventilation to occur as compared to Intravenous induction (IV) with relaxation. In such cases, it is only a guess as to how 'deep' the patient's anaesthesia is and whether they can recall the entire process.

We present a case of a patient with an anticipated difficult intubation who had a history of awareness under a previous anaesthetic. No details are available regarding the previous anaesthetic technique.

Case Report

A 34 years old male presented to us for a laparoscopic cholecystectomy. The patient had a history of episodic right upper quadrant pain associated with occasional nausea and vomiting. He had no other co-morbidities. Previous anaesthetic history was positive for awareness during intubation whilst he was paralyzed. Routine laboratory evaluation was normal and patient was vitally stable. The patient weighed 109.5 Kg with a body mass index (total weight in kilograms divided by body surface area in m²) of 39.5 kg/m²; implying morbid obesity. His airway examination revealed a Mallampatti grade of III. Difficult intubation was anticipated.

After an oral pre-medication and aspiration prophylaxis, the patient was brought to the operating room. In addition to routine American Society of Anaesthesia (ASA) monitoring, a BIS monitor electrode was placed on his forehead whilst the patient was awake. A baseline reading of 97 was obtained (as shown in Table). We proceeded carefully with inhalation induction using Sevoflurane® 5-7% (a short acting volatile anaesthetic) with a small dose of IV Propofol® - a short acting hypnotic, at 1 mg/kg. Spontaneous ventilation was maintained till the BIS monitor showed a reading of 30 at which point direct laryngoscopy was performed with a Macintosh® number 3 blade. The vocal cords were visualized showing a Cormack and Lehane Grade 2 intubation.⁹

Table: BIS readings during the case.

	BIS reading
Baseline	95-97
Induction and intubation	30-32
Maintenance	45-55
Emergence	97

After a non-depolarizing muscle relaxant (Atracurium 0.5 mg/kg IV) was injected, endotracheal intubation was performed using a size 8.0 PVC endotracheal tube without any difficulty. BIS monitor reading remained between 30-35 during this process.

During the case, anaesthesia was maintained with a mixture of oxygen, nitrous oxide and Isoflurane®, another volatile agent which is longer acting. No recall of any period during the case was experienced by the patient on interview in the post operative visit by the anaesthesiologist.

Discussion

Awareness results from the administration of an insufficient amount of general anaesthetic drugs leading to return of consciousness and ability to recall the events experienced during the episode of unconsciousness.^{7,8} This is probably one of the most dreaded complications of general anaesthesia. A recently developed method of ensuring loss of consciousness without overdosage of agents that result in apnea is by means of a BIS monitor. Maintaining spontaneous breathing while assessing an anticipated difficult airway for intubation is the recommendation given by the ASA.¹⁰

By combining an inhalation induction titrated to a reasonable BIS score we were able to navigate a difficult airway and safely secure an endotracheal intubation, and also ensure amnesia in this patient. There was no awareness in our case postoperatively. The cost incurred to the patient for the electrode was Rupees 1000 (\$ 16). We recommend the use of BIS monitoring for such patients who need delicate titration of anaesthesia in order to evaluate the airway whilst at the same time being certain that the patient will not have recall.

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