ANAESTHESIA IN A DEAF-MUTE: USE OF THE BISPECTRAL INDEX MONITOR

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Abstract:

Anaesthesia for the deaf-mute could be a taxing experience for the anaesthetist due to ineffective communication. The Bispectral index (BIS) monitor has been validated to measure the hypnotic component of anaesthesia. We report the use of the BIS monitor in the anaesthetic management of a deaf-mute undergoing general anaesthesia for myomectomy. This case report documents the similarity in BIS values of a deaf-mute and normal patients. Furthermore, the usefulness of the BIS monitor in recovery of anaesthesia in a patient, in whom effective communication in the immediate postoperative could be challenging, is highlighted.

Key Words:

Anaesthesia technique: general, Monitor: Bispectral Index; Deafness. Recovery

Case Report:

A 42 year old congenital deaf-mute nulliparous patient, weight 65 kg, height 156 cm, BMI 26.7, with a 22 week size uterine fibroid was scheduled for myomectomy. Preoperative communication was by quasi sign language and written questions to which the patient also replied in writing. She had no previous anaesthetic experience and no co-existing medical problems. On examination, she was pleasant, had normal set ears and no obvious facial abnormality. Her systems were essentially normal. Mallampati classification was II and haemoglobin, electrolytes, creatinine and urea values were all within normal limits.

Electrocardiography was normal. She was given a physical status of ASA II. She was not premedicated.

During the preoperative visit, she was educated on what to expect in the immediate postoperative period. At the end of surgery, on gentle tapping on her right arm she was required to open her eyes. Subsequently, she should mimic the anaesthetist by protruding her tongue and lifting her head.

In the operating room, initial monitoring included electrocardiography, non-invasive blood pressure, pulse oximetry and the Bispectral index adult sensor strip (Aspect A-2000, Bispectral Index® XP Aspect Medical Systems, Newton, MA).

After preoxygenation anaesthesia was induced with intravenous midazolam 2 mg, fentanyl 1 $\mu g.kg^{-1}$ and 5 $mg.kg^{-1}$ sodium thiopentone. She was intubated at first attempt with a # 7.0 mm cuffed endotracheal tube after facilitation with $1mg.kg^{-1}$ of suxamethonium chloride. Maintenance of relaxation was with pancuronium bromide and intravenous pentazocine and dipyrone given for analgesia. Anaesthesia was maintained with 1 MAC of halothane in 60% nitrous oxide in oxygen.

Additional monitoring included peripheral nerve stimulation, estimation of end-tidal carbon dioxide concentration ($EtCO_2$), minimum alveolar concentration (MAC), fractional inspired and end-tidal concentrations of halothane using the Datex Ohmeda® Capnomac.

Her average heart rate was 85 beats $minute^{-1}$ and corresponding blood pressure was 126 / 86mmHg during the three and a half hour procedure. The BIS value preoperatively was 97 and while under anaesthesia the value ranged from 60-69 with an average of 65.

At the end of surgery, halothane and nitrous oxide were discontinued and residual neuromuscular paralysis reversed with neostigmine in atropine. There was spontaneous eye opening at a BIS value of 83. She was able to protrude her tongue at 84 and lift her head at 87. She was extubated at BIS of 88. She attained her preoperative BIS 15 minutes after extubation.

Discussion

Anaesthesia for the deaf mute could be a challenging experience because of the potential for ineffective pre and postoperative communication. Physicians including anaesthetists have little training in communication skills for such situations.[1] Some institutions, employ personnel trained in the American Sign Language (ASL), but this service is unavailable in our center. In this patient the mode of communication was by the use of quasi-sign language and writing.

There is paucity of literature on general anaesthesia for the deaf-mute and to the best of our knowledge; this is the first documented report of the use of the BIS monitor in the anaesthetic management of a deaf mute.

Congenital deafness is associated with syndromes with anatomic and physiologic anomalies of anaesthetic significance. Treacher Collins syndrome (congenital and familial deformities of the ears, eyes, maxilla and mandible) is a cause of difficult intubation.[2] Jervell and Lange-Nielsen syndrome (JLNS), is characterized by congenital deafness, long QTc interval and microcytic hypochromic anaemia and has been reported to cause a potentially fatal arrhythmia under halothane anaesthesia.[3] Our patient appeared normal so we postulate that her deafness might have been due to a late intra uterine infection or a possible ototoxic drug ingestion by patient's mother during pregnancy.

The BIS monitor was designed to measure the hypnotic component of anaesthesia. It is a complex index, but it predominantly quantifies, on a scale of 0 to 100, the degree of coherence among different frequencies in the electroencephalograph (EEG) signal. The BIS value recommended general anesthesia ranges from 40 to 60.[4-6]

This patient did not have a BIS-guided anaesthetic because we were uncertain of the BIS values that this patient would exhibit because of her pathology. Her BIS values ranged from 60 – 67 with an average of 65 and an awakening BIS value of 83. This high intraoperative value is in agreement with Edward et al in Florida who noted that BIS value ranged between 55 – 70 in patients undergoing halothane anesthesia compared to sevoflurane (35–50 U) and desflurane (~ 45–50 U) when equipotent concentrations of volatile anaesthetic agents were used.[7] Similarly, Davidson and Czarnecki in Australia[8] noted significantly greater BIS values with halothane than with equipotent concentration (1 MAC) of isoflurane. There was also no significant difference in mean BIS values on awakening (81.1 Vs 82.5). Daily follow up while on admission and weekly interrogation up to 4 weeks after discharge was negative for intra operative awareness.

In summary, we note that this deaf-mute exhibited BIS pattern similar to normal patients. We also postulate that the BIS monitor may be useful for the recovery of patients with communication challenges.

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References:

1. Iezzoni LI, O'Day BL, Killeen M, Harker H. Communicating about Health Care: Observations from Persons Who Are Deaf or Hard of Hearing. *Ann Intern Med.* 2004; 140:356-362.
2. Ebata T, Nishiki S, Masuda A, Amaha K. Anaesthesia for Treacher Collins syndrome using a laryngeal mask airway. *Canadian Journal of Anesthesia* 1991; 38: 1043-45
3. Adu-Gyamfi Yaw, Said A, Chowdhary U, Abomelha A, Sanyal S K. Anaesthetic-induced ventricular tachyarrhythmia in Jervell and Lange-Nielsen syndrome. *Canadian Journal of Anesthesia* 1991; 38: 345-46.
4. Sigl J, Chamoun N: An introduction to bispectral analysis for the electroencephalogram. *Journal of Clinical Monitoring* 10:392-404, 1994
5. Rampil IJ: A primer for EEG signal processing in anesthesia. *Anesthesiology* 89:980-1002, 1998
6. Johansen JW, Sebel, PS Development and Clinical Application of Electroencephalographic Bispectrum Monitoring. *Anesthesiology* 2000 93:1336-44.
7. Edwards JJ, Soto RG, Thrush DM, Bedford RF. Bispectral Index Scale Is Higher for Halothane than Sevoflurane during Intraoperative Anesthesia. *Anesthesiology* 2003; 99: 1453 – 54.
8. Davidson AJI, Czarnecki CI. The Bispectral Index in children: comparing isoflurane and halothane. *Br. J. Anaesth*. 2004; 92: 14-17.