ORIGINAL ARTICLE

EFFECT OF MIDAZOLAM PREMEDICATION ON DOSES OF PROPOFOL FOR LARYNGEAL MASK AIRWAY INSERTION IN CHILDREN

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Background: Propofol is a widely-accepted medication for the successful insertion of laryngeal mask airway (LMA). When propofol is used alone, larger doses are required which can lead to cardiorespiratory distress resulting in hypotension and prolonged apnoea. The objective of this study was to evaluate the effect of premedication of midazolam on different doses of propofol for LMA insertion. **Methods:** In this randomized clinical trial, eighty-six (86) patients who were scheduled to undergo elective surgery is supine position not requiring the need for tracheal intubation from September 2015 to 6 March 2016 were included. In group I (n=43), the LMA was introduced after induction of anaesthesia with Propofol alone. In Group II (n=43, the patient was premeditated with midazolam (0.05 mg/kg) before induction of anaesthesia with propofol. Each group was divided into three subgroups depending upon the dose of propofol used for LMA insertion. **Results:** In this study, there were 53.5% females in group I and 48.8% females in group II. The mean age of Children in group I was 7.30±2.55 years and 7.47±2.46 years in group II. Incidence of incomplete Jaw relaxation, coughing and limb movements was significantly high in in Group I patients (*p*-values <0.001, <0.001 and <0.001 respectively). Effectiveness of anaesthesia was compared among different subgroups. On comparison of subgroup Ia and IIa, the effectiveness rate was significantly high in subgroup IIa 50% versus only 7.1% in subgroup Ia (*p*-value 0.012). Similarly, in subgroup IIb effectiveness was achieved in 100% patients as compared to only 64.3% patients in subgroup IIb (*p*-value 0.014). There was no significant difference in effectiveness rate in subgroup Ic and IIc (*p*-value 0.309). **Conclusion:** With midazolam pre-medication, the dose of propofol for LMA insertion is decreased. The incidence of adverse events during LMA insertion is also low with midazolam premedication.

Keywords: Laryngeal mask airway; Propofol; Midazolam

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INTRODUCTION

Management of airway is a core and important skill of anaesthesia practice.[1] Non-invasive supraglottic airway device (SAD) also known as Laryngeal mask airway (LMA) is a safe and simple technique for paediatric anaesthesia and is being used in clinical practice 1990.[2] The 2nd generation SAD, Pro Seal™ laryngeal mask airway is its new version that provide higher sealing pressure and oesophageal drainage and thus prevents gastric aspiration.[3] It replaces the need of endotracheal intubation and prevents the anxiety response associated with intubation.[4] However LMA insertion and its maintenance is not always achieved easily, appropriate depth of anaesthesia along with adequate doses of muscle relaxants are required to prevent complications of LMA such was patients struggling, patient movements, laryngospasm and cough.[5] Propofol is a widely accepted medication for the successful insertion of LMA. When propofol is used alone, larger doses are required which can lead to cardiorespiratory distress resulting in hypotension and prolonged apnea.[6] To prevent this complication associated with propofol usage, co-induction drugs such as midazolam, atracurium and opiods are used to lessen the dosages of propofol for LMA management.[7,8] In this study we evaluated the effect of premedication of midazolam on different doses of propofol for LMA insertion and associated hemodynamic changes before, during and after LMA insertion.

MATERIAL AND METHODS

This randomized clinical trial was conducted in Nishter Hospital Multan. The duration of this study was from September 2015 to 6 March 2016. Ethical approval for this study was taken from Institutional review board of Nishtar Hospital Multan. Eighty-six (86) patients who were scheduled to undergo elective surgery is supine position not requiring the need for tracheal intubation were included in this study. This sample size was calculated by using the rate of

effectiveness in a previous study in propofol only group (60.8%) and propofol plus midazolam group (84.6%), using confidence level 95% and power of test 80%, the calculated sample size was 43 children in each group.[8] Patients were randomly divided into two equal groups using lottery method. In group I, the LMA was introduced after induction of anaesthesia with Propofol alone. In Group II, the patient was premeditated with midazolam (0.05 mg/kg) before induction of anaesthesia with propofol.

Each group was divided into three subgroups Group Ia, Ib, Ic and IIa, IIb, IIc. Propofol was given at doses of 3 mg/kg, 4 mg/kg, and 5 mg/kg in three sub groups respectively. Once in place, the cuff of the LMA was inflated immediately. No muscle relaxation was used in any group. Supraglottic LMA device was inserted after loss of verbal contact. Patients was monitored according to our clinical standard operating procedures. Patients with Planned operation time greater than 1 hour, high risk of aspiration (non-fasted, massive gastro oesophageal reflux/treated disease), cervical spine disease, upper respiratory tract infection in the last week and poor dental condition with high risk of damage, and impossible facemask ventilation were excluded. Prior ethical approval was taken. Jaw reflex, coughing and limb movements were compared before, after 5 minutes and after 10 minutes of LMA insertion.

Effectiveness of different doses of propofol was measured using the following scoring system. Score ≤4 was considered as significant. The collected information was entered and analysed through SPSS version 23. Descriptive statistics was used to calculate mean & standard deviation for systolic blood pressure, age and weight. Frequencies and proportions for jaw relaxation, coughing, limbs movement, gender and effectiveness of anaesthesia. ANOVA test was used for the comparison of systolic blood pressure between different subgroups. Chi-square test was used for comparison of qualitative variables between and among different subgroups.

RESULTS

In this study, 43 patients were included in each group. There were 53.5% females in group I and 48.8% females in group II. The mean age of Children in group I was 7.30±2.55 years and 7.47±2.46 years in group II. There was no significant difference in baseline systolic blood pressure of all Patients. Systolic blood pressure at the time of LMA insertion was significantly less in subgroups Ic and IIc as compared to the other groups (*p*-value 0.01). The same sequence was seen in systolic blood pressure after 5 minutes of LMA insertion and after 10 minutes of LMA insertion *p*-value 0.016 and 0.03 respectively. Jaw relaxation at the time of LMA insertion was significantly high in subgroup Ic, IIb and IIc. In these subgroups, jaw relaxation was achieved in all patients (*p*-value <0.001). In sub group IIa and Ib jaw relaxation was achieved in 85.7% patients and in group Ia, jaw relaxation was achieved only in 14.3% patients.

There was no incidence of coughing at the time of LMA insertion in subgroup Ic, IIb and IIc, while in group IIa the incidence of coughing was in 35.7% patients, in subgroup Ib in 21.1% patients and 71.4% in subgroup Ia, this difference was significant with *p*-value <0.001. Similarly, no limb movements were seen at the time of LMA insertion in subgroup Ic, IIb and IIc as compared to other subgroups (*p*-value <0.001).

Effectiveness of anaesthesia was compared among different subgroups. On comparison of subgroup Ia and IIa, the effectiveness rate was significantly high in subgroup IIa 50% versus only 7.1% in subgroup Ia (*p*-value 0.012). Similarly, in subgroup IIb effectiveness was achieved in 100% patients as compared to only 64.3% patients in subgroup IIb (*p*-value 0.014). There was no significant difference in effectiveness rate in subgroup Ic and IIc, in these subgroups the rate of effectiveness was 93.3% and 100% respectively (*p*-value 0.309).

Table-1: Scoring scale for assessment of drug effect

Name of variable	Score
Pulse:	
Change in pulse/min b/w 0–5	1
Change in pulse/min b/w 6–10	2
Change in pulse/min above 10	3
Jaw relaxation:	
Relaxed	1
Not-relaxed	2
Cough	
Present	2
Absent	1
LIMB Movement	
No movement	1
Upper limb movement	2
Lower limb movement	3
All limbs movements	4

Table-2: Baseline characteristics of patients.

Name of variable	Group I	Group II	*p*-value
Number of Patients	43	43	
Age of Patients	7.30±2.55	7.47±2.46	0.76
Female Gender	23 (53.5%)	21 (48.8%)	0.66
Weight of Patients	23.51±7.00	23.00±7.52	0.74

Continuous variables are presented as mean±SD

Table-3: Comparison of outcome variable between subgroups.

Name of Variable	Group I			Group II			*p*-value
	Ia	Ib	Ic	IIa	IIb	IIc	
	n =14	n=14	n=15	n=14	n=14	n=15	
Baseline Systolic Blood Pressure	109.14±13.6	108.93±11.22	99.33±11.97	108.07±12.16	106.93±14.72	103.86±16.97	0.34
Systolic Blood Pressure at time of LMA Insertion	120+50±14.7	113.14±11.31	101.73±12.29	111.92±14.62	107.78±14.14	105.53±15.73	0.01
Systolic Blood Pressure after 5 minutes of LMA insertion	119.85±14.31	111.78±11.23	101.13±12.61	112.28±15.01	108.28±13.93	106.20±16.22	0.016
Systolic Blood Pressure after 10 minutes of LMA Insertion	117.85±15.58	111.57±11.33	100.8±12.54	112.29±14.09	108.07±13.62	106.13±16.42	0.03
Jaw Relaxation	2 (14.3%)	12 (85.7%)	15 (100%)	12 (85.7%)	14 (100%)	15 (100%)	<0.001
Coughing on LMA insertion	10 (71.4%)	4.0 (21.1%)	0.0 (0.0%)	5.0 (35.7%)	0.0 (100%)	0.0 (100%)	<0.001
Limb Movements	13 (92.9%)	2 (14.3%)	0.0 (0.0%)	4 (28.6%)	0 (0.0%)	0 (0.0%)	<0.001
Effectiveness of anaesthesia	1 (7.1%)	9 (64.3%)	14 (93.3%)	7 (50.0%)	14 (100%)	15 (100%)	<0.001

Continuous variables are presented as mean±SD

Table-4: Comparison of effectiveness of anaesthesia among different groups.

Effectiveness	Effectiveness (Present)	Effectiveness (Absent)	*p*-value
Subgroup Ia	1 (7.1%)	13 (92.9%)	0.012
Subgroup IIa	7 (50%)	7 (50%)	
Subgroup Ib	9 (64.3%	5 (35.7%)	0.014
Subgroup IIb	14 (100%)	0.0 (0.0%)	
Subgroup Ic	14 (93.3%)	1 (6.7%)	0.309
Subgroup IIc	15 (100%)	0.0 (0.0%)	

DISCUSSION

Co-induction is a practice of combining different anaesthetic agents in smaller doses to achieve similar induction effects as achieved by higher doses of individual drugs to prevent the adverse effects associated with high doses of these drugs.[9,10] In this study we compared the effects of premedication of midazolam on different doses of propofol for insertion of LMA in children. The doses of propofol given were 3 mg/kg, 4 mg/kg and 5 mg/kg given to subgroups Ia, Ib and Ic patients of group I respectively. In subgroup IIa, IIb and IIc similar doses of propofol were given along with premedication of 0.05 mg/kg of midazolam. We found that the dose of propofol was reduced to 4 mg/kg from 5 mg/kg in group II patients in whom midazolam was used along with propofol, i.e., midazolam decreased the dose of propofol from 5 mg/kg to 4 kg/kg to achieve anaesthesia effectiveness in 100% patients. The incidence of adverse events e.g., incomplete jaw relaxation at the time of LMA insertion, cough and limb movements was high in Ia and Ib subgroups of group I as compared to their counterpart's subgroups in group II. However, the incidence of adverse events was same in subgroup Ic and IIc. According to Blake et al the incidence of adverse events, i.e., laryngospasm, gagging and coughing is high when the profundity of anaesthesia is light.[11]

Bhasker *et al* found similar results as compared to our study. In their study, the incidence of adverse events at the time of LMA insertion was high in propofol subgroups as compared to the midazolam plus propofol subgroups. They also concluded that the dose of propofol is reduced when premedication with midazolam is given to patients before LMA insertion.[8]

Short and Chiu also concluded similar results, they suggested that the dose of propofol is reduced to 52% when midazolam is used along with propofol.[12] Some studies did not found any significant difference of hemodynamic parameters between different doses of propofol.[13] Other studies found significant difference in mean systolic blood pressures when different doses of propofol were used for LMA insertion.[8,12] Bhasker *et al* found significant decrease in mean systolic blood pressure at high doses of propofol as compared to other subgroups.[9] In our study, we also found significantly larger decrease in systolic blood pressure with propofol was given in a dose of 5 mg/kg, the decrease in blood pressure was less in counterpart subgroup in which midazolam was given along with propofol. Goyagi *et al* found similar effects of high doses of propofol on mean systolic blood pressures as that of our study.[14] So we found that midazolam premedication significantly decreases the dose of propofol for LMA insertion and it decreases the incidence of adverse events during LMA insertion.

CONCLUSION

With midazolam premedication, the dose of propofol for LMA insertion is decreased. The incidence of

adverse events during LMA insertion is also low with midazolam premedication.

AUTHORS' CONTRIBUTION

MA: conceive idea, study design. AF: manuscript writing, data analysis. MKS: Data collection.

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