OUTCOME COMPARISON OF MIDAZOLAM AND SUCCINYLCHOLINE IN LARYNGEAL MASK AIRWAY

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Abstract

Background: The most vital element in providing functional respiration is the airway and the major responsibility of the anesthetist is to provide respiration for the patient through a patent airway and adequate ventilation. The use of Laryngeal Mask Airway (LMA) is well established in anesthetic practice. The LMA is an innovative airway management device intended as an alternative airway to face mask use and being used in millions of patients for routine and emergency procedures. LMA obviates the need for tracheal intubation during anesthesia. The efficacy of thiopentone can be altered by midazolam or succinylcholine in combination. We used thiopentone sodium (5mg/kg) and midazolam (0.05mg/kg) as induction agent in group A (Control group) and thiopentone sodium (5mg/kg) and succinylcholine (0.25mg/kg) in group B for LMA. This randomized trial was conducted to compare the effectiveness of midazolam and succinylcholine added with thiopentone in smooth insertion of LMA. **Materials and methods:** The study was done in the Department of Anesthesiology, Chittagong Medical College from July 2013 to December 2014. All the patients scheduled for elective surgical procedures under general anesthesia fulfilling the inclusion criteria, were the study population. Data was analyzed by computer based software SPSS-17. **Results:** Mean age of patients were 33.50 years ± SD- 10.629 years in group A and 32.22 years ± SD- 9.192 years in group B. In all patients (42) from group A, LMA was successfully inserted after first attempt and in group B 36 (85.71%) patients required single attempt. The overall insertion condition of LMA was excellent in 21 (50%) patients in group A and in 13 (30.95%) patients in group B. **Conclusion:** In the perspective of our study, midazolam-thiopentone sodium is more effective and safe to use in smooth insertion of LMA.

Key words

Laryngeal Mask Airway (LMA); Smooth insertion; Midazolam-Thiopentone sodium; Mini-dose Succinylcholine.

Introduction

Anesthesia has made major advances in recent years. Considerable efforts have been devoted to airway management by the anesthesiologists during the past decades. A large number of supraglottic airway devices have been introduced recently. The original purpose was to reduce the need for more invasive methods of airway management while offering a more reliable alternative to the facemask. The Laryngeal Mask Airway (LMA) is one such innovative device designed for airway management[1]. Since the LMA is placed directly over the posterior pharynx, it avoids tracheal stimulation and hence the systemic and ocular stress response associated with tracheal intubation. LMA offers distinct advantages over the facemask and the endo-tracheal tube[2]. Need for time efficient and safe surgeries such as those in the ambulatory setting. Most of these are under general anesthesia using the LMA, as regional or neuraxial anesthesia is associated with slower recovery and later discharge[3]. In fact around the world, the use of the LMA is becoming more common for different surgeries accounting for it being the dominant choice of airway in around 50% of cases in the UK[4].

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LMA insertion is accomplished using propofol as it helps blunt the laryngeal reflexes well, when compared to other induction agents. Propofol is the induction agent of choice in LMA placement as it blunts the laryngeal reflexes[5]. The disadvantage of using propofol alone is excessive patient movement, coughing, and gagging. This leads to additional propofol usage, ensuing hypotension, and prolonged duration of apnea. Salem found that failed insertion attempts of LMA placement were due to coughing and gagging in 75% of patients when only propofol was used and successful insertion at first attempt was only 60% and its routine use for LMA insertion has been questioned. Much research has therefore been conducted using a variety of supplementary drugs to find a compound which eases LMA insertion[6].

Thiopentone, on the contrary, may not depress airway reflex adequately, as much as propofol, resulting in gagging, coughing, head & limb movement and laryngospasm, which are undesirable for LMA insertion but does not produce significant bradycardia or hypotension. Furthermore, to overcome these difficulties associated with thiopentone, a number of co-induction agents are introduced with thiopentone, as potential combination of agents for LMA insertion as suitable alternatives to propofol. Midazolam, particularly, when used as an adjuvant to thiopentone may decrease the incidence of adverse response to LMA insertion. The combination of midazolam with thiopentone for LMA insertion may obtund airway reflexes sufficiently to allow satisfactory insertion of LMA at a lesser cost[7]. Thiopentone sodium is a thiobarbiturates is a hygroscopic yellow powder, containing thiopentone sodium and 6% sodium-carbonate stored under an atmosphere of nitrogen The drug is reconstituted in water prior to use to yield a 2.5% solution mainly used as hypnotic and anticonvulsant. After intravenous administration rapidly diffuses into the brain and is thought to act primarily at synapses by depressing post-synaptic sensitivity to neurotransmitters and by impairing pre-synaptic neurotransmitter release.

Use of rapid onset, short-acting neuromuscular blocking drugs, such as succinylcholine as an adjuvant to Thiopentone, may be another method of choice, as these drugs suppress laryngeal reflexes by depolarization of motor neuron end-plates[4].

Succinylcholine is a quick onset, short acting depolarizing muscle relaxant. It is a time tested drug, easily available, and cost-effective. The use of succinylcholine to aid insertion of the LMA is advantageous as it avoids depression of the respiratory center and has no influence on consciousness. Succinylcholine has been proven to facilitate LMA insertion, with and without an additional agent such as fentanyl or midazolam[8]. Previous studies had proven the usefulness of mini-dose succinylcholine (0.1mg/kg) for insertion of LMA without significant patient reaction under propofol anesthesia in patients coming for elective short surgical procedures[9].

The efficacy of thiopentone can thereby altered by midazolam or succinylcholine in combination. This study was aimed to explore the comparative evaluation of effectiveness of thiopentone - midazolam and thiopentone mini dose succinyl-choline in smooth insertion of LMA.

Materials and methods

The study was an experimental study conducted in the Department of Anesthesiology, Chittagong Medical College Hospital (CMCH) over a period extended from July, 2013 to December, 2014. All the patients scheduled for elective surgical procedures under general anesthesia fulfilling the inclusion criteria, were the study population. Subjects were included for the study after obtaining written informed consent. Before inclusion, consent form was read aloud to the patients and his right to withdraw from the study, at any stage, for any reason was mentioned. During the study possible risks and the rescue measures arranged to save the patient from any adverse situation were explained.

Data was collected by a pre-tested and pre designed case record form from a total of 84 patients, 42 in each group. In Group A we used midazolam with thiopentone sodium and in Broup B we used mini dose succinylcholine with thiopentone for induction of LMA. The allocation of intervention was done consecutively to the subjects in an alternative manner. In the pre-anesthetic check-up room patients were examined thoroughly before the intervention for baseline findings. 03 times clinical evaluation were made after the application of the interventions as immediately after induction, after insertion of LMA and 03 minutes after insertion and the findings were compared statistically.

The demographic variables were age, sex and weight of the patients. The clinical variables were blood pressure, heart rate, partial pressure of oxygen, co-existing diseases etc. The variables like jaw relaxation, head- extension, coughing, gagging, tearing/blinking, pt's movement and laryngospasm were assessed during insertion of LMA. No. of attempts required for LMA insertion and overall quality of anesthesia were also observed. Descriptive and inferential statistical analysis was done by computer based software, SPSS- version 17 for appropriate results.

Inclusion criteria

i) Patients scheduled for LMA insertion in CMCH.
ii) Adult patients of 18 - 50 yrs of age.

Exclusion criteria

i) Patients with tumor and / or ulcer in the oral cavity.
ii) Tracheostomized patients.
iii) Patients not consenting to the procedure.

Results

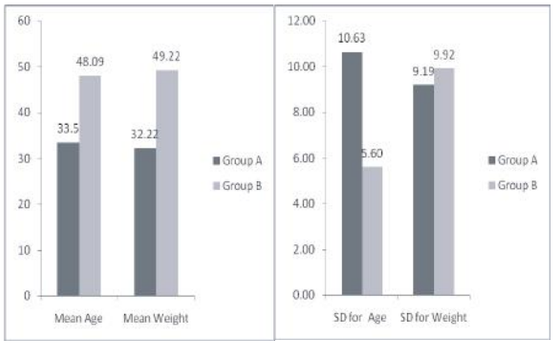

Fig 1: Mean and SD for age and weight in A and B group (n=84)

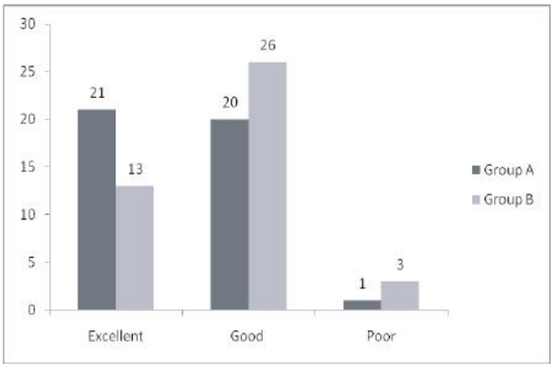

Fig 2 : Showing overall insertion condition in A and B group (n=84)

Table I : No. of attempt for LMA insertion

Attempt for LMA insertion	Group A (n=42)		Group B (n=42)		p value
	n	%	n	%	
1st	42	100.00	36	85.71	0.020*
2nd	0	0.00	6	14.29	

*p values reached from chi-square test

Table II: Conditions during LMA insertion

Parameters	Group A (n=42)		Group B (n=42)	
	n	%	n	%
Jaw relaxation				
Excellent	34	80.95	14	33.33
Good	7	16.67	23	54.76
Poor	1	2.38	5	11.90
Head extension				
Excellent	30	71.43	20	47.62
Good	12	28.57	19	45.24
Poor	0	0.00	3	7.14
Tearing/ eye blinking				
Present	4	9.52	7	83.33
Absent	38	90.48	35	16.67
Gagging				
None	37	88.10	31	73.81
Mild	5	11.90	7	16.67
Moderate	0	0.00	4	9.52
Severe	0	0.00	0	0.00
Coughing				
None	31	73.81	25	59.52
Mild	8	19.05	9	21.43
Moderate	3	7.14	8	19.05
Severe	0	0.00	0	0.00
Pt's movement				
None	30	71.43	22	52.38
Mild	6	14.29	9	21.43
Moderate	4	9.52	8	19.05
Severe	2	4.76	3	7.14
Laryngospasm				
None	39	92.86	42	100.00
Partial	3	7.14	0	0.00

Table III: Hemodynamic comparison between Group A and Group B (n=84)

	Group A (n=42)	Group B (n=42)	p value
	Pre induction		
Systolic	124.84±1 3.871	126.50±1 6.230	0.662
Diastolic	76.72±9.904	78.63±10.552	0.459
HR	92.78±1 5.007	89.78±13.190	0.399
$Sp0_2$	99.09±.777	98.84±.767	0.200
	Post induction		
Systolic	115.59±1 6.883	122.50±20.802	0.150
Diastolic	72.41+10.025	76.78±1 2.362	0.125
HR	91.91±12.553	89.88±1 3.708	0.539
$Sp0_2$	98.97±.822	98.56±.982	0.078
	Immediate after LMA insertion		
Systolic	112.94±19.518	127.68±19.414	0.004
Diastolic	72.06±1 3.476	77.16±12.253	0.122
HR	90. 13±1 3.528	89.26±1 7.831	0.828
$Sp0_2$	99.03±.861	98.58±.992	0.059
	03 minutes after insertion		
Systolic	115.94±1 8.604	123.19±20.724	0.148
Diastolic	73.34±1 1.967	75.35±1 1.808	0.505
HR	90.09±1 3.834	86.29+17.486	0.341
$Sp0_2$	99.28±1.651	98.03±3.834	0.096

p values reached from 't' test

A total of 84 patients undergoing routine operations under general anesthesia were divided into two groups-Group A received Inj. Midazolam (0.05mg/kg) and Thiopentone (5mg/kg) and Group B received inj. Thiopentone (5mg/kg) and Succinylcholine (0.25mg/kg). The prescribed variables and hemodynamic parameters were recorded in the case record form. The findings of data analysis are documented above.

In all patients (42) from Group A, LMA was successfully inserted after first attempt and in Group B 36 (85.71%) patients required single attempt while 06 (14.29%) patients required second attempt for LMA insertion (Table-I). Observable differences of all forms of excellent jaw relaxation were found between the patients from Group A (Excellent- 80.95%, Good- 16.67%, Poor- 02.38%) and Group B (Excellent- 33.3%, Good- 54.76%, and Poor- 11.90%). There were also a measurable difference for head extension between the groups as observed Group A (Excellent- 71.43%, Good- 28.57%, Poor- 00.00%) and Group B (Excellent- 47.62%, Good- 45.24%, and Poor- 07.14%). The number of patients with tearing/ blinking, gagging, coughing, laryngospasm and patient movement were not distinctly between Group A and B. (Table II).

The overall insertion condition of LMA was graded excellent in 21 (50%) patients in Group A and in 13 (30.95%) patients in Group B. On the contrary, good LMA condition was observed in 20 (47.62%) patients from Group A and 26 (61.90%) patients from Group B with observable poor condition in 01 (2.38%) patient from Group A and 03 (07.14%) patients from Group B (Fig 2).

No significant change observed in case of heart rate, diastolic blood pressure and SpO_2 in post-induction period compared to pre-induction levels in 02 groups. There were significant change observed in systolic blood pressure (p=0.004) between groups immediately after LMA but no significant difference was observed in 03 minutes after LMA insertion (Table III).

Discussion

The use of LMA is well established in anesthetic practice. LMA obviates the need for tracheal intubation during anesthesia[10]. This study was intended to compare the ease of insertion of Pharyngeal Mask Airway (LMA) between the study groups. We used thiopentone sodium (5mg/kg) and midazolam (0.05mg/kg) as induction agent in Group A (Control group) and thiopentone sodium(5mg/kg) and succinylcholine (0.25mg/kg) in Group B. There was no mentionable difference in demographic data among the groups.

Benzodiazepines are well known to reduce upper airway reflexes. Results showed that easy insertion of LMA was seen in patients with Thiopentone (5mg/kg) and midazolam (0.05mg/kg) as induction agent as found in an earlier study[11]. The use of midazolam with thiopentone (Group-A) was associated with all forms of excellent jaw relaxation (Excellent- 80.95%, Good- 16.67%, Poor- 02.38%) similarly found in other studies in comparison to Group B[12,13]. Administration of Group A resulted in successful LMA insertion at first attempt in all patients with a higher incidence (100%) as observed excellent or satisfactory insertion in 98%

patients in midazolam (0.04g/kg)- thiopentone group in another study[14]. Though there is little difference, yet the probable explanation may be that the particular study had used midazolam 0.04mg/kg, but in our study we used midazolam in higher dose 0.05mg/kg.

In Group-B, Succinylcholine was used in a dose of 0.25mg/kg in our study leading to successful LMA insertion in 85.71% patients at first attempt and causing head extension as (Excellent- 47.62%, Good- 45.24%, and Poor- 07.14%) as corresponding to other studies[15,16]. The number of patients with tearing/blinking, gagging, coughing, laryngospasm and patient movement were not distinctly between Group A and B. The use of mini-dose Succinylcholine (0.25mg/kg) facilitated LMA insertion probably by relaxing the laryngeal muscles, thus improving mouth opening and attenuating the gagging and coughing responses. Higher dose of succinylcholine (0.5 mg/kg) gave better results but with more side effects (Apnoea, fasiculation, myalgia, and desaturation). In our study, desaturation and apnoea were not observed in any case. In another study found the incidence of muscle pain was higher in patients who received 0.5mg/kg succinylcholine and incidence of muscle pain was significantly lower in group receiving 0.25mg/kg succinylcholine[17]. Though mini-dose succinylcholine was used, yet fasciculation were observed in almost every case. As fasciculation may be a cause of myalgia and myalgia was not included as a variable in our study, so further evaluation is needed with lower doses of succinylcholine to see the intensity of myalgia.

In our study, hemodynamic variables (Systolic & diastolic blood pressure, heart rate and SpO_2) were observed in both groups during pre-induction, post-induction, immediately after LMA insertion and 03 minutes after LMA insertion. These values showed no significant differences pre-induction and post- induction period except systolic blood pressure. Immediately after LMA insertion, statistically significant ($p<0.004$) changes in systolic blood pressure was observed among the groups. These findings are compatible with other study results[15,16].

Study had shown excellent insertion condition of LMA in 90% patients, who received 0.5mg/kg of succinylcholine with thiopentone(5mg/kg) and in 45% patients who received 0.25mg/kg of succinylcholine. The result was found to be closer to that of our study (n-13, percentage- 30.95%)[18]. The probable explanation of the difference in the two results might be due to the higher dose of midazolam (0.1mg/kg) used in that particular study. Based on findings of our study, thiopentone sodium - midazolam regime is found to be equally effective and produces minimum complication, so this cheap and safe alternative can be used routinely for smooth insertion of LMA.

Limitations

Small sample size used in this study, so to generalize the findings further study with larger sample is required. In our study, fasciculation was observed with mini-dose succinylcholine but myalgia was not included as variable, so further study would be necessary to elucidate this point.

Contribution of authors

SNK - Conception, drafting the article and final approval.

MRHT - Design, drafting and final approval.

SN - Analysis, drafting and final approval.

KMBB - Acquisition of data, critical revision and final approval.

GAC - Interpretation of data, critical revision and final approval.

AKMSA - Data analysis, critical revision and final approval.

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Conclusion

Overall LMA insertion condition had improved by the use of midazolam with thiopentone sodium (Group-A) than mini dose succinylcholine with thiopentone (Group-B). Though the drug regime used in Group-A (Midazolam-thiopentone sodium) is expensive than Group-B, hemodynamic stability was observed better in group-A than Group-B. So, in the perspective of our study, we can conclude that for smooth insertion of LMA: midazolam-thiopentone sodium can be a better mean to achieve a successful LMA.

Disclosure

All the authors hereby declare no competing interest.

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