

Title: HALOTHANE DOSE DEPENDENCY OF CANINE SPINAL, FAR-FIELD AND NEAR-FIELD SOMATOSENSORY EVOKED POTENTIALS

Authors: K. Hogan, M.D., M.A. Gravenstein, M.D., F. Sasse, M.D.

Affiliation: Department of Anesthesiology, University of Wisconsin, Clinical Science Center, Madison, Wisconsin 53792.

**Introduction:** Halogenated anesthetic agents depress near-field somatosensory evoked potentials (SEPs) occurring from 25 to 100 msec. after stimulus onset, whereas far-field responses recorded before 25 msec. may be refractory to halothane and related drugs. In order to identify the preferred monitoring technique, halothane dose dependencies of spinal, near-field and far-field responses were compared while controlling variables known to alter the SEP.

**Methods:** Anesthesia was induced by mask in eight unselected mongrel dogs, followed by tracheal intubation and venous and arterial catheterization. Blood pressure ( $70.9 \text{ mmHg} \pm 21.0$ ), core and limb temperatures (core  $37.9^\circ\text{C} \pm 1.4$ ), inspired oxygen of 40% in air and end-tidal carbon dioxide ( $4.0\% \pm 0.6$ ) were continuously controlled. Muscle relaxation was maintained with pancuronium ( $0.05\text{mg/kg/hr}$ ). The left posterior tibial nerve was stimulated five times per second with 200 usec. constant current pulses at 1.5 twitch threshold current (Grass S88). SEPs were simultaneously recorded from bipolar sites L3-L1, T8-T6, vertex-neck and vertex-brow with platinum subdermal needle electrodes. 1024 near-field (gain 25,000, filter bandpass 30-250 Hz.) and 2048 far-field responses (gain 100,000, filter bandpass 150-1500 Hz.) were averaged and replicated (Nicolet 1170). Levels of end-tidal halothane (Beckman LB-2) at 1.0, 1.5, 2.0 and 2.5 MAC (MAC = 0.86%) were delivered in random order. Thirty minutes was allotted between each level for equilibration. Spinal potentials were analyzed with a paired sample T-test. A two factor ANOVA appropriate for repeated measures was performed on the scalp-recorded evoked potential data. A significance level of  $p < 0.05$  was adopted for differences between replications and differences between doses.

**Results:** Lumbar, far-field and near-field SEPs were observed in all dogs at 4 levels of halothane with no significant difference between the first and second replication in any trial. Small amplitude thoracic potentials were seen in only two of eight dogs and were therefore not entered into analysis. Triphasic positive-negative-positive lumbar spinal potentials showed no change in latency with increasing halothane dose. Far-field SEPs consisted of up to five positive and five negative

peaks. Amplitudes and latencies of the most prominent early peaks (PI, PII, NII, PIII) were stable at all halothane levels. Increasing halothane caused incremental changes in latency accompanied by decremental changes in amplitude of the far-field NV and near-field P1, N1, P2, and N2 peaks. Susceptibility of these components to the adverse effect of halothane was proportional to peak latency (figure). The amplitude of both near-field and far-field SEPs was greater with vertex referenced to neck than to brow.

**Discussion:** The absence of a halothane dose effect on lumbar potentials confirms the value of this measure as a reliable indicator of adequate central nervous system stimulation during general anesthesia. The vulnerability of near-field SEPs depreciates their value as monitors of somatosensory conduction when use of halothane is desired. Early components of the far-field SEPs are unaffected by halothane, and when referenced to neck may be the preferred monitoring technique. These findings are of particular relevance to the clinician seeking the widest possible anesthetic armamentarium without loss of monitoring sensitivity.

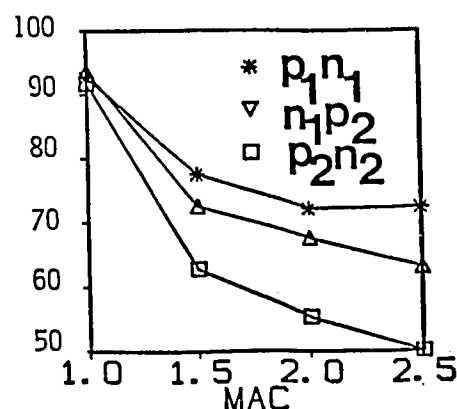


Figure. Mean percent change with halothane dose of near-field component amplitudes at vertex-brow.