

TITLE: EFFECTS OF HALOTHANE AND ISOFLURANE ON SOMATOSENSORY EVOKED POTENTIALS IN MAN

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While it is generally held that volatile anesthetics produce considerable attenuation of cortical somatosensory evoked responses (SSEP)¹, only enflurane in low concentrations has been studied systematically². The following study was undertaken to define the effects of halothane (H) and isoflurane (I) on median nerve SSEP's (MnSSEP's).

Methods: With Human Studies Committee approval, 12 consenting, healthy adults undergoing non-neurologic surgery were studied. None received CNS-active medication prior to premedication with intramuscular morphine 0.15mg/kg and promethazine 0.35mg/kg. Duplicate MnSSEP's were recorded prior to induction of anesthesia. Following induction (methohexital 2mg/kg, succinylcholine) and intubation, H (n=5) or I (n=6) in 60% N₂O was administered. An end-tidal (ET) concentration (mass spectrometry) of 0.5 MAC H (0.38%) or I (0.58%), was achieved and maintained for 15 minutes. Duplicate MnSSEP's were recorded, and repeat recordings were subsequently made after similar equilibration at the 1.0 and 1.5 MAC levels. N₂O was then omitted and final recordings were made 15 minutes later. The 0.5 MAC recordings were performed prior to surgical incision and the remainder were done thereafter. ET CO₂ was held at 35-40 mmHg and nasopharyngeal temperature was maintained at the immediate post-induction level.

Results: Each 0.5 MAC increment of both H and I resulted in increases in latency and decreases in amplitude of the cortical response (cMnSSEP). The cMnSSEP was present in all H patients at all MAC levels, whereas at 1.5 MAC I, there was no discernable response in 5 of 6 I/N₂O patients and in 3 of 6 I/no N₂O patients. The central conduction time (CCT) also showed significant lengthening (see table) with increasing MAC levels. The cervical spine (C₂) responses showed minor latency increases at 1.5 MAC H and at ≥ 1.0 MAC I (see Table).

Discontinuation of N₂O at the 1.5 MAC level resulted in a decrease in latency and an increase in amplitude of the cMnSSEP in both groups.

Discussion: Both H and I caused dose-related changes in the cMnSSEP and the CCT, and these effects were more pronounced with I. While the cMnSSEP was present in all patients at 1.0 MAC I, it was of sufficiently low amplitude that effective monitoring would be impractical in all but the most favorable signal-to-noise ratio circumstances. By contrast, the cMnSSEP was present in all H patients at 1.5 MAC, and at 1.0 MAC had an amplitude compatible with effective monitoring. Our results suggest that the administration of 1.0 MAC H or 0.5 MAC I (both with 60% N₂O) should permit effective MnSSEP recording in normal subjects. However, if alterations in ET concentration of H or I occur, changes in wave forms and CCT should be anticipated and must be considered during interpretation. Our data (at 1.5 MAC) confirm the N₂O-related reduction in cMnSSEP amplitude observed by McPherson et al.²

and therefore suggest that the H or I concentrations compatible with effective monitoring may be greater if N₂O is not employed.

References:

1. Grundy BL: Intraoperative monitoring of sensory-evoked potentials. *Anesthesiology* 58:72-87, 1983.
2. McPherson RW, Mahla M and Traystman RJ: Effects of anesthetic gases on somatosensory evoked potentials during narcotic anesthesia. *Anesthesiology* 59:A319, 1983.

	Latency (msec)			Amplitude
	C ₂	N ₁	CCT	N ₁ -P ₁
Pre-induction	14.19±1.22	19.66±1.53	5.47±0.40	2.92±1.35
0.5 MAC H, 60% N ₂ O	14.38±1.29	20.69±1.73*	6.30±0.47*	1.20±0.61*
1.0 MAC H, 60% N ₂ O	14.48±1.22	21.41±1.76*	6.93±0.64*	0.89±0.43*
1.5 MAC H, 60% N ₂ O	14.54±1.14	22.29±1.77*	7.74±0.89*	0.60±0.40*
1.5 MAC H, no N ₂ O	14.64±1.19*	21.98±1.96*	7.34±0.89*	0.88±0.45*
Pre-induction	13.13±0.38	18.75±0.31	5.61±0.36	2.08±0.75
0.5 MAC I, 60% N ₂ O	13.28±0.41	20.03±0.81*	6.75±0.74*	1.07±0.36*
1.0 MAC I, 60% N ₂ O	13.51±0.26*	21.03±0.82*	7.52±0.75*	0.56±0.11*
1.5 MAC I, 60% N ₂ O	13.97±0.25*	22.80 (n=1)	8.96 (n=1)	0.30 (n=1)
1.5 MAC I, no N ₂ O	14.23±0.26*	22.67±1.26* (n=3)	8.35±1.03* (n=3)	0.38±0.20* (n=3)

Table: Latencies and amplitudes (±SD) recorded pre-induction and at various MAC levels of H (n=5) and I (n=6). C₂=upper cervical spine, N₁ and P₁ as per Figure, CCT=central conduction time (N₁-C₁), * significantly different (paired t, p<0.05) vs pre-induction, ** significantly different vs control and vs preceding recording.

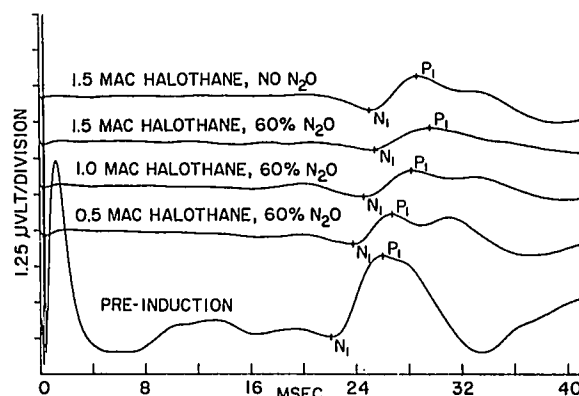


Figure. MnSSEP cortical response (C₃' or C₄'-FPZ) at various MAC levels of H with 60% N₂O, and at 1.5 MAC without N₂O.

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