ORIGINAL RESEARCH PAPER
Volume - 12 | Issue - 03 | March - 2023 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

EVALUATION OF EASE OF INSERTION OF CLASSICAL LARYNGEAL MASK AIRWAY IN CHILDREN USING DEXMEDETOMIDINE AS CO-INDUCING AGENT WITH PROPOFOL COMPARED TO INDUCTION WITH PROPOFOL ALONE.

Anaesthesiology

Dr Safiya Pegu PGT, Department of Anaesthesiology and Critical care, Assam Medical College and Hospital (AMCH), Dibrugarh, Assam.

Dr Diganta Saikia MD, Associate Professor, Department of Anaesthesiology and Critical care, Assam Medical College and Hospital (AMCH), Dibrugarh, Assam.

Dr Karuna Kumar Das MD, Professor, Department of Anaesthesiology and Critical care, Assam Medical College and Hospital (AMCH), Dibrugarh, Assam.

ABSTRACT

Background: Laryngeal mask airway (LMA), is an essential tool for anaesthesiologist's in airway management. Propofol is an induction agent of choice for LMA insertion. However larger doses of propofol may cause haemodynamic instability. Dexmedetomidine has advantageous effects in children over propofol. Objective of our study was to determine the ease of LMA insertion following co-induction with propofol and dexmedetomidine compared to induction with propofol alone. **Methods:** A prospective observational study, was conducted in the department of Anaesthesiology, Assam Medical College and Hospital (AMCH), Dibrugarh, Assam from the month of January to June, 2022. In this study, 60 children of age 4-12yrs, both male and female were assigned into two groups, PD & P: 30 each. Group PD were induced with injection propofol 3mg/kg and injection dexmedetomidine 0.5mcg/kg while group P received 4mg/kg of propofol alone. LMA insertion condition, hemodynamic parameters were assessed. The data were analysed in terms of mean±standard deviation and median. **Results:** In group PD, the overall LMA insertion condition was statistically better with greater hemodynamic stability compared to group P ($p< 0.05$), with less incidence of apnea in group PD. **Conclusion:** In children, the combination of propofol and dexmedetomidine provide suitable LMA insertion condition and better haemodynamics.

KEYWORDS

LMA, Propofol, Dexmedetomidine, Ease of insertion.

INTRODUCTION:

LMA is a supraglottic airway device that is fabricated for airway management. Though less stimulating than tracheal intubation, effective insertion of LMA requires an optimum depth of anaesthesia to avoid unwanted airway reflexes like gagging, coughing, swallowing or involuntary limb movements [1,2]. Propofol is a commonly used induction agent for insertion of LMA in children. Propofol being a non-opioid, non-barbiturate sedative-hypnotic agent with rapid induction and recovery time along with antiemetic effect [3]. When propofol is used as a sole agent larger dose of it is required for LMA insertion [4,5]. This larger dose needed for LMA insertion may be associated with dose dependent cardio respiratory depression like apnoea or hypoventilation and haemodynamic effect like hypotension, bradycardia [6,7]. However co-induction of Propofol with Dexmedetomidine can reduce the dose of Propofol for sedation and anaesthetic induction. Dexmedetomidine is highly selective alpha-2 receptor agonist which produces sedative anxiolytic and analgesic effect without causing significant respiratory depression [8,9]. Therefore Dexmedetomidine may be useful co-induction agent to facilitate LMA insertion with minimal respiratory depression. In the present study we aimed to evaluate the ease of classical LMA insertion condition, using dexmedetomidine as co-induction agent with propofol versus propofol alone, in children undergoing short surgical procedures under general anaesthesia.

MATERIALS AND METHODS:

A hospital based prospective observational study was conducted in AMCH, Dibrugarh, Assam for a duration of 6 months from January 2022 to june '22 after obtaining ethical approval (No. AMC/EC/245) from Institutional Ethics Committee of AMCH, Assam. Sixty (60) patients of age between 4 and 12 years of both sexes belonging to ASA (grade 1 and 2) admitted to the Paediatric Surgery ward of AMCH and scheduled for the elective short general surgical procedure under general anaesthesia were the study participants. The patients were divided into two groups and each group constitutes 30 participants. Group PD:–received propofol and dexmedetomidine as induction agent and Group P:–received propofol as induction agent. Parent/guardian's refusal to participate, children having known allergy to either of study drugs, children requiring emergency surgery and those who were at risk of regurgitation, children with suspected difficult airway, cardiac or pulmonary abnormalities and, neuromuscular, metabolic or psychological disorder were excluded from the study. Assuming the level of significance (α) = 0.05, power of the study = 0.80 (β = 0.20) and effect size 0.7, sample size for our study was calculated using G*Power software version 3.1.9.7 and found that 26 subjects per group is required to answer our research question. Considering 10% chances of loss of follow up, we included 30 patients in each group of our study population.

Preoperatively patients were pre-medicated with oral midazolam 0.5mg/kg 30 mins prior to induction. In the operating room, a good IV access was secured with 24G or 22G according to age of the patient. Multiparameter monitor was connected and vitals were recorded. Injection glycopyrolate 0.004mg/kg body wt., injection fentanyl (1mcg/kg body wt.) was given IV approximately 3 mins prior to induction.

After pre oxygenation for 3 minutes with 100% O2 via mask. Group PD received injection propofol 2mg/kg and dexmedetomidine 0.5mcg/kg as induction agent. Group P received injection propofol 4mg/kg as induction agent. 60secs after induction of anaesthesia the insertion of appropriate size LMA classic (size 1.5, 2 or 2.5) was performed using standard method by an experienced anaesthetist. Following insertion of LMA the cuff was inflated with a recommended volume of air for each size. Then the position of the LMA was confirmed by sufficient tidal volume, oxygen saturation >95% and capnograph values between 35-45mmhg. Normothermia was maintained by warm IV fluids and operating room temperature set at 24ºC. The patients were allowed to breath spontaneously and anaesthesia was maintained by sevoflurane 1 to 1.5% in 50% oxygen and 50% medical air. If apnoea occurred for more than 30 secs manual ventilation was provided to maintain spO2 more than 95% and the incidence and duration of apnoea was recorded. If LMA insertion failed in the first attempt, subsequent bolus dose of propofol 1mg/kg was administered and ventilated with face mask. A maximum of three attempts were allowed for insertion of LMA and insertion condition was assessed only for the first attempt. An addition incremental bolus dose of propofol was given if the patient develops laryngeal response like swallowing, coughing, gagging or laryngospasm after LMA insertion.

In such cases increasing the depth of anaesthesia was beneficial rather than removal of the LMA and reinserting it as it can be more stimulating to the patient. Mean arterial pressure, heart rate and spO2 were monitored continuously throughout the surgery and were recorded at the following interval: before induction, immediately after induction, immediately after insertion of LMA, 5 min and 10 min after LMA insertion. Intraoperative analgesia was maintained by injection ketorolac 0.5mg/kg body wt. and infusion paracetamol 10mg/kg body wt. At the end of the surgery, LMA was removed and oropharyngeal

suctioning was done and the patients were oxygenated with 100% oxygen for 5mins and then shifted to recovery room.

The overall LMA insertion conditions were graded as excellent, satisfactory, and poor [10] as follows:

1. Excellent: No gagging or coughing, no patient movement or laryngospasm.
2. Satisfactory: Adverse response to airway manipulations, but not affecting the insertion of LMA.
3. Poor: a. Moderate to severe adverse responses requiring additional boluses of drugs,

b. More than two attempts were required for LMA insertion.

Statistical Methods:

Data were expressed as the mean ± sd and median (range) as appropriate. Statistical analysis were performed by SPSS 20.0 software. The analysis of variance (ANOVA) for repeated measures were used to compare hemodynamic parameters i.e. blood pressure and heart rate. Categorical variables were analyzed using Fisher's exact test if the number of subjects in any cell of the contingency table found to be less than five. $P < 0.05$ will be considered statistically significant.

RESULTS:

Demographic Data Of Patient:

Table: 1.1

AGE group (in years)	GROUP P		GROUP PD		p value
	N	%	N	%	
4 – 7	21	70.00	19	66.33	0.5839
8 – 12	09	30.00	11	33.67	
Mean±SD	7.10±2.41		6.30±2.02		

Table: 1.2

GENDER	GROUP P		GROUP PD		p value
	N	%	N	%	
MALE	17	56.67	18	60.00	0.7913
FEMALE	13	43.33	12	40.00	

From table 1.1 and 1.2 it is seen that the demographic data were similar between the two groups regarding patients' age and gender.

Table: 2 Lma Insertion Conditions

VARIABLES		Group P		Group PD		p-value
		n=30	%	N=30	%	
Jaw Relaxation	Fully Relaxed	10	33.33	24	80.00	0.0029
	Mild Relaxation	11	36.67	4	13.33	
	Tight But Open	6	20.00	2	6.67	
	Nil	3	10.00	0	0.00	
Mouth Opening	Full	10	33.33	26	86.67	0.0001
	Partial	16	53.33	4	13.33	
	Nil	4	13.33	0	0.00	
Gagging / Coughing	Gross	4	13.33	0	0.00	0.0001
	Slight	22	73.33	4	13.33	
	Nil	4	13.33	26	86.67	
Involuntary Limb Movement	Gross	3	10.00	0	0.00	0.0045
	Slight	18	60.00	9	30.00	
	Nil	9	30.00	21	70.00	
Overall LMA Insertion Condition	Excellent	10	33.33	26	86.67	0.0001
	Good	10	33.33	4	13.33	
	Poor	10	33.33	0	0.00	

The summed up score describing the overall LMA insertion conditions was significantly better in group PD compared to group P ($p< 0.05$) as shown in table 3. Excellent insertion condition in group PD was 86.67% vs 10% in group P and good condition in 13.33% in group PD vs 10% in group P.

Table 3: Change In Mean Arterial Pressure

VARIABLE	GROUP PD		GROUP P		p value
	Mean	SD	Mean	SD	
Baseline	83.21	4.21	83.78	5.38	0.6513
Immediately after induction	79.07	3.69	71.12	5.55	<0.0001
Immediately after insertion	83.96	4.60	90.34	5.04	<0.0001
5 mins after LMA insertion	82.28	3.63	91.32	5.82	<0.0001
10 mins after LMA insertion	82.88	7.81	79.53	2.61	0.0297

The baseline mean blood pressure was comparable between both the groups as shown in table 3. Mean arterial pressure measured immediately after induction, immediately after insertion, 5 mins and 10 mins after LMA insertion were statistically significant ($p<0.05$)

Table 4: Change In Heart Rate

VARIABLE	GROUP PD		GROUP P		p value
	MEAN	SD	MEAN	SD	
Baseline	97.83	8.71	100.10	9.81	0.3480
Immediately after induction	85.50	5.67	100.10	9.81	<0.0001
Immediately after LMA insertion	85.80	4.81	110.80	10.64	<0.0001
5 min after LMA insertion	83.37	9.00	117.50	11.15	<0.0001
10 min after LMA insertion	84.83	5.13	99.67	6.40	<0.0001

The baseline heart rate was comparable between both the groups as shown in table 4. Heart rate measured immediately after induction, immediately after insertion, 5 mins and 10 mins after LMA insertion were statistically significant ($p<0.05$)

Table 5: Recovery

VARIABLE		GROUP PD		GROUP P		p value
		n	%	n	%	
Incidence of apnea	Present	3	10.00	11	36.67	0.0325
	Absent	27	90.00	19	63.33	
Postoperative nausea vomiting(PONV)	Yes	0	0.00	0	0.00	1.000
	No	30	100.00	30	100.00	
Emergence Delerium(ED)	Present	0	0.00	13	43.33	0.0002
	Absent	30	100.00	17	56.67	

From table 5 it is seen that incidence of apnea was seen in only 10% patients in group PD compared to 36.67% patients in group P and none of the patients had PONV in both the groups .There was no incidence of ED in group PD compared to group P with incidence of ED in 13% patients.

DISCUSSIONS:

The results and observations made in the study were discussed in detail with relevant studies on the subject by other authors and critically analysed.

In children, dose of propofol required to produce adequate conditions for LMA insertion is suggested to be more than 3 mg/kg[11] such high dose of propofol causes cardiorespiratory depression [12]. The co-induction of propofol and dexmedetomidine has been proposed with considerable success as a way to lessen the adverse cardiorespiratory depressive effects of propofol, however there is little information in the literature about the use of dexmedetomidine- propofol as a co-induction agent as compared to propofol alone [13,14].

The main finding of this study was that dexmedetomidine- propofol as a co-induction agent had better overall LMA insertion condition and also provided better hemodynamic stability and lower incidence of adverse effects when compared to propofol alone.

In the present study, the incidence of absolute jaw relaxation and excellent LMA insertion conditions was higher in the PD group with 80% patients having fully relaxed jaw and mild relaxation in 13.34% patients. Thus we observed better jaw relaxation with dexmedeto midine group which was similar to that found by *Surabhi et al* [15] however they used dexmedetomidine- propofol versus propofol-fentanyl instead of propofol alone. Also *Hanci V et al* [16] had finding similar to our study, though they studied the drugs for endotracheal intubation without muscle relaxant.

With regards, to mouth opening PD group had statistically significant mouth opening compared to group P. With full mouth opening in 86.67% and partial opening in 13.34% patients in PD group. *Surabhi et al* [15] and *Wong CM et al* [17] using propofol – fentanyl as coinduction

found that a standard fentanyl dose of 1µ/kg co-administered with propofol 2.5mg/kg, reported a higher incidence of resistance to mouth opening with use of fentanyl.

In our study, slight gagging was found in 13.34% patients and slight limb movements in group PD which was insignificant and did not hamper the LMA insertion. *Surabhi et al* [15] comparing the co-induction of dexmedetomidine –propofol vs fentanyl –propofol had found adequate jaw relaxation and reduced gagging/coughing in the propofol-dexmedetomidine group, thus better insertion condition, which was in accordance to our study.

There was no rise in blood pressure in dexmedetomidine group in our study, hemodynamic stability was statistically better in group PD compared to group P. In the study by *Uzumcugil F et al* [18] they found no difference in SBP between dexmedetomidine and fentanyl, which was not in accordance to our study. Also, in our study group PD showed decrease in HR as compared to P, which was similar to study conducted by *Surabhi et at* [15]The incidence of apnea was significantly higher in P as compared to PD, which was similar in study by *Jayaram et al* [19]

Our study had certain limitations like it was a single-centric, observational study with a small sample size, depth of anaesthesia was not monitored, effect of dexmedetomidine in preserving respiration had not been assessed, incidence of complications such as bronchospasm, and laryngospasm were not measured in our study.

CONCLUSION:

The result of this study showed that LMA insertion condition was better in group PD compared to propofol group. There was a decrease in propofol requirement for induction in the ketofol group. There was a more stable MAP picture in the group PD when compared to that of propofol group.

REFERENCES

1. Benumof JL. Laryngeal Mask Airway and the ASA difficult airway algorithm. International anesthesiology clinics. 1998 Apr 1;36(2):61-90.
2. Brain AI, McGhee TD, McAteer EJ, Thomas A, Abu.Saad MA, Bushman JA. The laryngeal mask airway: development and preliminary trials of a new type of airway. Anaesthesia. 1985 Apr;40(4):356-61.
3. White PF. Clinical pharmacology of intravenous induction drugs. International Anesthesiology Clinics. 1988 Jul 1;26(2):98-104.
4. Martlew RA, Meakin G, Wadsworth R, Sharples A, Baker RD. Dose of propofol for laryngeal mask airway insertion in children: effect of premedication with midazolam. British journal of anaesthesia. 1996 Feb 1;76(2):308-9.
5. Allsop E, Innes P, Jackson M, Cunliffe M. Dose of propofol required to insert the laryngeal mask airway in children. Pediatric Anesthesia. 1995 Jan;5(1):47-51.
6. Short SM, Aun CS. Haemodynamic effects of propofol in children. Anaesthesia. 1991 Sep;46(9):783-5.
7. Purcell-Jones G, Yates A, Baker JR, James IG. Comparison of the induction characteristics of thiopentone and propofol in children. BJA: British Journal of Anaesthesia. 1987 Nov 1;59(11):1431-6.
8. Hsu YW, Cortinez LI, Robertson KM, Keifer JC, Sum-Ping ST, Moretti EW, Young CC, Wright DR, MacLeod DB, Somma J. Dexmedetomidine pharmacodynamics: part I: crossover comparison of the respiratory effects of dexmedetomidine and remifentanil in healthy volunteers. The Journal of the American Society of Anesthesiologists. 2004 Nov 1;101(5):1066-76.
9. Hall JE, Uhrich TD, Barney JA, Arain SR, Ebert TJ. Sedative, amnestic, and analgesic properties of small-dose dexmedetomidine infusions. Anesthesia & Analgesia. 2000 Mar 1;90(3):699-705.
10. Yeo KS, Kua SW, Teoh GS, Onsiong MK. The use of thiopentone/propofol admixture for laryngeal mask airway insertion. Anaesthesia and intensive care. 2001 Feb;29(1):3842.
11. Martlew RA, Meakin G, Wadsworth R, Sharples A, Baker RD. Dose of propofol for laryngeal mask airway insertion in children: effect of premedication with midazolam. British journal of anaesthesia. 1996 Feb 1;76(2):308-9.
12. Chari P, Ghai B. Comparison of butorphanol and thiopentone vs fentanyl and thiopentone for laryngeal mask airway insertion. Journal of clinical anesthesia. 2006 Feb 1;18(1):8-11.
13. Akin A, Esmaoglu A, Tosun Z, Gulcu N, Aydogan H, Boyaci A. Comparison of propofol with propofol–ketamine combination in pediatric patients undergoing auditory brainstem response testing. International journal of pediatric otorhinolaryngology. 2005 Nov 1;69(11):1541-5.
14. Willman EV, Andolfatto G. A prospective evaluation of "ketofol"(ketamine/propofol combination) for procedural sedation and analgesia in the emergency department. Annals of emergency medicine. 2007 Jan 1;49(1):23-30.
15. Lande SA, Gadkari CP, Bhure AR, Aich S. Comparison of dexmedetomidine propofol versus fentanyl–propofol for conditions of laryngeal mask airway insertion in elective surgeries. J Evol Med Dent Sci. 2014 Apr 14;3:4042-51.
16. Hancı V, Erdoğan G, Okyay RD, Yurtlu BS, Ayoğlu H, Baydilek Y, Turan İÖ. Effects of fentanyl-lidocaine-propofol and dexmedetomidine-lidocaine-propofol on tracheal intubation without use of muscle relaxants. The Kaohsiung journal of medical sciences. 2010 May 1;26(5):244-50.
17. Wong CM, Critchley LA, Lee A, Khaw KS, Kee WN. Fentanyl dose–response curves when inserting the LMA Classic™ laryngeal mask airway. Anaesthesia. 2007 Jul;62(7):654-60.
18. Uzümcügil F, Canbay O, Celebi NA, Karagoz AH, Ozgen SA. Comparison of dexmedetomidine–propofol vs. fentanyl–propofol for laryngeal mask insertion. European journal of anaesthesiology. 2008 Aug;25(8):675-80.
19. Jayaram AS, Subhadra PJ, Rao MH. Comparison of dexmedetomidine combined with propofol Vs fentanyl combined with propofol for laryngeal mask insertion. Journal of Clinical and Scientific Research. 2014 Oct 1;3(4):228-36.