

A Comparative Study of Bolus Dose of Propofol with Equipotent Dose of Thiopentone Facilitating LMA Insertion

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Abstract

Objective: The LMA (Laryngeal Mask Airway) is a method to offer endotracheal intubation while avoiding the dangerous side effects of visualization of cords and forcing them apart. The present study is designed to compare the conditions to facilitate the insertion of LMA with the two most used agents Thiopentone and Propofol after adequate pre-induction doses of midazolam and fentanyl.

Materials and Methods: A study conducted on 60 patients of either sex belonging to 18 to 50 years of age and ASA grade 1 who were to undergo elective surgeries. Patients were randomly divided into two groups. Both groups received pre-induction doses of Glycopyrrolate (0.2mg), Midazolam (0.5mg/kg) and Fentanyl (1.5mg/kg), and were induced with either Propofol (3mg/kg) or Thiopentone (6mg/kg) to facilitate insertion of LMA.

Result: Conditions facilitating LMA insertion and ease of insertion were significantly greater in Propofol group when compared to Thiopentone group. The difference was statistically significant ($p < 0.0001$).

Conclusion: In view of better ease of insertion, lesser time taken for insertion and better recovery profiles associated with Propofol seems to be superior to Thiopentone in LMA insertion.

Keywords: Laryngeal; Propofol; Mask; Airway; Thiopentone.

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Introduction

The Laryngeal Mask Airway (LMA) is a supraglottic airway device designed by British anaesthesiologist, Dr. Archi Brain. The laryngeal mask airway is inserted blindly into the hypopharynx. When the cuff is inflated, it forms a low-pressure seal around the laryngeal inlet, permitting gentle positive

pressure ventilation.² It has revolutionized the management of patients who would otherwise have received anesthesia by the conventional face mask. It enables the anesthesiologist to have both his/her hands free. The insertion of the LMA requires the upper airway reflexes to be obtunded sufficiently, to prevent undesired patient responses like coughing,

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gagging, laryngospasm etc. If general anesthesia is used, insertion requires a depth like that necessary for insertion of an oropharyngeal airway, but not as deep as is needed for tracheal intubation.¹

Absence of motor response to a jaw thrust is a reliable method of assessing the adequacy of depth of anaesthesia for LMA insertion.³ Various induction agents and their combinations have been used to facilitate its insertion with least side effects. However, each of them has their own limitations, and none of them have evolved as a standard method for insertion of the LMA so far. Hence, the present study is designed to compare the conditions to facilitate the insertion of the LMA with the two most commonly used agents-Thiopentone and Propofol, after adequate pre-induction doses of midazolam and fentanyl.

Methods

The study was conducted at Vinayaka Mission's Medical College and Hospital Karaikal. This prospective study was conducted on 60 adults, ASA- Grade I patients, aged between 18 to 50 of either sex, posted for elective surgeries in general surgery, orthopedic, ENT and gynecology obstetric. Patients were randomly divided into two groups of 30 each. Group P - Propofol group.

Group T - Thiopentone group Ethical committee clearance from our college was taken and written informed consent was taken from all the patients.

Pre-anesthetic evaluation

Patients were visited on the previous day of surgery, and the procedure was explained to them. A detailed medical history was taken, and systemic examinations were carried out and relevant investigations were advised.

Patients under following categories were excluded from the study:

- Patients below 18 years or above 50 years of age.
- Morbidly obese patients.
- Patients with anticipated difficult intubations.
- Patients with history of drug allergy.
- History of upper respiratory tract infection within 10 days prior to surgery.
- Surgeries in prone position.
- Head and neck surgeries.
- Patient with history of chronic smoking, hypertension, COPD, bronchial asthma, DM, etc.

Basic laboratory investigations like complete haemogram, blood sugar, routine urine analysis, bleeding time, clotting time were carried out routinely in all patients. ECG and Chest X-ray was done in all patients above 40 years of age.

Premedication

All patients were pre-medicated with tablet Diazepam-5mg two hours prior to surgery.

Anesthetic Technique

On arrival at the operation theatre, an intravenous line was secured and the patient's baseline vital data were recorded using pulse oximeter (for oxygen saturation), ECG and NIBP. Both groups received Inj. Midazolam (0.05mg/kg) and Inj. Fentanyl (1.5mg/kg) along with Inj. Glycopyrrolate (0.2mg/kg) prior to induction. Exactly 3 minutes after the pre-induction dose of midazolam, during which the patient was pre-oxygenated the induction agent was administered by a second anaesthetist. The dose used were thiopental- 6mg/kg in Group T and Propofol-3 mg/kg in Group P. The induction agent was injected at a constant rate over 30 seconds. After 30 seconds, adequacy of anaesthesia was assessed (loss of eye lash reflex). If it was found to be adequate, LMA insertion was attempted using the standard technique. If the depth of anaesthesia was inadequate, Propofol or Thiopentone was repeated in a dose of 0.25mg/kg or 0.5mg/kg respectively. If conditions for insertion of LMA were still not satisfactory, 25mg of succinylcholine was given, and patient was ventilated with 100% oxygen using face mask and LMA was then inserted. The cuff was inflated with the recommended volume of air. Following LMA insertion, anaesthesia was maintained with 66% nitrous oxide in oxygen along with halothane (0.8% to 1%). Total dose of induction agent, including any bolus required, and time taken for successful LMA insertion from time of injection of midazolam were noted. Conditions for LMA insertion were graded on a three-point scale using six variables: Jaw opening, ease of insertion, coughing, gagging, Laryngospasm/airway obstruction and patient's movements.

Statistical Analysis

Data was analyzed using students't' test for the continuous variables (age, weight and hemodynamic parameters), and Chi-square test for categorical variables (conditions for LMA insertions). A value of $p < 0.05$ was considered statistically significant.

Results

Table 1: Jaw Opening.

	Grade	Description	Group P n = 30	Group T n = 30	p Value
Jaw opening	3	Full	26	24	0.73
	2	Partial	4	6	
	1	Nil	0	0	

Jaw opening was completed in 26 patients in Propofol group compared to 24 in Thiopentone group. 4 patients in Propofol group had partial jaw opening as of 6 in Thiopentone group. But the difference between the 2 groups was not statistically significant (p value=0.73). (table 1).

Table 2: Ease of insertion

	Grade	Description	Group P n = 30	Group T n = 30	p Value
Ease of insertion	3	Easy	28	22	<0.0001
	2	Difficult	2	8	
	1	Impossible	0	0	

There was easy insertion of LMA in 28 patients in Propofol group compared 22 in Thiopentone group. It was considered difficult in 2 patients in Propofol group and in 8 patients in Thiopentone group. However, insertion was possible in all patients.

The statistical analysis by Chi Square test showed that ease of insertion was significantly better in patients who were administered Propofol compared to those given thiopentone. (p value < 0.001 extremely significant). (table 2).

Table 3: Coughing.

	Grade	Description	Group P n = 30	Group T n = 30	p Value
Coughing	3	NIL	30	29	0.31
	2	+	0	1	
	1	++	0	0	

Coughing was observed in one patient in Thiopentone group, and in none of the patients in Propofol group (p value = 0.31).(table 3).

Table 4: Gagging.

	Grade	Description	Group P n = 30	Group T n = 30	p Value
Gagging	3	NIL	29	27	0.12
	2	+	1	3	
	1	++	0	0	

Gagging occurred in 1 patient in Propofol group and in 3 patients belonging to Thiopentone group (p value = 0.12).(table 4).

Table 5: Laryngospasm and airway obstruction.

	Grade	Description	Group P n = 30	Group T n = 30	p Value
Laryngospasm and airway obstruction	3	NIL	30	26	0.12
	2	Partial	0	4	
	1	Total	0	0	

Partial airway obstruction occurred in 4 patients in Thiopentone group, but none in Propofol group (p value = 0.12).(table 5).

Table 6: Patient movements.

	Grade	Description	Group P n = 30	Group T n = 30	p Value
Patient movements	3	NIL	24	28	0.25
	2	Moderate	6	2	
	1	Vigorous	0	0	

There were moderate patient movements in 6 patients in Propofol group whereas only 2 patients had moderate movements in Thiopentone group (p value=0.25).(table 6).

Hence, it was observed that, the only parameter which was statistically significant between Propofol group and Thiopentone group was, the case of insertion of LMA. It was found to be significantly easier in patients who were administered Propofol for induction of anaesthesia.

Discussion

The laryngeal mask airway introduced in 1983 by Dr. Archie Brain has revolutionized the airway management in many patients who would have otherwise undergone endotracheal intubation or received anaesthesia through the conventional face mask.⁵ This device with its ease of use helps the anaesthesiologist by keeping his hands free for other work. It also avoids the adverse effects of endotracheal intubation. With exception of ketamine all induction drugs act on respiratory center to cause respiratory depression. This effect is most profound with Propofol and a period of apnoea is usually seen.⁸ Insertion of the LMA requires adequate mouth opening and obtundation of laryngeal and pharyngeal reflexes to a sufficient degree to avoid coughing or gagging which would otherwise make correct positioning difficult or even impossible.¹¹

A variety of agents have been used to make LMA insertion smooth, with least side effects and cost effective. Thiopentone and Propofol are two such agents used.⁶ However, both these

drugs have disadvantages when used alone. Respiratory depression and period of apnoea are most profound with Propofol.⁸ Propofol markedly reduces airway and pharyngeal reflexes which makes it the ideal and most popular drug for LMA insertion.¹² However, its cardiovascular side effects especially hypotension has been a cause for concern. Propofol is generally considered the most effective agent at blocking upper airway reflexes during direct laryngoscopy or LMA placement^[9]. It also produces less bronchospasm than Thiopentone and etomidate.⁷ Thiopentone although a cheaper alternative for LMA insertion compared to Propofol, causes coughing, sneezing, hiccoughs and laryngospasm when employed as IV anaesthetic agent. Among these, laryngospasm is the chief complication of Thiopentone anaesthesia. The causes of this laryngospasm include the direct effect of Thiopentone on inhibitory system of brain leaving behind the excitatory part, low dose and LMA insertion. Rarely bronchospasm is also seen with Thiopentone anaesthesia. Vomiting and regurgitation are more likely to occur during lighter planes of anaesthesia. An effective laryngeal reflex thus confers some protection against aspiration during such an event.

Conditions for insertion of LMA

In this study, in Group P. four patients exhibited partial jaw opening, six patients showed movements, difficulty in LMA insertion was encountered with two patients and gagging was observed in one patient. In Group T. six patients exhibited partial jaw opening Coughing, gagging and partial airway obstruction were seen in one, three and four patients respectively. Three patients showed moderate movements and difficulty in LMA insertion was encountered with eight patients. It was also noted that three patients in Group P and five patients in Group T required additional dosage of the respective induction agents. This additional drug dosage requirements might have been due to the effects of lighter planes of anaesthesia. It was observed that Thiopentone group showed higher incidence of adverse effects during LMA insertion making it an unacceptable induction agent for LMA insertion. It was noticed that these adverse effects were reduced when the dose of Thiopentone was increased and when Thiopentone was supplemented with narcotics. This supplementation may however cause increased cardiorespiratory depression and delayed recovery.⁴ Laryngeal reflexes are less depressed after Thiopentone administration than equivalent dose of Propofol.

The result of our study showed that Propofol is a better choice in facilitating LMA insertion when compared to Thiopentone. There was less head movement, gagging and laryngospasm and adequate relaxation was better in Propofol group.

Conclusion

In conclusion, ease of insertion of LMA was significantly greater in patients who were induced with Propofol. The time taken for insertion was also considerably less with Propofol induction compared to induction with thiopentone. However, there was no difference in the incidence of jaw opening, coughing, gagging, laryngospasm/airway obstruction and patient movements between the two groups. The severity of undesired responses was found to be more in Thiopentone group compared to Propofol group, but they were not statistically significant. The haemodynamic parameters showed a statistically significant fall in heart rate and blood pressure in the Propofol group compared to Thiopentone group. However, these changes were not of clinical significance. Both Propofol and Thiopentone along with midazolam and fentanyl serve the purpose of insertion of the laryngeal mask airway.¹⁴ However, in view of better ease of insertion, lesser time taken for insertion, and better recovery profiles associated with Propofol, a midazolam-fentanyl-Propofol combination seems to be marginally superior to a midazolam-fentanyl Thiopentone combination to facilitate insertion of the laryngeal mask airway.¹⁹⁻²⁰

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