

Isoflurane versus Desflurane for Anaesthesia in Surgery Operation: A Comparison of Maintenance and Hemodynamic Profile

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ABSTRACT

Background: Inhaled volatile anesthetics continue to be the most extensively used drugs for maintenance of general anesthesia because of their ease of administration and predictable intraoperative and recovery characteristics. The aim of this study was to assess the use of Isoflurane and desflurane during operation. **Methods:** In this study, a total of 58 patients were included whom undergo surgery in governmental hospitals in Tripoli, Libya. All cases were assessed for the use of anesthesia gases (types, duration, and any possible side effect). Brief information about the study, the subject information and the type of operation was taken and recorded in specific form during the study. **Results:** Our result have found that 51.7% of patients were males, while 48.3% of patients were female. The study subjects were predominated by Libyans in both genders. The main age of male was 28.2%, while the main age of female patients was 30%. There were 20% patients were undergo orthopedic operation, while 80% were surgical operation. We have also found that desflurane has been given to patients with median dose 2.08 MAC twice during operations, in compare to isoflurane 1.6 MAC twice during operation. The main duration of action of desflurane was 8.3 min, while the main duration of action of isoflurane was 7.8 min. **Conclusion:** The results in this study found that isoflurane has been used more frequently than desflurane, with dose of 1.6 MAC and 2.08 MAC of isoflurane to desflurane respectively. The duration of action was longer with isoflurane usage than with desflurane. Both of the inhalation gases have been used twice during the operation time, and no side effects has been reported in this study with the use of both agents.

Keywords: Inhalation – Anesthesia – Isoflurane – Desflurane.

INTRODUCTION

An inhalational anaesthetic is a chemical substances possessing general anaesthetic properties that can be administered by inhalation [1]. They are administered by anaesthetists via an anaesthesia mask, laryngeal mask airway or tracheal tube attached to an anaesthetic vaporiser and an anaesthetic delivery system. The inhaled anesthetics include isoflurane, and desflurane are thought to stimulate inhibitory postsynaptic channel activity and suppress excitatory synaptic activity. The mechanism of action of inhaled anesthetics has not been completely well-defined. A numeral of factors can impact the pharmacokinetics of inhaled anesthetics, including solubility in blood, cardiac output, tissue

equilibration, extent of tissue perfusion, metabolism, and age. All of the existing inhaled anesthetics are effective for inducing or maintaining anesthesia or both [2].

Many clinical trials of inhaled anesthetics have estimated differences in induction and emergence from anesthesia by linking times to loss of reflex, extubation, and response to verbal orders; setting to time and place; and capability to sit up without support [3]. Variances between inhaled anesthetic agents in time to retrieval from anesthesia can be significant for patients who are experiencing ambulatory surgery.

A quick recovery may simplify the use of a cost-saving method in which patients who meet certain conditions are discharged directly from the operating room to a phase two step-down unit instead of to an intermediary phase one post-anesthesia care unit.

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The choices in these cases are restricted to the halogenated agents desflurane, halothane, isoflurane, and sevoflurane because of their considerably greater effectiveness than that of nitrous oxide [4]. Isoflurane is an inhalational anesthetic whose low solubility that enables a quick induction of and recovery from anesthesia. The insignificant pungency of isoflurane may border the rate of induction, although extreme salivation or tracheobronchial secretions do not seem to be stimulated [5]. Desflurane is a greatly fluorinated methyl ethyl ether used for maintenance of general anesthesia. It is gradually substituting isoflurane for use in humans. It has the greatest rapid onset and offset of the volatile anesthetic drugs used for general anesthesia because of its low solubility in blood [6].

The perfect volatile anaesthetic agent passes smooth and consistent induction and maintenance of general anaesthesia with slight effects on other organ systems. Therefore, this study was conducted to assess the different between some anaesthetic gases in regard to their induction time and maintenance during operation.

METHODOLOGY

Study setting and study flow

This study was carried out in two government hospitals in Tripoli, Libya [Tripoli Medical hospital and central hospital of Tripoli] during the period from December 2016 to February 2017. The study protocol was approved by the higher institutae of sciences and Medical technology, Tripoli, Libya.

Informative consent was obtained from all patients or their legal guardians before enrollment in the study. A total of 58 patient were included in an observational study. All cases were assessed for the use of two commonly used anesthesia gases isoflurane and desflurane [onset of action, clinical duration, frequency of use, and any possible side effect]. Brief information about the study, the subject information and the type of operation was taken and recorded in specific form during the study. The selected subjects are within the age range of 18 to 70 years old, not pregnant and was informed on the study objectives, methodology and possible inconveniences. Subjects undergo emergence operation were not included in this study.

Statistical analysis

Data were presented as mean \pm SD. Comparing the use of inhalation anesthesia with the type of operation were made using excel sheet.

RESULTS

Demographic data distribution.

The demographic and clinical data of the subjects in this study are as shown in figure 1 and 2 respectively. A total of 58 patients were included in this study. 51.7% of patients were males, while 48.3% of patients were female. The study subjects were predominated by Libyans in both genders. The main age of male was 28.2%, while the main age of female patients was 30%. There were 20% patients were undergo orthopedic operation, while 80% were surgical operation.

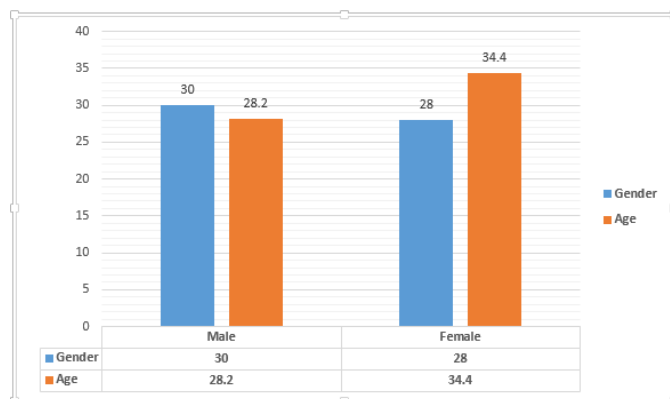


Figure 1. Demographic data distribution

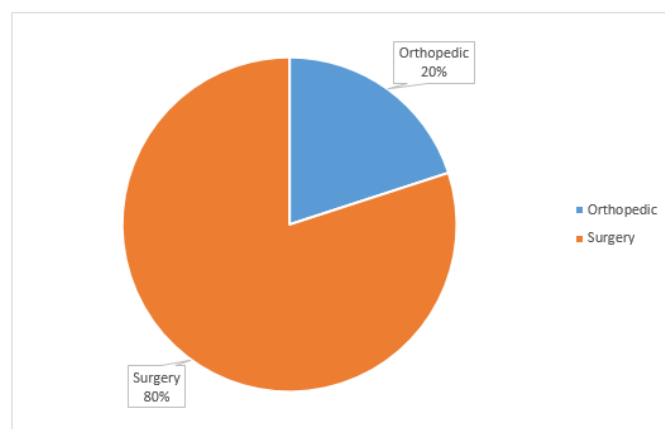


Figure 2. Operation type assessed during the study

The choice of inhalation anesthesia agent

The inhaled anesthetic agents differ in their cardiovascular and respiratory effects and their potential to cause hepatic and renal toxicity. These variances might impact the selection of an inhaled anesthetic agent for patients with cardiovascular, respiratory, hepatic, or renal injuries.

In this study, we have found the percentage use of isoflurane in the operation were 86.2% in compare to desflurane 13.8% [Table 1]. Most of desflurane usage were during orthopedic operation. We have also found that desflurane has been given to patients with median dose 2.08 MAC twice during operations, in compare to isoflurane 1.6 MAC twice during operation. The main duration of action of desflurane was 8.3 min, while the main duration of action of isoflurane was 7.8 min. There were no significant side effects noticed with the use of both inhalation gases during operation.

Table 1: Difference in dose, duration, and frequency of use between desflurane and isoflurane

Type of inhalation gases	Frequency of use per total (n=58)	Dose (MAC)	Duration of action min	Frequency during operation
Desflurane	13.8%	2.08	8.3	Twice
Isoflurane	86.2%	1.6	7.8	Twice

DISCUSSION AND CONCLUSION

This study compares the clinical features and hemodynamic changes between isoflurane and desflurane in patients undergoing surgical operations. Our results showed that isoflurane has been used more frequently than desflurane, with dose of 1.6 MAC and 2.08 MAC of isoflurane to desflurane respectively. The duration of action was longer with isoflurane usage than with desflurane.

Our results also revealed that both of the isoflurane and desflurane has showed stable hemodynamic parameters. In agreement with these findings, Dupont et al. [7] reported that there were no significant differences between isoflurane and desflurane groups as blood pressure was maintained within 20% of baseline values during maintenance by the two inhalational anesthetics in patients undergo elective lobectomy or

pneumonectomy.

In contrast to the current study, Bennet et al. [8], showed that there were statistically significant differences between isoflurane and desflurane groups at any time after incision as blood pressure raised greater than 20% of baseline when treated with a 30% increase in inspired anesthetic concentration for 3 min or until blood pressure was within 10% of baseline; it was also observed that anesthetic depth could be titrated more rapidly with desflurane compared with isoflurane. Another study was carried out by Loan et al. [2] compared the heart rate changes in patients undergo dental surgeries as there were changes in heart rate in both groups that were greater in the desflurane group and statistically significant in the isoflurane group and desflurane group after induction of anesthesia.

Desflurane, isoflurane, and sevoflurane cause much less myocardial depression than halothane [9]. The halogenated anesthetics vary in their sympathetic nervous system action. Desflurane rises sympathetic activity and the heart rate if the concentration is abruptly amplified and high concentrations (i.e., 6%) are used [10]. This high concentration of desflurane irritates the airways, which appears to play a significant part in producing this transient sympathetic hyperactivity. The hyperactivity may be moderated by opioid agonists, esmolol, or clonidine [11]. Our results in this study found that isoflurane has been used more frequently than desflurane, with dose 1.6 MAC and 2.08 MAC of isoflurane to desflurane respectively. The duration of action was longer with isoflurane usage than with desflurane. Both of the inhalation gases have been used twice during the operation time. No side effect has been reported in this study with the use of both agents.

In conclusion, the results of the study indicate that desflurane has shorter duration of action in comparison with isoflurane in patients undergoing surgical operations. Both agents are hemodynamic stable.

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Nil.

DISCLOSURE STATEMENT

There are no conflicts of interest.

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