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Original Research Paper

Anaesthesiology

## COMPARISON OF 6% AND 8% SEVOFLURANE FOR INHALATIONAL INDUCTION IN ADULTS

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## **KEYWORDS**:

#### INTRODUCTION:

Inhaled anaesthetics are the widely used drugs for the induction and maintenance of general anaesthesia. The evolution of volatile anaesthetics began with the introduction of Diethyl ether46, Nitrous oxide to the modern inhaled anaesthetics like Desflurane and Sevoflurane(1). These modern inhaled anaesthetics form the important tool for altering the central nervous system functions in patient undergoing general anaesthesia. In 1950, all halogenated anaesthetics with an exception of Nitrous oxide were flammable and potentially toxic to the liver. Replacing the hydrogen atom with a fluorine atom led to introduction of newer anaesthetics which are non-inflammable and are resistant to metabolism(2).

Desflurane, a totally fluorinated methyl ethyl ether was introduced in 1992 followed by the introduction of totally fluorinated methyl isopropyl ether Sevoflurane in 1994.Sevoflurane with low blood-gas partition coefficients facilitated rapid induction of anaesthesia, precise control of end-tidal concentration during maintenance of anaesthesia and prompt recovery at the end of anaesthesia independent of the duration of anaesthesia(3,4). The introduction and rapid clinical acceptance of Sevoflurane led to their use in ambulatory surgery.

Sevoflurane is a potent, non-pungent volatile anaesthetic, which was introduced into clinical practice in the 1990s. Due to a low blood-gas partition coefficient of 0.62, it displays rapid uptake and elimination. These properties promote its use as an inhalational induction agent. Its cardiovascular effects compare favourably with other volatile and Intravenous induction agents(5). A concern with gaseous induction in comparison to intravenous induction has been the relatively slow passage through the excitatory stage 2 of anaesthesia, especially with low concentrations of inhalational agents. It may be that, by further increasing the concentration of sevoflurane, this stage will be passed through more rapidly(6-9). Cost is an important consideration in the practise of these newer anaesthetics which can be decreased by using low fresh gas flow rates. So in this study we compare the Induction characteristics, hemodynamic parameters and level of consciousness between sevoflurane6% and 8%

#### AIM

The main aim of the study was to Compare the Inhalational induction agents 6% and 8% sevoflurane in adults

#### OBJECTIVE

- 1. To compare the induction characteristics such as loss of eye lash reflex and constriction of pupil between 6% and 8% Sevoflurane
- 2. To compare the hemodynamic parameters and level of consciousness during induction between 6% and 8% Sevoflurane

The approval of the Institutional Ethical Committee was obtained. This study was a randomised comparative study conducted on 60 patients over a period of six months. Patients were explained about the procedure in detail and informed written consent was obtained. The study population was divided into two groups:

Group A-Patients induced with 6% Sevoflurane Group B-Patients induced with 8% Sevoflurane

#### Pre-anaesthetic Evaluation:

Pre-anaesthetic assessment- a detailed history and complete physical examination was performed. Complete blood count, renal function test, blood grouping/typing, random blood sugar, electrocardiograph and chest x-ray were done.

#### Inclusion Criteria:

- Age between 18-65 years
- ASA physical status I and II undergoing surgery under general anaesthesia.

#### Exclusion Criteria:

- ASA physical status III and IV.
- Metabolic disease Recent anaesthetic history (<7 days)
- Emergency surgery
- History of allergic reactions to drugs
- Patients chronically receiving opioid analgesia
- History of gastro-oesophageal reflux, hiatus hernia or other gastro-oesophageal abnormality.
- Known or potential airway problem
- Pregnant or lactating women.

Patients were divided into two groups, then the circuit was primed with 6% or 8% sevoflurane accordingly. Group A was given 6% sevoflurane and Group B was given 8% sevoflurane for induction of general anaesthesia along with oxygen at the rate of 6 litres / min via semi closed system. Patients were asked to take three deep breaths and thereafter breathe normally. The time at which eyelash reflex lost and constriction of pupil(miotic pupil) attained was noted. Vital parameters like Heart Rate and Blood Pressure were noted at  $2^{nd}$ ,  $4^{th}$  and  $6^{th}$  minute of induction. After ideal induction time of 6 anaesthesia till the surgical procedure is completed. The observations recorded in each group were statistically analysed using the SPSS(statistical package for social sciences) version 20.

#### **RESULTS:**

# Table 1. Demographic characteristics of the study population

Parameter	Group A (n=30)	Group B (n=30)	p value
	Mean± SD		
Age in years	39± 10.73	$36 \pm 6.82$	0.8

Table 1 shows the analysis of age between Group A and B, there was no statistical significance, hence they were comparable.

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Table2. Distribution of Physical status according to American Society of Anaesthesia (ASA) guidelines

ASA physical status	Group A	Group B
Ι	26	25
II	4	5

According to table 2 major part of the study participants belong to ASA physical status-I

#### Table 3. Induction characteristics between Group A and B

Parameter	Group A (n=30)	Group B (n=30)	p value
	Mean $\pm$ SD		
Eyelash reflex	$46.37 \pm 4.2$	$49.27 \pm 7.2$	0.61
lost (seconds)			
Time of Pupillary	192.8 ± 7.1	194.53 ± 19.13	0.64
Constriction			
(seconds)			

Table 3 shows the analysis of time at which loss of eyelash reflex and pupillary constriction occurred in Group A and B, there was no statistical significance,

## Table4. Intra operative Vital parameters recorded at 2, 4, 6 minutes of induction between Group A and B

Parameter		Group A	Group B	p value
		(n=30)	(n=30)	
		Mean $\pm$ SD	)	
Heart Rate	Basal	$77.7 \pm 8.4$	$76 \pm 6.6$	0.3
(beats/minute)	2 minute	83.9 ± 7.3	97.2 ±8.4	0.042*
	4 minute	82.7 ± 6.5	$93.2 \pm 6.3$	0.046*
	6 minute	80.1 ± 6	$89.5 \pm 6.4$	0.044*
Systolic Blood Pressure(SBP)	Basal	$123.4 \pm 7.9$	$121.9 \pm 7.5$	0.47
	2 minute	$111.4 \pm 6.6$	97.5 ± 8.2	0*
(mm/Hg)	4 minute	$113.5 \pm 3.9$	$111.9 \pm 4.6$	0.14
	6 minute	$120.1 \pm 5.7$	$119.1 \pm 5.4$	0.49
Diastolic Blood Pressure(DBP) (mm/Hg)	Basal	$76.6 \pm 4.8$	75.8 ± 6.9	0.6
	2 minute	$65.8 \pm 6.6$	$54.4 \pm 6.08$	0*
	4 minute	$61.6 \pm 5.3$	$62.6 \pm 5.5$	0.4
	6 minute	$70.8 \pm 6.4$	$71.5 \pm 5.3$	0.6

From table 4 its noted that There was significant increase in HR in group B than A at 2, 4 and 6 minute of induction. There was significant fall in SBP and DBP in group B than A at 2 minute of induction.

## Table 5. Intra operative bispectral index monitoring between Group A and B

Bispectral	Group A (n=30)	Group B (n=30)	p value
index	Mean ± SD		
2 minute	64.8 ± 2.7	$65.1 \pm 2.5$	0.8
4 minute	54.8 ± 2.6	55.9 ± 2.3	0.6
6 minute	$47.8\pm4.9$	$48.1 \pm 4.1$	0.5

The p-values of comparison in BISPECTRAL INDEX between the group A and B at 2, 4, 6 min was statistically not significant

#### DISCUSSION

In our study, out of 60 patients 30 were given 6% sevoflurane and 30 were given 8% sevoflurane. The demographic and induction characteristics like loss of ELR, pupillary constriction, Heartrate and BP values among Group A and Group B were analysed. Table1 showing the difference in mean age(years) between Group A ( $39\pm10.73$ ) and Group B ( $36\pm6.82$ ) was statistically not significant (p=0.8). Hence Group A and B were age matched and were comparable. According to Goodwin et al, Gender does not influence the effects of sevoflurane, hence they were not gender matched. but there is some evidence suggesting that ethnic factors play a major role.

According to **Smith et al**, as the age increases there will be hemodynamic instability leading to various intraoperative

complications (10). **Dupont and Mckay et al** have concluded in their study that linear relation between age and time to attain induction characteristics increases (11,12). Table 2 showing the distribution of Physical status (PS) according to American Society of Anaesthesia (ASA) guidelines that around 85% of study subjects belong to PS-I and 15% belong to PS-II. This is consistent with study conducted by **Isik et al** on influence of physical status on General anaesthesia(13).

Table 3 shows the time(seconds) at which the induction characteristics like loss of ELR and pupillary constriction attained. In Group A it was 46.37  $\pm$  4.2 and 192.8  $\pm$  7.1, and in Group B it was  $49.27 \pm 7.2$  and  $194.53 \pm 19.13$  respectively with no statistical significance. But the induction characteristic was attained earlier in Group A than Group B. This is consistent with the study done by Franks et al on the effects of sevoflurane on airway reflex. He said that the minimum alveolar concentration was attained earlier with 6% sevoflurane leading to early attainment of induction characteristics by to its influence on supratentorial region (14). According to Mapleson et al, who studied the Molecular mechanisms of general anaesthesia, the effect of inhalational anaesthetic agents was inversely proportional to its concentration, the lesser the concentration greater is their MAC (15). In contrast to this, studies done in Japan and the USA have demonstrated the induction times of less than 60s with high concentration sevoflurane, with incidents of increased airway secretions or laryngospasm rarely reported, and minimal breath-holding or coughing(16,17) On analysing the Heartrate and blood pressure from Table 4, its found that there was a significant increase in HR (tachycardia) in Group B with mean 97.2  $\pm$  8.4, 93.2  $\pm$  6.3, 89.5  $\pm$  6.4 at 2,4,6 minute than Group A with mean 83.9  $\pm$  7.3, 82.7  $\pm$  6.5, 80.1  $\pm$  6 with statistical significance. There was significant decrease in both systolic and diastolic BP (hypotension) at 2 minute of induction in Group B (97.5  $\pm$  8.2, 54.4  $\pm$  6.08) than Group A (111.4  $\pm$  6.6, 65.8  $\pm$  6.6) respectively. In present study, an unstable hemodynamic profile with tachycardia and hypotension was noted in Group B than Group A.

According to **Cohen et al**, sevoflurane with low blood-gas partition coefficients facilitate rapid induction of anaesthesia, precise control of end-tidal concentration during maintenance of anaesthesia and prompt recovery at the end of anaesthesia independent of the duration of anaesthesia(18). In another study conducted by **Petrozza et al** on the Hypotension indued by general anaesthetic agent says that even in patients with poor cardiovascular reserve, 6% sevoflurane has been shown to offer good stability(19).

Experimental studies done by Mandal, Goodwin and Cardesin et al have clearly indicated that volatile anaesthetic agents are capable of protecting the myocardium against the consequences of ischemia by decreasing the extent of myocardial damage, decreasing the extent of reperfusion injury, and better preserving myocardial function. Subsequent research has to be done toward unraveling the underlying mechanisms and intracellular pathways of these cardioprotective effects (20,21,22) According to Canada health society, Bispectral index(BIS) is the first quantitative EEG index to assess the depth of anaesthesia. In present study the BIS in group A and B indicates adequate General anaesthesia without any statistical significance. Jones, Artru et al studied the effects of sevofluane on central nervous system and proposed that Sevoflurane is a cerebral vasodilator. Cerebral autoregulation is maintained at low concentrations of sevoflurane, but higher doses seem to decrease autoregulatory capacity(23,24). In neurosurgical patients, sevoflurane at lower concentrations maintained middle cerebral artery flow velocity, no epileptiform electroencephalogram activity and reduced fluctuations of intracranial pressure(25)

So in our study there is early attainment of induction characteristics, less fluctuations in Heart rate, Blood pressure on using 6% sevoflurane when compared to 8% sevoflurane. of sevoflurane on cerebral circulation and metabolism in patients with ischemic cerebrovascular disease. Anesthesiology, 79(4), 704-709.

#### CONCLUSION

In this study comparing 6% and 8% concentration of sevoflurane for inhalational anaesthesia, we conclude that 6% sevoflurane offers better hemodynamic profile than 8% sevoflurane. Since its introduction in clinical practice, sevoflurane has gained wide acceptance as an anaesthetic for various types of surgery especially at lower concentration. Its ease of administration, versatility, and stable hemodynamic profile make it a safe and easily applicable anaesthetic agent.

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