

A Cross Sectional Study on Comparing the Effects of Sevoflurane and Desflurane in Adult Patients Undergoing General Anesthesia with Laryngeal Mask Airway

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ABSTRACT

The Laryngeal Mask Airway (LMA) lowers the incidence of postoperative morbidity, associated with the insertion of endotracheal tube. Sevoflurane and desflurane are volatile anesthetic agents that are commonly used in general anesthesia procedure in adult patients. Desflurane has low solubility in blood which enables the rapid awakening of patients. Desflurane, faster emergence compared to sevoflurane. Sevoflurane, an inhalational anesthetic agent with less pungency and non-irritant odor which rapidly and conveniently administered without discomfort. Because of the low solubility, Sevoflurane facilitates a good control over the depth of anesthesia also provides a rapid smooth induction and emergence from general anesthesia. To evaluate the effects of sevoflurane and desflurane in adult patients undergoing general anaesthesia with laryngeal mask airway. In this study, totally 60 patients involving ASA I and ASA II at the age between 18 to 60 years who are scheduled for elective surgical procedures under general anesthesia with Laryngeal Mask Airway. Patient under general anesthesia receiving sevoflurane with LMA were grouped as Group S and patients receiving desflurane with LMA were grouped as Group D. The emergence time was significantly shorter in Group D (4.5 ± 1.2 minutes) compared to Group S (7.8 ± 1.5 minutes) ($p < 0.01$). Hemodynamic stability was comparable between groups, with no significant differences in mean arterial pressure or heart rate during maintenance. However, Group D had a higher incidence of postoperative coughing (4/15) compared to Group S (1/15). No laryngospasm was observed in either group. Desflurane allows faster emergence from anaesthesia compared to Sevoflurane, making it advantageous in settings requiring rapid recovery. However, its higher association with coughing suggests careful consideration in patients at risk for airway irritation.

INTRODUCTION

The most popular medication used to provide general anesthesia are inhalational anesthetics. Amnesia and a state of unconsciousness are produced by combining oxygen with small amount of volatile anesthesia. A balanced anesthesia technique is produced when intravenous adjuvants, opioids and benzodiazepines are combined. This technique produces analgesia, additional sedation, or hypnosis amnesia. Because they are simple to administer and be effectively tracked with both clinical symptoms and end tidal concentration, inhaled anesthetics are widely used for surgical procedures[1]. An inhalational anaesthetics are chemical compound possessing general anesthetic properties that can be delivered via inhalation. They can be administered through laryngeal mask airway or tracheal tube connected to anesthetic vaporizer and anesthetic delivery system.

The Laryngeal Mask Airway (LMA) minimizes the incidence of postoperative airway morbidity that is associated with insertion of an endotracheal tube (ETT) for airway management. Coughing and laryngospasm are intraoperative adverse upper airway events associated with use of LMA devices. Anaesthetists often attempt to minimize intraoperative adverse effects by applying optimal LMA insertion techniques and using anesthetic agents such as opioids that are capable of decreasing upper airway reactivity[1].

These ambulatory procedures has increased in the last two decades, primarily owing to rapid medical advances and the desire for cost savings. One vital improvement is the development of anesthetic agents that maintain stable surgical conditions while allowing a more rapid recovery of consciousness with minimal side-effects[1]. Sevoflurane and desflurane are two of the most widely used volatile anesthetic agents for ambulatory procedures because of their ideal pharmacokinetic properties and few adverse effects.

Sevoflurane and desflurane are volatile anesthetic agents that are commonly used in general anesthesia procedure in adult patients. These volatile agents help patients to get deep unconscious level[2]. Desflurane has been associated with faster awakening when compared with sevoflurane; however, desflurane had airway irritant properties when administered at high concentrations. Sevoflurane is an

ether inhalational anesthetic agent with low pungency, non-irritant odor and a low: gas partition coefficient. It can be rapidly and conveniently administered without discomfort, and its low solubility facilitates precise control over the depth of anesthesia and a rapid and smooth induction of, and emergence from, general anesthesia [2].

Objective

- To observe the intraoperative hemodynamic stability of patients undergoing general anesthesia with desflurane and sevoflurane with laryngeal mask airway.
- To observe the post operative recovery of patients undergoing general anesthesia with desflurane and sevoflurane with laryngeal mask airway.

METHODOLOGY

In this study 60patients undergone general anesthesia with laryngeal mask airway were included.A Cross-sectionalstudyinvolvingASA Iand ASAIIindividualsattheage between 18 to 60 who are scheduled for elective surgical procedures under general anesthesia with laryngeal mask airway.30 patients undergonegeneral anesthesia receivedsevoflurane with laryngeal mask airway were grouped as Group Sand 30 patients receiveddesflurane with laryngeal mask airway were grouped as Group D.

RESULTS

1. AgeDistribution In Study Population

Table1. AgeDistributionin Study Population.

AGE	GROUPS		GROUPD	
	NO	%	NO	%
UPTO20 YEARS	1	3.3	1	3.31
21-30 YEARS	5	16.6	8	26.6
31-40 YEARS	10	33.3	7	23.3
41-50 YEARS	10	33.3	8	26.6
ABOVE 50 YEARS	4	13.3	6	20
TOTAL	30	100	30	100
MEAN	33.3		33.3	
SD	13.12547142		9.702562548	
P.VALUE	1.0000NON SIGNIFICANT			

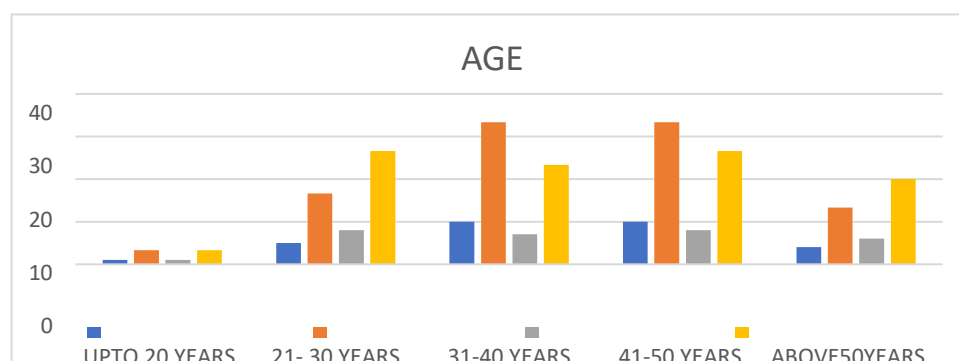


Figure1. AgeDistribution

This Graph shows the age difference between group S andgroupD. It is statisticallynon- significant.

2. Weight Distribution In Study Population

Table2. Weight distribution in study population

	GROUP S	GROUP D	P VALUE
MEAN	50.5	52.3	0.0268
SD	3.15	2.98	

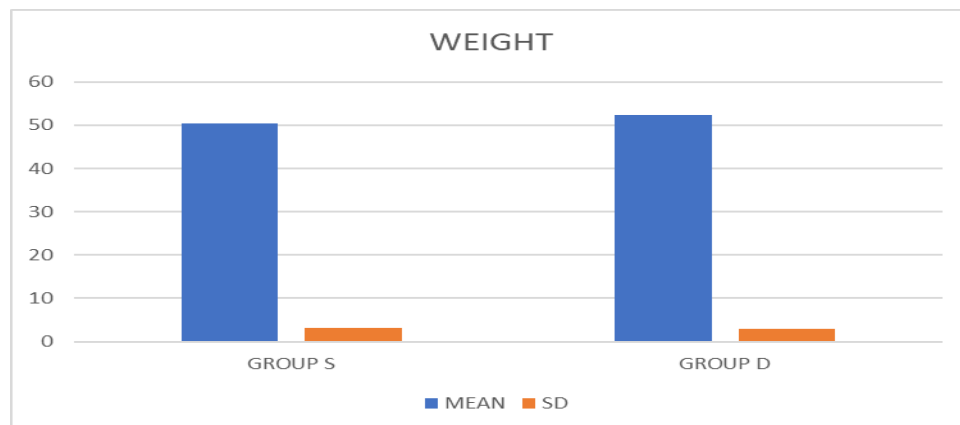


Figure 2. Weight distribution study population

This Graph shows the weight difference between group S and group D. It's statistically non- significant

3. Heart Rate

Table 3. Heart Rate

HEART RATE RANGE	GROUPS		GROUPD		T VALUE	DF	P VALUE	
	MEAN	SD	MEAN	SD				
LOW	0	1	0.51	1.625	3.05	58	0.0035 SIGNIFICANT	
NORMAL	29.125	0.64	26.5	0.75	14.58	58	<0.0001 SIGNIFICANT	
HIGH	0.125	0.35	1.87	0.35	1.745	58	<0.0001SIGNIFICANT	

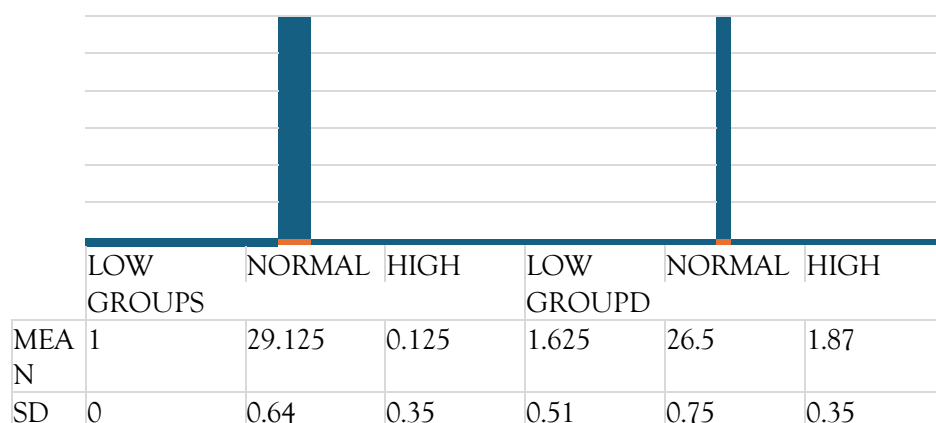


Figure 3. HeartRate

This Graph shows Mean Heart Rate between group S and group D. The results were comparable and statistically significant

4. Mean Arterial Pressure (MAP)

Table 4. Mean Arterial Pressure

MAP RANGE	GROUPS		GROUPD		T VALUE	DF	P VALUE	SIGNIFICANCE
	MEAN	SD	MEAN	SD				
LOW	1.125	0.35	1.625	0.7	3.345	58	0.0014	SIGNIFICANT
NORMAL	28.25	1.16	26.75	1.16	5.008	58	<0.0001	
HIGH	0.62	0.91	1.6	0.517	5.207	58	<0.0001	

The values are statistically significant and also shows comparable difference. The P value for the patients with low MAP values has 0.0014. The P value for the patients with normal MAP values has <0.0001. The P value for the patients with high MAP values has <0.0001 . Both groups possess statistically significant P values.

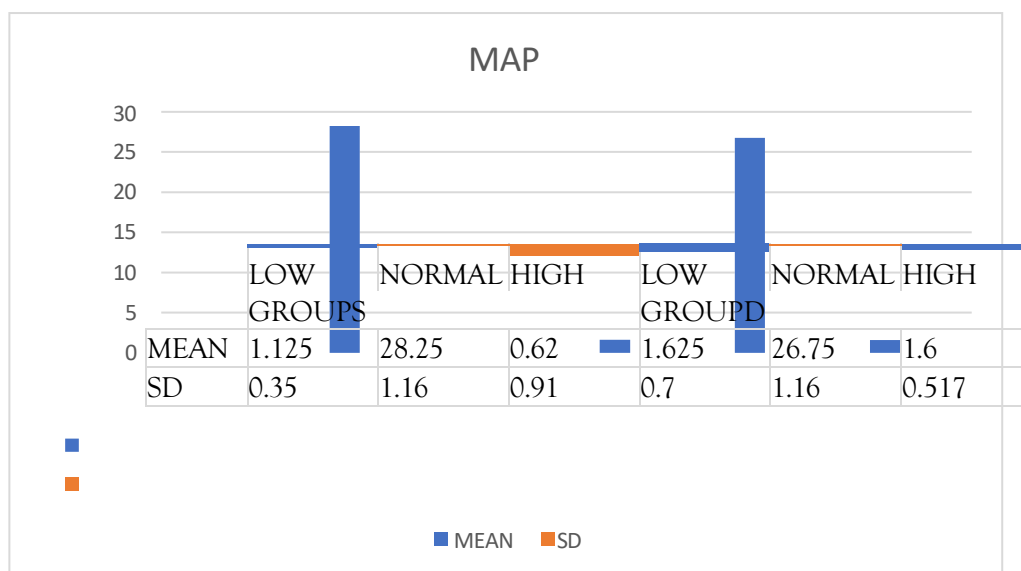


Figure 4. MeanArterialPressure

This graph shows the Mean Arterial Pressure difference between Group S and Group D. It is statistically significant.

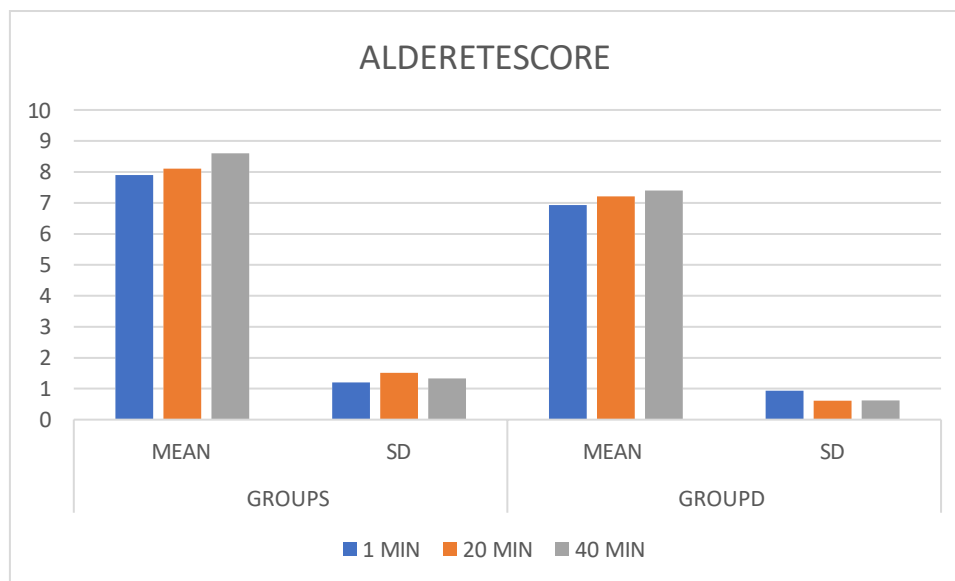
5. AldreteScore

Table 5. AldreteScore

	GROUPS		GROUPD		T VALUE	DF	P VALUE	SIGNIFICANCE
	MEAN	SD	MEAN	SD				
1 MIN	7.9	1.2	6.93	0.93	3.672	58	0.0005	SIGNIFICANT
20 MIN	8.1	1.51	7.2	0.61	3.027	58	0.0037	
40 MIN	8.6	1.34	7.4	0.62	4.45	58	<0.0001	

This table shows that the P values of aldrete scores are statistically significant.

Figure 5. AldreteScore



This graph shows the difference between mean and standard deviation for aldrete score that passes by both the group.

DISCUSSION

The mechanism of action of the inhalational anesthesia agents is still unclear. Inhalational anesthetics interact with ion channels present in the central and peripheral nervous system by blocking excitatory channels and increasing the activity of inhibitory channels.

Desflurane

Desflurane is similar to isoflurane except for addition of a fluorine atom. This atom alters the physical properties of desflurane compared to other agents. The vapor pressure of desflurane at 20 °C is 681 mm Hg, with a boiling point of 22.8 °C. It requires a temperature-controlled, pressure-regulated vaporizer. The molecular weight of desflurane is 168 grams, and the body metabolizes a small percentage of the anesthetic compared to other inhalational agents.[4]

Sevoflurane

Sevoflurane is a halogenated inhalational anesthetic that is FDA approved for the induction and maintenance of general anesthesia in adults and pediatric patients. Sevoflurane is a volatile anesthetic that provides hypnosis, amnesia, analgesia, akinesia, and autonomic blockade during surgical and procedural interventions.[5][6]

Laryngeal mask airway

Laryngeal mask airways (LMA) are single-use or reusable supra-glottic airway devices used to maintain an open airway during the administration of anesthesia or as an immediate life-saving measure in a difficult airway. Introduced into clinical practice in the 1980s, they were initially used predominantly in the operating room but have become widely used in the intensive care unit, emergency room. LMA's are easier to use and more effective than a bag-valve-mask in the hands of basic life support providers and may be used as an alternative to intubation by advanced life support providers.[7][8][9]

Suppiah et al. demonstrated that respiratory complications and hemodynamic changes after extubation were more common in adult patients undergoing endotracheal intubation than in patients who were replaced with LMA at the end of tracheal surgery [10]. The Proseal LMA is a recent advancement in the family of LMA with some added features over the classic LMA. The design of PLMA with better seal and inclusion of drain tube, makes it a choice of SAD to be used for laparoscopic surgery.[15]

In study of Pathomporn Pin-On et al., they concluded that Desflurane is non-inferior to sevoflurane in the occurrence of laryngospasm at emergence after LMA anesthesia. The superiority of desflurane compared to sevoflurane with regards to respiratory complications requires further investigation.[11]

Stevanovic et al. and De Oliveira et al. also conducted meta-analyses on this topic. In their respective

studies, Stevanovic et al. pooled 13 studies that included 1143 individuals who were administered desflurane or other anaesthetics during general anaesthesia with laryngeal mask. De Oliveira et al. pooled seven studies that included 657 individuals who were administered desflurane or sevoflurane during general anaesthesia with LMA. In our present study, we pooled 13 studies that included 1267 patients with an emphasis on the differences between desflurane and sevoflurane in ambulatory surgery. Although Stevanovic et al.¹¹ mentioned that the occurrence of airway events was higher in the desflurane group than in the sevoflurane group[2][12].

General anesthesia is popular among surgeons, anesthesiologists, and patients, and it is still used as the primary method of anesthesia in many hospitals. With the introduction of less soluble volatile anesthetics that promote early recovery while also maintaining hemodynamics and providing amnesia, general anesthesia has become the preferred technique for many patients. This study contains 60 patients with ASA I and ASA II undergoing elective surgeries under general anesthesia. It is preferable to recover from anesthesia as quickly as possible.

The hemodynamic and recovery responses of Desflurane and Sevoflurane in general anesthesia are investigated in this study. When compared to the Sevoflurane group, spontaneous movement and pain response were shorter in the Desflurane group. In the Desflurane group the extubation time, name recall, and hand grip were faster compared to Sevoflurane group. Patients in the Desflurane group moved their limbs in 4 minutes on average after anesthetics were stopped, whereas it took 7.2 minutes in the Sevoflurane group. The time to respond to pain was 5.37 minutes on average in the Desflurane group and 8.57 minutes on average in the Sevoflurane group. Patients in the Desflurane group were extubated sooner than those in the Sevoflurane group. Patients in the Desflurane group could recall their names in an average of 6.53 minutes, while those in the Sevoflurane group took 10.4 minutes.

The investigation of Desflurane and Sevoflurane in general anesthesia intraoperative hemodynamic stability and recovery response. The baseline HR and MAP were the pre-operative heart rate (HR) and mean arterial pressure (MAP) before any medication was given. At regular intervals, the HR and MAP of the Desflurane group were compared to those of the Sevoflurane group. HR and MAP low, normal, and high values were also compared in both groups. And it was discovered that the HR and MAP of the Desflurane and Sevoflurane groups were comparable with statistically significant difference.

Hypotension was managed with fluid replacement, and no patients were excluded in either group. In summary, Sevoflurane lowers blood pressure and CO levels, indicating that Sevoflurane is dose dependent. Desflurane causes tachycardia and hypertension due to sympathetic stimulation. It has a pungent odor and may cause bronchospasm and hyper secretion, making it unsuitable for inhalational induction in children. Its advantage is that it has a faster recovery time.

According to Nathanson et al., Sevoflurane and Desflurane provided comparable intraoperative conditions during the maintenance period. Despite the fact that recovery was faster after desflurane[13] Macario A et al. conducted a meta analysis of 22 studies on a total of 746 patients who received sevoflurane and 752 patients who received Desflurane to compare their post operative recovery characteristics. [14] Patients given with Desflurane were extubated, and followed commands, were oriented 8-12 minutes earlier than Sevoflurane group.

The purpose of this study was to compare the hemodynamic and recovery responses of Desflurane and Sevoflurane in general anesthesia. 60 ASA I and II patients were divided into two groups for elective surgeries lasting at least 2 hours under endotracheal general anesthesia. The groups were both induced using standard intravenous induction techniques.

Meta Group D was kept at 6% Desflurane, while Group S was kept at 2% Sevoflurane, 30% oxygen, and 70% nitrous oxide, Injection if necessary, 0.5 mcg/kg fentanyl is administered. Mean arterial pressure and heart rate were measured before, during and 20 minutes after induction. If the MAP increased by more than 20% from the baseline value, it was treated with a 1 mcg/kg fentanyl injection. If the MAP dropped by more than 20% from the baseline value, it was treated with intravenous fluids and replacement of intraoperative blood loss.

When the patient's hemodynamics were unresponsive to the above measures, the patients were removed from the study. After the last skin suture, the nitrous oxide and volatile anaesthetic were stopped. The residual neuromuscular blockade was reversed intravenously with injections of neostigmine and glycopyrolate. The time of anaesthetic agent discontinuation was recorded as time zero for all subsequent measurements, and recovery times were calculated at 1 minute intervals after awakening.

The following results were obtained of the two groups compared,

- 1.Age and weight were comparable in both the groups and their p values are non significant
- 2.Both desflurane and sevoflurane maintain hemodynamics and difference was statistically significant.
- 3.Aldrete score of the both the groups were also statistically significant.

CONCLUSION:

A cross-sectional study comparing Sevoflurane and Desflurane in adult patients undergoing general anesthesia with a laryngeal mask airway (LMA) would focus on evaluating key aspects like hemodynamic stability, induction times, recovery characteristics, and post-anesthesia outcomes. For hemodynamic stability sevoflurane maintained stable hemodynamics ,while desflurane caused more fluctuations.For induction and maintenance desflurane had a faster onset and recovery than sevoflurane,caused less irritation to the airway.During postoperative period both agents caused fewer incidence of emergence agitation ,nausea and vomiting.Cost and Efficiency desflurane is more expensive and requires more precise monitoring ,while sevoflurane is less costly and easier to manage in clinical practice. In accordance with the study results, both Desflurane and Sevoflurane provided similar hemodynamic changes with minimal fluctuation for intraoperative maintenance of general anesthesia. When compared to Sevoflurane, Desflurane causes an increase in heart rate. In conclusion, the recovery phase from general anesthesia was faster with Desflurane than with Sevoflurane.

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