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RESEARCH ARTICLE

A COMPARISON OF PROPOFOL VERSUS SEVOFLURANE FOR LARYNGEAL MASK AIRWAY INSERTION

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ABSTRACT

Background: IV Propofol is widely used for providing anaesthesia for LMA insertion. Sevoflurane is a new volatile anaesthetic with rapid induction and recovery characteristics.
Aims & Objectives: To compare effect of propofol versus sevofluran for laryngeal mask airway insertion.
Methodology: Total 60 partcipiants are included in this study. A randomized, double blinded trial was conducted to compare conditions for LMA insertion after induction of anaesthesia with either inhalation of Sevoflurane or intravenous Propofol in fifty ASA grade I or II female patients, who were randomly divided into two groups (n=30 in each group). Group P received IV Propofol. In Group S, after priming the Magills circuit with Sevoflurane 8% in N_2O 50% and O_2 (flow rate – 8 litres / minute) for 30 seconds, patients were asked to take vital capacity breaths via the face mask connected to the primed circuit. After the loss of eye lash reflex, which was considered as the end point of induction, the LMA insertion was attempted by an anaesthesiologist blinded to the induction technique. Scoring systems were used to grade the conditions for insertion and Fibreoptic bronchoscope position of the LMA.
Results: 80% patients in Group P had full jaw opening when compared to 30% patients in Group S (p=0.037).. Excellent conditions for the LMA insertion were obtained in a significantly greater number of patients in Group P (93.33%) than in Group S (83%) (p=0.02). The mean score for conditions for LMA insertion was significantly better in Group P (p=0.012). Induction was more rapid with IV Propofol.
Conclusion: Conclusion is that Propofol is superior to Sevoflurane for insertion of the Laryngeal Mask Airway.

Key Words: Propofol, Sevoflurane, Laryngeal Mask Airway

INTRODUCTION

Satisfactory insertion of the Laryngeal Mask Airway after induction of anaesthesia requires sufficient depth for suppression of airway reflexes (Driver *et al*., 1997). 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, apnea 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. Several studies have shown that induction of anaesthesia after inhalation of Sevoflurane is comparable with IV Propofol (Lian *et al*., 1999; Mary *et al*., 1999). The aim of this randomized double-blinded study was to compare the conditions for Laryngeal Mask Airway insertion following induction of anaesthesia with inhalation of Sevoflurane or intravenous induction with Propofol.

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MATERIALS AND METHODS

This study was conducted at AMC MET medical college,Sheth L.G Hospital ahmedabad,Gujarat from January 2012-april 2013. After informed consent, 60 ASA Grade I or II female patients, between 30 and 70 years of age, undergoing general anaesthesia for elective breast surgery were enrolled in the study. Exclusion criteria: Patients were excluded if they were predicted to have a difficult airway (Mallampatti Grade III or IV), had a history of GI reflux, were receiving anti-epileptic medication, had a history of cardio-vascular, renal, hypertensive disease, pregnancy or known allergy to any anaesthetic. Every patient received intra-muscular Midazolam $(0.07 \text{ mg kg})^{-1}$ half an hour prior to induction of anaesthesia. Monitoring consisted of ECG, Non-invasive blood pressure, Spo_2 and $ETCO_2$. Intravenous access was established and the slow infusion of crystalloids commenced.

Patients were randomized into one of the two groups (Group P: Propofol and Group S: Sevoflurane) of 30 each for induction of anaesthesia. Both groups received IV Lignocaine (2 ml of 1%) before induction of anaesthesia Prior to the induction of anaesthesia, patients in both groups had a face mask placed over their face and were breathing spontaneously. Group P received intravenous Propofol (mean dosage - 2.45 mg kg^{-1} body weight) with 100% oxygen via the face mask. In group S, the Magills circuit was primed with Sevoflurane 8% in N_2O 50% and O_2 (Flow Rate – 8 litres $min.^{-1}$) for 30 seconds.

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. Loss of eyelash reflex was considered as the end point of induction in both groups. IV Fentanyl (2 mcg kg^{-1}) was injected immediately after loss of eye lash reflex and Laryngeal Mask Airway insertion was attempted by an experienced anesthesiologist blinded to the induction technique. He stayed outside the anaesthetic room during the initial induction period and was called after the loss of eyelash reflex for the insertion of the Laryngeal Mask Airway. If the first attempt was unsuccessful and there was a requirement for more anaesthetic, he left the room and was recalled for Laryngeal Mask Airway placement after the repeat administration of either Propofol or Sevoflurane.

The time for induction i.e. the time (in secs.) taken from induction of anaesthesia to the loss of eye lash reflex, and the time for Laryngeal Mask Airway insertion i.e. the time (in secs.) taken from loss of eye lash reflex to successful Laryngeal Mask Airway insertion were recorded in both the groups Fibreoptic bronchoscope was inserted through the tube of the Laryngeal Mask Airway and the position was scored (Table 2).

Table 1. Laryngeal mass airway insertion grading

Introduction of LMA	3	2	1
Ease of insertion	Easy	Difficult	Impossible
Jaw opening	Full	Partial	Nil
Patient response	3	2	1
laryngospasm	Nil	Partial	Full
Gaging	Nil	Minor	Severe
Couging	Nil	Minor	Severe
Patient movements	Nil	Moderate	Vigorous
Total scores			
18	Excellent		
16-17	Satisfactory		
<16	poor		

Table 2. Fibreoptic bronchoscope score of the position of the Laryngeal Mask Airway

4	Only vocal cords seen
3	Cords + Posterior epiglottis seen
2	Cords + Anterior epiglottis seen
1	Cords not seen but function adequate

Haemodynamic parameters (Mean Arterial Pressure and Heart Rate) were recorded at baseline, at induction and every minute for five minutes after induction. Statistical analysis was performed using online student t-test calculator by calculating p-value. $P < 0.05$ was taken as statistically significant.

RESULTS

There was no significant difference between the groups with respect to age, weight, ASA grade distribution. The mean age in Group P was 45.2 ± 5.2 (S.D.) and in Group S, it was 48.2 ± 6.2 (S.D.). The mean weight in Group P was 53.7 ± 6.89 (S.D.) and in Group S, it was 54.6 ± 8.10 (S.D.). Induction was more rapid with IV Propofol. The mean time (in seconds) for induction in Group P was 41.7± 10.1 (S.D.) and in Group S, it was 51.1 ± 10.4 (S.D.) seconds (p= 0.002)

Table 3. Age wise comparison of study group

Age group	Mean age(yr) (Group P)	Mean age (Group P)	P value
35-70 year	45.2±5.2	48.2±6.2	P=0.231

Table 4. Individual analysis of the conditions for Laryngeal Mask Airway insertion and patient response

	Group P(n=30)	Group S(n=30)	P value
Jaw opening			
Full	20(80%)	09(30%)	P=0.037(Significant)
Partial	10(33.33%)	21(70%)	
Ease of insertion			
Easy	28(93.33%)	25(83.33%)	P=0.08
Difficult	02(6.66%)	05(16.66%)	
Gaging			
Nil	28(93.33%)	28(83.33%)	P=1
Minor	02(6.66%)	05(16.66%)	
Coughing			
Nil	30(100%)	30(100%)	P=1
Laryngospasm			
Nil	29(96.66%)	25(83.33%)	P=0.09
Partial	1(3.33%)	05(16.66%)	
Partial movement			
Nil	24(80%)	18(60%)	P=0.27
Moderate	06(20%)	12(40%)	

There was no difference in the mean time to Laryngeal Mask Airway insertion between the groups. The mean time (in seconds) for Laryngeal Mask Airway insertion in Group P was 17.2 ± 11.6 (S.D.) and in Group S, it was 18.2 ± 11.8 (S.D.) seconds. (p= 0.65). 5 patients each in either group required a second attempt for insertion of Laryngeal Mask Airway. In the remaining 25 patients each in both groups, Laryngeal Mask Airway was placed successfully at the first attempt itself.

Analysis of the total scores for conditions for Laryngeal Mask Airway insertion indicated that conditions for Laryngeal Mask Airway insertion were superior in Group P. The mean score in Group P was 17.3 ± 0.77 and 16.5 ± 1.15 in Group S (p=0.012). Analysis of the individual scores for criteria for Laryngeal Mask Airway insertion and the patient's response indicated that scores for jaw opening in Group P were significantly better than Group S (p=0.047). (Table 3).

Fibreoptic bronchoscope scores between the two groups was not statistically significant. The mean score in Group P was 3.64 ± 0.63 and in group S, it was 3.24± 0.72 (p= 0.22). Both the groups exhibited stable haemodynamic profiles. Comparison of the Haemodynamic parameters (Mean Arterial Pressure, Heart Rate) between the two groups showed a statistically significant difference in the Mean Arterial Pressure in group P, three minutes after induction. (Table 4)

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 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.

Table 5. Comparision of Haemodynamic parameters between propofol(P) and Sevoflurane(S) group

	Time after the start of anaesthetic induction (minutes)					
	0	1	2	3	4	5
MAP						
Group P	97.1±11.8	75.5±11.7	75.4±11.7	66.6±8.9	71.9±10.5	72.2±14.1
Group S	95.9±14.5	77.5±13.6	78.0±15.3	75.0±11.4	74.2±13.4	76.0±11.7
p-value	0.20	0.41	0.25	0.03	0.20	0.28
Heart rate						
Group P	92.6±18.1	84.9±14.4	77.2±16.2	74.2±15.6	74.0±13.9	75.6±13.5
Group S	96.4±14.3	78.5±13.2	75.9±13.5	76.4±13.5	76.4±13.5	69.2±10.7
p-value	0.36	0.17	0.76	0.19	0.14	0.07

We also found that the induction time was longer with Sevoflurane than with Propofol which was statistically significant, similar to a study by Hall *et al*. (1997). The Laryngeal Mask Airway could be successfully placed in both the groups, with equal number of patients requiring a second attempt. However, excellent conditions for insertion of the Laryngeal Mask Airway were seen in more number of patients in the Propofol group (64%) as compared to the Sevoflurane group (32%). This was probably due to the inadequate jaw relaxation with Sevoflurane. Propofol is known to have a relaxant effect on jaw muscles whereas inhalational anaesthetics may cause an increased muscle tone and spasticity. Therefore, for a similar end point of induction i.e. loss of eye lash reflex, there may be greater jaw relaxation with Propofol. In a related study, Muzi *et al*. (1996) achieved insertion of Laryngeal Mask Airway after Sevoflurane induction in 1.7 minutes compared with 18.2 seconds in our study. This may be because of the fact that these investigators considered relaxation of the jaw muscles sufficient for a jaw thrust as the end point of induction. However the end point of induction in our study was loss of eye lash reflex.

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. This feature could also explain the absence of laryngospasm in the Propofol group whereas three patients exhibited laryngospasm in the Sevoflurane group. IV Fentanyl and IV Lignocaine, which also have a role in attenuation of laryngeal reflexes, have been used in the study. However, their doses have been standardized and were common to both groups of patients. The incidence of laryngospasm was not statistically significant in patients given Sevoflurane, probably due to an inadequate sample size for this complication. Other features like coughing, gagging and patient movements did not reach statistical significance in our study. The depth of anaesthesia between the two groups was not compared. However, a point to note is the difficulty of comparing the depth of anaesthesia between inhaled and IV anaesthetics.

Conclusion

In conclusion, we found that Propofol is superior to Sevoflurane for insertion of the Laryngeal Mask Airway.

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