Original Article

Laryngeal Mask Airway Insertion: Intravenous Bolus Dose of Propofol vs Intravenous Equipotent Dose of Thiopentone

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Abstract

Background: *A number of induction agents and combinations of these agents have been shown to be effective in facilitating the insertion of a laryngeal mask airway with little adverse effects. Patients having minor procedures requiring general anesthesia were randomly assigned to receive either propofol or thiopentone as an induction agent, with patients being blinded to which drug they received.*

Objective: *To compare thiopentone to propofol as a means of inducing anesthesia for LMA implantation after an appropriate induction with midazolam and fentanyl.*

Method: *This prospective comparative study was carried out at the Anaesthesiology and Critical Care Department of Holy Family Red Crescent Medical College. The randomized, double-blinded study comprised 200 patients aged 18 to 60 years undergoing minor surgeries (≤45 minutes) under general anaesthesia fitting into the American Society of Anesthesiologists (ASA) physical status I and II and Mallampati score (MPS) 1 and 2. The participants were randomly divided into two groups in a 1:1 ratio. Group A (n = 100) received propofol (2.5 mg/kg), while group B (n = 100) received thiopentone (5 mg/kg) injections for induction of anaesthesia. Pre-medication with midazolam (0.04 mg/kg) injection and fentanyl (1.5 mcg/kg) injection was provided to patients in both groups. Post-laryngeal mask airway insertion, parameters like conditions for insertion, time taken for laryngeal mask airway insertion, overall response and haemodynamic parameters were recorded. The data analysis was executed using equivalence tests considering a two-sided $p < 0.05$ as significant.*

Results: *The insertion ease was found to be significantly greater in Group A ($p = 0.029$). There was a statistically significant difference ($p = 0.001$) in the mean insertion time between the two groups. There was no statistically significant difference between the two groups in terms of the overall reaction to insertion. Reductions in heart rate and systolic and diastolic blood pressure were statistically different across the groups ($p = 0.001$).*

Conclusion: *Propofol at a rate of 2.5 mg/kg was found to be superior to thiopentone at a rate of 5 mg/kg as far as suppression of upper airway reflexes in laryngeal mask airway insertion.*

Keywords: *General anesthesia, minor surgery, thiopentone, propofol, laryngeal mask airway (LMA).*

Introduction

Endotracheal intubation is the most reliable method of securing the airway, delivering anesthetic gases, and preventing aspiration. However, during laryngoscopy and endotracheal intubation, hemodynamic changes and sympathoadrenal responses are common[1]. By offering some of the advantages of endotracheal intubation without the primary problem of sight and separating the cords by force, the laryngeal mask airway (LMA) was designed to minimize such unfavorable reactions[2]. Before inserting the LMA, the patient's upper airway reflexes must be carefully obtunded to prevent unfavorable responses as coughing, choking, and laryngospasm[3].

Low-risk LMA insertion has been made possible by using a variety of induction agents and drug combinations. However, there are limitations to each of these approaches, and none of them has become a standard way[4]. However, propofol, the most often used medication to ease LMA implantation, is both costly and uncomfortable to administer. As the dosage increases, it lowers arterial blood pressure and slows breathing[5]. Finding a cheaper induction method that is just as effective as propofol would be very helpful[6]. Conversely, thiopentone may not suppress the airway reflex as well as propofol, leading to undesired phenomena such as choking, coughing, head and limb movement, and laryngospasm during LMA installation. No severe bradycardia or hypotension is produced, however. The work introduces several co-induction agents as a suitable replacement for LMA insertion.[7] The idea of co-induction in anaesthesia involves delivering tiny amounts of sedative or other anesthetic agents to reduce the dosage needed of the induction agent, hence enhancing anaesthesia quality, facilitating better haemodynamic stability, and reducing adverse effects.

Few studies have compared the effects of an IV bolus of propofolvsthiopentone for LMA placement. While there is a small body of literature comparing the two induction agents for LMA insertion, it is constrained by the use of the same adjuvants and equipotency ratio as this study. Therefore, the purpose of this study is to evaluate the relative safety and effectiveness of propofol and thiopentone during LMA insertion. Furthermore, thiopental is more economically viable than propofol in India, which might reduce the induction cost in childcare procedures. If our research with IV thiopentone and IV propofol finds similar or superior insertion circumstances for the LMA, then it makes sense to use the less costly medicine.

Therefore, the purpose of this research is to evaluate the efficacy of frequently used drugs thiopentone and propofol in their equipotent dose after the successful beginning of midazolam and fentanyl in facilitating LMA installation. It is our working hypothesis that intravenous thiopentone, in comparison to intravenous propofol, greatly improves the environment in which the LMA is inserted. The purpose of this research was to compare thiopentone to propofol as a means of inducing anesthesia for LMA implantation after an appropriate induction with midazolam and fentanyl.

Materials and Method

From February 1, 2022, to January 31, 2023, researchers in the Anaesthesiology and Critical Care Department of Holy Family Red Crescent Medical College in Dhaka used a randomized, double-blind, parallel design to compare outcomes. One hundred and twenty patients of both sexes between the ages of 18 and 60 undergoing various elective minor surgeries (45 minutes) under general anesthesia were included in the study. These patients were classified as American Society of Anesthesiologists (ASA) grade I and II patients with Mallampati scores (MPS) of 1 and 2.

Patients with MPS 1 and 2 between the ages of 18 and 60 who were having elective minor procedures (less than 45 minutes) under general anesthesia were included in the research. Patients with cardiovascular, hepatic, renal, and upper respiratory tract infections, expected difficult airways, and pregnant cases were excluded, as were persistent smokers, hypertensive patients, patients with chronic obstructive pulmonary disease, bronchial asthma, diabetes, and medication allergies.

A total of 200 patients who matched the inclusion criteria were randomly assigned to one of two groups (A or B) using a computer-generated random selection of 40-person blocks for each group. Group A (propofol) and Group B (placebo) were secretly assigned using thick, sealed envelopes (thiopentone).

Results

Table-I shows age distribution of the patients where 55% were belong to 50-60 years age group. followed by 20% belong to >60 years age group and 25% belong to <50 years age group.

Table-I: Age distribution of the patients

Age group	%
<50 years	25%
50-60 years	55%
>60 years	20%

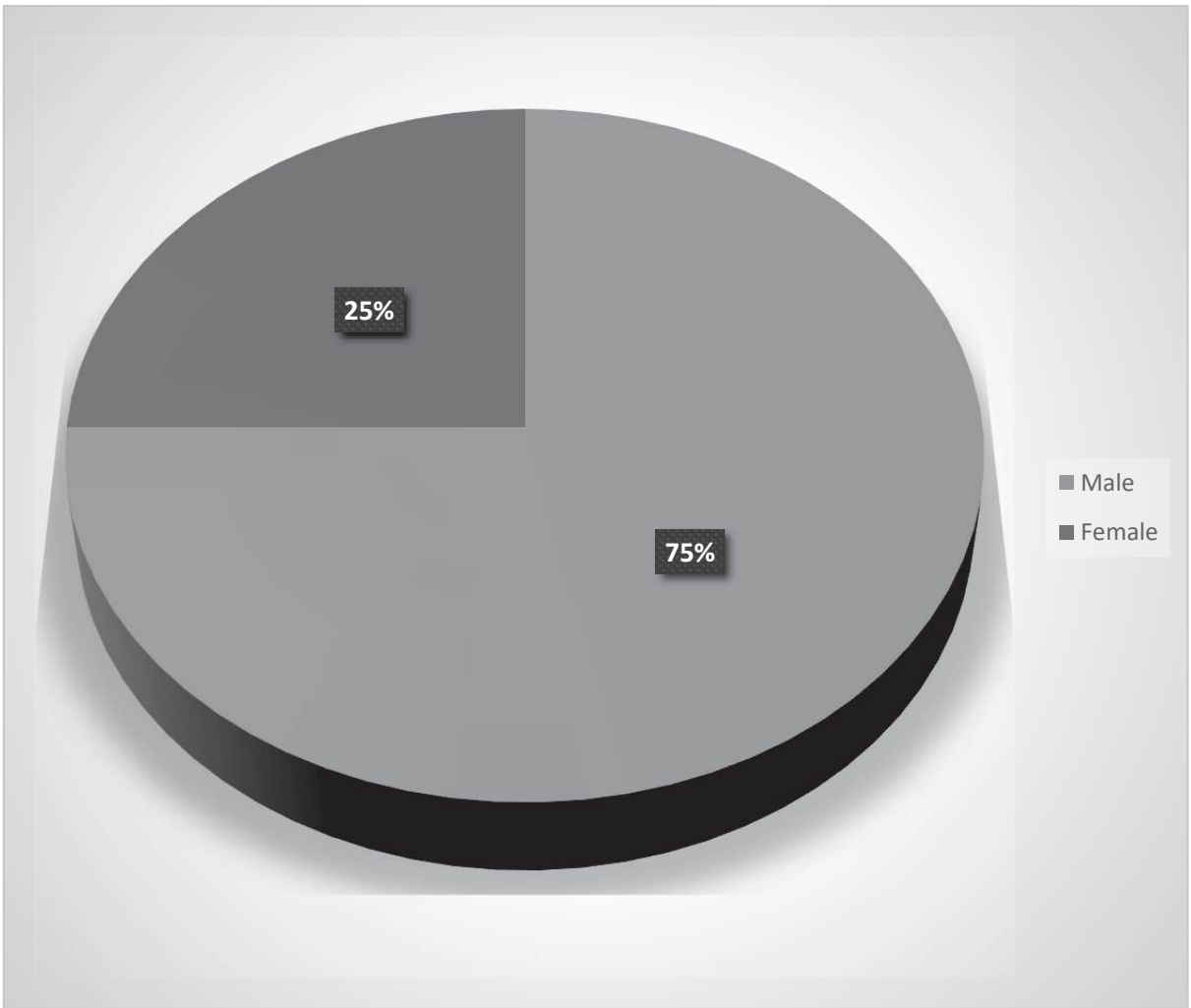

Figure-1: Gender Distribution

Figure-1 shows gender distribution where majority were male 75%

Table-II reveals LMA insertion conditions between the two groups where the number of patients with complete jaw opening was higher in group A (75%) than in group B (60%). However, no statistically significant distinction was documented between the groups ($p < 0.05$). The LMA insertion was accessible in 95% of patients in group A. While in group B, 30% of patients presented difficulty in LMA insertion. The difference in ease of LMA insertion was significant between the groups. Only 2% patient in group B experienced mild coughing, whereas 4% in group A and 10% in group B experienced mild gagging. Laryngospasm was not observed in any of the patients. Mild movements were found in 10% and 13% patients in group A and group B, respectively. Except for ease of insertion, other LMA insertion conditions showed no significant difference between the two groups.

Table-II: LMA insertion conditions between the two groups

Conditions of LMA insertion	Grade	Description	Group A, %	Group B, %	P value
Jaw opening	3	Full open	75%	60%	0.54
	2	Partial open	25%	40%	
	1	Nil	0	0	
Ease of insertion	3	Easy	95%	70%	0.029
	2	Difficult	5%	30%	
	1	Impossible	0	0	
Coughing	4	Nil	100%	98%	0.98
	3	Mild	0	2%	
	2	Moderate	0	0	
	1	Severe	0	0	
Gagging/swallowing	4	Nil	96%	90%	0.33
	3	Mild	4%	10%	
	2	Moderate	0	0	
	1	Severe	0	0	
Laryngospasm	3	Nil	100%	100%	
	2	Partial	0	0	
	1	Severe	0	0	
Partial movement	4	Absent	90%	87%	0.95
	3	Mild	10%	13%	
	2	Moderate	0	0	
	1	Severe	0	0	

Table-III shows Time taken for LMA insertion between two groups where the mean time taken for LMA insertion was significantly higher in group B than in group A ($p < 0.001$).

Table-III: Time taken for LMA insertion between two groups

Time taken for LMA insertion (in seconds)	Group A, mean ±SD	Group B, mean ±SD	P value
	14.20 ± 3.10	16.17 ± 2.4	<0.001

Table-IV shows overall responses to LMA insertion. In terms of overall conditions of LMA insertion, no statistically considerable difference was found between the groups ($p > 0.05$). In group A, no undesired responses occurred in 90% of patients compared to 86% in group B. Mild to moderate responses were encountered more in group B.

Table-IV: Overall responses to LMA insertion

Response grades	Group A (n = 100)	Group B (n = 100)	P-value
Nil	90%	86%	0.97
Mild	6%	9%	
Moderate	4%	5%	
Severe	0	0	

Table-V explains Sequential haemodynamic changes during LMA insertion where the baseline and pre-medication (pre-LMA) heart rates in the groups were similar (p-value for t-test > 0.05). There was a decline in heart rate at the post-LMA at one minute, two minutes, and three minutes in both groups, although the reduction was noticeably greater in group A. The Student's unpaired t-test showed that the decline in heart rate in group A was highly significant than in group B at one, two, and three minutes post-LMA ($p < 0.001$). Systolic, diastolic, and mean blood pressures were similar across the two groups, with a p-value of 0.05 or more at baseline and following pre-medication. However, after LMA, there was a decrease in systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean blood pressure (MBP) in both groups, with the cases of group A experiencing a greater decline. The fall in SBP, DBP, and MBP at post-LMA at one minute, two minutes, and three minutes was statistically highly significant ($p < 0.001$).

Table-V: Sequential haemodynamic changes during LMA insertion

Variables	Group	Baseline	Pre-LMA	Post-LMA (1 min)	Post-LMA (2 min)	Post-LMA (3 min)
Heart rate	Group A#	81.66 ± 10.46	82.3 ± 8.06	74.17 ± 6.9	73.33 ± 5.93	70.87 ± 6.01
	Group B#	85.76 ± 8.09	85.52 ± 7.96	86.97 ± 6.80	85.09 ± 6.13	85.15 ± 7.42
	P-value	0.15	0.08	<0.001	<0.001	<0.001
SBP	Group A#	122.43 ± 9.68	116.8 ± 9.25	109.3 ± 7.41	100.12 ± 8.59	95.61 ± 9.47
	Group B#	122.52 ± 7.85	117.77 ± 8.7	117.07 ± 6.01	115.02 ± 7.28	111.98 ± 7.27
	P-value	0.96	0.63	<0.001	<0.001	<0.001
DBP	Group A#	80.15 ± 8.42	73.74 ± 8.22	69.58 ± 7.56	63.17 ± 7.62	61.35 ± 6.54
	Group B#	77.29 ± 7.12	75.02 ± 7.78	73.31 ± 7.31	71.96 ± 5.61	70.01 ± 6.02
	P-value	0.11	0.48	<0.001	<0.001	<0.001
Mean BP	Group A#	93.13 ± 8.19	88.94 ± 6.87	82.38 ± 8.24	75.7 ± 6.18	72.31 ± 5.8
	Group B#	91.84 ± 5.93	90.06 ± 6.28	88.84 ± 4.5	85.97 ± 5.14	84.02 ± 7.51

Discussion

When administering general anesthesia, intubation of the trachea with the use of a tube is standard practice and provides a safe means of maintaining airway patency. In spite of this, both laryngoscopy and tracheal intubation trigger a stress reaction, manifesting as a reflex increase in sympathoadrenal activity. As a consequence, cardiac patients have potentially fatal dysrhythmias and elevations in heart rate and blood pressure. When complete intravenous anesthesia and volatile induction are employed for brief surgical procedures, face masks are often used throughout induction and maintenance. However, this method requires patients who are breathing on their own to retain the mask in place at all times.

LMA began to gain popularity as an alternative to endotracheal intubation and facemask because it results in fewer haemodynamic variations, is linked to a negligible increase in intraocular pressure, reduces the likelihood of sore throat, and frees the anesthesiologist's hands to perform other crucial tasks during surgical procedures. Surgery performed in a childcare setting may drastically save expenses in underdeveloped nations[7]. With LMA, patients had fewer problems and airway morbidity, leading to earlier discharges and shorter hospital stays[8]. This research aimed to compare and contrast the effectiveness of intravenous (IV) midazolam and intravenous (IV) fentanyl in preparing two groups of patients for LMA insertion under the prescribed pharmacological conditions.

Age, sex, weight, ASA and body mass index, as well as mental and physical wellbeing, were similar across the two groups. Multiple additional research found results that were consistent with this one[5,9,10].

In the present investigation, more patients in group A had normal jaw movement than in group B. The difference, nevertheless, was not statistically significant ($p > 0.05$). These findings are consistent with those of another research that evaluated the circumstances of LMA installation in 70 patients who were not premedicated with midazolam, alfentanil, thiopentone, and propofol20. Despite the lack of statistical significance for complete jaw opening, the clinical importance of the data is paramount 11. Moreover, we found that there were substantial differences in the degree of difficulty in inserting the LMA across the groups. When comparing groups A and B, insertion of the LMA was much easier in group A (p 0.05). Many additional studies have shown the same results[12,13]. We found that the patients in our research group B were more likely to exhibit symptoms such as coughing, choking, and patient movement. Another research had similar experiences[4]. Coughing, choking, and laryngospasm were more common in group B of a research comparing the effects of midazolam, alfentanil, and thiopentone for LMA placement to those of midazolam, alfentanil, and propofol. Other studies corroborate the fact that these interpretations were not statistically significant[13]. In our investigation, laryngospasm never occurred. Our findings are supported by another research that compared patients in group A without lignocaine spray to those in group B who were given the spray to make it easier to install the LMA. Patients in Group B required significantly longer (16.15 2.4) to implant an LMA (p 0.001) than those in Group A[11]. Similar patients in group A and group B had day surgery with a mean interval of 16.6 (11.6) and a mean interval of 18.2 (12.8) seconds, respectively[14]. However, there was no statistically significant difference between the two groups.Group A had a higher rate of successful LMA insertion on the first try when combined with midazolam, whereas group B had a lower rate of successful LMA insertion on the first try[15]. These findings were very similar to our own research.During and soon after LMA installation, Talwar et al. analyzed the hemodynamic changes in patients who were comparable to those in either group A or group B in the current investigation[12]. Consistent with our results, they found that after implantation, heart rates and arterial blood pressure decreased in both groups, with a greater decrease in individuals in group A compared to group B[12]. Another research found that post-LMA heart rates and arterial blood pressures (systolic, diastolic, and mean) decreasedv after one minute, two minutes, and three minutes, even though baseline heart rates were similar across the two groups. Group A saw more reduction than Group B did. These results are very significant ($p=0.0001$) and corroborate the findings of our study[16].

Conclusion

Patients in group A who were given propofol had a much easier time inserting their LMAs. Less time is needed for the induction compared to the thiopentone group B patients. Group A patients, however, saw a decline in haemodynamic measures when compared to Group B patients. Midazolam, fentanyl, and propofol seem to be slightly superior than midazolam, fentanyl, and thiopentone for facilitating insertion of the LMA owing to their enhanced ease of insertion, shorter time needed for insertion, and better recovery profiles.

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