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RESEARCH ARTICLE

SEVOFLURANE AND PROPOFOL AS AN INDUCTING AGENT FOR LARYNGEAL MASK AIRWAY INSERTION IN ADULT PATIENTS SCHEDULED FOR DAY CARE SURGERY – A CLINICAL COMPARATIVE STUDY

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ABSTRACT

Background: Ambulatory surgery continues to grow and thrive in vast majority (60-70%) of all surgical procedures is performed on day care basis. The speed of recovery from anaesthesia depends on the choice of anaesthesia technique[1]. Satisfactory insertion of the Laryngeal Mask Airway (LMA) after induction of anaesthesia requires sufficient depth for suppression of airway reflexes[2].
Objective: To compare 8% Sevoflurae and Propofol induction according to ease of laryngeal mask airway placement and hemodynamic effects in adult patients.
Methods: This study was undertaken on 60 ASA grade I and II patients, aged between 18 to 60 years scheduled for day care surgical procedures at Silchar Medical College and Hospital, Silchar from December, 2011 to November, 2012. The patients were allocated into 2 groups and were administered Propofol (P) (n=30) 10 mg i.v. bolous and 8% Sevoflurane (S) (n=30).
Results: Induction was more rapid with IV Propofol. In Group P, it was 54.03 ± 4.11 (S.D.) seconds and in Group S, 58.77 ± 5.51 (S.D.) seconds (p= 0.0004). Adequate jaw relaxation time in Group P was 80.27 ± 9.07 (S.D.) seconds shorter than Group S, which was 111.73 ± 11.57 (S.D.) seconds (p=0.0001). The mean time for successful LMA insertion was shorter in Propofol group which was 99.77 ± 8.32 seconds compared to Sevoflurane group which was 130.83 ± 10.91 seconds (p= 0.0001).
Conclusion: In conclusion, we found that Propofol is superior to Sevoflurane for insertion of the Laryngeal Mask Airway.

Key words: Laryngeal mask airway (LMA), Propofol, Sevoflurane.

INTRODUCTION

Ambulatory surgery continues to grow and thrive such that the vast majority (60-70%) of all surgical procedures is performed on an outpatient basis. Expeditious recovery and shorter hospital stay are necessary to improve efficiency of an ambulatory facility and reduce health care costs. One of the major factors that determine the speed of recovery from anaesthesia is the choice of anaesthesia technique (Joshi *et al*., 2003). Satisfactory insertion of the Laryngeal Mask Airway after induction of anaesthesia requires sufficient depth for suppression of airway reflexes (Driver *et al*., 2007). A popular method of providing anaesthesia for Laryngeal Mask Airway insertion is with the use of IV Propofol, which has the advantages of inducing anaesthesia rapidly and depressing upper airway reflexes. However bolus IV Propofol has been associated with adverse effects like hypotension, apnoea and pain on injection (Scanlon *et al*., 1993; Brown *et al*., 1991). Sevoflurane is a recently introduced halogenated volatile anaesthetic agent, with a pleasant odour and low blood gas solubility, which allows rapid smooth inhalational induction with excellent recovery.

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Several studies have shown that induction of anaesthesia after inhalation of Sevoflurane is comparable with IV Propofol (Brown *et al*., 1991). Although local and regional anaesthesia techniques are increasingly used in the ambulatory setting because they allow a more rapid recovery, general anaesthesia is still the most common anaesthetic technique (Joshi *et al*., 2001; Joshi *et al*., 2000).

MATERIAL AND METHODS

This study was undertaken on 60 ASA grade I and II patients, aged between 18 to 60 years scheduled for day care surgical procedures at Silchar Medical College and Hospital, Silchar from December, 2011 to November, 2012. Exclusion criteria: Patients were excluded if they were predicted to have a difficult airway; morbidly obese; had a history of GI reflux; receiving anti-epileptic medication; presence of any hepatic, renal or metabolic disorder; had a history of cardio-vascular, renal, hypertensive disease; pregnancy or known allergy to any anaesthetic. After pre-anesthetic check-up every patient received I.V. Midazolam (0.07 mg kg), Inj Ranitidine (i.v slowly) and Inj Glycopyrolate (i.v.) half an hour prior to induction of anaesthesia. Monitoring consisted of Heart Rate, SpO_2, ECG, Non-invasive blood pressure measurement, and

$ETCO_2$. Patients were randomized into one of the two groups (Group P: Propofol and Group S: Sevoflurane) of 30 patients in each group for induction of anaesthesia. Efforts were made for homogenous matching (Age, Sex etc.) in both the groups. All patients were pre-oxygenated for three minutes with 100% O_2 at a fresh gas flow rate of 8L/min prior to inducing anaesthesia. Loss of verbal contact was considered as the desired end point for induction of anaesthesia in both the groups. Immediately after loss of eye lash reflex, inj. Fentanyl (2 µg/kg i.v.) was administered, following which the adequacy of jaw relaxation was assessed.

If the jaw relaxation was deemed adequate enough, insertion of a standard size lubricated LMA was attempted, using the method as described by Dr. Brain. If the jaw relaxation was not adequate enough, repeat assessment were made after 15 seconds. In group P, each assessment for adequate jaw relaxation was preceded by incremental Propofol bolous 10 mg i.v., till the jaw was adequately relaxed, while the patient breathed 100% O_2 at 8L/min. In group S, similar assessment was made every 15 seconds, till the jaw was adequately relaxed, while the patients breathe 8% Sevoflurane in O_2 at fresh gas flow rate of 8 L/min. Each patient was asked to exhale maximally and the primed circuit was then connected to the face mask.

They were asked to take vital capacity breaths. Throughout the procedure no controlled or assisted ventilation was given, unless SpO_2 fell below 90%. After insertion of LMA, anaesthesia was maintained with $N_2O + O_2$ (2:1) + Halothane (as required) at a fresh flow rate of 8L/min.The time for induction i.e. the time (in seconds) taken from induction of anaesthesia to the loss of eye lash reflex, and the time for Laryngeal Mask Airway insertion were recorded in both the groups. Haemodynamic Parameters (Systolic and Diastolic Blood Pressure, Mean Arterial Pressure and Heart Rate) were recorded at baseline, induction, one minute, two minute and at five minutes after induction. Statistical analysis was performed using online student t-test calculator by calculating p-value and Standard Deviation (SD). $P < 0.05$ was taken as statistically significant.

RESULTS

The mean age in Group P was 33.67 ± 10.15 (S.D.) and in Group S, it was 30.80 ± 13.21 (S.D.). The mean weight in Group P was 52.66 ± 7.38 (S.D.) and in Group S, it was 51.66 ± 6.76 (S.D.). (Table: 1) Induction was more rapid with IV Propofol. The mean time (in seconds) for induction in Group P was 54.03 ± 4.11 (S.D.) and in Group S, it was 58.77 ± 5.51 (S.D.) seconds (p= 0.0004).

Table 1. Demographic criteria of the studied groups

Groups	Group P (n=30)	Group S (n=30)	P-Value
	Mean ± SD	Mean±SD	
Age (Y)	33.67 ± 10.15	30.80 ± 13.21	0.35
Gender (M/F)	21/9	21/9	----
Weight (Kg)	52.66 ± 7.38	51.66 ± 6.76	0.561

Data are expressed as Mean & SD.

Table 2. Analysis of the Haemodynamic parameters

	Time after the start of anaesthetic induction (minutes)				
	Baseline	Induction	1 Min	2 Min	5 Min
Heart Rate					
Group P	83.50 ± 6.95	81.36 ± 6.79	78.03 ± 7.14	77.13 ± 7.41	76.33 ± 8.38
Group S	85.10 ± 7.19	84.76 ± 7.59	86.93 ± 10.05	81.30 ± 9.53	80.53 ± 9.89
P-Value	0.385	0.073	0.0002	0.064	0.081
SBP					
Group P	122.87± 7.31	117.67 ± 8.47	110.67 ± 7.21	108.33 ± 5.78	104.40 ± 6.71
Group S	12.33 ± 5.54	122.00 ± 9.32	117.07 ± 9.06	111.90 ± 8.14	105.20 ± 9.92
P-Value	0.146	0.065	0.003	0.055	0.712
DBP					
Group P	77.80 ± 6.13	76.93 ± 6.14	69.97 ± 5.61	67.63 ± 3.77	66.00 ± 5.99
Group S	79.87 ± 7.93	78.13 ± 8.07	71.87 ± 7.18	69.06 ± 6.05	66.27 ± 5.72
P-Value	0.264	0.519	0.258	0.276	0.861
MAP					
Group P	93.23 ± 5.99	90.51 ± 5.63	83.51 ± 5.54	81.53 ± 3.73	79.78 ± 6.13
Group S	95.35 ± 5.50	93.12 ± 7.09	86.99 ± 6.27	83.34 ± 5.55	79.51 ± 6.04
P-Value	0.157	0.120	0.026	0.143	0.866

Data are expressed as Mean & SD; SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure; MAP: Mean Arterial pressure.

Table 3. Comparison of time for LMA insertion

	Time of events			
	Loss of VC	LOELR	Adequate JR	Completion of LMAI
Group P	54.03 ± 4.11	62.30 ± 5.67	80.27 ± 9.07	99.77 ± 8.32
Group S	58.77 ± 5.51	68.67 ± 5.71	111.73 ± 11.57	130.83 ± 10.91
P-Value	0.0004	0.0001	0.0001	0.0001

VC: Verbal command; LOELR: Loss of Eye Lash Reflex; JR: Jaw reflex; LMAI: Laryngeal Mask Airway Induction

Table 4. Grading of conditions for LMA insertion

Parameter	Grade	Description	Group P	Group S
Jaw relaxation	3	Full	30	30
	2	Partial	00	00
	1	Difficult	00	00
Ease of LMAI	3	Easy	30	30
	2	Difficult	00	00
	1	Impossible	00	00
Coughing	3	Nil	30	30
	2	Transient	00	00
	1	Persistent	00	00
Biting	3	Nil	30	30
	2	Transient	00	00
	1	Persistent	00	00
Gagging	3	Nil	30	30
	2	Transient	00	00
	1	Persistent	00	00
Laryngoscopy	3	Nil	30	30
	2	Partial	00	00
	1	Total	00	00

Total scores: 18 Excellent; 16-17 Satisfactory; <16 poor

The mean time taken from the beginning of induction to successful LMA insertion was significantly shorter in Propofol group as compared to Sevoflurane group. The mean time for Laryngeal Mask Airway insertion in Group P was 62.30 ± 5.67 (S.D.) and in Group S, it was 68.67 ± 5.71 (S.D.) seconds. (p= 0.0001), (Table 2). In this study, the mean time required for adequate jaw relaxation Group P was 80.27 ± 9.07 (S.D.) seconds and in Group S, it was 111.73 ± 11.57 (S.D.) seconds (p= 0.0001). The mean time for the successful LMA insertion was 99.77 ± 8.32 seconds and 130.83 ± 10.91 seconds respectively in the P and S group and was significant (p= 0.0001), (Table 3). Both the groups exhibited stable haemodynamic profiles. Comparison of the Haemodynamic Parameters between the two groups showed a statistically significant difference in the Mean Arterial Pressure, Systolic Blood Pressure and Heart Rate in group P, one minutes after induction.

DISCUSSION

Intubating conditions for the Laryngeal Mask Airway using Sevoflurane compared favourably with Propofol in a number of studies (Lian*et al*., 1999; Mary *et al*., 1999). However, we have also found that for the same end point of induction, which is the loss of eye lash reflex in both the groups, conditions for Laryngeal Mask Airway insertion were superior with Propofol than with Sevoflurane. We also found that the induction time was shorter with Propofol which was statistically significant, similar to a study by Topuz *et al* (2010). I Smith *et al*., in 1999 and A Thwaites *et al*., in 1997 reported that induction of anaesthesia with Propofol was significantly more rapid compared with 8% Sevoflurane. In the present study, the mean time required for adequate jaw relaxation and successful LMA insertion were significantly faster in Propofol group (p= 0.0001). Laryngeal Mask Airway placement requires suppression of the less sensitive hypopharynx for successful placement as well as attenuation of the laryngeal reflexes in order to reduce stimulation of the anterior laryngeal structures during insertion. Propofol is known to depress laryngeal reflexes, thus facilitating Laryngeal Mask Airway insertion. However, no such exaggerated reflexes like coughing, gagging or biting were observed in Sevoflurane Group (Table 4).

In our study, comparison of the Haemodynamic Parameters between the two groups showed a statistically significant difference in the Mean Arterial Pressure, Systolic Blood Pressure and Heart Rate in group P, at one minutes after induction. Ganatra *et al*. (2002) and Muhammad Umar *et al*. (2010), noted in their study that there were no significant difference in terms of heart rate between two groups like our study. However, Propofol produced a larger fall in SBP, DBP and MAP which was statistically significant (p=00.5).

Conclusion

Using the high concentration of Sevoflurane (8%), inhalational induction with it using VCB technique is comparable to 2.5 mg/kg intravenous propofol for induction and insertion of LMA in adult. However, longer time required for adequate jaw relaxation in the Sevoflurane group. Quality of jaw relaxation, ease of LMA insertion for successful LMA insertion was comparable in both the groups. In conclusion, we found that Propofol is superior to Sevoflurane for insertion of the Laryngeal Mask Airway. Sevoflurane therefore may be used an alternative induction agent to propofol for LMA insertion, in conditions where propofol may not be ideal.

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