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Propofol vs Sevoflurane for Laryngeal Mask Airway Insertion Under General Anaesthesia in Day Care Surgeries

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Abstract

Background: Laryngeal mask airway (LMA) is an excellent airway device used in day care surgeries. We aimed to compare two induction anaesthetic agents, propofol and sevoflurane for LMA insertion conditions in day care surgeries.

Patients and Methods: This prospective, randomized study was conducted on 80 adult, ASA grade I and II patients, of either gender, undergoing elective day care surgical procedures. Patients were randomly divided in two groups of 40 each. Group P received intravenous propofol infusion at the rate of 800ml/ hour for induction followed by LMA insertion. Group S received 8% sevoflurane for induction followed by LMA insertion. Both groups were compared for LMA insertion conditions in terms of time taken from the start of induction to loss of verbal contact, loss of eyelash reflex, jaw relaxation, successful LMA insertion conditions, number of attempts of LMA insertion and effective airway establishment time. Unpaired student – t test and Chi square test were used for statistical analysis.

Results: Patients in Group P achieved earlier LMA insertion conditions as compared to Group S i.e. shorter time to loss of verbal contact (33.48 ± 6.55 seconds vs 41.30 ± 4.12 seconds), loss of eye lash reflex (36.50 ± 6.67 seconds vs 44.40 ± 4.06 seconds), adequate jaw relaxation (40.35 ± 7.64 seconds vs 49.02 ± 4.45 seconds), and effective airway establishment time (44.88 ± 8.86 vs 54.65 ± 4.28 seconds) (P value <0.001).

Conclusion: We concluded that both the agents can be used for insertion of LMA however induction and insertion of LMA is faster with propofol.

Keywords: Laryngeal mask airway; Propofol; Sevoflurane; Eye lash reflex; Airway establishment time.

Introduction

Day care surgery help to reduce the burden on hospital and health care system and can improve patient satisfaction and comfort. However, apart from proper patient selection, preparation, surgical techniques it requires a good balanced anaesthesia technique. Various techniques are employed for maintaining airway during daycare surgeries including facemasks, supraglottic airway devices and endotracheal tubes.[1]

Facemask are usually used along with the triple jaw manoeuvre to keep the airway patent. But there are several reports of pressure injuries to the eyes, lips and the nerves of the face with the use of face mask.[2] Facemask also requires constant occupation of the anaesthesiologist hand and undivided attention to the patient's head and neck during the procedure.

Tracheal intubation requires laryngoscopy that can cause injuries to the lips, teeth and soft tissues of the mouth. There is also significant pressor response during laryngoscopy which can have deleterious effect.[3,4] There is also increased resistance while breathing spontaneously through a tracheal tube. A high incidence of postoperative sore throat has made tracheal intubation an unattractive alternative for short day care surgical procedures.[5]

Laryngeal Mask Airway (LMA) is an excellent tool for maintaining airway in short duration day care surgical procedures. This device sits outside the trachea but provide a hands-free means of achieving a gas tight airway.[3] It is also very useful in difficult intubation and emergency resuscitation.[6,7] LMA can also be used for providing both spontaneous and controlled ventilation.

Ideal induction agent for LMA insertion should be able to provide easy and early loss of consciousness, adequate jaw relaxation, absence of upper airway reflexes without anycardiorespiratory compromise.[8] The choice of induction agent can affect the patient recovery and early ambulation.[9]

Various anaesthetic agents have been used for LMA insertion with each having its own advantages and disadvantages. Present study was planned to compare LMA insertion conditions in adult patients following induction of anaesthesia with sevoflurane or with propofol.

Methods

The present study was conducted in a randomized control manner in tertiary care rural hospital in 80 adult patients of either gender, aged 18–65 years from October 2018 to October 2019. It included American Society of Anaesthesiologists (ASA) grade I and II patients with Mallampati Grade (MPG) grade I and II, who were scheduled for elective day care surgeries. Present study was approval by Institutional Ethical Committee (wide letter no BFUHS/2K18p-TH/8599 dated 29/9/19) and was registered under central trials registry-India with registration number CTRI/2018/07/014944.

Exclusion criteria were patients with difficult airway, patients with history of oesophageal reflux or hiatus hernia and pregnant women.

A routine preanesthetic check-up was conducted. A written informed consent was obtained from all patients. All the patients were kept nil per orally for 6 hours prior to surgery.

On day of the surgery after connecting standard ASA monitors, patient's baseline vital heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), oxygen saturation (SpO_2), end tidal cardon-di-oxide ($EtCO_2$) and temperature were recorded. Patients received injection pentazocine 0.5 mg/kg iv prior to induction.

Patients were randomly allocated into two groups of 40 each, Group P and Group S through sealed envelope technique. In group P, induction was done with iv propofol infusion at the rate of 800 ml/hour through infusion pump and in Group S induction was done with inhalation of sevoflurane 8%. All time intervals were recorded by using a stop watch.

The point of start of injection of propofol or introduction of sevoflurane 8% was considered as the starting point of induction. Loss of eyelash reflex was considered as the desired end point for induction in both techniques. Loss of verbal contact was assessed by the response to calling out the patient's name. Jaw relaxation was assessed by an anaesthesiologist responsible for maintaining the airway. If jaw relaxation was not adequate, it was reassessed after every 10 seconds. Once jaw relaxation was adequate, LMA insertion was attempted using method as described by Dr. Archie Brain.[10]

Time taken from the start of induction to loss of verbal contact, loss of eyelash reflex, jaw relaxation, successful LMA insertion, number of attempts of LMA insertion were recorded. The parameters of insertion of LMA were graded by an observer on a three-point scale using six variables as shown in Table I. Total score was graded as 18 as excellent, 16–17 as satisfactory and < 16 as poor.

Table 1: Grades for LMA conditions Insertion.

Variable	3	2	1
1. Jaw opening	Full	Partial	Nil
2. Ease of insertion	Easy	Difficult	Impossible
Patient response	**3**	**2**	**1**
1. Coughing	Nil	Minor	Severe
2. Gagging	Nil	Minor	Severe
3. Laryngospasm	Nil	Partial	Total
4. patients movements	Nil	Moderate	Vigorous

Airway establishment time was noted from the time of start of induction till LMA is successfully inserted and confirmed by auscultation. Haemodynamic variables such as HR, SBP, DBP, SpO_2, $EtCO_2$ and temperature were monitored continuously. Side effects or complications if any, were also noted.

The sample size was calculated using Statistical Package Software Statistical Analysis System software based on previous studies with an alpha error of 0.05, confidence of 95% for an infinite population. The calculated power of the study was 88%. Data was collected, tabulated, coded in MS excel and then analysed using SPSS, computer software version 16. Continuous variables were presented as mean and standard deviation (SD) while categorical variables were presented as percent. As regard continuous variables, unpaired student – t test was used. Chi square test was used to find out association between two categorical variables.

Results

The present study was conducted amongst 80 patients of either gender, aged 18–65 years, undergoing elective day care surgical procedures under general anaesthesia. Age, weight, ASA status in both the groups were statistically comparable (p value >0.05) as mentioned in Table II. Mean duration of surgery in group P was 30.25 ± 21.95 minutes and in group S was 19.50 ± 9.66 minutes. P value came out to be 0.006, which was significant. The difference in duration of surgery was attributable to the type of surgeries both groups underwent. We studied only the induction characteristics of the drugs.

Table II: Demographic variables; P value >0.05, insignificant; P value <0.05, significant.

Variables	Propofol (n=40)	Sevoflurane (n=40)	P value
Age in years (mean ± SD)	42.75±14.08	38.72± 12.48	0.180
Weight in kg (mean ± SD)	57.57±7.86	53.37±4.16	0.233
Gender (male/female)	7/33	5/35	0.531
Asa grade (I/II)	30/10	31/9	0.793
Duration of surgery in minutes	30.25 ± 21.95	19.50 ± 9.66	0.006

Induction characteristics in both the groups are shown in Table III. Loss of verbal contact in group P was earlier, being 33.48 ± 6.55 seconds and in group S, it was 41.30 ± 4.12 seconds (P value <0.001). Time taken for loss of eye lash reflex in group P was 36.50 ± 6.67 seconds and in group S was 44.40 ± 4.06 seconds (P value <0.001). Time taken to achieve adequate jaw relaxation in group P was 40.35 ± 7.64 seconds and in group S was 49.02 ± 4.45 seconds(P value <0.001). Mean value of effective airway establishment time in group P was 44.88 ± 0.22 seconds and in group S was 54.65 ± 4.28 seconds (P value <0.001). Hence, propofol group P showed early induction as compared to sevoflurane group and also airway establishment time was less in group P.

Table III: Induction characteristics in both the groups ,P value <0.001, highly significant.

Variables	Propofol (n=40)		Sevoflurane (n=40)		P value
	Mean	SD	Mean	SD	
Loss of verbal contact in seconds	33.48	6.55	41.30	4.12	<0.001
Loss of eye lash reflex in seconds	36.50	6.67	44.40	4.06	<0.001
Time to achieve adequate jaw relaxation in seconds	40.35	7.64	49.02	4.45	<0.001
Effective airway establishment time in seconds	44.88	8.86	54.65	4.28	<0.001

Comparison of groups on basis of LMA insertion conditions is shown in Table IV. LMA insertion conditions were judged on the basis of jaw opening, ease of insertion, coughing, gagging, laryngospasm and patients movements. Mean value of total score in group P was 17.70 ± 0.61 and in group S was 17.88 ± 0.40. P value was 0.133, which was insignificant statistically. Moreover, individual variables P value also came out to be less than 0.05 and insignificant statistically. Mean value of number of insertions attempts in group P was 1.05 ± 0.22 and group S was 1.13 ± 0.33. P value was 0.241 which was statistically insignificant. Hence both the agents, propofol and sevoflurane provide equally good insertion conditions in terms of jaw opening, ease of insertion, coughing, gagging, laryngospasm and patients movements with comparable insertion attempts.

Table IV: Comparison of groups on basis of LMA insertion conditions, P value >0.05, insignificant.

Grade	Propofol (n=40)		Sevoflurane (n=40)		P value
	Mean	SD	Mean	SD	
Jaw opening	2.98	.16	2.95	.22	0.562
Ease of insertion	2.95	.22	2.92	.27	0.649
Coughing	3.00	.00	3.00	.00	NA
Gagging	2.98	.16	2.98	.16	1.00
Laryngospasm	3.00	.00	3.00	.00	NA
Patients movements	3.00	.00	3.00	.00	NA
Total score	17.70	.61	17.88	.40	0.133
Number of insertion attempts	1.05	.22	1.13	.33	0.241

Discussion

Safe and efficient airway management is the

foundation of anaesthetic practice.[11] LMA has been shown to have numerous advantages over other invasive airway devices like increased speed and ease of placement, better hemodynamic stability, avoiding pressor stress responses at induction and during emergence. It has shown to have an easy learning curve. There is minimal increase in intracranial, intragastric and intraocular pressure following insertion. There is reduced anaesthetic requirements as compared to invasive devices for airway tolerance.

With acceptance of the LMA as a suitable airway management device in day care anaesthesia practice, there is an ever-growing need for an ideal anaesthetic agent which would be able to provide good insertion condition without any cardiopulmonary compromise. The purpose of this study was to evaluate the LMA insertion conditions using propofol and sevoflurane as induction agents.

We found that patients in Group P achieved earlier LMA insertion conditions as compared to Group S i.e. shorter time to loss of verbal contact (33.48 ± 6.55 seconds vs 41.30 ± 4.12 seconds), loss of eye lash reflex (36.50 ± 6.67 seconds vs 44.40 ± 4.06 seconds), adequate jaw relaxation (40.35 ± 7.64 seconds vs 49.02 ± 4.45 seconds), and effective airway establishment time (44.88 ± 8.86 vs 54.65 ± 4.28 seconds) (P value <0.001).

Chavan et al used propofol 2.5 mg/kg at rate of 40 mg every 10 seconds and sevoflurane 8% into fresh gas flow of 8 liters of oxygen in their study and reported time taken for loss of verbal contact in propofol group to be 40.13 ± 7.27 seconds and in sevoflurane group to be 64.80 ± 7.40 seconds.[12] Earlier loss of verbal contact in present study could be due to use of injection pentazocine 0.5 mg/kg iv as premedication. They used injection fentanyl 1.2 mcg/kg iv as premedication. Injection fentanyl is less sedative than injection pentazocine as explained by Tammisto et al in their study where they compared injection pentazocine 3 mg/kg iv and injection fentanyl 5 mcg/kg iv.[13]

Similarly study done by Soomro et al also showed early induction with propofol.[14] They used injection propofol 2 mg/kg and sevoflurane 6–8% on vaporizer setting with 50% nitrous oxide in oxygen with a total fresh gas flow of 10 litres/min with circle carbondioxide absorber circuit and reported that time taken to loss of eye lash reflex in propofol group as 27.9+6.71 seconds and 43.8+8.97 seconds in sevoflurane group.

Priya et al who used propofol 2.45 mg/kg body weight with 100% oxygen via the face mask and sevoflurane 8% in N_2O 50% and O_2 at flow rate 8 litres/min for 30 second found out that mean time to loss of eye lash reflex in propofol group was 41.7 ± 10.1 seconds and in sevoflurane group was 51.1 ± 10.4 seconds.[15] Patel et al also reported that mean time taken to loss of eye lash reflex in propofol group was earlier as compared to sevoflurane group.[16]

The results of this study also correlated well with Ravi et al study who reported that time to achieve adequate jaw relaxation in propofol group as 49.4 ± 5.69 seconds and in sevoflurane group as 107.3 ± 17.51 seconds. Hence induction with sevoflurane takes longer time for jaw relaxation as inhaled anaesthetics may cause increased muscle tone and spasticity whereas propofol is known to have relaxant effect on jaw muscles.[6] Therefore, for similar depth of anaesthesia, there might be greater jaw relaxation with propofol than sevoflurane.

In present study, LMA insertion conditions were judged on the basis of jaw opening, ease of insertion, coughing, gagging, laryngospasm and patients movements. Mean value of total score insignificant statistically as sown in table III. Hence both the agents, propofol and sevoflurane provide equally good insertion conditions. Other authors have also showed that LMA insertion conditions were almost similar with both propofol and sevoflurane groups.[12,15,16] Thus, this study indicated that both the drugs provide almost equal ease of LMA insertion.

Patel et al reported 96.66% cases in propofol group and 83.33% cases in sevoflurane group did not show laryngospasm while 3.33% cases in propofol group and 16.66% cases in sevoflurane group showed partial laryngospasm. This might be again due to not use of any premedication before induction while we used pentazocine 0.5 mg/kg iv before induction of anaesthesia.[16]

In this study, LMA insertion was successful at 1st attempt in 95% cases in propofol group and 87.5% cases in sevoflurane group. Mean value of number of insertions attempts in group P was 1.05 ± 0.22 and in group S was 1.13 ± 0.33. P value was 0.241, insignificant (Table III). So, we found that a smaller number of repeated attempts required for LMA insertion with propofol as compared to sevoflurane although it was statistically insignificant. Haemodynamic parameters were comparable when compared statistically in both the groups.

However, this study had few limitations; we could not compare the depth of anaesthesia achieved for LMA insertion in two groups and cost effectiveness of agents was not compared. Use of

bispectral index (BIS) monitor could have helped in this regard. We studied only the induction characteristics of drugs, studying the recovery characteristics in day care surgeries could have added to the significance of study.

Conclusion

Both propofol and sevoflurane can be used as induction agent for LMA insertion in day care surgeries. Both drugs provide with excellent LMA insertion conditions with negligible side effects. Propofol has an added advantage of early induction and early adequate airway establishment time.

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