International Journal of Research in Medical Sciences
Bakshi SA et al. Int J Res Med Sci. 2019 Apr;7(4):1271-1275
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012
DOI: http://dx.doi.org/10.18203/2320-6012.ijrms20191338

Original Research Article

Comparative evaluation of induction with propofol vs induction with sevoflurane for insertion of laryngeal mask airway in children

Sandhya A. Bakshi, Sanjay S. Bule*, Ganesh U. Shingade

Department of Anaesthesia, Government Medical College, Nagpur, Maharashtra, India

Received: 30 January 2019
Accepted: 09 March 2019

***Correspondence:**
Dr. Sanjay S. Bule,
E-mail: sanjay.bule2412@gmail.com

ABSTRACT

Background: There is increasing use of laryngeal mask airway in children because of ease of insertion and minimal disturbances in cardio respiratory system and lesser risk of airway injury during perioperative period as compared to endotracheal tube. It is also simple, well-tolerated, safe, reusable, cost effective method of airway management in paediatric patients. Intravenous propofol (1%) is a preferred induction agent for LMA insertion till date, while sevoflurane, a halogenated volatile inhalational, non-irritating anaesthetist agent with pleasant odour is also suitable for inhalational induction of children. This study was carried out to study and compare clinical efficacy of propofol and sevoflurane for laryngeal mask airway (LMA) insertion in children undergoing short surgical procedures.
Methods: In this study, total 100 children of ASA grade I/II of either sex with age group 3-8 years, weighing between 10-20 kg were enrolled. They were induced with either sevoflurane (group S) or intravenous propofol (group P) 3 mg/kg. Then appropriate size LMA was inserted. Various parameters like jaw relaxation and ease of insertion attempts required hemodynamic changes were noted and compared in two groups.
Results: In group P, 94% patients and groups S, 90% patients had full jaw relaxation. The LMA insertion was easy in 98% patients in groups P and 94% patients in groups S. In 98% patients of groups P and 96% patients in groups S, LMA was inserted successfully in first attempt. The mean time required for LMA insertion was 19.16±5.29 seconds in groups P and 20.8±6.39 seconds in groups S. Both the groups were comparable with respect to haemodynamic changes observed which were transient and clinically not significant though statically significant.
Conclusions: Both the groups showed comparable and satisfactory LMA insertion conditions, hence both can be routinely used for induction of anaesthesia in children.

Keywords: Airway management, Inhalational anaesthesia, Laryngeal mask airway, Propofol, Paediatric, Sevoflurane

INTRODUCTION

There is increasing use of LMA in children because of ease of insertion and minimal disturbances in cardio respiratory system and lesser risk of airway injury during perioperative period as compared to endotracheal tube.[1-3] It is also simple, well-tolerated, safe, reusable, cost effective method of airway management in paediatric patients.[4,5] Since its introduction, various induction agents like thiopentone, propofol, etomidate, ketamine, halothane etc. have been used for induction of anaesthesia for insertion of LMA in children.

Intravenous propofol (1%) is a preferred induction agent for LMA insertion till date as it provides smooth induction with depression airway reflexes allowing easy insertion of LMA with reduced incidence of side effects like coughing, gagging, laryngospasm. However, it also

causes significant cardio-respiratory depression and pain at injection site, and expensive too. Sevoflurane, a halogenated volatile inhalational, non-irritating anaesthetist agent with pleasant odour and hence, suitable for inhalational induction of children. Also, sevoflurane having low lipid solubility (blood/gas partition coefficient at 370 c is 0.63-0.69) provides smooth and rapid induction, quick adjustments of anaesthetic depth, rapid elimination and predictably short clear recovery, making it very effective as a sole anaesthetic inducing agent fort day care anaesthesia.[6-8]

In this study, author compared the conditions for LMA insertion in children following induction of anaesthesia with intravenous (IV) propofol or inhalational sevoflurane.

METHODS

Total 100 children of age group 3 to 8 years, ASA grade 1/2, both sexes and weight 10 to 20 kg, posted for various elective short (<1 hour) surgical procedures after detailed preanesthetic evaluation and informed consent were enrolled in this study. Patients were premedicated with Inj. glycopyrolate 0.004 mg/kg, Inj. midazolam 0.03 mg/kg, Inj. fentanyl 2 mg/kg and Inj. Ondansetron 0.1 mg/kg intravenously. Then preoxygenation with 100% oxygen done for 3 minutes. patient was induced with either inhalational sevoflurane (group S) or IV Inj. propofol 3 mg/kg (group P). In group S, children had inhalational induction with sevoflurane 1% with oxygen 50% and nitrous oxide 50% and then sevoflurane concentration increased stepwise at every third breath by 1% up to 7% till the endpoint reached. The induction time was noted from start of drug administration to loss of eyelash reflexes, appropriate size LMA was inserted with partially inflated cuff by standard rotational movement technique.

After satisfactory depth of anaesthesia, appropriate size LMA was inserted. LMA insertion time (start of induction to successful placement of LMA) was noted. Successful placement of LMA judged by chest wall movement, auscultation of breath sounds, capnograph tracing, absence of air leak and attempts required for insertion were recorded. Failed attempt was defined removal of the device from the mouth. Various parameters like jaw relaxation, ease of LMA insertion, attempt and time required for successful insertion and associated hemodynamic changes during and after insertion were recorded. Overall ease of insertion was assessed by grading of condition for LMA insertion (Table 1). Overall condition of LMA insertion was assessed as excellent, satisfactory or poor based on total score. Maximum score was 18 (excellent), score 16 to 17 was satisfactory and score <16 was labelled poor. Patients response like coughing, gagging, laryngospasm, bronchospasm was noted and compared between two groups. Statistical analysis of all the observational data done using statistical package of social sciences SPSS version 16.

Table 1: Grading of condition for LMA insertion.

Criteria	Grading (score)		
	3	2	1
Jaw relaxation	Full	Partial	Nil
Ease of insertion	Easy	Difficult	Impossible
Patient response	3	2	1
Coughing	Nil	Minor	Severe
Gagging	Nil	Minor	Severe
Laryngospasm	Nil	Minor	Severe
Patient movement	Nil	Moderate	Vigorous
Total score			

Maximum score- 18 (excellent), score 16-17 (satisfactory), score <16 (poor).

RESULTS

The demographic profiles of the patient, duration and type of surgical procedures and total time required for LMA insertion were comparable between two groups (Table 2).

Table 2: Comparison of demographic data, duration and type of surgery, total time required for LMA insertion between two groups.

Parameters	Group P	Group S	P value
Age (years)	5.46±1.528	5.4±1.591	0.8479
Weight (kg)	14.14±2.907	14.04±2.871	0.863
Duration of surgery (min)	32.42±11.25	31.88±11.12	0.810
Type of surgery			
Circumcision	14 (28%)	13 (26%)	0.768
Dermoid removal	1 (2%)	0	
Herniotomy	13 (26%)	13 (26%)	
Hydrocele repair	1 (2%)	5 (10%)	
Hypospadias	4 (8%)	4 (8%)	
Lymph node biopsy	4 (8%)	3 (6%)	
Orchidopexy	9 (18%)	10 (20%)	
Suprapubic cystolithotomy	4 (8%)	2 (4%)	
Mean time for LMA insertion	19.16±5.29	20.8±6.39	0.165

There was no statistical significant difference in mean time for LMA insertion in group S (20.8±6.39 seconds) and group P (19.16±5.29 seconds). There was full jaw relaxation in 47 patients (94%) in group P as compared to group S in which 45 patients had (90%). Three patients in group P and five patients in group S had partial jaw relaxation.

The LMA insertion was easy in 49 patients in group P and 47 patients in group S respectively which is statistically insignificant. The LMA was successfully placed at first attempt in 49 patients in group P and 48 patients in group S with adequate jaw relaxation in both the groups and one patient in group P and 2 patients in group S required second attempt for successful insertion. None of patient required more than two attempts. Incidence of coughing, gagging, laryngo or bronchospasm was nil in both groups.

The overall condition of LMA insertion was statistically comparable in both the groups. Condition of LMA insertion in 43 (86%) patients were excellent and in 7 (14%) patients were satisfactory in group P, while condition was excellent in 42 (84%) patients and satisfactory in 8 (16%) patients group S (Table 3).

Table 3: Overall condition for LMA insertion.

Overall condition	Number of patient (%)		P value
	Group P	Group S	
Excellent	43 (%)	42 (%)	0.786 (Not significant)
Satisfactory	7 (%)	8 (%)	
Poor	0	0	
Total	50 (100%)	50 (100%)	

None patients in both the groups had poor condition for insertion.

Comparison of the haemodynamics parameters (heart rate, systolic blood pressure) showed a statistically significant difference between two groups. Propofol group showed decrease in heart rate and systolic blood pressure just after induction and which gradually increased and approached near baseline. While in sevoflurane group heart rate increased after induction and gradually decreased as well as systolic blood pressure decreased just after induction which gradually increased and approached near baseline. 10 minutes after insertion of LMA which was statistically comparable, ($p>0.05$). Spo2 remained within the normal range of 98%-100% throughout intraoperative period. The oxygen saturation (spo2) was maintained throughout the study (induction, maintenance) up to 98% or >98% in all the patients from both the groups as there was no incidence of laryngospasm, apnea during induction.

DISCUSSION

Successful insertion of LMA requires an adequate depth of anaesthesia using either inhalation or intravenous agents to suppress pharyngeal and laryngeal reflexes. Inhalational sevoflurane and intravenous propofol are popular agents for inducting and maintenance of general anaesthesia with LMA to reduce morbidity with endotracheal tube in children. Propofol is considered as the drug of choice for the insertion of LMA because of its depressant effects on airway reflexes. Propofol has several adverse effects including pain on injection, apnea, hypertension and excitatory patient movement. On other hand, sevoflurane is non-pungent inhalational anaesthetic with a low blood gas solubility co-efficient (0.69) and minimal respiratory irritant characteristics that makes it suitable as inhalational agent for induction of anaesthesia and insertion of LMA.[9,10] Therefore, the present study was planned to evaluate and compare the ease of insertion of LMA in children after induction with IV propofol 3 mg/kg over 30 seconds and sevoflurane having dose regimen similar to those used in previous studies.[11-15]

The study included 50 patients in each group to obtain the power >80% based on previous study. From literature review and manufacturers recommendation the study had chosen LMA size 2 for positive pressure ventilation in children of weight between 10-20 kg in both groups i.e. 94% patients of both the groups.[16,17]

In the present research, maximum patients show full jaw relaxation in both groups i.e. 94% patients from group P and 90% patients from group S. Which was comparable (p value=0.461) and similar to those achieved by Dedhia KN et al.[14] Insertion of LMA was observed to be easy in most of the patients (i.e. 98% and 94% in group P and group S respectively) which can be explained by the fact that author used partially inflated cuff by standard rotational movement technique as described by McNicol. This result compares with O'Neill B et al, he reported that the ease of insertion of the LMA in children was improved by partial inflation of the cuff.[18]

The incidence of coughing, gagging, and laryngospasm was nil in both the groups. When comparing two groups they have comparable result and co-relates with the observations of Dedhia KN et al, Vora KS et al, and Ravi S et al.[11,12,14]

None of the patients had apnea causing fall in SpO2. This may be because author used standard doses of propofol and given slowly over 30 seconds. Both the groups had comparable results with respect to patient movement during insertion of LMA, (p value=1). No movement observed in 46 (92%) and 47 (94%) patients and moderate movements in 4 (8%) and 3 (6%) patients in P and S group respectively. This finding co-relates well with different studies.[11,12,14]

In group P, 43 (86%) patients had excellent condition and 7 (14%) had satisfactory condition for LMA insertion while in sevoflurane group 42 (84%) patients had excellent condition and 8 (16%) patients had satisfactory condition for LMA insertion which was comparable.

In group P, LMA was successfully inserted in maximum patients (98%) in first attempt whereas in group S, 96% patients which was comparable. None of the patients required more than 2 attempts for LMA insertion which

was consistent with the findings of various author.[11,12,14,19]

In this study, author calculated the total time required for LMA insertion from picking of LMA after induction to confirmation of successful insertion of LMA (p value=0.165) which co-relates with Priya V et al, she recommended that the time for LMA insertion was taken as, time (in seconds) taken from loss off eye lash reflex to successful LMA insertion.[19]

When both the groups were compared with respect to haemodynamic changes they were observed to be transient and statistically significant but not clinically. This finding co-relates with the observations of Ravi S et al.[12]

The haemodynamic changes in both the studies can be attributed to the cardiac depressant action of propofol and decreased peripheral resistance with compensatory tachycardia after induction with sevoflurane.

The oxygen saturation (SpO2) was maintained throughout the study (induction, maintenance) up to 98% or >98% in all the patients from both the groups as there was no incidence of laryngospasm, apnea during induction as well as maintenance.

The limitations of the study were equipotent doses of propofol, and sevoflurane could not be determined. Also, the study was carried out to compare the induction of propofol and sevoflurane for insertion of LMA only. Hence, further intra operative and post-operative parameters were not studied in detail.

CONCLUSION

From the observations of present study, it can be concluded that both propofol as well as sevoflurane provides comparable and satisfactory relaxation of jaw, haemodynamic stability and ease of insertion of LMA in children.

ACKNOWLEDGEMENTS

Authors would like to thank Department of Anaesthesiology, Surgery, other staff of operation theatre and administration of Government medical college, Nagpur, Maharashtra, India for their help during study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee GMC, Nagpur, Maharashtra, India (No. ECR/43/Inst/MH/2013)

REFERENCES

1. Goudsouzian NG, Denman W, Cleveland R, Shorten G. Radiologic localization of the laryngeal mask airway in children. Anesthesiol. 1992;77(6):1085-9.
2. Watcha MF, White PF, Tychsen L, Stevens JL. Comparative effects of LMA and ET insertion on intraocular pressure in children. Anesth Analg. 1992;75:255-60.
3. Power M, Kohli M, Usha C, Gupta R. A comparative study of the effects of placement of LMA vs ETT on haemodynamic parameters and IOP in children. Ind J Anaesth. 2001;45:123-7.
4. Lerman J. Sevoflurane in pediatric anesthesia. Anesth Analgesia. 1995;81(6S):4S-10S.
5. Fredman B, Nathanson MH, Smith I, Wang J, Klein K, White P. Sevoflurane for outpatient anesthesia: a comparison with propofol. Anesth Analgesia. 1995;81(4):823-8.
6. Lerman J, Sikich N, Kleinman S, Yentis S. The pharmacology of sevoflurane in infants and children. Anesthesiol. 1994;80(4):814-24.
7. Black A, Sury MR, Hemington L, Howard R, Mackersie A, Hatch DJ. A comparison of the induction characteristics of sevoflurane and halothane in children. Anaesth. 1996;51(6):539-42.
8. Sigston PE, Jenkins AM, Jackson EA, Sury MR, Mackersie AM, Hatch DJ. Rapid inhalation induction in children: 8% sevoflurane compared with 5% halothane. Brit J Anaesth. 1997;78(4):362-5.
9. Stevens WC, Kingston HGG. lnhalational anaesthesia, In: Barash PG, Cullen BF, Stoelting RK (Eds.). Clinical Anesthesia, 2nd ed., Philadelphia: J.B. Lippineott Co., 1992:441.
10. Ganatra SB, D'Mello J, Butani M, Jhamnani P. Conditions for insertion of the laryngeal mask airway: Comparisons between sevoflurane and propofol using fentanyl as a co-induction agent. A pilot study. Eur J Anaesthesiol. 2002;19:371-5.
11. Vora K, Shah V, Patel D, Modi M, Parikh G. Sevoflurane versus propofol in the induction and maintenance of anaesthesia in children with laryngeal mask airway. Sri Lanka J Child Heal. 2014;43(2).
12. Ravi S, Krishnamoorthy K, Ganesan I. Comparison of sevoflurane and propofol for laryngeal mask airway insertion in children. Ind J Clin Anaesth. 2015;2(3):137-40.
13. Paris ST, Cafferkey M, Tarling M, Hancock P, Yate PM, Flynn PJ. Comparison of sevoflurane and halothane for outpatient dental anaesthesia in children. Brit J Anaesth. 1997;79(3):280-4.
14. Dedhia KN, Kudalkar A. Comparison of Sevoflurane and Halothane for induction of anesthesia and laryngeal mask airway insertion in pediatric patients. Ind J Anaesth. 2004;48(6):465-8.
15. Bachnani B. Induction characteristics of sevoflurane vs isoflurane in paediatric patients. Ind J Anaesth. 2003;47(2);97-99.
16. Jamil A. A study of the use of LMA in children and its comparison with endotracheal intubation. Ind J Anaesth. 2009;53(2);174-178.

17. Seyedhejazi M, Eydi M, Ghojazadeh M, Nejati A, Ghabili K, Golzari SE, et al. Propofol for laryngeal mask airway insertion in children: effect of two different doses. Saudi J Anaesth. 2013;7(3):266.
18. O'neill B, Templeton JJ, Caramico L, Schreiner MS. The laryngeal mask airway in pediatric patients: factors affecting ease of use during insertion and emergence. Anesth Analgesia. 1994;78(4):659-62.
19. Priya V, Divatia JV, Dasgupta D. A comparison of propofol versus sevoflurane for laryngeal mask airway insertion. Ind J Anaesth. 2002;46(1):31-4.

Cite this article as: Bakshi SA, Bule SS, Shingade GU. Comparative evaluation of induction with propofol vs induction with sevoflurane for insertion of laryngeal mask airway in children. Int J Res Med Sci 2019;7:1271-5.