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Title: Reduced Exposure to Halothane and Nitrous Oxide by Operating Personnel during Induction of Anesthesia in Children using Double Mask System.

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Introduction

High flows of halothane and N₂O are commonly used in children during induction of anesthesia. Direct application of the face mask frequently produces fear and a sense of suffocation and thus it is applied close but without contacting the child's face. Such a technique exposes the operating room personnel to a potential harmful concentration of inhalational anesthetics. We prospectively evaluated the efficiency of double mask system (Bernier-Medivent) during inhalational induction in children.¹

Methods

Following informed parental consent, 32 ASA I, II & III children, ages 5 days-8.5 yrs were studied. All children received midazolam either orally 0.5 mg/kg or intramuscularly 0.1 mg/kg with atropine 30 minutes prior to induction. The anesthesia was induced with inspired halothane concentration of 2-3% and N₂O 50-70% in 6-8 liters of fresh gas flow via Jackson-Rees breathing system. Children were randomly assigned into two groups. Anesthesia was induced in group I using Rendall-Baker mask. A regular scavenging device was connected to the breathing bag at 14 liters/minutes. In group II a double mask system was used and connected to an active scavenging system at 580 liters/minutes. The double mask system consists of an inner smaller mask which is separated from an outer larger mask by a slot connected to a scavenging device. Halothane and N₂O were measured at 10 cm below the chin of the anesthesiologist performing the induction until the mask could be closely fitted to child's face. Halothane and N₂O were analyzed by photoacoustic infrared spectroscopy (Bruel & Kjaer). Data were analyzed using t-test.

Results

There was no significant difference in mean age between the two groups. Halothane and N₂O concentrations were significantly lower with the use of double mask system compared to conventional mask (P < 0.0001) (Table). The high-flow scavenging device of double mask produced noise but did not bother the children or interfere with induction.

Conclusion

There is little correlation between room air turn over rate in the operating room and the occupational exposure to inhalational anesthetics.² We demonstrated that the use of double mask system with a local scavenging device substantially reduced the exposure of the anesthesiologist to halothane by 89% and N₂O 80% during inhalational induction respectively.

Reference

1. Acta Anaesth Scand 30:260-265, 1986
2. Anaesth 35:354-359, 1980

Table	Group I	Group II	P-value
Age (yr)	2.20 ± 1.97	2.2 ± 2.3	> 0.05
Halothane (ppm)	130.4 ± 102	14.9 ± 7	< 0.0001*
N ₂ O (ppm)	1916 ± 34	385 ± 177	< 0.0001*

* = statistically significant

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TITLE: DOES GENERAL ANESTHESIA PRODUCE RETROGRADE AMNESIA IN UNPREMEDICATED CHILDREN?

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INTRODUCTION: Studies in unpremedicated adults have shown that general anesthesia does not produce retrograde amnesia for preoperative events.¹ In contrast, studies in children have suggested that general anesthesia may cause retrograde amnesia for the immediate preinduction period.² However, in these studies the induction technique was not randomized and the use of premedicants was not controlled. To determine whether general anesthesia causes retrograde amnesia in children, the following prospective, randomized, single-blinded study was undertaken.

METHODS: This study was approved by the Human Subjects Review Committee and written informed consent was obtained from the parents of all children. Sixty-four, ASA 1 or 2, unpremedicated children (GA) aged 4 to 12 years scheduled for minor elective surgery of less than 1 hour duration were assigned to either an intravenous (IV) or inhalational (mask) induction by random selection. Immediately prior to induction, the children were shown one of four possible pictures (house, airplane, light bulb, or pencil) and asked to name it. The following day the children were telephoned by a nurse who was blinded to the induction technique and were asked to recall the picture shown prior to induction and the induction technique used. These children were compared to an age-matched control group of 32 children (control) who were scheduled for the ambulatory orthopedic clinic. These children were shown one of the same set of pictures while awaiting an appointment to the clinic. They were telephoned the next day to determine the incidence of amnesia for the picture. Fisher's exact test and Chi square analysis were used to identify statistically significant differences (p<0.05).

RESULTS: The incidence of amnesia for the picture in the GA group (10/64 (15.6%)) was significantly greater than that in the control group (0/32 (0%); p<0.05). In the GA group, 17 of the 64 children (26.5%) had amnesia for the induction technique. This was independent of the type of induction (IV 9/32 (28%) vs mask 8/32 (25%); p=NS). The incidence of amnesia for the induction technique (17/49 (34.7%) vs 0/15 (0%); p<0.05) and the picture (10/49 (20.4%) vs 0/15 (0%); p<0.05) was significantly greater in children less than 8 years of age.

DISCUSSION: The results of this study demonstrate that general anesthesia does produce retrograde amnesia for the immediate preinduction period in some unpremedicated children. The incidence of retrograde amnesia is independent of the method of induction, but does depend on the age of the patient. The increased incidence of retrograde amnesia in children under 8 years of age is supported by studies of brain function using event related potentials (ERPs).³ ERP morphology matures with age during childhood, achieving adult morphology at 8 years of age. We conclude that general anesthesia by intravenous or inhalational induction causes retrograde amnesia for the induction technique in 35% of unpremedicated children less than 8 years of age undergoing minor ambulatory surgery.

REFERENCES:

1. Anesthesiology 71: 200, 1989.
2. Br. J. Anaesth, 58:490, 1986.
3. Biological Psychology, 26: 325, 1988.

Table 1. The incidence of amnesia for a picture in children following general anesthesia (GA).

PATIENT GROUP	AMNESIA	NO AMNESIA
GA	10/64 (15.6%)*	54/64 (84.4%)
CONTROL	0/32 (0%)	32/32 (100%)

*P<0.05 vs control