

COMPARATIVE ANALYSIS OF THE CHARACTERISTICS OF RECOVERY FROM ANAESTHESIA WITH ISOFLURANE AND HALOTHANE IN DAY - CARE SURGERY

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Abstract

Background: Isoflurane is a volatile anesthetic approved by the Federal Drug Administration (FDA) for the induction and maintenance of general anesthesia. Halothane is a clear, heavy, and colorless liquid with a sweet and non-irritating odour. Hence; the present study was conducted for comparatively evaluating recovery characteristics from anaesthesia with isoflurane and halothane in day - care surgery. **Materials & Methods:** A total of 60 patients were enrolled. Complete demographic and clinical details of all the patients was obtained. Two study groups were formed as follows: Group A- Isoflurane group, and Group B- Halothane group. Restriction of solid and fluid diet was done for upto 2 hrs. before surgery. Premedication of all the patients was done with oral 0.5 mg alprazolam night before surgery. After pre-medication, the patient was wheeled into operating room and transferred onto operating table. Patient was induced with 1% propofol 2 mg/kg-1; slowly i.e every 4 ml in 10 seconds until the eyelash reflex was obtunded. On abolition of eyelash reflex patient was maintained on spontaneous ventilation and isoflurane 1.5 % in group – A or halothane 1.5 % in group – B patients. Intraoperative variables were compared. **Results:** At 30 mins 83.33 percent of the patients of group A and 63.33 percent of the patients of group B were able to sit up at 30 minutes. 73.33 percent of the patients of group A and 56.67 percent of the patients of group B were able to stand unsupported at 120 minutes; on comparing the results were found to be statistically significant. Mean time to opening eyes on command among patients of group A and group B was 341 seconds and 636 seconds respectively; on comparing the results were found to be statistically significant. **Conclusion:** In comparison to Halothane, patients of the Isoflurane group demonstrated significantly better results.

INTRODUCTION

Isoflurane is a volatile anesthetic approved by the Federal Drug Administration (FDA) for the induction and maintenance of general anesthesia. Unlike enflurane, isoflurane is a non-flammable volatile anesthetic but carries a strong, pungent odour that makes it difficult to use for inhalational induction of general anesthesia. Induction and maintenance of general anesthesia are achieved through various sites of action. The most likely of these sites include inhibition of neurotransmitter-gated ion channels such as GABA, glycine, and N-methyl-d-aspartate (NMDA) receptors in the central nervous system (CNS). Inhibition of these receptors helps to produce the amnesia and sedation needed for adequate surgical conditions.^[1-3]

Halothane is a clear, heavy, and colourless liquid with a sweet and non-irritating odour. Halothane's structure is that of an alkane. It has primarily been used clinically as an inhalational anesthetic. Ether and chloroform were rapidly replaced by halothane upon its introduction in 1956. Halothane is associated with a lower risk of nausea and vomiting than fluorinated methyl ethyl ether agent. Although widely replaced by isoflurane or sevoflurane, halothane is the last common non-ether anesthetic used in the operating room. Halothane is the most soluble of the currently used anesthetic agents, indicating that the equilibration of inspired/brain partial pressures is the greatest. Although this property would seem to improve the safety profile of halothane, halothane is also the most potent of inhalational anesthetics.^[4-6] Hence; the present study was conducted for comparatively evaluating

recovery characteristics from anaesthesia with isoflurane and halothane in day - care surgery.

MATERIALS AND METHODS

The present study was conducted in the Department of Anaesthesia and Critical Care, GS Medical College, Hapur, Uttar Pradesh (India) for comparatively evaluating recovery characteristics from anaesthesia with isoflurane and halothane in day - care surgery. A total of 60 patients were enrolled. Complete demographic and clinical details of all the patients was obtained. Two study groups were formed as follows:

Group A- Isoflurane group, and Group B- Halothane group

Restriction of solid and fluid diet was done for upto 2 hrs. before surgery. Premedication of all the patients was done with oral 0.5 mg alprazolam night before surgery. After pre-medication, the patient was wheeled into operating room and transferred onto operating table. Patient was induced with 1% propofol 2 mg/kg-1; slowly i.e every 4 ml in 10 seconds until the eyelash reflex was obtunded. On abolition of eyelash reflex patient was maintained on

spontaneous ventilation and isoflurane 1.5 % in group – A or halothane 1.5 % in group – B patients. Intraoperative variables were compared. All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis. SPSS software was for evaluation of results.

RESULTS

All Mean age of the patients of group A and group B was 45.3 years and 44.1 years respectively. There were 18 males and 12 females in group A and 16 males and 14 females in group B. Mean BMI among the patients of group A and group B was 23.8 Kg/m² and 24.1 Kg/m² respectively. At 30 mins 83.33 percent of the patients of group A and 63.33 percent of the patients of group B were able to sit up at 30 minutes. 73.33 percent of the patients of group A and 56.67 percent of the patients of group B were able to stand unsupported at 120 minutes; on comparing the results were found to be statistically significant. Mean time to opening eyes on command among patients of group A and group B was 341 seconds and 636 seconds respectively; on comparing the results were found to be statistically significant.

Table 1: Demographic data

Variables	Group A	Group B
Mean age (years)	45.3	44.1
Males (n)	18	16
Females (n)	12	14
Mean BMI (Kg/m ²)	23.8	24.1

Table 2: Ability to stand and walk without support

Variable	Group A	Group B	p- value
Ability to sit up at 30 mins	83.33 percent	63.33 percent	0.0001*
Ability to stand unsupported at 120 mins	73.33 percent	56.67 percent	0.0001*

*: Significant

Table 3: The average response time

Opening eyes on command	Group A	Group B	p- value
Mean (mins)	341 seconds	636 seconds	0.000*
SD	51.5	102.4	

*: Significant

DISCUSSION

Isoflurane is the most recently available inhalational anesthetic agent on the market today. Although there have been few clinical trials comparing its use to halothane and methoxyflurane, the pharmacology of the agent suggests certain situations in which it may be the preferable agent. These include avian anesthesia, geriatric patients, patients with cardiovascular disease or hepatic disease, critically ill and unstable patients, cases such as brachiocephalics where upper airway obstruction is a concern during recovery, patients where increases in intracranial pressure should be avoided, and cesarean section.^[7,8] The fluorinated hydrocarbons that are used for anesthesia are derived from ether. Although they

have many benefits, there are several side effects of these drugs, including untoward hepatic effects. Whether the use of halothane gas can be revitalized is unknown. Introducing nanocarriers inside the halothane molecule can increase its benefits as an anesthetic in the lungs and cardiovascular system and prevent exposure to the liver.^[9, 10] Hence; the present study was conducted for comparatively evaluating recovery characteristics from anaesthesia with isoflurane and halothane in day - care surgery. Mean age of the patients of group A and group B was 45.3 years and 44.1 years respectively. There were 18 males and 12 females in group A and 16 males and 14 females in group B. Mean BMI among the patients of group A and group B was 23.8 Kg/m² and 24.1 Kg/m² respectively. Mean time to opening eyes on

command among patients of group A and group B was 341 seconds and 636 seconds respectively; on comparing the results were found to be statistically significant. Beaussier M et al, in a previous study, compared anaesthesia recovery after desflurane and isoflurane, administered for more than three hours. Patients were randomly assigned to either desflurane (n = 15) or isoflurane (n = 15) groups. Mean anaesthesia duration was 292 mins and 304 mins in the desflurane and isoflurane groups respectively. Ranges of times to reappearance of recovery variables in the desflurane group were less than those after isoflurane. After long duration anaesthesia lasting up to three hours, desflurane allowed recovery and extubation in approximately half the time required by isoflurane.^[11] In the present study, at 30 mins 83.33 percent of the patients of group A and 63.33 percent of the patients of group B were able to sit up at 30 minutes. 73.33 percent of the patients of group A and 56.67 percent of the patients of group B were able to stand unsupported at 120 minutes; on comparing the results were found to be statistically significant. Lerman J et al determined whether the induction, recovery, and safety characteristics of sevoflurane differ from those of halothane, the following open-labeled, multicenter, randomized, controlled, phase III study in children undergoing ambulatory surgery was designed. Three hundred seventy-five children, ASA physical status 1 or 2, were randomly assigned in a 2:1 ratio to receive either sevoflurane or halothane, both in 60% N₂O and 40% O₂. During induction of anesthesia, the time to loss of the eyelash reflex with sevoflurane was 0.3 min faster than with halothane (P < 0.001). The incidence of airway reflex responses was similar, albeit infrequent with both anesthetics. The total MAC.h exposure to sevoflurane was 11% less than the exposure to halothane (P < 0.013), although the end-tidal MAC multiple during the final 10 min of anesthesia was similar for both groups. Early recovery as evidenced by the time to response to commands after sevoflurane was 33% more rapid than it was after halothane (P < 0.001), although the time to discharge from hospital was similar for both anesthetics. The mean (+/- SD) plasma concentration of inorganic fluoride 1 h after discontinuation of sevoflurane was 10.3 +/- 3.5 microM. The overall incidence of adverse events attributable to sevoflurane was similar to that of halothane, although the incidence of agitation attributable to sevoflurane was almost threefold greater than that attributable to halothane (P < 0.004). Sevoflurane compared favorably with halothane.^[12]

Limitations

Limitations of this study include its nature as a single institute prospective examination and the small

patient population. Accumulation of additional cases is necessary to clarify the utility of ALI as a prognostic factor in patients with lung cancer. Second, this study focused on the pre-treatment ALI and NLR, which may be affected by other factors like infections or cancer-related complications. Also, ALI is a continuous variable hence there may be little difference between ALI of 17 and 19 though they fall on the side of high risk and low risk respectively based on Jafri et al. Patients height, weight, albumin, ANC and ALC were not necessarily from the same date though most were within two weeks of diagnosis.

CONCLUSION

In comparison to Halothane, patients of the Isoflurane group demonstrated significantly better results.

REFERENCES

1. Joas TA, Stevens WC. Comparison of the arrhythmic doses of epinephrine during Forane, halothane, and fluroxene anesthesia in dogs. *Anesthesiology*. 1971 Jul;35(1):48-53.
2. Freeman LC, Ack JA, Fligner MA, Muir WW., 3rd Atrial fibrillation in halothane- and isoflurane-anesthetized dogs. *Am J Vet Res*. 1990 Jan;51(1):174-177.
3. Steffey EP, Howland D., Jr Isoflurane potency in the dog and cat. *Am J Vet Res*. 1977 Nov;38(11):1833-1836.
4. Lindenbaum J, Leifer E. Hepatic necrosis associated with halothane anesthesia. *N Engl J Med*. 1963;268:525-30.
5. Whalen FX, Bacon DR, Smith HM. Inhaled anesthetics: an historical overview. *Best Pract Res Clin Anaesthesiol*. 2005;19(3):323-30
6. You Q, Cheng L, Reilly TP, Wegmann D, Ju C. Role of neutrophils in a mouse model of halothane-induced liver injury. *Hepatology*. 2006;44(6):1421-31
7. Steffey EP, Howland D., Jr Comparison of circulatory and respiratory effects of isoflurane and halothane anesthesia in horses. *Am J Vet Res*. 1980 May;41(5):821-825.
8. Hubbell JA, Muir WW, 3rd, Bednarski RM, Bednarski LS. Change of inhalation anesthetic agents for management of ventricular premature depolarizations in anesthetized cats and dogs. *J Am Vet Med Assoc*. 1984 Sep 15;185(6):643-646.
9. Peer D, Karp JM, Hong S, Farokhzad OC, Margalit R, Langer R. Nanocarriers as an emerging platform for cancer therapy. *Nat Nanotechnol*. 2007;2(12):751-60.
10. Sonavane G, Tomoda K, Makino K. Biodistribution of colloidal gold nanoparticles after intravenous administration: effect of particle size. *Colloids Surf B Biointerfaces*. 2008;66(2):274-80.
11. Beaussier M, Deriaz H, Abdelahim Z, Aissa F, Lienhart A. Comparative effects of desflurane and isoflurane on recovery after long lasting anaesthesia. *Can J Anaesthesia*. 1998; 45(5): 429- 434
12. Lerman J, Davis PJ, Welborn LG, Orr RJ, Rabb M, Carpenter R et al. Induction, Recovery, and Safety Characteristics of Sevoflurane in Children Undergoing Ambulatory Surgery: A Comparison with Halothane. *Anesthesiology*. 1996; 84: 1332-1340.