Comparison of Recovery Characteristics of Sevoflurane and Halothane in Children Undergoing Adenotonsillectomy

Ahmad Sbaihat,[1] Emil Batarseh* [2]

Abstract

Objective: To compare recovery characteristics of sevoflurane and halothane anaesthesia in children.

Patients and Methods: A total of 80 children aged 3-8 years presenting for elective adenotonsillectomy. Children divided into two groups: **Group I:** In which received sevoflurane anaesthesia. **Group II:** In which received halothane anaesthesia.

Results: The mean time of emergence and time of interaction after surgery was significantly shorter in group I than group II. The time taken to be ready for discharge from recovery room to the ward was also significantly shorter in group I than group II.

Conclusion: Recovery is significantly faster with sevoflurane than with halothane anaesthesia.

Keywords: Sevoflurane, Halothane, Recovery, Children, Anaesthesia.

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Introduction

Sevoflurane is a volatile ether inhalational anaesthetic. It received Food and Drug Administration (FDA) and Committee on Safety of Medicines (CSM) approval in 1995. [1] But it has been used in Japan for patients since 1990. [3] Sevoflurane produces rapid induction of anaesthesia [4] and it has a number of properties that make it potentially suitable as a volatile anaesthetic agent for paediatric patients.

It has much lower blood solubility [2] with the potential for more rapid onset and offset of anaesthesia. It has low blood: gas partition coefficient. [6]

1. Department of Otolaryngology, Royal Medical Services, Jordan.
2. Department of Anaesthesia, Royal Medical Services, Jordan.
**** Correspondence should be addressed to:***
Ahmad Sbaihat
P.O. Box: 867 Amman, 11953 Jordan.
E-mail: drsbaihat@hotmail.com

One of the biggest advantages of sevoflurane is its pleasant, nonirritating odour that makes it more acceptable to children [3, 5] with a low airway irritability for inhalational induction.

Sevoflurane has a low arrhythmogenicity and limited cardiovascular depression. [4]

Halothane, an alkane, usually provides a smooth inhalation induction in children. The major disadvantages of halothane are myocardial depression, a propensity toward cardiac arrhythmias and significant degree of metabolism.

The aim of our present study was to compare the recovery characteristics of sevoflurane and halothane anaesthesia in children, and to assess whether sevoflurane offers clinical advantages compared to halothane.

Materials and Methods

Eighty children aged between 3 and 8 years were scheduled to undergo adenotonsillectomy under general anaesthesia to receive inhalational induction with either sevoflurane or halothane, without pre medication.

Children included in the study had no previous medical problems including cardiac, respiratory, renal, hepatic, or central nervous system disease.

Patients were randomly assigned to receive either sevoflurane anaesthesia (group I) or halothane anaesthesia (group II).

In the operating room, using a breathing circuit, induction of anaesthesia was initiated by mask using nitrous oxide 4L /min., and oxygen 4L/min, concentrations of halothane and sevoflurane were steadily increased, in increments of 0.5-1% for halothane up to 2%, or 1.5- 2% for sevoflurane up to 4%.

As soon as consciousness was lost, tracheal intubations was performed under deep anaesthesia for all patients.

All patients received diclofenac 0.5-1 mg/kg per rectum soon after induction.

The inspired concentration of vapour was kept constant. All the inhalational agents were discontinued after adenotonsillectomy had been completed and haemostasis was secured by the surgeon. Then 100% oxygen was delivered to the patient.

The children were extubated when the gag reflex had returned and were breathing adequately.

Vital signs were recorded preoperatively, at induction and then at frequent intervals during maintenance, emergence, and in the post operative recovery period.

In the recovery room, all patients were given oxygen via simple plastic face mask.

The following times were recorded**:**

1. Total time of anaesthesia: from start of induction to end of surgery.
2. Emergence time: time from the end of inhalation anaesthetic to the time the patient moved or responded to non painful stimuli.
3. Interaction (orientation) time: the time from the end of inhalation anaesthetic until the patient was able to spontaneously open eyes and interact with others.
4. Time of discharge from recovery area: the time from the end of inhalation anaesthetic to the time the patient was eligible for recovery room discharge.

All observations were recorded by a trained observer and had been present during the induction.

Results

The 80 children in the study were equally divided into two groups; there were no demographic differences between the two groups for age, sex or weight (Table 1). The mean total anaesthetic time was similar in both groups, 41.8 min. in group I and 39.5 min. in group II.

Table (1): Distribution of age, body weight and gender in both groups.

	Group I (n=40)	***Group II (n = 40)***	***P value***
Mean age (years)	*5.3*	*5.4*	*0.811*
Sex-n (%) male	*26 (65%)*	*22 (55%)*	*0.247*
Female	*14 (35%)*	*18 (45%)*	
Mean weight	*19.4*	*19.6*	*0.813*

The emergence time, interaction time and time of discharge from recovery were shorter in group I table (2), and associated with statistically significant rapid recovery in group I than group II.

Table (2): Recovery times in both groups.

Mean recovery times	*Group I*	*Group II*	*P value*
Mean emergence time (min)	*7.6*	*11.8*	*0.000*
(S.D)	*0.6*	*0.7*	
Mean interaction time (min)	*14.4*	*26.1*	*0.000*
(S.D)	*1.1*	*0.9*	
Mean time of discharge from recovery (min)	*21.1*	*35.9*	*0.000*
(S.D)	*1.3*	*1.0*	

Pain scores in recovery did not differ between the two groups, that there was no post-operative analgesic requirements in any of both groups.

The incidence of post-operative nausea and vomiting was lower in group I, two children in group I and 8 children in group II had nausea in the recovery room.

Six children, all in group II, vomited during recovery.

In the first 24 hours post-operative, seven children complained of nausea and three of them vomited from group I, while twelve children who felt nausea also vomited.

Vital signs during recovery remain stable in both groups (Heart rate remains 90-120 beat/ min. and respiratory rate 20-40/ min).

Neither laryngospasm nor bronchospasm occurred in any patient of both groups. Table (3).

Table (3): Complications of anaesthesia in recovery in children in both groups.

Complications	*Group I*	*Group II*
-In the recovery room		
Shivering	*3*	*2*
Nausea	*2*	*8*
Vomiting	*0*	*6*
Laryngospasm	*0*	*0*
Bronchospasm	*0*	*0*
-In the ward		
Shivering	*2*	*2*
Nausea	*7*	*12*
Vomiting	*3*	*12*
Laryngospasm	*0*	*0*
Bronchospasm	*0*	*0*

Discussion

Sevoflurane is a smooth, safe and efficacious drug for inhaled induction and maintenance of anaesthesia. It is effective as halothane in providing smooth and rapid induction of anaesthesia, haemodynamic tolerance is better if compared to halothane. [8]

Some studies have reported no differences in incidence of post-operative excitation and the time to discharge home after an outpatient paediatric surgeries between using sevoflurane and halothane. [9] While other studies reported that with sevoflurane, the time of agitation and recovery was significantly shorter. [7, 10, 11] Our findings in the present study supports the results of other authors, [1,3,6,7] that with sevoflurane the time to awaken was faster, than with halothane and has more rapid recovery. The lower blood gas solubility of sevoflurane is probably the major factor to account for the rapid recovery.

However, all children in our study receive diclofenac analgesia pre operatively, all of them in both groups had the same severity of pain and discomfort post-operative.

As in previous studies, the incidence of nausea and vomiting in recovery room and in the first 24 hours were greater in those children who received halothane. Otherwise, the frequency and severity of side effects were similar in both who receive either sevoflurane or halothane.

In Summary, we found sevoflurane to be a suitable alternative to halothane in children for adenotonsillectomy, that recovery with sevoflurane is faster than those with halothane. In addition, the incidence of nausea and vomiting post operative are significantly lower in children who receive sevoflurane.

Conclusion

Sevoflurane provides a faster anaesthetic emergence and recovery than halothane. Although there were no major complications in both groups, the incidence of side effects in recovery is less with sevoflurane than halothane.

This suggests that sevoflurane is a useful substitute for halothane in paediatric patients.

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مقارنة خصائص استعادة الانتعاش للسيفوفلورين والهالوثين عند الأطفال

أحمد الصبيحات، [1] أميل بطارسه [2]

1– دائرة الأنف والأذن والحنجرة، الخدمات الطبية الملكية، عمان، الأردن؛ 2– دائرة التخدير والانعاش، الخدمات الطبية الملكية، عمان، الأردن.

الملخص

الأهداف: تهدف الدراسة الى مقارنة خصائص استعادة الانتعاش للسيفوفلورين والهالوثين عند الأطفال.

الوسائل: أجريت هذه الدراسة لأطفال تتراوح أعمارهم بين 3–8 سنوات (80 طفلاً) من الذين ستجرى لهم عمليات استئصال اللوزتين والناميات. وتم تقسيمهم الى مجموعتين: **المجموعة الأولى:** الأطفال الذين استخدم لهم سيفوفلورين للتخدير. **المجموعة الثانية:** الأطفال الذين استخدم لهم هالوثين للتخدير.

النتائج: الوقت المتوسط لاستجابة الطفل والوقت المتوسط للتفاعل اللاإرادي أقصر عند الأطفال في المجموعة الأولى مما هو لدى المجموعة الثانية. كما أن الوقت المستغرق ليكون الطفل جاهزا للخروج من غرفة الإنعاش أقصر بشكل ملحوظ عند الأطفال في المجموعة الأولى.

الخلاصة: استعادة الانتعاش أسرع بشكل ملحوظ باستخدام ال سيفوفلورين عنه بأستخدام الهالوثين في التخدير.

الكلمات الدالة: سيفوفلورين، هالوثين، استعادة، الأطفال، تخدير.