

Title: COMPARISON OF ENFLURANE, HALOTHANE, AND ISOFLURANE FOR OUTPATIENT PEDIATRIC ANESTHESIA

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Introduction. In the absence of evidence suggesting superiority of a single inhalational anesthetic, the choice of agents for brief procedures in ambulatory pediatric patients depends on the preference of the anesthesiologist. Thus, we determined the induction, maintenance, emergence, and recovery characteristics of enflurane, halothane, and isoflurane in infants and children given general anesthesia for brief painful procedures.

Methods. After obtaining approval from the local committee on human research and informed consent, we performed 107 studies on 76 children (8 months-18 years) given general anesthesia for diagnostic and therapeutic procedures for cancer. Patients were NPO for 6 h and received no premedication. Anesthesia was induced via facemask with N₂O and enflurane, halothane, or isoflurane selected randomly; no patient received the same agent more than once. After induction, the patient was turned to the lateral position for lumbar puncture (97), bone marrow aspirate (101), and/or bone marrow biopsy (18). After the procedures, patients recovered in their parents' arms until fully awake, and were then discharged to the oncology clinic. An independent observer recorded the duration of induction (placement of the facemask until beginning of skin prep), maintenance (skin prep to completion of procedure), emergence (completion of procedure to spontaneous eye opening), and recovery (eye opening to departure from OR). In addition, the observer recorded the presence and severity of complications (table). Mean values for duration were compared by ANOVA and the Newman-Keuls test. Incidence of complications was compared by chi-square analysis. For all comparisons, P < 0.05 was considered statistically significant.

Results. The most rapid induction of anesthesia and the lowest incidence of excitement was with halothane (table). The highest incidence of laryngospasm during induction and of coughing during emergence and recovery occurred with isoflurane. Enflurane did not differ from halothane except in duration and incidence of excitement during induction.

Discussion. An optimal anesthetic agent for brief pediatric outpatient procedures would produce a rapid and pleasant induction, smooth maintenance, uncomplicated emergence and no undesirable postanesthetic effects. Of the agents tested, halothane produced the smoothest inductions and isoflurane the most complications during induction (however, none was life-threatening). The agents were similar in their maintenance characteristics. Isoflurane was associated with more coughing during emergence and recovery. None of these agents has significant disadvantages except isoflurane, which was associated with more coughing and laryngospasm

during induction. In a busy practice, rapid and uncomplicated inductions may make halothane the agent of choice.

Table. Duration and Incidence of Complications with Enflurane, Halothane, and Isoflurane.

	Enflurane 38	Halothane 42	Isoflurane 27
Duration (min, mean ± SD)			
Induction	3.3 ± 0.8	2.7 ± 1.0*	3.4 ± 1.2
Maintenance	5.3 ± 3.0	6.1 ± 4.0	6.5 ± 3.6
Emergence	4.6 ± 4.6	6.3 ± 4.7	6.7 ± 4.1
Recovery-OR	7.6 ± 5.6	7.8 ± 5.7	8.8 ± 5.9
Total	20.7 ± 8.4	22.9 ± 7.6	25.5 ± 7.7
Incidence of complications (%)			
<u>Induction</u>			
Laryngospasm	5	5	30*
Coughing	24	19	30
Vomiting	3	2	4
Excitement	32	12*	44
<u>Maintenance</u>			
Coughing	5	0	11
Laryngospasm	5	0	15
Vomiting	0	0	0
Bradycardia	0	0	0
Hypotension	0	0	0
Arrhythmias	3	0	0
<u>Emergence</u>			
Coughing	16	10	44*
Laryngospasm	0	0	0
Vomiting	0	0	0
Laughing	5	0	0
<u>Recovery-OR</u>			
Vomiting	3	14	11
Coughing	13	19	56*
Dizziness	3	10	11
Headache	8	0	4
Laughing	10	14	4
Hunger	26	26	33
Sore throat	0	0	4
Depression	16	21	30
Nausea	3	12	11
<u>Recovery-Clinic</u>			
Vomiting	8	10	0
Coughing	0	0	0
Dizziness	0	0	0
Headache	0	7	0
Laughing	3	5	15
Hunger	42	49	67
Sore throat	0	0	0
Depression	10	5	4
Nausea	5	12	7

*Different from other groups by ANOVA and Newman-Keuls or chi-square analysis.