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Original Article

LAYRYNGEAL MASK AIRWAY PLACEMENT: A COMPARISON BETWEEN PROPOFOL AND THIOPENTONE SODIUM IN THE DAY CASE SURGERY

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Abstract

Background: Laryngeal Mask Airway (LMA) placement is now considered a common airway management practice. Although there are many studies which focus on various airway techniques, research regarding difficult LMA placement is limited, particularly for anesthesiologist trainees

Objective: To assess the effectiveness of Laryngeal Mask Airway (LMA) placement after induction with propofol or thiopentone in one hundred day case urological patients.

Methods: An analytical, non interventional, cross sectional comparative study. Patients were divided into Group A (Propofol Group n=50) received propofol (2.5mg/kg) and Group B (Thiopentone group n=50) received thiopentone sodium (4-6 mg/kg) IV. Management of anaesthesia was identical in both groups. Standard monitoring was including NIBP, pulse oxymetery and ECG was done. Co-induction with done with midazolam 0.1 mg/kg body weight. LMA was inserted after adequate level of anaesthesia and then assessed. The presence of gaging, coughing, laryngospasm and movement were noted , recorded by a colleague anaesthetist who entered the induction room during the two minutes assisted ventilation phase and was not aware of the type of induction agent. Statistical analysis was done by using SPSS version 10. The mean and standard deviation was calculated for age. Frequency of subjects was calculated for gender Lund and stovner assessment scheme. The p value of less than 0.05 was considered significant.

Results: Thiopentone was associated with an adverse response in 76% of patients, compared with propofol in 26% ($p<0.01$). Head movement, Laryngospasm, inadequate jaw relaxation were more common using thiopentone ($p<0.05$). The quality of anaesthesia according to patients was significantly higher in the propofol group (Group A, 80%) than in thiopentone group (Group B, 30%).

Conclusion: Adverse responses in Group A were less than Group B. Propofol, therefore is superior to thiopentone as an induction agent for laryngeal mask airway.

Key words: Propofol, thiopentone, midazolam, airway, laryngeal mask.

Introduction

Laryngeal Mask Airway (LMA) has been safely and effectively used in spontaneous and controlled ventilation originally described by Brain. It has been proposed as airway for general anaesthesia and an aid in the management of difficult air way. 1 It provides and maintains a seal around laryngeal inlet for spontaneous ventilation and allows controlled ventilation. It is better tolerated during recovery thus reducing the possibility of airway obstruction. The LMA is useful in serving as emergency airway in the patients in whom lungs cannot be ventilated using a bag or conventional mask and whose trachea cannot be intubated2. It can be used as intubator (conduit) for intubating tracheal stylet or fibre optic bronchoscope 3 .The most common causes of poor LMA placement are inadequate anaesthesia or inadequate relaxation, pharyngeal or laryngeal muscle spasm, failure to negotiate 90 degrees turn from the posterior pharynx to the hypo pharynx. In 8-33% of LMA placement more than one attempt is required4.

Common agents such as sevoflurane, propofol or thiopentone are used for placement of LMA5 . Propofol is considered the drug of choice for the insertion of the laryngeal mask air way during induction because of its depressant effect on airway reflexes , rapid onset of action and low risk of nausea and vomiting. Propofol has got rapid smooth recovery with no hangover effect due to its rapid, extensive distribution and rapid metabolic clearance. However propofol is costly and is associated with several adverse effects like hypotension, respiratory centre depression and pain at injection site and it can result in excitatory patient movement. These features make propofol especially appropriate for day case anesthesia6. It is reported that pharyngeal and laryngeal airway reactivity is more effectively depressed with propofol than by thiopentone. Thiopentone increases airway irritability because of the relatively greater depressant effect of the drug on the sympathetic than on the parasympathetic reflex arch. Successful insertion with thiopentone would require either adequate reflex suppression or deeper plane of anesthesia7. Midazolam and thiopentone combination

provide satisfactory condition for LMA insertion. Midazolam does not enhance air way reactivity and has synergistic effect on thiopentone. The hypnotic action is potent but has no analgesic effect. Consciousness is usually regained in 5-10 minutes. Myocardial contractility is depressed ,so profound hypotension may occur in patients with hypovolemia or cardiac disease8. Thiopentone sodium decreases ventilator drive as a result of reduced sensitivity of the respiratory centre to carbon dioxide and hangover effect is observed along with slow early recovery. Although it is cheaper than propofol but takes longer to recover therefore propofol is preferred over thiopentone for day surgery. Due to this quality propofol has gained wide spread popularity and has become the drug of choice for induction of anesthesia.9 Although there are several studies comparing a vital capacity induction with thiopentone sodium and propofol for induction anaesthesia during LMA insertion in adult, but few studies have compared thiopentone sodium and propofol on the basis of Lund and stovener scheme for assessment of LMA insertion10. This study compared propofol and thiopentone sodium as induction agent for short urological procedures to select a better induction agent for LMA insertion at Pakistan Institute of Medical Sciences.

Methodology:

The study was conducted at the department of anaesthesiology, Pakistan Institute of Medical Sciences, Islamabad after obtaining written informed consent from participants. It was a cross sectional comparative study to evaluate the ease of LMA placement by propofol anaesthesia compared to thiopentone anaesthesia on the basis of Lund and stovner assessment scheme.

A total of 100 patients both male and female undergoing day case urological procedures with ASA I, II and III and aged between 13 to 80 were included. Patients with pharyngeal pathology, anatomical abnormality of mouth, pharynx and larynx, sore throat, high airway resistance, Mallampati class 3/4 and those with high risk of aspiration were excluded. Also patients with renal or liver dysfunction, breast feeding mothers, smokers, and patients with drug allergy, low pulmonary compliance and operation duration exceeding 60 minutes were excluded.

Patients were allocated randomly to two equal induction groups. Group A (n=50) received propofol and group B (n=50) received thiopentone sodium. All patients received 0.03 mg/kg I.V midazolam as premedication before the operation. Haemodynamic parameters were recorded before anaesthesia was given. Patients breathed 100% O2 via a face mask for 3 minutes before induction. Group A received propofol 2.5 mg/kg slow I.V in titrating dosage and Group B received thiopentone sodium 5 mg/kg in 2.5% solution slow I.V in titrating dosage till the loss of consciousness. Heart rate and blood pressure of the patients were measured before and after induction and also immediately and 5 minutes after LMA insertion. Anaesthesia was maintained with sevoflurane (2% end tidal concentration) in nitrous oxide 50% and O2 50% mixture, patients were kept on spontaneous ventilation. The LMA was inserted after adequate relaxation of jaw and mask was inflated with 25-30 cc air. LMA insertion conditions were graded recording and using variables like is Jaw opening, ease of LMA insertion, coughing, gaging, laryngospasm, airway obstruction and patient movements. The overall insertion conditions were assessed Lund and stovner. An ethical approval was taken from PIMS Islamabad.

Figure 1: Level of reaction from patients.

Excellent	**Insertion easy, no reaction from patient**
Good	Insertion resulting in slight coughing or moving
Poor	Insertion possible but resulting in more marked patient response

To control immediate post-operative pain , Ketorolac 0.5 mg/kg was given in a loading dose up to 30 mg I.V introperatively. When patient regained consciousness and responded to verbal commands, laryngeal mask was removed. Score for both the groups was calculated. Data was analyzed by using SPSS version 10. The mean and standard deviation was calculated for age. Percentage of subjects was calculated for gender . Chi-square test was used to compare frequency of different categories of assessment between two groups. The P-value of less than 0.05 was accepted to be significant.

Results:

There was no significant difference between the groups with respect to age, sex, weight and ASA grade distribution (Table 1).

Table 1: Difference between Propofol and Thiopentone

	Propofol n=50 (Group A)	Thiopentone n=50 (Group B)
Age (years)	33 ± 12.43	37.53 ± 13.2
Gender (Male/Female)	35/15	38/12
Weight (kg)	67.4 ± 14.7	75.4 ± 17.6

Table 2: Urological procedures and induction agent used for LMA.

	Propofol n=50, Group A	Thiopentone Group B
Cystourethroscopy	22	18
Litholepexy	2	1
Optical urethrotomy	5	5
D.J Stenting	4	4
Orchiopexy	3	2
TURBT*$_1$	1	3
Hydrocele excision	2	3
Varicocele excision	2	2
Stent removal	1	1
Urethral Stricture Dilatation	2	0
Ureterorenoscopy	3	1
Hypospadias Repair	2	0
Vesicolithomy	1	1
TURP*$_2$	2	2
Radical Prostatectomy	1	0

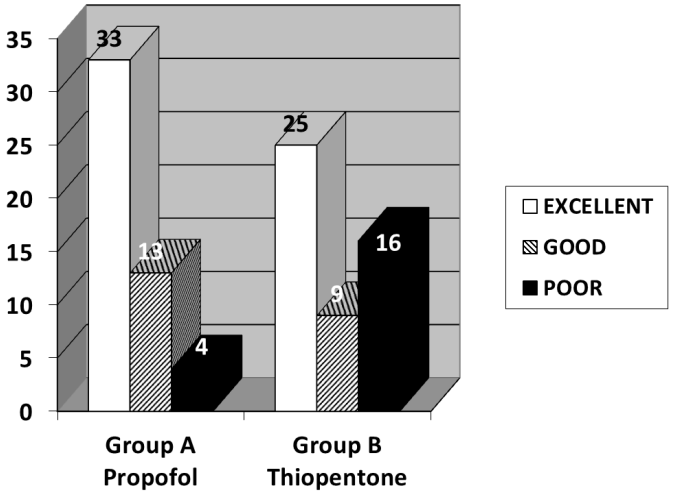
*1 Transurethral resection of urinary bladder tumour.
*2 Transurethral resection of prostate.

Induction was more rapid with IV propofol. The mean time (in seconds) for induction group A was 41.7 ± 10.1 (S.D) and in Group B, it was 51.1 ± 10.4 (S.D) seconds (P=0.002).
There was no difference in the mean time to Laryngeal Mask Airway insertion between the groups. The mean time (in seconds) for laryngeal Mask Airway insertion in Group A was 16.6 ±11.6 (S.D.) and in Group B, it was 18.2 ± 12.8 (S.D) seconds (P=0.65). Insertion of LMA was assessed. Insertion of LMA was assessed as poor in 16 (32%) patients (P=0.0001) in thiopentone Group and 4 (8%) in propofol group . Superior conditions for LMA insertion were observed in propofol group compared with thiopentone group (P=0.0001). Figure 2 shows overall assessment of LMA insertion.

Table 3: Assessment of LMA insertion

Assessment	Propofol n=50 Group A	Thiopentone n=50 Group B	P Value
Excellent and satisfactory	46 (92%)	34 (68%)	0.0001
Poor	4 (8%)	16 (32%)	0.0001

Figure 2: OVERALL ASSESSMENT OF LMA INSERTION



No patient in the propofol group (Group A) required treatment for laryngospasm. Fewer patients (26%) in the propofol group responded to LMA insertion than in the thiopentone group (76%), p<0.01 There was less head movement (10%) and laryngospasm (8%) in the propofol than in the thiopentone group (34% p<0.05, and 30% p<0.05 respectively).
No patient had inadequate jaw relaxation in Group A and this was less than the 12 % in the Group B (p<0.05). Patient comfort was significantly higher in the propofol group (80%) than in the thiopentone group (30%) (p<0.01).

Table 4: Comparison between two groups and their assessment

Assessment	Propofol n= 50 Group A	Thiopentone n=50 Group B	P Value
Overall Response	13 (26%)	38 (76%)	<0.01
Head Movement	5 (10%)	17 (34%)	<0.05
Laryngospasm	4 (8%)	15 (30%)	<0.05
Inadequate Jaw Relaxation	0 (0%)	6 (12%)	<0.05
Cough	3 (6%)	9 (18%)	NS
Limb Movement	10 (20%)	9 (18%)	NS
Patient Satisfaction	40 (80%)	15 (30%)	<0.01

Discussion:

Various LMA variants are currently being used in clinical practice like ,Classical LMA , Intubating LMA ,ProSeal LMA and Reinforced LMA 11. Intravenous induction with

either a single or two drug method can be used in combination with local anaesthetic, muscle relaxant or an inhalational agent. Propofol, Thiopentone, Etomidate, Lignocaine and Thiopentone, Ketamine with Succinylcholine or Midazolam have been found to have markedly improved insertion conditions11.

This study compared LMA insertion conditions using either propofol or thiopentone. Thiopentone has been assessed for its usefulness in aiding LMA insertion but produces less satisfactory conditions than propofol12. The Intravent LMA manual specifically recommends propofol for induction of anaesthesia. However there may be problems related to the use of propofol including the relatively high cost of the drug.

Successful insertion of the LMA requires depression of upper airway reflexes. The sequelae of gagging, laryngospasm or coughing can be avoided by succinylcholine, increased dose of induction agent or sedative premedication midazolam, fentanyl and midazolam-alfentanil. The problems with these techniques are unpleasant muscle pain following succinylcholine or cardiorespiratory depression and delayed recovery where narcotics or greater dose of induction agent is given. Propofol is particularly well suited for the insertion of the LMA because of its greater depressant effect on the airway reflexes than that of thiopentone. Brown et al9 compared propofol with thiopentone and found that thiopentone was associated with higher incidence of gagging on LMA .

Scannlon et al13 compared the conditions for LMA insertion after either propofol (2.5mg) or thiopentone (5mg). They showed that thiopentone was associated with higher incidence of adverse responses (76%) than was propofol (26%). It is suggested that thiopentone increases airway irritability because of relatively greater depressant effect of the drug on the sympathetic than parasympathetic reflex arch. It is clear that the successful insertion with thiopentone would require either adequate reflex suppression or deeper plane of anaesthesia. In our study co induction was done with midazolam 0.1mg/kg while Group A was given propofol 2.5 mg/kg and Group B was given thiopentone sodium 4-6 mg/kg body weight to attenuate airway reflexes while ensuring rapid recovery and early ambulation. The observations of Nimmo et al 14 strongly support the supposition that the use of propofol combined with opioids for induction is superior to thiopentone.

Propofol has a high metabolic clearance rate, approximately ten times greater than that of thiopental15. The patient rapidly regains consciousness after discontinuation of the propofol infusion and may be discharged with minimal residual sedation. In a study by Priya et al81 excellent conditions were obtained in a significantly greater number of patients in propofol group (P= 0.02). Analysis of the total scores for conditions for laryngeal mask airway insertion indicated that conditions were superior in propofol group. In our study excellent and satisfactory conditions were 92% in propofol group and 68% in thiopentone group (P=0.0001). There was less head movement, gaging or laryngospasm in the propofol group and adequate relaxation was better in propofol group. These findings are comparable to other studies16.

Scannlon et al13 compared equipotent doses of propofol and thiopentone and reported that thiopentone is associated with adverse responses in 76% as against 26% for propofol group. Taha et al17 obtained excellent intubating conditions in 84% of propofol group and 50% of thiopentone group patients (P<0.05). Hashimoto et al18 found that succinylcholine (0.5mg/kg) was sufficient to provide satisfactory LMA insertion conditions with thiopentone. In another study Bandari et al19 have investigated the conditions for LMA insertion in 40 patients by application of topical lidocaine on posterior pharyngeal wall before thiopentone induction. The topical lidocaine group had significantly fewer poor/unacceptable conditions for LMA insertion (P<0.05). Thiopentone as a single agent produces poor airway conditions for LMA insertion

Brown et al9 assessed conditions for insertion of the laryngeal mask airway following induction of anaesthesia with either propofol 2.5mg/kg or thiopentone 4mg/kg in 80 patients premedicated with diazepam 10 mg. The scoring of conditions for LMA insertion showed a significantly higher incidence of gaging in the thiopentone group (P<0.01) but there was no significant difference in the incidence of coughing (P=0.30). In our study the incidence of coughing was also statistically not significant. Cough was encountered on average of 0-13.5 % in a group receiving propofol in another study by Smith et al15. Laryngospasm was seen in 8% patients in propofol group and 30% in thiopentone group.

In a study by Bahk et al20, even after premedication with diazepam and mask ventilation with oxygen, N2O and isoflurane (2%) for two minutes, thiopentone (5 mg/kg) resulted in more frequent laryngospasm and even failure (incidence of 11%) to insert LMA because of inadequate relaxation. Comparison between propofol and thiopentone has shown that the thiopentone (4 mg/kg) group shows a much more frequent incidence of gagging as propofol has relaxant effect on jaw muscles.

Our study has shown that no patient in propofol group had inadequate jaw relaxation as against 6(12%) in thiopentone group (P<0.05). These findings are consistent with those by Scannlon et al13 who reported no problem in jaw opening with propofol. In our study analysis patient satisfaction was 80% in propofol group as compared to 30% in thiopentone group. These observations are comparable to findings reported by other studies 15

It is concluded that propofol is a better choice for LMA insertion. Incidence of adverse effects such as head movement, laryngospasm and cough are less as

compared to thiopentone. Adequate relaxation is better with propofol than with thiopentone.

Conclusion:

The study has shown that propofol seems to have advantages in facilitating LMA insertion and is suitable induction agent in day case anaesthesia similar to international results. Propofol has the advantages over thiopentone for its prompt recovery and low incidence of adverse effects and can be considered as a better anaesthetic agent for ambulatory short surgical procedures. The rate of recovery from anaesthesia has been shown to be an important determinant of patient satisfaction. Faster awakening will also result in cost saving from more efficient utilization of the operating room. This likely benefit of speedy clear headed recovery may outweigh the concern about additional cost of propofol.

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