

RECOVERY PROFILE FOR MAGNETIC RESONANCE IMAGING IN PEDIATRIC DAYCASE

- Sevoflurane vs. Isoflurane -

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Abstract

Background: Magnetic resonance imaging (MRI) is gaining ground over other investigations particular in study of brain and soft tissues. The MRI procedure is painless but requires an immobile patient for a successful study. Children are required to be sedated or anesthetized for this procedure. We compared two inhalational anesthetics, namely sevoflurane and isoflurane, for the recovery profile of each with aim to determine the ideal drug for early discharge of children.

Patient and Methods: 100 patients aged 3 yrs to 10 yrs (ASA I and II) were divided into Group S (Sevoflurane), Group I (Isoflurane). The induction time, duration of the MRI study, recovery and discharge times were recorded. The data were subjected to Students t-test and Levene's test for equal variance.

Results: In Group S, 27 male and 23 female were enrolled in comparison to 30 male and 20 female in Group I. The induction time in

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Group S resulted in a mean of 133.7 seconds (± 19.32), Group I yielded a mean of 157.44 seconds (± 24.20) $p > 0.05$. The mean recovery time with Group S was 124.4 seconds (± 31.57) when compared with Group I a mean of 376.46 seconds (± 58.20) $p < 0.05$. The mean discharge time in Group S was 25.20 minutes (± 5.71) in comparison to a mean of 37.40 minutes (± 7.43) $p < 0.05$ in Group I.

Conclusion: Sevoflurane can be an ideal inhalational anesthetic for Volatile Induction and Maintenance Anesthesia (VIMA) in children under going daycase MRI examinations.

Key Words: Daycase, MRI, VIMA.

Introduction

The trend of daycase and office anesthesia is increasing due to early discharge and quick turnover of patients. Magnetic Resonance Imaging (MRI) is one of the facilities included under the daycase umbrella for children and un-cooperative adult patients to remain motionless for the examination period. The need for quick recovery and discharge has led to the performance of many studies to determine the ideal anesthetic complying with this procedure.

The use of total intravenous(TIVA) versus volatile induction and maintenance anesthesia (VIMA) is still under debate^{2,3}. Unlike surgical operations, MRI is a painless procedure, so the analgesic requirement is negligible and reduces the number of drugs for induction and maintenance, thus avoiding delayed recovery and hospital admission. TIVA requires expensive and MRI compatible infusion pumps for maintenance, alternatively a long intravenous line (5-6 meters) to place the infusion pump outside the strong magnetic field. In the VIMA technique, airway is secured and the patient is maintained on inhalational anesthetic with agents like sevoflurane or isoflurane.

The aim of this study was to compare sevoflurane and isoflurane recovery profiles for MRI in pediatric daycase in a randomized prospective single blinded study.

Patient and Methods

After approval from the Ethics Committee and informed written consent from the responsible adult, 100 outpatients (ASA I and II) (3-10 yrs) were divided into two groups scheduled for MRI examination were enrolled in this study. Inpatients, patients on prolonged anticonvulsant therapy and patients repeating the examination were excluded from this study.

Preoperative evaluation of these patients consisted of a questionnaire provided during the appointment for MRI, which was answered by an accompanying adult and a review of the patient just prior to anesthesia by the anesthesiologist responsible for that day's list. Patients were instructed to be kept NPO for 4 hours prior to the conduct of anesthesia, they were randomly assigned by computer generated randomization to either Group S (Sevoflurane) or Group I (Isoflurane) (Table 1).

Table 1
Demographic data

	Sevoflurane (Group S)	Isoflurane (Group I)
Mean Age (yrs)	5.61	6.1
Male	27	30
Female	23	20
Induction Time (sec)	133.7	157.4
Recovery (sec)	124.24	376.46
Discharge (sec)	25.2	37.4

All patients were induced with 8% sevoflurane in increments using a Jackson Rees circuit 2.5 meters long fresh gas flow corrugated tube (Intersurgical), an IV access was secured and an appropriate sized Laryngeal Mask Airway (LMA Classic) was introduced when the patients breathing was regular and at the onset of diaphragmatic respiration. Patients belonging to Group S were maintained on sevoflurane of 1 Minimum Alveolar Concentration (MAC) and patients belonging to Group I were maintained on 1 MAC of Isoflurane in 3:3 liters of oxygen

and air, spontaneously breathing connected to MRI compatible anesthetic machine (Penlon MRI). Pulse oximetry, capnography, inhalational agent monitor; non-invasive blood pressure and the electrocardiography were monitored by MRI compatible equipment Magnitude (Invivo) with a remote monitor outside the MRI suite. All the durations were measured using a stopwatch, the observer in the recovery room was blinded to the agent administered and patient was transferred to the recovery room along with the digital stopwatch. The following parameters were recorded: Induction time (from application of face mask to LMA insertion), duration of examination (total time taken for the MRI study), recovery (time from discontinuation of inhalational anaesthetic to removal of LMA), discharge time (time of LMA removal to discharge), recovery characteristic like purposeful movement, crying or responding to commands were noted. The results were analyzed by using Student t-test for equality of means and Levene test for equality of variance.

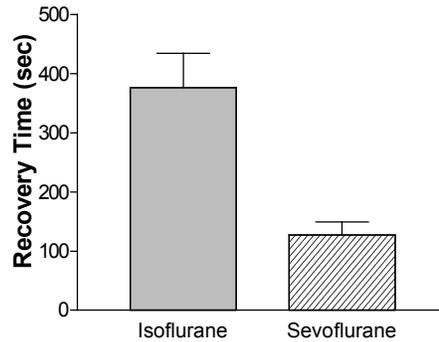
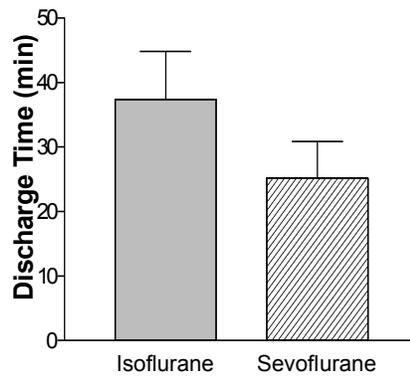
Results

In Group S (27 male and 23 female) were enrolled in comparison to 30 male and 20 female in Group I, Other demographic data did not show any statistical difference between the two groups. The induction time in Group S resulted in a mean of 133.7 seconds (± 19.32). Group I yielded a mean of 157.44 seconds (± 24.20) $p > 0.05$. The duration of examination in Group S showed a mean of 37.90 minutes (± 13.77) in comparison with Group B mean of 38.40 minutes (± 13.30) $p > 0.05$.

The mean recovery time with Group S was 124.4 seconds (± 31.57) when compared to Group I with a mean of 376.46 seconds (± 58.20) $p < 0.05$ which is highly significant (Fig. 1).

The mean discharge time in Group S was 25.20 minutes (± 5.71) in comparison to a mean of 37.40 minutes (± 7.43) $p < 0.05$ in Group I which was also very significant.

We report a few of cases in Group S with emergence delirium (4/50) and nausea (2/50)..

*Fig. 1**Comparison of two groups according to the Recovery time***Group I: Isoflurane Group S: Sevoflurane $p < 0.05$** *Fig. 2**Comparison of Discharge time for two groups***Group I: Isoflurane Group S: Sevoflurane $p < 0.05$**

Discussion

The debate about sedation in the MRI and airway problem during the sedation administered by non anesthesiologists has led many centers to adopt a policy of administering general anesthesia by a consultant

anesthesiologist. The running of such a service is a costly affair in comparison to only sedation technique. However, the safety and good quality images obtained under general anesthesia are far superior to the cost incurred on failure of examination and waste of MRI time utilization encountered during the sedation of pediatric patients as seen earlier in our Institute. The control of a patent airway is more guaranteed with insertion of an LMA. The complications were almost negligible in comparison with the number of patient examined. Our findings are in agreement with other trials for day surgery that sevoflurane has a better profile in recovery than any of the other drugs used¹. The use of sevoflurane as a sole agent for MRI daycase has not been extensively investigated^{3,7}. The other advantage of sevoflurane is the early discharge of children as complete recovery is faster compared to isoflurane thus avoiding hospital admission^{2,9,10}.

In this study we did not include the complications like post procedural nausea and vomiting¹¹, delirium, which were encountered in a few cases. These complications have been investigated separately but in cases involving surgery in day case. The time of removal of LMA has been debated as there are reports of laryngeal spasm and respiratory problems when LMA is removed after awakening of the patient, we did not encounter any significant event during our study⁵. Monitoring in MRI suite is a real obstacle and the remoteness of the patient is a drawback and a disadvantage to the anesthesiologist. A moving reservoir bag and a chest movement, with end tidal carbon dioxide (ETCO₂) waveform are reassuring in making MRI anesthesia safe, this also needs an observant anesthesiologist.

Conclusion

In conclusion our study confirms that the recovery profile of sevoflurane in MRI examination is far superior compared to isoflurane, Sevoflurane can be used as VIMA with shorter induction and recovery time, allowing for early discharge of patients. We recommend further investigations of respiratory, cardiovascular and other complications encountered in day case surgical procedures.

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