TITLE: BRAINSTEM AUDITORY EVOKED POTENTIALS DURING ENFLURANE AND NITROUS OXIDE ANESTHESIA IN MAN

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Introduction. Short latency brainstem auditory evoked potentials (BAEP) have been utilized to monitor functional integrity of the brainstem and entire auditory system from the periphery to the thalamic projections. Since evaluations are often done in the presence of general anesthesia, it is important to consider the effects of anesthetics on normal BAEP monitoring. The scant data available in anesthetized patients present conflicting findings which may relate to the presence or absence of N_2O and whether measurements were made in subjects with normal or abnormal hearing.[1,2] Middle ear pressures may rise with N_2O and produce a conductive hearing deficit sufficient to alter the latency of BAEP. The purpose of this study was to identify whether inhalation anesthesia affects BAEP waveforms in normal patients. We also sought to evaluate the effects of N_2O since the latter is the mainstay of many anesthetic techniques, particularly those in neurosurgical anesthesia.

Methods. Following institutional approval for the study six healthy adults (3 males, 3 females, ages 20-59) underwent screening audiometry. Subjects were then studied before and during general anesthesia for elective gynecological and plastic surgery. The BAEP were elicited by ipsilateral clicks at a rate of 11.3/s (intensity 75 dBnHL) and recorded by summing 2048 stimulus presentations.* Patients were intubated, paralyzed, and then anesthetized with either enflurane-O_2 anesthesia (1.5% inspired enflurane) followed by N_2O-O_2 anesthesia (70% N_2O) or in reverse sequence. Recordings of BAEP were performed after 30 min of stable anesthesia with each technique and compared to preanesthetic responses. The absolute latencies of Wave I (acoustic N.), Wave III (superior olive, pons) and Wave V (inferior colliculus, midbrain) were computed, as well as the interpeak latencies, which reflect neural transmission time.

Results. The absolute latencies for Waves I, III, and V in awake subjects were not significantly altered by anesthesia with 1.5% enflurane or 70% N_2O (Table 1). The mean interpeak latencies were also unaffected by the anesthetics. Two of the older patients, who demonstrated mild high frequency hearing deficits on preoperative audiometry did show marked increases in absolute latencies for Waves I, III, and V during N_2O anesthesia. No increases in interpeak latency were noted in these patients. The changes suggested normal brainstem transmission since the major phenomenon was an increase in latency for Wave I.

Discussion. Our findings failed to demonstrate significant effects of enflurane-O_2 anesthesia on BAEP in normal patients. Although mean changes with N_2O-O_2 were also not significant, individual patients with mild hearing deficits did exhibit increased absolute latencies for Waves I through V which appeared to result primarily from increased latency of Wave I. This suggests an effect of N_2O consistent with a conductive hearing loss. Although N_2O may have no effect on patients with normal hearing, the presence of certain forms of peripheral hearing impairment may accentuate the effects of N_2O on the latency of BAEP. We conclude therefore that the interpeak latencies of BAEP, which reflect brainstem transmission, are unaffected by conventional general anesthetics. Absolute latencies of BAEP may be increased in individuals with baseline peripheral hearing deficits when N_2O is administered.

Table 1

	ABSOLUTE LATENCIES (msec)			INTERPEAK LATENCIES (msec)		
WAVE	I	III	V	I-IV	I-III	III-V
AWAKE	1.6 (.2)	3.7 (.2)	5.8 (.3)	4.2 (.2)	2.1 (.2)	2.1 (.2)
ENFLURANE	1.6 (.2)	3.7 (.2)	5.8 (.2)	4.2 (.2)	2.1 (.2)	2.1 (.2)
N_2O	1.7 (.2)	3.8 (.2)	5.8 (.3)	4.2 (.2)	2.2 (.2)	2.0 (.1)

Values are Mean ± SD for six patients

References.
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2. Duncan PG, Sanders RA, McCullough DW: Preservation of auditory-evoked brainstem responses in anesthetized children. Canad Anaesth Soc J 26:492-495, 1979

*Nicolet 1174 (Nicolet Biomedical Inc., Madison, WI).