

Comparison of isoflurane and sevoflurane in anesthesia for day case surgeries using classical laryngeal mask airway

Hasnaa A. Ahmed^a, Mohamed A. Soliman^a, Salah M. Asida^a

^aAnaesthesia, Intensive Care And Pain Management Department, Faculty of Medicine, Qena University Hospital, South Valley University, Qena, Egypt.

Abstract

Background: Advances in anesthetic induction agents and airway management have contributed to the success of day case surgeries. An ideal day-case anesthetic agent should have rapid smooth induction; provide optimum surgical conditions with rapid recovery and minimal side effects.

Objectives: Comparing isoflurane and sevoflurane as maintenance anaesthetic agents in day case surgeries.

Patients and methods: This study was done on 100 patients scheduled for operations under general anesthesia divided in two groups of maintenance anaesthesia (isoflurane and sevoflurane) 50 patients in each.

Results: MAP was with more decrease in group B (75.8 ± 7.2) than group A (90.2 ± 8.8). LMA hyper-reactivity score was with more decrease in mild (20%) and moderate (6%) in group A than group B, mild (46%) and moderate (8%). LMA removal (min) was statistically significant between two groups A (8.8 ± 1.2) B (5.1 ± 0.8). Emergence was statistically significant with (0% of cases) and (24% of cases) for groups A and B respectively. PONV score, was statistically significant with negative (88%, 98%) and mild (12%, 2%) for groups A and B respectively. discharge time, was statistically significant with (21.1 ± 8.3 hours, 9.4 ± 2.5 hours) for groups A and B respectively.

Conclusions: Sevoflurane and isoflurane are suitable for day care anaesthesia.

Keywords: Isoflurane, Sevoflurane, Laryngeal mask airway, Day case surgery.

Introduction:

Day case surgery is a planned surgery where in the patients, requiring early recovery and discharge, are admitted for short stay for surgery on a non-resident basis (Ghatge et al., 2000).

Advances in anesthetic induction agents and airway management have contributed to the success of day case surgeries. An ideal day-case anesthetic agent should have rapid smooth induction; provide optimum surgical conditions with rapid recovery and minimal side effects (Ghatge et al., 2000).

This study was conducted to compare isoflurane and sevoflurane, when used as maintenance anesthetic agents for anesthesia using classical Laryngeal mask airway (LMA) in day case surgery. The

study was designed to determine if these agents offered advantages in terms of providing adequate depth of anesthesia, intraoperative haemodynamic stability, cardio respiratory effects, recovery profile, emergence reactions and adverse effects including severity of airway hyper reactivity associated with LMA removal (Elcock et al., 2002).

Patients and methods:

The present study was carried out on 100 patients scheduled for operations under general anesthesia divided in two groups of maintenance anaesthesia (isoflurane and sevoflurane) 50 patients in each.

The patients were selected from Qena university hospitals in the duration from august 2017 to march 2018 to compare

isoflurane and sevoflurane, as maintenance anesthetic agents for anesthesia using classical Laryngeal mask airway (LMA) in day case surgery.

Data collection:

1-The Hemodynamic variables (H.R, SBP, DBP, MBP), PSao₂, R.R were noted during various stages of the surgery: Baseline, just after induction and every 5 minutes till the end of the surgery. 2-Airway Hyperreactivity Score was noted after LMA insertion. 3-Time of LMA removal:"it is the time between stop of inhalational anaesthesia and LMA removal"was recorded.

4-The recovery characteristics were assessed using Modified Aldrete Score (0 to 10) after removal of LMA.5- Emergence : is an altered state of consciousness, which continues through the early recovery period of anaesthesia, this was recorded too. 6- PONV was assessed and recorded on a scale (0-3) (Elcocketal., 2002). 7- The first dose of post-operative analgesia was recorded. 8- Discharge time:"the time between the end of the operation to the discharge from the hospital" was recorded for all the patients.

Ethical consideration:

All patients were included in the study after taking a written consent from the patients or the parents after full explanation of the purpose, nature and risks of all procedures used according to the ethical committee of the Qena University hospital.

-All the patients were fasting for 6 hours at least as per standard guidelines, no premedication was administered.

-On arrival to the operating room, the patients were positioned supine and a small roll was placed underneath the neck.

-All patients were connected to the standard monitors included pulse oximetry probe, non- invasive blood pressure monitoring, electrocardiogram and also end-tidal CO₂

monitoring was performed after induction of anesthesia.

-The base line of the heart rate (HR), blood pressure (BP) and oxygen saturation were recorded.

-Induction of anesthesia was initiated by propofol1%(2 mg/kg) iv injection after inserting i.v line then classical LMA was inserted.

-All hemodynamics were recorded just after the induction of anaesthesia.

-Anaesthesia maintained with isoflurane MAC 1-1.5 in group (A) or sevoflurane MAC 2-4 in group(B), and 100% oxygen with total fresh gas flow 3-5 l/min. on spontaneous ventilation. Isoflurane and sevoflurane concentration were titrated to maintain heart rate (HR) and mean blood pressure within $\pm 20\%$ of their baseline values in response to surgical stimulation.

-At the end of surgery, administration of isoflurane or sevofluane was discontinued without tapering. The LMA was removed after eye opening and mouth opening to command.

-Heamodynamic variables heart rate (HR), blood pressure, oxygen percentage saturation (SpO₂), respiratory rate (RR) were monitored every 5 minutes till the end of the surgery.

-Recovery score, airway reactivity score, post-operative nausea and vomiting, first dose of analgesia after the end of the operation, discharge time and any complications as emergence were noted.

Statistical

analysis:

All analysis were performed with the IBM SPSS 23.0 software. The data were tested for normality using the Anderson-Darling test and for homogeneity variances prior to further statistical analysis. Continuous variables described by mean standard deviation (MEAN \pm SD) where categorical variables were described by number and percent (N,%). Comparison between

continuous variables was done by t-test where chi-square and fisher exact tests were used to compare the categorical variables. A two-tailed $p < 0.05$ was considered statistically significant.

Results:

This study was conducted on 100 patients admitted to Qena university hospital. The patients were randomly allocated into two groups: group A ($n=50$) received isoflurane and group B ($n=50$) received sevoflurane.

The patient characteristics were comparable in the two studied groups with no statistically significant difference (Table 1). Regarding hemodynamic parameters, there was statistically significant difference between the two studied groups as regard to MAP measured just post-induction with more decrease in group B (75.8 ± 7.2) than group A (90.2 ± 8.8) (Table 2). Regarding LMA hyper-reactivity score, there was statistically significant difference in comparison between the two studied groups with more decrease in mild hypersensitivity (20%) and moderate hypersensitivity (6%) in group A than group B, mild hypersensitivity (46%) and moderate hypersensitivity (8%), (Table 3). Regarding LMA removal (min), there was statistically significant difference between the two studied groups (8.8 ± 1.2 , 5.1 ± 0.8) for groups A and B respectively. (Table 4).

Regarding emergence, there was statistically significant difference between the two studied groups (0% of cases) and (24% of cases) for groups A and B respectively (Table 4). Regarding recovery score, there were no statistically significant differences between the two studied groups (9.38 ± 0.697 , 9.42 ± 0.575) for groups A and B respectively (Table 10).

Regarding for PONV score, there was statistically significant difference between

the two studied groups negative (88%, 98%) and mild (12%, 2%) for groups A and B respectively.

Regarding discharge time, there was statistically significant difference between the two studied groups (21.1 ± 8.3 hours, 9.4 ± 2.5 hours) for groups A and B respectively.

Regarding Time of post-operative analgesia time (min), there were no statistically significant differences between the two studied groups (4.9 ± 0.3 , 4.7 ± 0.5) for groups A and B respectively.

Table 1: patient characteristics.

Variable	group A (N =50)	group B (N =50)	P- value
Age (mean±SD)	35.4±18.4	39.7±22.9	.301#
Sex (N) (%)	Male	31 (62%)	.836#
	Female	19(38%)	
BMI (mean±SD)	27.6±4.2	27.8±5.5	.837#
Operation duration (min)	35.6±9.1	33.5±10.1	.06#

#No statistically significant difference ($p > .05$)

Data presented in (mean ±SD) using independent sample t test for comparison.

Data presented in (no. and %) using Chi-square test for comparison.

BMI: body mass index

Table2: Comparison according to hemodynamics.

Variable	MAP		P-value
	group A (n =50)	group B (n =50)	
pre induction	95.7± 6.4	97.4± 8.4	.379
just post induction	90.2 ±8.8	75.8±7.2	000*
after 5min	84.2± 7.8	75.9 ±5.5	000*
after 10 min	83.4±6.9	76.6±4.8	000*
after 15 min	83.2± 4.5	78.4± 4.3	000*
after 20 min	82.8± 5.07	76.6±1.2	000*
after 25 min	82.3± 5.3	76 ±.85	000*
after 30 min	82.1± 4.3	76.6± 2.4	000*
after 35 min	82.6± 4.7	75 ±1.7	000*
after 40 min	84.6± 4.6	76±3.04	000*

Table 3: Comparison between groups LMA hyper- reactivity score.

		group A (N =50)	group B (N =50)	P vlaue
LMA hyper- reactivity score	No	36(72%)	23(46%)	.028*
	Mild	10(20%)	23(46%)	
	Mod	3(6%)	4(8%)	
	ever	1(2%)	0(0%)	

Table 4: Comparison between groups as regard LMA removal time, emergency and Recovery score.

		group A (N =50)	group B (N =50)	P- vlaue
LMA removal time (min)		8.8±1.2	5.1±.8	.000*
Emergence (N %)	Yes	0 (0%)	12(24%)	.05*
Recovery score		9.38±.697	9.42±.575	.755

Discussion:

Advances in anesthetic agents and airway management have contributed to the success of day case surgeries. An ideal day-case anesthetic agent should have rapid smooth induction, provide optimum surgical conditions with rapid recovery and minimal side effects(**Ghatgeetal. 2000**).

Although no single anesthetic agent completely satisfies all these requirements, pharmacological developments over the past decades have brought us considerably closer. In recent times, inhalational agents like isoflurane and sevoflurane have shown a promising result(**Elcock et al.,2002**). we have undertaken this study primarily to compare isoflurane and sevoflurane, when used as maintenance anesthetic agents for anesthesia using classical Laryngeal mask airway (LMA) in day case surgery.

100 patients scheduled for operations under general anesthesia were collected in the study , divided in two groups 50 patients in each as isoflurane (group A) and sevoflurane (group B).

The comparison between the two groups in our study resulted in statistically

significant differences as regard to hemodynamic measurement, Airway hyper reactivity, Time of LMA removal, Emergence, Post Anesthesia Nausea and Vomiting, and The discharge time.

In accordance to our hemodynamic results, (**Frinketal.,1992**) in their comparison of sevoflurane and isoflurane in healthy subjects found that comparing to baseline values, sevoflurane anaesthesia decreased systolic and diastolic arterial blood pressures 3-5 min before surgical incision, whereas in the isoflurane group, systolic and diastolic arterial blood pressures did not differ from baseline values at this time.

In accordance to the results of airway hypersensitivity, (**Pappas et al.,2001**) in their study found that awake LMA removal during isoflurane anaesthesia resulted in a higher incidence of adverse events and carried a high risk of severe airway hyperreactivity and critical events. So although our study showed a higher incidence of airway hyperreactivity in the isoflurane group.

In accordance to the results of LMA removal's time, (**Venkatesh et al.,2007**) in their study Comparison of sevoflurane and isoflurane in OPCAB surgery , they compared two volatile anaesthetic agents sevoflurane and isoflurane as a maintenance of anaesthesia in 40 patients undergoing OPCAB (Off Pump Coronary Artery Bypass) surgery, found that time to awakening and extubation was significantly shorter in sevoflurane group than in isoflurane group they compared two volatile anaesthetic agents sevoflurane and isoflurane as a maintenance of anaesthesia in 40 patients undergoing OPCAB(Off Pump Coronary Artery Bypass) surgery.

In accordance to the results of the incidence of emergence, (**Singh et al.,2012**) in their clinical study "comparative

evaluation of incidence of emergence agitation and post-operative recovery profile in pediatric patients after isoflurane, sevoflurane and desflurane anaesthesia", found that a higher number of patients in sevoflurane group were agitated in the recovery period and required rescue medications compared with isoflurane.

In accordance to the results the incidence of Post Anaesthesia Nausea and Vomiting, (Frink et al., 1992) in their clinical comparison of sevoflurane and isoflurane in healthy patients reported that the incidence of postoperative nausea did not differ between the sevoflurane and isoflurane groups, with an incidence of 10 and 12% respectively, occurring in the post anesthetic care unit immediately after anaesthesia.

In accordance to the results of the discharge time, (Gupta et al., 2004) concluded that discharge time was faster with sevoflurane compared to isoflurane. They found a minor difference of 5 min in home readiness between sevoflurane and isoflurane

Conclusion:

sevoflurane and isoflurane are suitable for day care anaesthesia.

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