

Comparison of Sevoflurane and Halothane Anesthesia Cognitive Function in Adult

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Abstract: **Background:** Patients reach their full cognitive and psychomotor potential during the intermediate period of recovery. We still utilize Halothane, which has a delayed recovery profile, despite the fact that rapid clearance drugs like Sevoflurane have a positive impact on early cognitive recovery, which permits early mobility and reduces post-surgical complications. **Objective:** The study's goal was to promote the use of sevoflurane over halothane by contrasting the two anesthetics' effects on patients' cognitive functioning after surgery. **Method:** The prospective randomized comparative study was carried out in the Department of Anaesthesia, Analgesia and Intensive Care Medicine, between the period of September 2021 to June 2022. Study population was the patients of either sex, aged between 18-50 years, ASA-I and II, patients undergoing elective surgery by general anaesthesia, lasting for 1 hour or more and remaining 24 hours after surgery. A total number of 100 patients were divided into two groups. 50 patients were in Sevoflurane group and 50 in Halothane group. **Results:** Group- Sevoflurane had a considerably faster emergence time (10.85 min vs. 15.13 min, P0.001) than Group- Halothane. Group-Sevoflurane had a mean BAMSE score of 29 at baseline and showed no change by the conclusion of the observation period, but Group- Halothane saw their scores both drop and then recover. Patients in Group- Sevoflurane finished the (TMT-A) 30 minutes after regaining consciousness in a considerably shorter amount of time (40.9 seconds vs. 55.8 seconds, P 0.001). Furthermore, there was no statistically significant difference between the groups after 1.5 hours, 2.5 hours, or 3.5 hours. **Conclusion:** So the study concludes that adult patient of sevoflurane group experienced an early post-operative cognitive recovery than halothane group. Though sevoflurane is costly, considering the benefits of patients in terms of early cognitive recovery that causes less postoperative complications and shorter hospital stay, sevoflurane should be used instead of halothane.

Keywords: Cognitive Recovery, Adult patients, Abdominal Surgery, Sevoflurane, Halothane.

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INTRODUCTION

Cognitive function, encompassing various mental processes such as perception, attention, memory, language, and problem-solving, is a critical aspect of overall brain function. When adults undergo surgery, the choice of anesthetic agents can

have a significant impact on cognitive function both during and after the procedure. Sevoflurane and halothane are two commonly used volatile anesthetic agents in clinical practice. Understanding the potential effects of these agents on cognitive function is crucial for optimizing patient outcomes. This discussion aims to compare the effects of

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sevoflurane and halothane anesthesia on cognitive function in adults, shedding light on the existing body of knowledge from relevant studies [1-4].

Preserving cognitive function during and after surgery is of paramount importance, as cognitive impairments can have long-lasting consequences on patients' quality of life. Various factors, including anesthetic agents, contribute to these potential cognitive effects. Sevoflurane and halothane have distinct pharmacological profiles and mechanisms of action, which may influence their impact on cognitive function [5-7].

Comparing the effects of sevoflurane and halothane anesthesia on cognitive function in adults has been the subject of scientific investigation. Studies have explored parameters such as the incidence of postoperative cognitive dysfunction (POCD) and the recovery of cognitive function following anesthesia. By examining these outcomes, researchers have sought to determine if there are differences between the two anesthetic agents in terms of their cognitive effects [8-10].

Understanding the potential cognitive effects of sevoflurane and halothane anesthesia is essential for anesthesiologists and perioperative care teams when making informed decisions about the choice of anesthetic agents. By evaluating the existing evidence on this topic, we can gain insights into the comparative effects of sevoflurane and halothane anesthesia on cognitive function in adults, facilitating improved patient care and outcomes.

OBJECTIVE

To assess post-operative cognitive recovery in adult patients receiving sevoflurane and halothane anaesthesia and with a view to increase the use of sevoflurane over halothane.

METHODOLOGY

The prospective randomized comparative study was carried out in the Department of Anaesthesia, Analgesia and Intensive Care Medicine, between the period of September 2021 to June 2022. Study population was the patients of either sex, aged between 18-50 years, ASA-I and II, patients undergoing elective surgery by general anaesthesia, lasting for 1 hour or more and remaining 24 hours after surgery. A total number of 100 patients were divided into two groups. 50 patients were in Sevoflurane group and 50 in Halothane group. Data were collected using a pre designed data collection sheet containing all the variables of interest. Randomization was done by lottery method. All patients were examined one day prior to surgery which was addressed as baseline value. Heart rate, SPO2, systolic, diastolic, mean arterial pressure: before induction and every 15 minutes during surgery were recorded. Bangla adaptation minimal state examination (BAMSE) and paper pencil test-Trail making test part-A (TMT-A) were also assessed and recorded. We compared the post-operative score with the baseline score that is the pre-operative score. Statistical analysis: Data were processed and analyzed using SPSS (Statistical Package for Social Sciences) for windows, version 17.0. The test statistics used to analyze the data were Student's t-Test (for comparison of data presented on continuous scale), Chi-square (c2) Test (for comparison of categorical data between groups) and Repeated Measure ANOVA statistics. The level of significance was set at 0.05 and $p < 0.05$ was considered significant.

RESULTS

Table 1 shows age distribution of the patients where 34.7% were in 47-57 years age group followed by 26.7% were in 58-68% years age group, 20% in 36-46 years age group.

Table 1: Age distribution of the patients

Age distribution	Frequency	Percent (%)
25-35 years	5	6.7
36-46 years	15	20.0
47-57 years	26	34.7
58-68 years	20	26.7
>69 years	9	12.0
Total	75	100.0

Figure 1 shows gender distribution of the patients where majority were male, 65.3%.

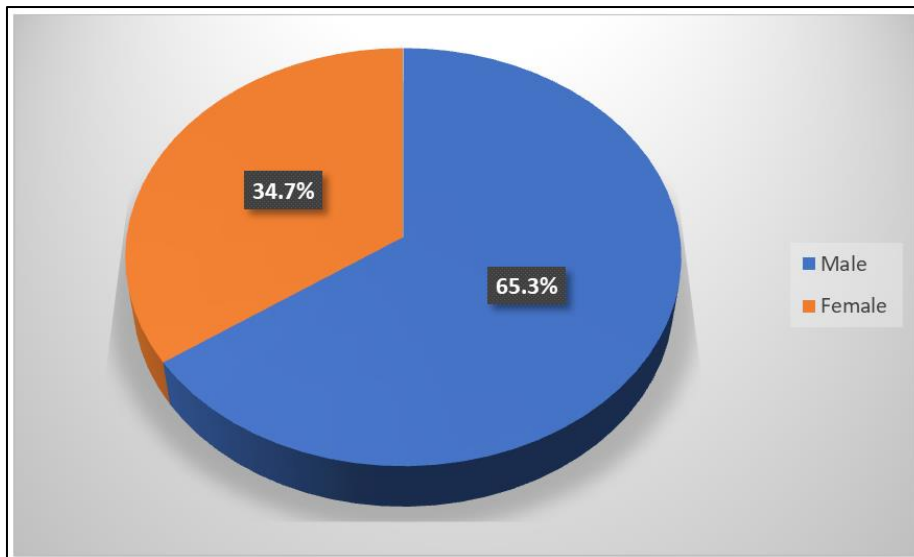


Figure 1: Gender Distribution

Table 2 shows baseline characteristics of the patients where there was significant difference was noticed between two groups.

Table 2: Baseline characteristics of the patients

Base line status	Sevoflurane	Halothane	P value
Weight*(kg)	56.4 ± 9.2	56.7 ± 8.7	0.886
Mean arterial	83 ± 6	84 ± 4	0.668
Heart rate*(beat/min)	82 ± 8	80 ± 7	0.292
SPO2	96.1 ± 0.4	96.3 ± 0.4	0.356
BAMSE score*	29.3 ± 0.3	29.9 ± 0.1	0.052
Time required to complete TMT-A*(sec)	36.1 ± 9.3	31.9 ± 10.1	0.103
ASA			0.234
GRADE I:	82%	85%	
GRADE II:	18%	15%	

Table 3 shows Comparison of per operative findings between two groups where in sevoflurane group at 75 min mean arterial pressure was 90 ± 6

mmHg whereas in Halothane group it was 95 ± 7 mmHg. In sevoflurane group mean Heart rate was 84 ± 8 whereas in Halothane group it was 92 ± 13.

Table 3: Comparison of per operative findings between two groups

Mean arterial pressure (mmHg)	Sevoflurane	Halothane	P value
At 15 min	86 ± 7	88 ± 5	0.203
At 30 min	83 ± 11	86 ± 12	0.223
At 45 min	86 ± 9	82 ± 13	0.783
At 60 min	83 ± 8	84 ± 11	0.003
At 75 min	90 ± 6	95 ± 7	-
Heart rate (beats/min)			
At 15 min	85 ± 10	83 ± 9	0.505
At 30 min	73 ± 9	74 ± 12	0.902
At 45 min	70 ± 8	69 ± 12	0.681
At 60 min	68 ± 9	72 ± 11	0.100
At 75 min	84 ± 8	92 ± 13	0.001
SPO2	99.8 ± 0.2	99.9 ± 0.1	0.326
Aldrete recovery score	9 ± 1	9 ± 1	0.986
Emergence time	10.85±1.64	15.13±2.29	0.001

Table 4 shows Comparison of BAMSE score at different time interval between two groups where in sevoflurane group BAMSE score for mean preoperative case was 29.3 ± 0.5 whereas as in

Halothane group it was 29.5 ± 0.5 . In post- operative cases, in sevoflurane group BAMSE score for 3.5 hrs was 30.0 ± 0.0 whereas in in Halothane group it was 29.9 ± 0.2 .

Table 4: Comparison of BAMSE score at different time interval between two groups

BAMSE score	Sevoflurane	Halothane	P value
Pre-operative	29.3 ± 0.5	29.5 ± 0.5	0.452
Post-operative			
1.5 hrs	29.7 ± 0.2	29.8 ± 0.2	0.873
2.5 hrs	29.8 ± 0.1	30.0 ± 0.0	0.624
3.5 hrs	30.0 ± 0.0	29.9 ± 0.2	0.624

Figure 2a and 2b shows Changes in mean arterial pressure & heart rate in different time interval during operative period.

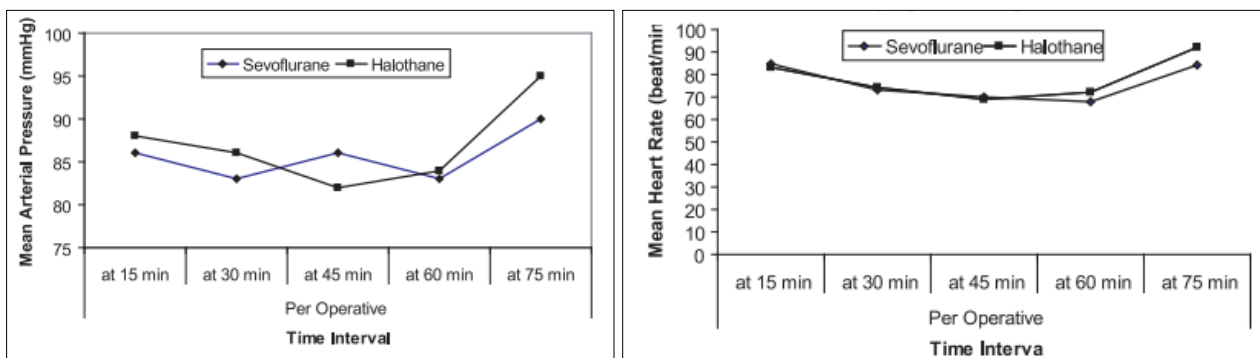


Figure 2a and 2b: Changes in mean arterial pressure & heart rate in different time interval during operative period

Figure 3 shows time required to complete (TMT-A) pre operatively and changes in post-operatively at different time interval [10].

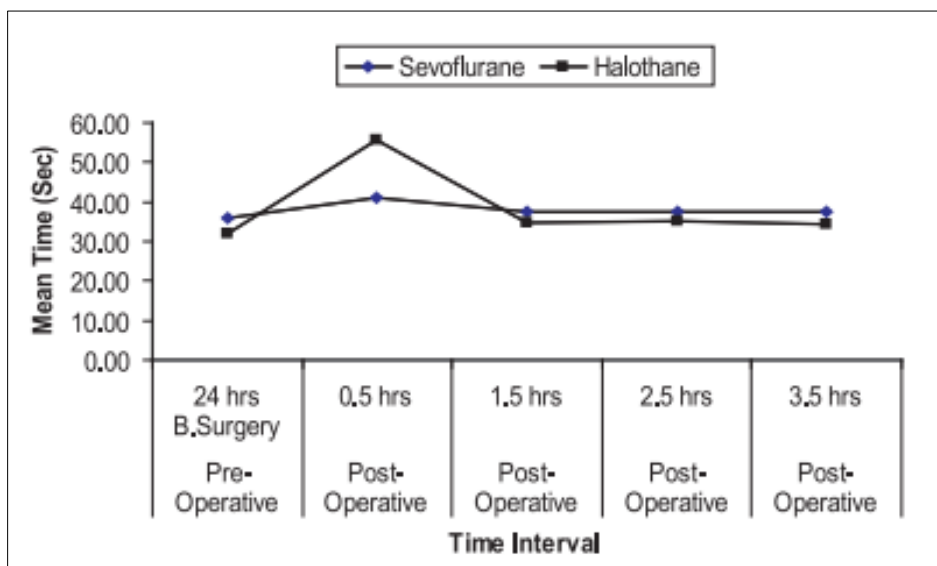


Figure 3

DISCUSSION

Sevoflurane is a desirable anaesthetic for induction and maintenance because of its low blood-gas solubility, rapid induction and emergence

characteristics, nonirritating airway properties and stable patient haemodynamic characteristics. In spite of its beneficial effect, use of sevoflurane in our country is limited because of its high cost. In this

study we demonstrated faster cognitive recovery of adult patient of prolong surgery with sevoflurane than commonly used agent halothane with a view to replace sevoflurane instead of halothane.

The present study demonstrates that the mean ages of both groups (sevoflurane and halothane) were almost identical (31.6 ± 7.2 vs. 31.4 ± 5.9 years, $p = 0.938$). However, a male predominance was observed in halothane group ($p = 0.020$), which was clinically non-significant in relation to cognitive performance. The mean weight, mean arterial pressure, heart rate, SPO₂, BAMSE score and time required to complete TMT-A at baseline were almost similar between sevoflurane and halothane groups. ASA grading was also found similar ($p=9$) was same in both groups ($p = 0.986$).

A study also found in their study, aldrete recovery score was same in both sevoflurane and halothane group. In this study the mean BAMSE score of sevoflurane group patients at baseline was 29 and in post-operative word at 0.5hrs, 1.5 hrs, 2.5hrs and 3.5hrs was 29, 29, 29, and 30 respectively [11]. On the other hand BAMSE score at baseline in halothane group was 29 and 27, 29, 30, 29 at 0.5hrs, 1.5hrs, 2.5hrs, and 3.5 hrs respectively in the post-operative word. So the study showed that sevoflurane group patient achieved their preoperative BAMSE score at 0.5hrs in post-operative word after recovery and demonstrated no change throughout the period of observation where halothane group experienced a fall and rise in BAMSE score from recovery to the end of observation [13]. The mean time required to complete TMT-A by the patients of sevoflurane group at baseline was 36.1sec and in post-operative word after recovery at 0.5hrs, 1.5hrs, 2.5hrs, 3.5hrs was 40.9sec, 37.6sec, 37.4sec, 37.5sec respectively. While patient of halothane group completed the TMT-A at baseline was 31.9sec and 55.8sec, 34.7sec, 35.1sec, 34.5sec at 0.5hrs, 1.5hrs, 2.5hrs, and 3.5hrs in post-operative word respectively. So the time to complete TMT-A was identically distributed throughout the observation except at 0.5hrs after recovery, when sevoflurane group had much lower score (40.9sec) and more nearer to pre-operative value (36.1sec) compared to their halothane counterpart (55.8sec). Other studies demonstrated in their study that cognitive function is more rapidly restored after sevoflurane anaesthesia administration compared with isoflurane or propofol plus nitrous oxide anaesthesia comparable to our study [11, 12]. Postoperative cognitive impairment is a common problem in elderly. Another study conducted a study to find out the cognitive function in elderly with desflurane and sevoflurane and found desflurane was associated

with a faster early recovery than sevoflurane [14]. However, post-operative recovery of cognitive function was similar with both volatile anaesthetics. Another report found in their study, emergence and return of cognitive function was significantly faster after remifentanilpropofol based anaesthesia compared with desflurane and sevoflurane anaesthesia [15].

Recently one study demonstrated that sevoflurane based anaesthesia was associated with better short term post-operative cognitive performance than propofol in their study. So it is clear that most of the studies have done to see the cognitive performance in elderly patients with newer volatile and intra venous agents in western countries [16]. But no single study was done in our country to see the cognitive recovery after anaesthesia with volatile agents. We found a single study comparing halothane and sevoflurane for their cognitive recovery characteristics in adult patients undergoing prolong (>1 hour) surgery. Besides most studies have done comparing these agents in paediatric and elderly patients undergoing ambulatory surgery. We found in our study that emergence time from discontinuation of volatile agent up to attainment of aldrete recovery score >9 in sevoflurane group was 10.85 min and in halothane group was 15.13 min. Another study also concludes that sevoflurane provides a rapid recovery from anaesthesia due to its lower solubility [17].

CONCLUSION

The results of this research indicate that patients in the sevoflurane group had a more rapid cognitive recovery after surgery than those in the halothane group. Despite the high cost of the sevoflurane vaporizer and the drug itself, sevoflurane should be used instead of halothane since it helps patients regain their mental faculties more quickly.

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