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Research Article

A comparative study of vital capacity breath inhalation with sevoflurane versus intravenous propofol to aid laryngeal mask airway insertion in adults

Mahananda Sarkar, Sarbari Swaika*, Bikash Bisui, Madhab Chandra Mandal, Swapnadeep Sengupta, Jagabandhu Sheet, Anamitra Mandal

Department of Anaesthesiology and Critical Care, Bankura Sammilani Medical College and Hospital, Bankura-722102, West Bengal, India

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***Correspondence:**
Dr. Sarbari Swaika,
E-mail: dr.s.swaika@gmail.com

ABSTRACT

Background: Laryngeal mask airway has already gained widespread acceptance as an alternative airway device and conduit for endotracheal intubation. Insertion of this Supraglottic Airway Device (SAD) to provide and maintain a seal around the laryngeal inlet for spontaneous ventilation as well as modest level of positive pressure ventilation requires a sufficient depth of anaesthesia and depression of airway reflexes to avoid adverse reactions like gagging, coughing, head and limb movements etc. This study was conducted with the intent to compare Vital Capacity Breath (VCB) inhalation with 8% sevoflurane versus intravenous (IV) propofol for quality and ease of insertion of Laryngeal Mask Airway (LMA) and associated complications

Methods: In this prospective, randomized study, 80 adult patients of ASA physical status I and II aged between 20 to 50 years, body weight <70 kg scheduled for short operative procedures under general anaesthesia were selected. The patients were divided into two groups. Group-S (n=40) were induced with 8% sevoflurane with 67% nitrous oxide in oxygen with a total gas flow of 8 litres per minute and group-P (n=40) were induced with injection propofol 2.5 mg/kg body weight intravenously.

Results: Insertion of LMA at first attempt was 92.5% with sevoflurane (VCB) and 95% with propofol. Time to loss of consciousness was 35.98 ± 6.23s and 36.26 ± 5.65s in group S and group P respectively. Complications were similar in both the groups.

Conclusions: A vital capacity induction with sevoflurane shows a slight faster loss of consciousness. The time to successful LMA insertion at 1st attempt and the incidence of side effects were similar in both the group (P >0.05).

Keywords: Laryngeal mask airway (LMA), Vital capacity breath (VCB), Intravenous (IV), Sevoflurane, Propofol

INTRODUCTION

Sympathetic stimulation by laryngoscopy and intubation leading to sudden unexpected high rise of blood pressure and heart rate, compelled researchers to venture alternative measures of airway management which are safe, effective and easier than bag mask ventilation.

In1981, Dr. A.I.G.Brain[1] designed the prototype of LMA. It is an excellent device to maintain airway in selected surgeries and obviates the need for endotracheal intubation. In year 1996, LMA was incorporated in ASA difficult airway algorithm.[2] Other advantages of LMA, like smoother transition from anaesthesia to emergence with LMA in situ and requirement of lesser skill for

insertion, has made LMA even more popular among anaesthesiologists.

Insertion of this SAD to provide and maintain a seal around the laryngeal inlet for spontaneous ventilation as well as for positive pressure ventilation, requires sufficient depth of anaesthesia and suppression of airway reflexes to avoid adverse reactions like gagging, coughing, head and limb movements etc. Considering the advantages of LMA over face mask and endotracheal intubation, the study had been taken up with an idea to compare the condition for LMA insertion, by most widely used intravenous inducing agent (Propofol) and volatile anaesthetic (Sevoflurane).

Propofol (2.5-3 mg/kg) remains the induction agent of choice for insertion of LMA as it attenuates airway reflexes more than any other inducing agent and it has also shorter elimination half-life.[3,4] On the other hand, it induces greater degree of hypotension, bradycardia, pain on injection and excitatory patient movement which is not desirable in many clinical conditions.

Sevoflurane has advantages like relatively low blood-gas solubility (0.69), low pungency and minimal respiratory irritation, make it suitable inhaled induction agent for insertion of LMA. Single VCB sevoflurane has been used as an alternative to IV induction in adults. This method is rapid, with little excitatory phenomena, high patient acceptance, and good hemodynamic stability.[5] Sevoflurane is associated with delayed jaw relaxation and longer time for LMA insertion.[6]

So, this study was conducted to compare clinically acceptable LMA inserting condition with sevoflurane versus propofol.

METHODS

After obtaining the institutional ethics committee clearance and written informed consent, 80 adult patients of ASA physical status I and II aged between 20 to 50 years, scheduled for short operative procedures under general anaesthesia were selected. Patients with h/o-difficult intubation, allergy or sensitivity to volatile anaesthetics or propofol, body wt. >70 kg, heavy smoker (>20 cigarettes/day), having any cardiac, renal or neurological disease, and patient's refusal were excluded from our study.

The patients were divided into two groups (Group-S and P) using a computerised random number table. After arrival of patients in the operation theatre, intravenous cannulation was done and all standard monitoring devices (ECG, NIBP, pulse oximetry, capnography) were attached. Each of them were preoxygenated for 3 minutes with 100% oxygen and premedicated with injection glycopyrrolate 0.2 mg intravenously (IV), injection midazolam 1 mg IV and injection ondansetron 4 mg IV.

For group S, a circle CO_2 absorber circuit with a 3 litres reservoir bag was primed with sevoflurane 8% in a 67% nitrous oxide in oxygen at a fresh gas flow of 8 L/min for 45 seconds (approx).[6,7]

While breathing 100% oxygen from a separate breathing system, the patients were asked to take a deep breath and exhale to tidal volume. Then the mask with the primed circuit were placed firmly over the patient's face and instructed to inhale a Vital Capacity Breath (VCB) and hold it as long as possible. If necessary a second breath had to be taken. The patients were asked to open their eyes every 3-5 seconds,[6] failure to do so was taken as loss of consciousness. This was confirmed by testing the loss of eyelash reflex. The start of induction was taken as the point at which the patient completed their VCB.[6]

After the loss of eyelash reflex, the ease of mouth opening was assessed (possible or impossible). If mouth opening was impossible, another attempt was made every 15 s up to a maximum of 3 tries. An attempt to open the mouth was considered an attempt at insertion. During this time, anaesthesia was maintained with sevoflurane at a dial concentration of 8% and nitrous oxide 67% in oxygen.

Patient in group P were induced with injection propofol 2.5 mg/kg body weight IV premixed with 2 ml of 1% lignocaine.[6-8] Time to loss of consciousness was calculated from the time of start of injection of propofol until loss of eyelash reflex and inability to open eyes upon verbal command.[6] After the loss of eyelash reflex, ease of mouth opening was assessed and, if possible, LMA insertion was attempted. If impossible, repeat attempts were made every 15 s up to a maximum of four attempts, each time preceded by propofol boluses of 0.5 mg/kg IV.[5]

Incidences of hiccup, coughing, gagging laryngospasm, involuntary movement were recorded during the procedure.

After insertion of LMA, anaesthesia was maintained with sevoflurane 1%-2% and 67% N_2O in O_2 with 8 L FGF.

RESULTS

40 patients who underwent VCB induction with sevoflurane and 40 patients who underwent IV induction with propofol were similar with respect to demographic characteristics.

Table 1: Demographic data: age and body weight.

	Group S (n=40)	Group P (n=40)
Age in years	34.37 ± 9.39	35.80 ± 8.98
Body weight in kg	52.44 ± 3.85	52.70 ± 4.32

Values are mean ± SD

Table 2: Parameter: sex.

Sex	Group S (n=40)	Group P (n=40)
Male	22 (55%)	19 (47.5%)
Female	18 (45%)	21 (52.5%)

Values are number (percentage)

There was no statistically significant difference between two groups in timing of loss of eyelash reflex and LMA insertion (P >0.05) except timing of jaw relaxation (P <0.05). There was no statistically significant difference between two drugs in respect of successful LMA insertion in 1st attempt (P >0.05) (Table 3).

Table 3: Characteristics of LMA insertion.

	Group S (n=40)	Group P (n=40)
Time to loss of eyelash reflex(s)	35.98 ± 6.33	36.2 5± 5.65
Time to jaw relaxation(s)	102.17 ± 23.40	90.40 ± 12.15*
Time to completion of successful LMA insertion(s)	120.95 ± 13.68	114.23 ± 22.77
Successful insertion of LMA at 1st attempt	37 (92.5%)	38 (95%)

Values are presented as mean ± SD, number and (percentage)
*Statistically significant

Table 4: Mean arterial pressure, pulse rate and oxygen saturation.

	Mean arterial pressure		Pulse rate		SPO_2	
	Group S	Group P	Group S	Group P	Group S	Group P
Base line	92.85 ± 9.76	91.03 ± 9.13	93.61 ± 15.19	89.83 ± 14.12	99.98 ± 0.16	99.95 ± 0.22
After induction	85.05 ± 10.98	84.88 ± 10.66	98.15 ± 18.34	90.98 ± 14.63	99.93 ± 0.26	99.98 ± 0,22
After LMA insertion	84.88 ± 13.57	82.98 ± 12.06	105.15 ± 14.46	101.15 ± 11.71	99.93 ± 0.26	99.98 ± 0.16

Values are presented as mean ± SD

There was no significant change in haemodynamic parameters or side effects between two groups at different time periods (Table 4 and 5).

Table 5: Incidence of complication during the procedure.

	Group S (n=40)	Group P (n=40)
During induction		
Movement	1	4
Hiccup	0	0
Cough	2	0
Laryngospasm	1	0
During LMA insertion		
Movement	2	4
Hiccup	0	2
Cough	1	1
Gagging	2	1

Values are number

DISCUSSION

Our study demonstrated sevoflurane VCB induction and insertion of LMA in adult compared favourably with IV propofol.[5] There was good acceptability for both groups.

The present study showed VCB technique with sevoflurane 8% or IV propofol (2.5 mg/kg) alone, resulted in successful LMA insertion at the 1st attempt in 92.5% and 95% of patient respectively. Sahar M. Siddik-Sayyid et al. compared induction with sevoflurane 8% in 2:1 ratio N_2O:O_2 with fresh gas flow of 6 L/min and with IV propofol 3 mg/kg, and found an incidence of successful LMA insertion at the 1st attempt in 46% and 61.5% of patients respectively,[6] which corroborated with the results of the present study.

The time to loss of eyelash reflex was faster in group S than group P whereas that to jaw relaxation was significantly shorter in group P in our study. J. E. Hall et al., in their study comparing induction with sevoflurane 8% in 2:1 ratio N_2O:O_2 and induction with IV propofol 3 mg/kg, found time to jaw relaxation was faster in the propofol group, similar to our study but time to loss of eyelash reflex was also slightly faster in the propofol group.[8] Again, Sahar M. Siddik-Sayyid et al. also found significant difference between the two groups in respect to jaw relaxation, corroborating our results.[6] Priya V et al. in their study, comparing IV propofol with sevoflurane for insertion of LMA concluded that jaw relaxation was better with propofol resulting in better LMA insertion conditions, which again was at par with our findings.[9]

The time to completion of successful LMA insertion was faster in the propofol group in our study which was

similar to the finding of Rashdi S et al., who compared the insertion of I-gel with either sevoflurane or propofol and found that the insertion time was comparatively short with propofol.[10] Koppula RK et al., in their study comparing propofol with sevoflurane, concluded that the clinical conditions of insertion of LMA obtained with sevoflurane was comparable to that of IV propofol.[11]

Beverly K. Philip et al. in 1999 in their study concluded that sevoflurane VCI was faster than and provided patients satisfaction similar to propofol IV induction in adult ambulatory surgery. But overall incidence of induction side effects like cough and laryngospasm were higher in sevoflurane group while patients' movement was higher in propofol group. Our findings are similar to the above mentioned study.[7]

The baseline haemodynamic data (MAP and pulse rate) did not differ between two groups however the mean arterial pressure decreased and pulse rate increased during induction and LMA insertion in both the groups which was not statistically significant. These findings can be compared with the results found by Sahar M. Siddik-Sayyid et al.,[6] Hall JE et al.[8] and Zahoor MU et al.[12]

In conclusion the vital capacity induction with sevoflurane shows a slight faster loss of consciousness than propofol and provides the incidence of successful LMA insertion at 1st attempt and the incidence of side effects similar to that of propofol induction in adults. Sevoflurane may be a useful alternative to propofol in providing anaesthesia to aid LMA insertion.

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REFERENCES

1. Brain AIG. The Laryngeal mask: a new concept in airway management. Br J Anaesth. 1983;55:801-5.
2. Benumof J. The laryngeal mask airway and the ASA difficult airway algorithm. Anesthesiology. 1996;84:686-9.
3. Blake DW, Dawson P, Donnan G, Bjorksten A. Propofol induction for laryngeal mask airway insertion: dose requirement and cardio respiratory effects. Anaesth Intensive Care. 1992;20(4):479-83.
4. Scanlon P, Carey M, Power M, Kirby F. Patient response to laryngeal mask airway insertion after induction with propofol or thiopentone. Can J Anaesth. 1993;40(9):816-8.
5. Ti LK, Chow MYH, Lee TL. Comparison of sevoflurane with propofol for laryngeal mask airway insertion in adults. Anaesth Analg. 1999;88:908-12.
6. Siddik-Sayyed SM, Aouad MT, Taha SK, Daaboul DG, Deeb PG, Massouh FM, et al. A comparison of sevoflurane-propofol versus sevoflurane or propofol for laryngeal mask airway insertion in adults. Anaesth Analg. 2005;100:1204-9.
7. Philip BK, Lombard LL, Roaf ER, Drager LR, Calalang I, Philip JH. Comparison of vital capacity induction with sevoflurane to intravenous induction with propofol for adult ambulatory anaesthesia. Anaesth Analg. 1999;89:623-7.
8. Hall JE, Stewart JIM, Harmer M. Single breath inhalational induction with sevoflurane anaesthesia with and without nitrous oxide; a feasibility study in adults and comparison with an intravenous bolus of propofol. Anaesthesia. 1997;52:410-5.
9. Priya V, Divatia JV, Dasgupta D. A comparison of propofol versus sevoflurane for laryngeal mask airway insertion. Indian J Anaesth. 2002;46(1):31-4.
10. Rashdi S, Iftikhar N, Iqbal F, Aftab S, Khan AB. Comparison of sevoflurane and propofol for I-gel insertion. Pak J Surg. 2013;29(1):23-5.
11. Koppula R, Shenoy A. Comparison of sevoflurane with propofol for laryngeal mask airway insertion in adults. J Anaesth Clin Pharmacol. 2005;21(3):271-4.
12. Zahoor MU, Mansoor R, Buland K, Kazi WA, Ehsan-ul-Haq M. Comparison of haemodynamic changes after laryngeal mask airway insertion with propofol versus sevoflurane. Pak Armed Forces Med J. 2010;60(3):410-4.

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