Title: SUFENTANIL DECREASES THE EEG SPECTAL EDGE FREQUENCY MORE THAN KETAMINE DURING HYPOTHERMIC CARDIOPULMONARY BYPASS

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The spectral edge frequency (SEF) is used to assess the degree of cerebral depression by pharmacological agents and hypothermia.

With institutional approval and informed consent, electroencephalographic (EEG) monitoring was performed on 24 adult patients undergoing open heart surgery. The Neurotrac^R was used to measure EEG and SEF using the standard 1020 system lead placement. SEF was defined at 97% of the compressed spectral array. The patients were randomized to 2 anesthetic groups: Group A received ketamine and midazolam (KM), and Group B received sufentanil (S). During hypothermic cardiopulmonary bypass (HCPB), SEF was measured every 3 minutes during cooling and rewarming. The data were analyzed using unpaired Student's t-tests. $P < 0.05$ was considered significant.

There were 13 patients in the Group A and 11 patients in Group B. The Groups were comparable in age, weight, length of perfusion, and perfusion pressure. At every temperature interval, the Group A SEF was significantly higher than the Group B SEF. The SEF data are summarized in the table.

It is hypothesized that SEF correlates with the degree of cerebral depression, and thus cerebral protection. These data demonstrate that the anesthetic technique has major influence on the SEF at various levels of hypothermia. Thus, it may be difficult to distinguish hypothermia from cerebral hypoxia using SEF. The artifacts in SEF produced by anesthetic technique may complicate the interpretation of EEG data in patients undergoing hypothermic cardiopulmonary bypass.

Table Means ± SD * p < 0.05 compared to Group A

Temperature (deg C.)	SEF Group A (Hz)	SEF Group B (Hz)
37-33 cooling	20.3±7.4	10.5±1.8*
32-27 cooling	16.1±3.3	10.2±2.3*
27-23 cooling	11.4±2.9	7.3±3.9*
<23 cooling	9.6±2.7	6.1±3.3*
23-27 warming	11.3±4.2	5.8±4.1*
27-33 warming	15.8±5.8	9.2±3.5*
33-37 warming	23.5±7.8	10.3±1.8*

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TITLE: USE OF EEG FOR DETERMINING PROPOFOL REQUIREMENT DURING NEUROANESTHESIA

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A reliable technique for monitoring the administration of sedative and analgesic drugs would facilitate the use of total intravenous anesthetic techniques. The purpose of this (IRB-approved) study was to evaluate a titration method using periodic drug-induced EEG burst suppression (EEG-BS) as a guide for propofol administration.

28 consenting patients (ages 18-75, ASA 1-3) were randomly assigned to receive either fentanyl-propofol or fentanyl-propofol-N_2O during neurosurgical procedures lasting 4 to 12 h. Anesthesia was induced with fentanyl, 3-4 μg/kg, and propofol 1 mg/kg/min (until loss of eyelash reflex). The initial maintenance infusion rate (MIR) of propofol was 9 mg/kg/h during the first 60 min (with N_2O 70%) or propofol, 12 mg/kg/h (alone). Fentanyl, 1-4 μg/kg/h, was administered for analgesia. A two-channel raw EEG was continuously evaluated (Neurotrac, Interspec). Depending on the EEG findings (i.e., presence or absence of EEG-BS), the propofol MIR was increased or decreased by 50% at 60 min. At 60 min intervals, consecutive small bolus doses of propofol, 0.3 mg/kg iv, were administered, until 4 sec intervals of EEG-BS was noted. If the amount of supplemental propofol necessary to obtain a EEG-BS pattern was between 0.6 and 1.2 mg/kg, the MIR was unchanged. If less than 0.6 mg/kg was required, the MIR was decreased by 50%, and if more than 1.2 mg/kg was needed, the MIR was increased by 50%. In 20 patients, propofol blood concentrations were determined using a standard HPLC technique. Data were analyzed with ANOVA and a paired t-test, with $p<0.05$ considered significant.

Patients receiving N_2O required a lower average MIR of propofol (7.8±1 vs 9.0±1 mg/kg/min for propofol alone). Pre- and post-bolus propofol concentrations (4.67±1.65 vs 3.61±1.13 μg/ml, and 6.27±1.26 vs 5.42±1.19 μg/ml) were also higher without N_2O. Times from termination of the propofol infusion to eye opening were similar in the two treatment groups (36±18 and 23±12 min, with and without N_2O respectively).

In conclusion, titration of propofol infusion as assessed by ability to produce a predictable EEG-pattern (4 sec interval of EEG-BS) in response to small doses of propofol is a useful method for determining an optimal maintenance infusion rate during neuroanesthesia.