

Does Bispectral index monitoring decrease the duration and improve the quality of recovery from sevoflurane anesthesia in children?

NJ Halliday MD; K Candiotti MD; B Acosta MD; A Rucekova MD; L Pereiras MD

Department of Anesthesiology, University of Miami, Miami, Florida 33136

Introduction: There are 2 commercially available devices to measure the depth of anesthesia. The PSA 4000 (Physiometrix) and the Bispectral Index Monitor (BIS). In adult practice the BIS monitor has been shown to reduce the quantity of anesthetic agent used, shorten recovery time and decrease morbidity in the post anesthesia recovery unit, (PARU)(1,2). In this study we set out to see if these advantages could be applied to pediatric practice.

Methods: After Institutional Review Board approval and written informed consent from a parent, 60 children between the ages of 2 and 12 years, ASA I or II, scheduled for elective surgery, were enrolled in the study. Those with a history of seizure disorders or taking anticonvulsant or sedative medication were excluded.

The EEG was recorded using the Aspect XP 2000 Bispectral Index ® Monitoring System and Pediatric sensors. The BIS number was recorded prior to induction, throughout the surgery and until the patients were awake. This was defined by spontaneous eye opening. The time of extubation, (swallowing, adequate respirations and purposeful movements,) was also noted.

Patients were randomized into one of two groups. In the control group the anesthesia provider was blinded to the BIS monitor index. In the study group the providers could see the BIS monitor, and they kept the BIS reading between 40 and 60 during anesthesia maintenance by changing the concentration of inhaled sevoflurane. No sedative premedication was administered. Anesthesia was induced with sevoflurane 1% increasing to 6% in increments of 0.5% every 3 breaths. Rocuronium 0.6mg/kg, fentanyl 1µg/kg were also given and the trachea was intubated by direct laryngoscopy. Maintenance was achieved with sevoflurane, N2O/O2, (60/40%), and fentanyl 0.5µg/kg. Controlled ventilation was used on all patients.

Emergence was facilitated by discontinuation of sevoflurane at an estimated time 10 minutes prior to the end of surgery.

Muscle relaxation was reversed with neostigmine 0.05mg/kg along with glycopyrrolate 0.01mg/kg.

In the PARU the presence of postoperative nausea and vomiting (PONV), and emergence delirium, were noted. The time to PARU discharge readiness was also noted.

Results: There were no statistical differences between the mean ages and mean duration of surgery in the 2 groups. (Table 1).

TABLE 1 Control n=30 mean age =6.9yrs (+/-3.9) mean duration= 1.36 hrs (+/-0.63)
Study n=30 mean age =6.87yrs(+/-3.2) mean duration = 1.52hrs(=/-1.16)

The times to eye opening and extubation from sevoflurane discontinuation, were significantly shorter in the study group.(Table 2).

TABLE 2 Mean time to eye opening. Control 10.8 min (+/- 4.76): Study 7.87(+/-3.66). p=0.009.
Mean time to extubation. Control 11.4min (+/-4.99): Study 8.7 min (+/-2.7). p=0.02

The times from extubation to attainment of discharge readiness were shorter in the study group though this was not of statistical significance. (Control 26.6min (+/-13.0) and study 21.9min(+/-11.7).

In the control group 2 patients had PONV compared to 1 in the study group. This was not statistically significant.

In the control group more children developed emergence delirium (5/30) than in the study group (2/30), though this was not of statistical significance.

Although there was no difference in the mean BIS numbers during anesthesia maintenance, (10 minutes after induction to sevoflurane discontinuation), there was considerably greater range and variability of BIS readings in the control patients. (Table 3).

TABLE 3 Mean SD Range Median Absolute deviations from median.
Control 49.5 12.5 27-70 50 10.5
Study 50.1 5.6 41-60 52 4.7

Discussion: We conclude that the use of BIS monitoring in healthy children between the ages of 2 and 12 years undergoing sevoflurane anesthesia, is beneficial in producing a more rapid return in consciousness. This may be due to a more consistent level of anesthesia as measured by the BIS monitor. Although this did not translate into statistical significance, the overall incidence of PONV and emergence delirium was reduced by use of this monitor.

Refs: 1. Song D. et al., Anesthesiology, 1997.

2. Gan T.J. et al., Anesthesiology 1997.