Title : DOES THIOPENTAL OR N2O DISRUPT THE EEG DURING ENFLURANE?

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Introduction. We have demonstrated that the EEG can help monitor the depth of anesthesia during rapidly changing concentrations of enflurane (E) . This study was designed to provided preliminary answers to the following questions: 1) Does the presence of N2O interfere with the EEG interpretation during E anesthesia? 2) Does the injection of thiopental (T) drastically alter the EEG pattern obtained during E?

Methods. Anesthesia was induced and maintained with E-O2 in each of five mongrel dogs. Ventilation was controlled to maintain an E.T.CO2 of 32-35 torr (eucapnea in the dog), and rectal temperature was maintained at 38±1°C. The EEG was obtained from either a bifrontal or frontal-occipital lead, monitored on a strip recorder and recorded on an FM magnetic tape recorder. The signal was Fourier Transformed by a Nicolet Med-80 computer. The sampling rate was 128 Hz and each analysis epoch was 16 sec. The result was displayed as a compressed spectral array, the mountain and valley picture recorded on an XY plotter. To test the ability of the EEG to reflect the depth of anesthesia and to follow rapid changes in the anesthetic concentrations, we used a PRBS testing method; E was administered in pulses, that is, it was either off or on at a preset value (5-7%). Nitrous Oxide: This agent was administered in concentrations of 30%, 50%, 70%, 50%, and 30%. Ten min. were allowed for each step. In addition, four PRBS sequences were performed with E in the presence of 50% N2O. Thiopental: During steady-state E anesthesia (2.5 or 3.5% end-tidal), T was administered in boluses of 0.5 to 5 Mg/Kg.

Results. The EEG followed the rapidly changing concentration of E in O2 as produced by the PRBS, although in a somewhat damped pattern. The changes were most apparent in the high-frequency range (10-30 Hz). Nitrous oxide: The addition of N2O to steady-state E: 1) Augmented a distinct high frequency band, and sometimes produced a mid-frequency band; 2) Increased the upper frequency limit 4.86±1.0 Hz at 50% N20. Thiopental: The injection of T rapidly decreased the upper frequency limit (Fig), with a more gradual recovery. The peak reduction in upper frequency limit was related to the dose of T given (F(Hz)=1.32 + 4.93*T (Mg/Kg), r = 0.93, p<.05). Although the initial recovery was relatively rapid, there was a longer term residual shift.

Discussion. Nitrous Oxide: Since the band shifted by N2O is the one most suitable for estimating the anesthetic depth with E, it would seem that the presence of N2O would create difficulties in EEG interpretation. However, the shift is predictable, and in clinical anesthesia one seldom changes the concentration of N2O. Thus, the observation that the presence of N2O not only does not disrupt the EEG pattern of E, but actually makes it easier to read during rapidly changing concentrations is encouraging. The presence of N2O should make computer analysis of the spectral envelope easier. Thiopental: The fact that the EEG pattern of E returns within minutes after giving T is equally gratifying. The shift in the envelope after injection is in the same direction as that produced by increasing concentrations of E. Three speculations would be interesting to study in the future: 1) Does the shape of the envelope represent the cerebral uptake and elimination of T? 2) Does the longer term shift in frequency represent a residual effect of T? 3) Are the EEG effects of T and E additive, that is, does the EEG represent the depth of anesthesia produced by the combination of T and E?

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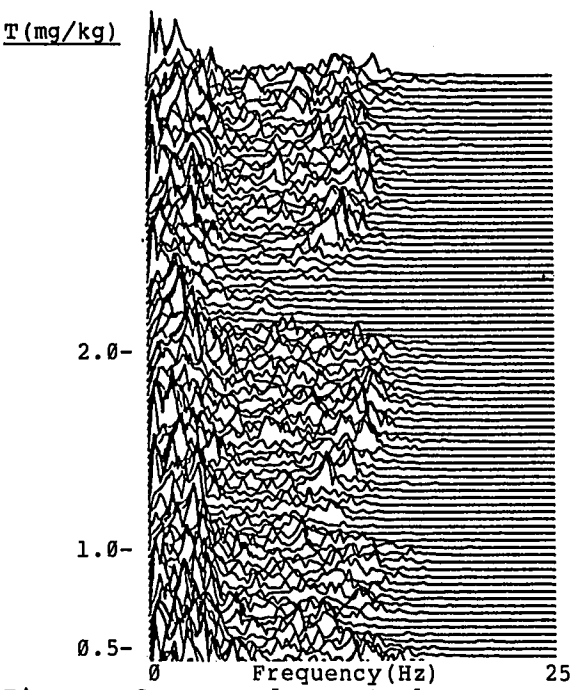

Figure. Compressed sprectral array of EEG during E with varying doses of T. Note the dose-dependent decrease in the highest frequency present.