

A Comparative Evaluation of the Characteristics of Recovery from Anesthesia with Isoflurane and Halothane in Day-Care Surgery

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Abstract

Background: The ideal anesthetic should produce a rapid and smooth onset of action, intra-operative amnesia and analgesia, good surgical conditions and a short recovery period without side-effects.

Objective: To evaluate recovery from Anesthesia with Isoflurane and Halothane in Day care surgery

Design: This was a hospital based Retro prospective Study

Duration: One Year January 2019 to December 2019

Setting: Department of Surgery, Owaisi Hospital & Research Centre

Participants: 60 Patients undergoing day care surgeries

Methods: This study was conducted in sixty patients (thirty patients in Group-I and thirty patients in Group-II). Glycopyrrolate 0.2 mg i.v was given. Patient was induced with 1% propofol 2 mg/kg; 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 by using Magill's circuit with N2O 6 Lts; O2 3 Ltrs. and Isoflurane 1.5% in Group-I or Halothane 1.5% in group-II patients.

Results: The early and intermediate recovery is faster with isoflurane than with halothane. The discharge times are also earlier with isoflurane than with halothane.

Conclusion: Isoflurane is a useful and better anesthetic even halothane and offers a clear advantage when used for maintenance of Anesthesia for operations of short duration performed on a day-care basis.

Keywords: Isoflurane; Halothane; Anesthesia; Propofol; Glycopyrrolate.

Introduction

The practice of performing surgery under general anesthesia in an outpatient setting is certainly not new. Nicoll operated on several thousand children during the early 1900's and Waters described an out-patient anesthesia clinic in 1919.¹ There has been a dramatic increase in the demand

for outpatient surgery over the last 20 years. For example, the American Hospital Association reported a 77% increase in out-patient procedures between 1979 and 1983, while inpatient procedures declined by 8%.² Although gynecological surgery is still the most common type of procedure, nearly all surgical sub-specialties are contributing to the increased surgery performed on an out-

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patient basis. Most of published studies relate to comparison of halothane or isoflurane to sevoflurane, desflurane and enflurane in pediatric surgeries done³⁻⁸, dentistry and oral surgeries⁹ or in animals.^{10,11} It is estimated that 40-60% of all surgical procedures could be performed in out-patient surgery centers. General anesthesia is the most widely used anesthesia technique for ambulatory surgery. The same basic equipment as for inpatient anesthesia is required for delivery of anesthetic drug, monitoring and resuscitation.

Isoflurane is a widely used major anesthetic agent with rapid onset of action and rapid dispersal. Isoflurane is a halogenated anesthetic, similar in structure and activity to halothane, desflurane, enflurane and sevofurane. Isoflurane is typically given in inhaled concentrations of 0.5% to 3% in oxygen. Because of its pungent odor and somewhat slow onset of action, isoflurane is typically used to maintain anesthesia after induction with other agents such as nitrous oxide, fentanyl and propofol.

Halothane is rather more soluble in blood than the newer agents, although in most circumstances the greater solubility of halothane is of little clinical significance. The relative instability of the halothane molecule compared with enflurane and isoflurane has complications in terms of the potential to cause organ toxicity related to the products of metabolism. Because halothane is relatively inexpensive it continues to be used in developing countries.

The rapid elimination of anesthetic gases allows a fast recovery and early discharge of the patient. A similar spectrum of pharmacological activity is produced by the three commonly used volatile agents - halothane, isoflurane and enflurane.

Materials and Methods

Place of Study: Department of Surgery, Owaisi Hospital & Research Centre, Hyderabad

Type of Study: Hospital based retro prospective study

Sample Collection: Sample size: 60 patients

Sampling Methods: Consecutive Sampling

Inclusion Criteria: Patients age ranging from 18 to 55 years and weighing between 35 to 75 kgs for minor surgical procedures of duration varying from 5 minutes to 35 minutes were chosen for the study.

Exclusion Criteria: Patients who were less than 18 years of age or more than 55 years of age and major surgical procedures were excluded from our study

Statistical Analysis: Data were presented in the form of statistical Tables and charts. SPSS software version 20 was used for statistical analysis.

Ethical Approval: Approval was taken from the Institutional Ethics Committee prior to commencement of the study.

A clinical study was carried out in ASA Group-I and Group-II patients to compare the recovery characteristics in day care surgery after the anesthesia with Isoflurane in Group-I and halothane in Group-II patients. This study was conducted in sixty patients (thirty patients in Group-I and thirty patients in Group-II) after taking institutional approval for day-care surgery and patients were chosen from Owaisi group of hospitals. Selected patients were in the age group of 15 years to 60 years, and weight ranging from 35 kg to 75 kg. Pre-anesthetic check-up conducted to obtain a detailed history and complete clinical examination was done. Routine investigations like complete blood picture, random blood sugar, blood grouping and Rh typing were done. These patients were instructed to fast for a period of 12 hours before the procedure. An informed consent was taken from all the patients. Patients for minor surgical procedures of duration varying from 5 minutes to 35 minutes were chosen for the study. The selected groups of patients were explained in detail about the anesthesia procedure and various tests to be performed in postoperative period.

Glycopyrrolate 0.2 mg i.v was given. Patient was induced with 1% propofol 2 mg/kg; 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 by using Magill's circuit with N₂O 6 Ltrs; O₂ 3 Ltrs. and Isoflurane 1.5% in Group-I or Halothane 1.5% in Group-II patients.

The early-recovery was tested by asking the patient every one minute till he opens his eyes on command and gives his name, date of birth or date of marriage. The intermediate recovery was tested every 15 minutes by the following psychomotor tests:

- Choice reaction time
- Perceptive Accuracy test
- Finger tapping test
- Peg board test
- Card sorting test
- Trigger dot test

Observations and Results

Sixty patients of ASA Grade I and II including thirty patients in Group-I (Isoflurane group) and thirty patients in Group-II (Halothane group), whose age ranged between 18 to 55 years and weight ranged between 35 to 75 kg were selected for the study.

Table 1: AGE and SEX distribution

Sex	Group - I		Group - II	
	No. of cases	Percentage	No. of cases	Percentage
Male	19	63	17	57
Female	11	37	13	43
Total	30	100	30	100
Age in years	Group - I		Group - II	
	No. of cases	Percentage	No. of cases	Percentage
16 - 25	10	33	9	30
26 - 35	8	27	9	30
36 - 45	7	23	7	23
46 - 55	5	17	5	17
Range	16 - 55 years		16 - 55 years	
Mean	33.8		34.2	

P value = 0.89 (p>0.05) is insignificant

Males were predominant in both Isoflurane and Halothane group and majority of the patients undertaken belonged to the age group of 16-25 years in both the groups.

Table 2: Recovery in both Isoflurane and Halothane group

	Opening eyes on command	Giving date of birth
Group-I Isoflurane	4 min 42 sec.	5 min 42 sec.
Group-II Halothane	9 min 30 sec.	10 min 30 sec.

P value = 0.00 (p>0.05) significant.

Table 3: Psychomotor test in both Isoflurane and halothane group

Test	Isoflurane Group-I	Halothane Group-II	P - Value	Difference
1. Choice Reaction time	6.7 sec.	9.4 sec.	0.00	Significant
2. Perceptive Accuracy Test	98%	88%	0.00	Significant
3. FTT Score No.	46	40	0.00	Significant
4. Peg Board Test	96%	84%	0.00	Significant
5. Card sorting Test	98%	89%	0.00	Significant
6. Trigger dot Test	97%	93%	0.00	Significant

The results were as follows:

Table 4: Ability to sit up and stand unsupported across the Isoflurane and Halothane group

	Isoflurane Group-I	Halothane Group-II	P - Value	Difference
Ability to sit up	Percentage of patients	Percentage of patients		
At 30 min.	87	67	0.06	Significant
At 30-60 min	13	33		
Ability to stand unsupported				
At 60-120 min.	83	60	0.04	Significant
At 120-180 min	17	40		

There is a significant difference between the two groups. The Isoflurane group responded earlier than halothane group.

Patients of both groups could not perform these tests at 15 minutes but could perform at 30 minutes and average values of the results of psychomotor tests are as follows:

There is a significant difference between the two groups in the performance of Psychomotor tests at 30 minutes.

The isoflurane group performed better than halothane in all the Psychomotor tests done at half-an-hour after the termination of anesthetic.

The recovery in both the groups was also assessed by observing the ability to sit and stand unsupported at the intervals of every half-an-hour after the termination of anesthetic.

There was significant difference between the two groups in the abilities to sit at 30 minutes and to stand at 120 minutes. The higher percentage of patient was able to sit at 30 min and stand at 120 min with Isoflurane than with Halothane. At 120 min the number of cases that were ready for discharge from recovery room were more in the Isoflurane group than in the halothane group. At 180 min all the cases in both the groups were able to stand and walk without support.

Discussion

Recent changes in medical system have resulted in a significant increase of ambulatory surgical procedures. Therefore, a safe and short postoperative recovery period and especially the full recovery of complex psychological function after general anesthesia has become increasingly important. In the present study between Isoflurane and halothane, we investigated the comparative profile of recovery including emergence time, psychomotor recovery, ability to sit and stand unsupported.

The only difference in both the groups is using isoflurane in one group and halothane in the other. Thus we have avoided narcotic analgesics and anti sialogogues such as atropine that cross blood brain barrier which may interfere with the recovery patterns. We found significant difference in average response time between both groups with average response time being more early in isoflurane group compared to halothane group. Our findings are similar to those done by Wren¹² which found that recovery from isoflurane was much faster.

The results of the psychomotor tests to assess the intermediate recovery also showed the significant difference between the two groups. The performance at half an hour in psychomotor tests such as choice reaction time (P value = 0.00), Perceptive Accuracy Test (P value = 0.00), Finger Tapping Test (P value = 0.00), Peg board Test (P value = 0.00), Card Sorting Test (P value = 0.00) and Trigger - dot test was better with isoflurane than with halothane. A study conducted by Bhandarker et al.¹³ (2006) also found that psychomotor recovery was quicker with isoflurane than with halothane.

There was difference between the two groups in the ability to sit at 30 min (P value = 0.06) and the ability to stand at two hours (P value = 0.04). Thus more number of patients in isoflurane group than in halothane group were able to sit at half-hour and stand at two hours. Thus the intermediate recovery was also found to be faster with isoflurane than with halothane, which were similar to study by Bhandarker et al.¹³

Thus the discharge times were found to be earlier with isoflurane than with halothane. The discharge times of 180 min with isoflurane in our results are comparable to the discharge times with isoflurane in Ekberg¹⁴ and Lenmarken's¹⁵ "study of comparison between desflurane and isoflurane for day care arthroscopy - 1996", journal of anesthesia which gives the discharges times with isoflurane in 92% of their study cases as around 180 min and in 100% of cases around 240 min.

The postoperative complications such as nausea, vomiting and pain were not present with either isoflurane or halothane which correlate with study done by Bhatia et al.¹⁶ but the discharge times with isoflurane are earlier than with halothane.

Conclusions

In the above study of short duration day care surgical procedures where anesthesia is maintained with either isoflurane or halothane after standardized pre-medication. It is found that the recovery times are faster with isoflurane anesthesia than with halothane anesthesia. The postoperative complications such as nausea, vomiting and pain were not present with either isoflurane or halothane but the discharge times with isoflurane are earlier than with halothane. In conclusion it can be said that isoflurane is a useful and better anesthetic over halothane and offers a clear advantage when used for maintenance of anesthesia for operations of short duration performed on a day-care basis.

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