Title: EFFECTS OF STIMULUS RATE AND HALOTHANE DOSE ON CANINE FAR-FIELD SOMATOSENSORY EVOKED POTENTIALS

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Introduction: Early recognition of myelopathy during intraoperative spinal cord monitoring is contingent upon rapid data collection. The shorter analysis time of far-field somatosensory evoked potentials (SEPs) allows higher rates of stimulation thereby minimizing time required for acquisition. The purpose of this investigation was to establish the rate dependencies and halothane dose-rate interactions of far-field SEP components in a canine model.

Methods: Eight mongrel dogs underwent halothane mask induction followed by tracheal intubation and venous and arterial catheterization. Muscle relaxation was maintained with pancuronium (0.05 mg/kg IV per hour). The following variables were continuously monitored and controlled: core and limb temperatures (core 37.9°C ± 1.4), inspired oxygen (40% in air) and end-tidal carbon dioxide (4.0% ± 0.6). No cases of significant hypotension were encountered, with blood pressure averaging 70.9 ± 21.0. Levels of end-tidal halothane (Beckman L-2) at 1.0, 1.5, 2.0 and 2.3 MAC (MAC = 0.86%) were delivered in randomized fashion. Thirty minutes was allocated between each steady-state level for equilibration. Bipolar SEPs elicited by 100 usec. constant current pulses to the left posterior tibial nerve at 1.5 times twitch threshold (Grass S88) were simultaneously recorded from vertex to neck and vertex to brow with platinum needle electrodes. Stimulation rates of 5, 15, 25 and 35 Hz were delivered in random order at each level of halothane. 2048 responses (gain 100,000, filter bandpass 150-1500 Hz.) were averaged at each stimulus rate (Nicolet 1170) and replicated. A three factor ANOVA appropriate for repeated measures design was used for data analysis. Differences reflecting dose effect, rate effect, and dose-rate interaction were considered significant for p<0.05.

Results: Five positive and five negative peaks were observed in vertex to neck recordings at all levels of halothane. Early latency components showed a small but significant change with rate and no significant dose or dose-rate effect. Longer latency peaks were prolonged and their amplitudes attenuated with changes in rate and dose. These effects were pronounced at rapid stimulus rates in the presence of high MAC levels of halothane. Vertex to brow responses were composed of a single positive and a single negative peak designated P'V and N'V due to similarities in morphology with P'V and N'V in the vertex to neck montage. P'V and N'V were sensitive to rate, dose and dose-rate interaction with nearly complete attenuation at 2.5 MAC and 35 Hz rate of stimulation (figure).

Discussion: Rapid rates of stimulation alter all far-field SEP components, however the magnitude of these changes increases with peak latency. Early components are easily recognized at high rates of stimulation even at the deepest levels of halothane anesthesia. The combined detrimental effects of dose and rate on later vertex-neck and vertex-brow components limits their value in detection of spinal cord pathology. Early components of the far-field SEP recorded from vertex to neck may be the preferred monitoring indices when early recognition is essential.

Figure. Mean percent change of P'V/N'V amplitude with halothane MAC (1.0-2.3) and stimulus rate (35-5 Hz left to right).