Title: USE OF EEG AS A MEASURE OF THIOPENTAL ANESTHETIC DEPTH.

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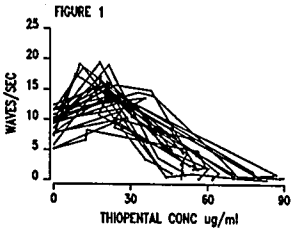
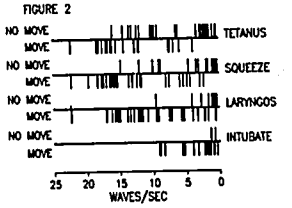
Introduction: The EEG can potentially be used to objectively quantitate the degree of CNS depression and as a measure of CNS response to perioperative stimuli. The objectives of this study are (1) to determine the relationship between a processed EEG parameter, waves/sec (WS) and constant thiopental concentration (CTC) achieved by computer controlled infusion pump (CCIP) and (2) to determine the correlation between the WS with clinical depth of anesthesia as assessed by movement response to noxious stimuli.

Methods: Following IRB approval and informed consent, we studied 26 unpremedicated ASA I or II male surgical patients. 4 Channels of EEG were recorded on FM tape for offline aperiodic analysis using Lifescan^R (Neurometrics, San Diego). Two CTCs were studied in each patient. After baseline recording of EEG, a CCIP rapidly achieved and maintained the first target CTC (10-30 ug/ml) for 5 minutes to allow blood-brain equilibration. Several noxious stimuli (50 Hz tetanus, trapezius muscle squeeze and laryngoscopy) were applied at 1 minute intervals. Movement responses were recorded. Then the second CTC (40-90 ug/ml) was achieved and maintained by the CCIP. After 5 minutes, the same stimuli were applied followed by intubation. Arterial blood was sampled frequently for thiopental assay.

Results: Figure 1 displays the biphasic relationship between CTC and WS (initial EEG activation with an increase of WS, then slowing of EEG with a decrease of WS). No evidence of EEG activation (increase of WS) occurred when noxious stimuli were applied and clinical signs of inadequate anesthesia (movement) was present. Loss of verbal responsiveness occurred at maximum EEG activation. Profound EEG slowing (0-5 WS) was needed to prevent movement responses to the other noxious stimuli. Figure 2 displays the relationship between EEG (WS) and the move/no move responses to different stimuli.

Discussion: This study demonstrates that the EEG can be used to assess clinical depth of anesthesia for thiopental. Since thiopental is a hypnotic without analgesic properties, profound EEG slowing (near burst suppression, 0-5 WS) is required to ablate the movement response to relevant clinical stimuli.





TITLE: EFFECT OF FENTANYL AND NITROUS OXIDE ON THE DESFLURANE MAC

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Desflurane (I-653), a new rapid and short-acting volatile anesthetic, will likely be used in combination with other anesthetic adjuvants, (e.g., opioid analgesics, barbiturates, and muscle relaxants). This study was designed to determine the effect of varying doses of fentanyl on the desflurane anesthetic requirement when it was administered in combination with nitrous oxide (N_2O).

Ninety-three (93) healthy, consenting ASA I-II patients scheduled for elective surgical procedures were randomly assigned to one of five study groups according to an IRB-approved protocol. Group I (control) received fentanyl 3 ug/kg iv and isoflurane. Groups II to V received desflurane with fentanyl 0, 3, 6, or 9 ug/kg iv, respectively. After obtaining baseline vital sign measurements, a defasciculating dose of d-tubocurarine, 3 mg iv, was administered to each patient. Those randomized to groups receiving fentanyl (I and III to V) were given 3, 6 or 9 ug/kg iv over 3-5 min prior to induction of anesthesia. Thiopental, 3-6 mg/kg iv, was titrated to produce loss of the eyelash reflex and succinylcholine, 1.5 mg/kg iv was given to facilitate intubation. Isoflurane (I) or desflurane (II-V) was administered with 60% N_2O for maintenance of anesthesia. The end-tidal anesthetic gas concentrations were kept constant at predetermined concentrations for at least 10 minutes prior to skin incision. The minimum alveolar concentration (MAC) was determined by recording the presence or absence of purposeful movement at the time of surgical (skin) incision. Continuous variables were analyzed using ANOVA and descriptive variables were analyzed using Chi-square or Fisher's exact test, with $p<0.05$ considered statistically significant.

All five study groups were comparable with respect to demographic data. The high-dose fentanyl groups (IV, V) received significantly less thiopental (3.4-3.6 mg/kg) during induction than did the low-dose fentanyl groups I, II, III (4.2-4.4 mg/kg). In group I (isoflurane), the MAC was determined to be 0.4±.05%. MAC was determined to be 3.7±0.5% in group II, 3.0±0.4% in group III, 1.2±0.2% in group IV, and 0.1±0.1% in group V (fig. 1).

In summary, there is a dose-effect relationship between the amount of fentanyl administered and the decrease in desflurane MAC. Fentanyl, 3 ug/kg iv, produced a 20% decrease in the desflurane-N_2O anesthetic requirement.