Sevoflurane requirements during electroencephalogram (EEG)-guided vs standard anesthesia Care in Children: A randomized controlled trial

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Study objectives: Intra-operative electroencephalographic (EEG) monitoring utilizing the spectrogram allows visualization of children's brain response during anesthesia and may complement routine cardiorespiratory monitoring to facilitate titration of anesthetic doses. We aimed to determine if EEG-guided anesthesia will result in lower sevoflurane requirements, lower incidence of burst suppression and improved emergence characteristics in children undergoing routine general anesthesia, compared to standard care.

Design: Randomized controlled trial.

Setting: Tertiary pediatric hospital.

Patients: 200 children aged 1 to 6 years, ASA 1 or 2, undergoing routine sevoflurane anesthesia for minor surgery lasting 30 to 240 min.

Interventions: Children were randomized to either EEG-guided anesthesia (EEG-G) or standard care (SC). EEG-G group had sevoflurane titrated to maintain continuous slow/delta oscillations on the raw EEG and spectrogram, aiming to avoid burst suppression and, as far as possible, maintain a patient state index (PSI) between 25 and50. SC group received standard anesthesia care and the anesthesia teams were blinded to EEG waveforms.

Measurements: The primary outcomes were the average end-tidal sevoflurane concentration during induction and maintenance of anesthesia. Secondary outcomes include incidence and duration of intra-operative burst suppression and Pediatric Anesthesia Emergence Delirium (PAED) scores.

Results: The EEG-G group received lower end-tidal sevoflurane concentrations during induction [4.80% vs 5.67%, -0.88% (-1.45, -0.31) p = 0.003] and maintenance of anesthesia [2.23% vs 2.38%, -0.15% (-0.25, -0.05) p = 0.005], and had a lower incidence of burst suppression [3.1% vs 10.9%, p = 0.044] compared to the SC group. PAED scores were similar between groups. Children <2 years old required higher average end-tidal sevoflurane concentrations, regardless of group.

Conclusions: EEG-guided anesthesia care reduces sevoflurane requirements in children undergoing general anesthesia, possibly lowering the incidence of burst suppression, without altering emergence characteristics. EEG monitoring allows direct visualization of brain responses in real time and allows clearer appreciation of varying sevoflurane requirements in children of different ages.