International Journal of Science and Research (IJSR)
ISSN: 2319-7064
Index Copernicus Value (2016): 79.57 | Impact Factor (2018): 7.426

Comparison of Addition of Nalbuphine or Fentanyl to Propofol for Laryngeal Mask Insertion Conditions and Hemodynamics in Patients Undergoing Short Surgical Procedures

Dr. Sweety Bhola[1], Dr. Surendra Raikwar[2]

Abstract: ***Background:*** ***Laryngeal mask airway is a non invasive supraglottic device in the management of modern general anaesthesia. The purpose of this study was to compare the laryngeal mask airway insertion conditions using either propofol-nalbuphine or fentanylas well as hemodynamic changes and side effects.*** ***Material Methods:*** ***60 patients scheduled for short surgeries were randomly allocated to receive iv either Nalbuphine or Fentanyl before induction of anesthesia with Propofol. HR and BP were measured. Assessment of LMA insertion was done using different variables. Incidence and duration of apnea were recorded.*** ***Result & Conclusion:*** ***The mean total and top up dose of propofol required was more in Group F as compare to Group N. The incidence of coughing/gagging (50%), swallowing (46.7%) and movement (33.3%) was higher in the F group, which is statistically significant (P<0.05). Laryngospasm was not seen in either group. Incidence of apnea was statistically significant (P= 0.007) between group F (73.3%) and group N (46.7%). HR and MAP changes were statistically insignificant (P>0.05) in either group. So from our study we have concluded that addition of Nalbuphine to Propofol for LMA insertion provides excellent insertion conditions with stable hemodynamics.***

Keywords: Nalbuphine, Fentanyl, Propofol, laryngeal mask airway

1. Introduction

Supraglottic airway devices are alternative to endotracheal intubation for securing airway, among which laryngeal mask airway (LMA) is the most preferred technique.[1] Laryngeal mask airway is a non invasive supraglottic device which is less stimulating than the tracheal intubation as visualization of cords and entry into larynx is not required.[2]Deep level of anesthesia with blunting of airway reflexes is very important for safe insertion of LMA as, inadequate anesthesia can cause coughing/gagging, laryngospasm, and may lead to desaturation, adverse haemodynamic changes and regurgitation/aspiration.[3, 4] Therefore, the optimal condition for LMA insertion mandates a munificent use of an anaesthetic agent for induction. Propofol due to its depressant action on upper airway reflexes, is the most commonly used induction agent for LMA insertion.[5, 6] Propofol, when used alone often exceeds 2.5 mg/kg which causes cardiorespiratory depression and also apnoea, hypotension, excessive patient movement and laryngospasm. So, various adjuvants such as fentanyl, dexmedetomidine, ketamine etc were used along with propofol for LMA insertion.[7, 8].

The purpose of this study was to compare the laryngeal mask airway insertion conditions using either propofol-nalbuphine orpropofol- fentanyl combination in surgical procedures when given intravenously as well as hemodynamic changes and side-effects if any will occur.

2. Material and Methods

After approval from the Institutional Ethics Committee and informed written consent from patients, the present study was carried out in the Department of Anaesthesiology, Gandhi Medical College & associated hospitals (Hamidia and Sultania), Bhopal during period from January to october 2018.It was Randomized, comparative, Prospective study.60 patients of ASA class I and II, aged between 20-55 years, of either sex (M & F), scheduled for elective day case surgeries, like hernia repair, biopsies, post burn plastic flap, hydroceles, & other short surgeries, under general anaesthesia with spontaneous breathing using a classic laryngeal mask airway (cLMA) were randomly (with the help of computerized system) allocated into 2 groups (n=30);

- **Group N**: Propofol 2–2.5 mg/kg with Nalbuphine 0.2 mg/kg
- **Group F:** Propofol 2–2.5 mg/kg with Fentanyl 2mcg/kg.

Inclusion Criteria: ASA grade I & II patients, age 20–55 years, mouth opening ≥ 2.5

Exclusion Criteria: Known allergy to fentanyl, nalbuphine or propofol. Any pathology like URTI, seizures, neuromuscular disease, cardiovascular pathology, hepatic or renal disease, long surgery (more than 2 h), any pharyngeal pathology (e.g. abscess, haematoma), patients at the risk of aspiration (hiatus hernia, pregnancy, fullstomach), morbid obesity, etc.

NBM at least 6hrs prior to surgery and patients received aspiration prophylaxis preoperatively with i/v on densetron 0.08 mg/kg and i/v ranitidine 1mg/kg. Premedication done with i/v 0.04 mg/kg midazolam & glycopyyrolate 0.01mg/kg.The monitored parameters were heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial blood pressure (MAP), respiratory rate, end tidal CO2 (ET CO2) and oxygen saturation. These parameters were recorded at: baseline value, before induction of anesthesia and after cLMA insertion at 1, 5, 10 and 15 min then after every 15 mins till the end of surgery. Then according to group assigned

drugs were given i/v over 10 secs i.e**. Group N:** Nalbuphine 0.2 mg/kg and **Group F:** Fentanyl 2mcg/kg. This was followed immediately by propofol 2-2.5 mg/kgi/v over 15 sec. If required, further incremental dose of propofol 0.5 mg/kg was given every 30s until loss of consciousness and loss of eyelash reflex occur. Insertion of LMA was performed 60s after injection of propofol after ensuring unconsciousness and jaw relaxation of patients. Patients were given additional bolus dose of propofol 0.5 mg/kg on first unsuccessful attempt. Insertion was tried to a maximum of 3 attempts then endotracheal intubation was carried out. However, the conditions during laryngeal mask airway insertion were only graded at the first attempt. Once the cLMA was successfully placed, patients were kept on spontaneous respiration. If apnea occurred (absence of respiration for 30s), ventilation was manually assisted through cLMA with 100% oxygen to maintain the arterial oxygen saturation above 95% until regular spontaneous respiration resumed. Anaesthesia was maintained with 1–2% of sevoflurane, 60% O2 and 40% N2O. At the end of surgery N2O and sevoflurane were stopped patients kept on 100% oxygen and LMA was removed.

Following parameters were noted during insertion of LMA:

1. Total &Top up dose of propofol required.
2. Presence of apnoea (>30s) and its duration.

Based on six variables on a 3 point scales cLMA insertion criteria were assessed**: (Young's criteria)[11]**

1. Resistance to mouth opening: Nil/Slight/Gross
2. Resistance to insertion: Nil/Slight/Gross
3. Swallowing: Nil/Slight/Gross
4. Coughing/gagging: Nil/Slight/Gross
5. Limb/head movements: Nil/Slight/Gross
6. Laryngospasm: Nil/Slight/Gross.

The overall conditions according to modified Scheme of **Lund and Stovener** (12)

1. Excellent: No gagging/coughing, no patient movement or laryngospasm
2. Good: Mild to moderate gagging/coughing or patient movement with no laryngospasm.
3. Poor: Moderate to severe gagging/coughing or patient's movement with no laryngospasm.
4. Unacceptable: Severe gagging/coughing or patient movement or laryngospasm.

Statistical Analysis: Patient's characteristics and parameters were analysed using SPSS software (version 15.0, SPSS, New York, USA). Variables are expressed as means±SD, percent and number (proportion) or median. The difference between the study group's data was performed using the Student's t-test for parametric data and Chi-square test for nonparametric data. $P < 0.05$ was considered statistically significant.

3. Observation

Table 1: Demographic Data of Patients in Two Groups

Parameter	Group N	Group F	P Value
AGE (20-55 Yrs)	33.8 ±5.87	34.9 ± 5.4	0.26
SEX (M/F)	16/14	13/17	0.29
Height (cm)	161 ± 1.34	163 ± 1.4	0.13
Weight (kg)	57.10 ± 7.99	55.23± 6.90	0.17
ASA Grade (I/II)	13/17	18/12	0.28
Duration of surgery (mins.)	75±8.4	79± 11.6	0.12

Data are expressed as means±SD or number (proportion)

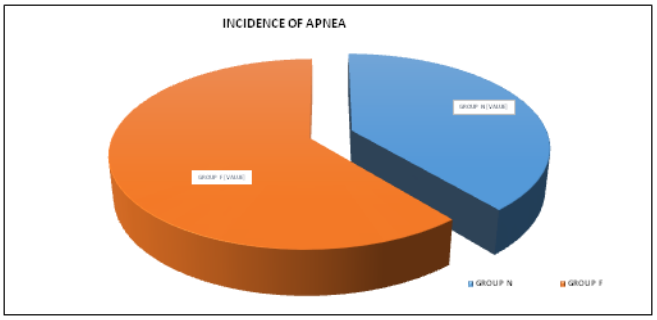
Table 2: conditions during LMA placement in two groups

LMA placement conditions	Group N	Group F	P Value
Resistance to mouth opening- Nil/Slight/Gross	29/1/0 (3.3%)	28/2/0 (6.7%)	0.31
Resistance to placement- Nil/Slight/Gross	28/2/0 (6.7%)	25/3/1 (13.3%)	0.24
Coughing or Gagging- Nil/Slight/Gross	22/7/1 (26.7%)	15/13/2 (50%)	0.018
Swallowing- Nil/Slight/Gross	26/4/0 (13.3%)	16/14/0 (46.7%)	0.017
Movement - Nil/Slight/Gross	27/3/0 (10%)	20/10/0 (33.3%)	0.007
Laryngospasm - Nil/slight/gross	0/0/0	0/0/0	NS

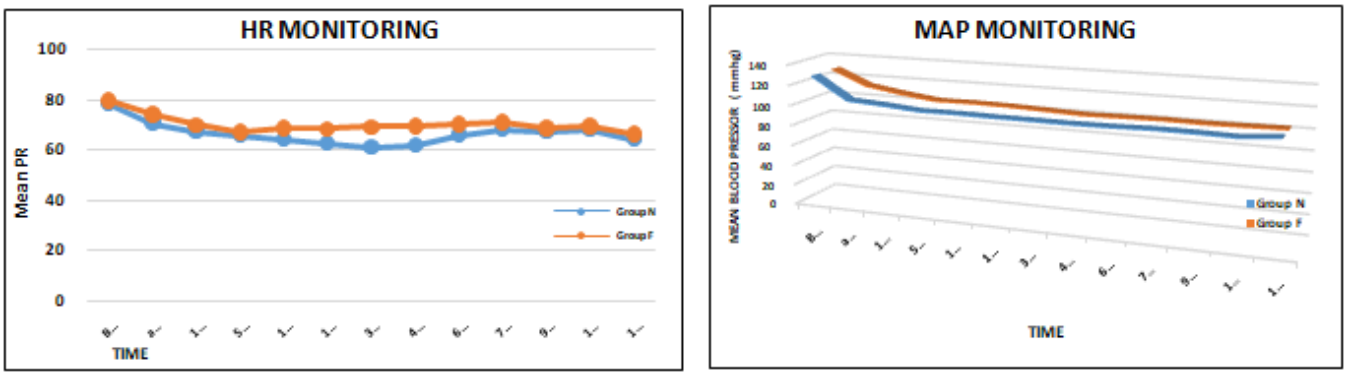
(Values are number or median).

Table 3: Showing dose of propofol and incidence of apnea and its duration

Parameter	Group N	Group F	P Value
Mean total dose of propofol (mg)	150.22 ± 17.18	160.37 ± 15.75	0.002
Topup dose of propofol requierd in patients	6 (20%)	17 (56.7 %)	0.003
APNEA	14 (46.7%)	22 (73.3%)	0.007
Apnea duration (sec)	33.76 ± 2.58	51.67 ± 12.28	0.008



Graph 1: Pie diagram showing comparison of incidence of apnea in study groups



Graph 2: Line diagram showing hemodynamic variation in two study groups

4. Result

Demographic data were comparable in both the groups and the difference was not statistically significant (P>0.05) [Table1]. The mean total dose of propofol required in Group N was 150.22±17.18 mg and in Group F 160.37±15.75mg. The number of patients requiring top up dose of propofol were more in Group F 17 (56.7%) as compare to Group N 6 (20%). Table 3 shows statistically significant difference (P = 0.007) in the incidence of apnea between the two groups, being 73.3% in group F higher than group N 46.7%.The mean duration of apnea was more in Group F 51.67±12.28 secs compare to Group N 33.76±2.58 secs. The difference in the mean blood pressure (MAP) and heart rate (HR) between Group N and F was statistically insignificant (P>0.05) but patients were more haemo dynamically stable with nalbuphine. Table 2 shows that the incidence of resistance to mouth opening between the two groups was statistically insignificant (P=0.31). Resistance to cLMA placement was (13.3%) in the group F, higher than group N (6.7%); however, this difference was statistically insignificant (P= 0.24).A statistically significant difference was observed between the two groups (P = 0.019) as regards coughing/gagging being higher in the F group (50%) compared to the N group (26.7%).The incidence of swallowing was significantly (P = 0.017)higher in F group (46.7%), compared to N group (13.3%).In case of coughing/gagging, further dose of Propofol0.5 mg/kg was given to control the incident followed by another attempt of cLMA insertion 60s later. Movement was higher in the group F (33.3%) compared to (10%) in group N. This difference was statistically significant (P =0.007). Laryngospasm was not seen in either group. The total incidence of cLMA reinsertion was higher (13.3%) in the F group compared to (6.67%) the group N; however, this difference was not statistically significant (P =0.311).

In our study, Excellent insertion conditions were observed in 81.6% patients in Group N and 58.3% patients in Group F, are due to better jaw relaxation and easy insertion, lesser incidence of coughing and gagging.

5. Discussion

LMA has gained wide acceptance for routine airway management, difficult airway and in emergency situation. Safe insertion of LMA requires deep levels of anesthesia with suppression of airway reflexes. Propofol is a widely used induction agent for insertion of LMA. However, propofol when used alone has some limitations such as involuntary movement, pain on injection, and no analgesic action.[15] To overcome that, it was combined with drugs such as ketamine, opioids, or muscle relaxants. Opioids such as fentanyl, though improved the insertion conditions, caused more respiratory depression and chest rigidity.[9, 10, 11]Newer drugs such as Nalbuphine is a potent analgesic which binds to μ, κ and δ receptors, but not to sigma receptors. It is primarily a kappa agonist/partial μ antagonist analgesic. It has several advantages such as cardiovascular stability, long duration of analgesia, no respiratory depression, and less nausea and vomiting.[14]

The dose of nalbuphine (0.2 mg/kg) and the dose of fentanyl (1 mcg/kg) used in our study was based on prior published observations.[9, 10, 17] The dose of propofol required to facilitate LMA insertion when used alone without any adjuvant is was about 2.5 mg/kg and causes more respiratory depression.[15] Hence, addition of these adjuvants provided better cLMA insertion conditions with less risk of respiratory depression as observed by Salman[16] and Uzümcügil et al.[17]

In our study the propofol requirement was significantly less in group Nas compared to group F, which shows that addition of these study drugs reduces the dose of propofol to 2 mg/kg. The Group N showed significantly lower number of attempts as compared to GroupF. This maybe because of better jaw relaxation achieved with Nalbuphine. We observed lower incidence of coughing/gagging in group N which could be attributed to its antitussive action. The higher incidence of coughing in the fentanyl group may be due to fact that bolus injections of i.v. fentanyl commonly induce patient coughing. In a study conducted by Wong CM et al[18]higher doses of fentanyl were associated with a notable increase in the incidence of coughing.

Patients in Nalbuphine group showed also less swallowing and less movements than those in Fentanyl group. Moreover, Nalbuphine mode of action (agonist on K receptors and antagonist on μ receptors, whereas, Fentanyl exerts full agonist activity on μ and k receptors), might directly or indirectly participate in the less incidence of swallowing and movement in the Nalbuphine group. Furthermore, the incidence of apnea was higher in the fentanyl group and this mightalter the reflex responses to

Fentanyl such as decrease in ventilator drive resulting in an increase of carbon dioxide. A significant difference between 2 groups (P = 0.007) is to be expected for two reasons: first, intravenous Fentanyl is known to cause apnea [14]; second, Nalbuphine has limited respiratory depression action owing to its μ receptors antagonism. This finding was in line with Khan et al. [18] who tested Nalbuphine versus Fentanyl on hemodynamics after intubation, and showed no significant alteration in MAP but HR was significantly higher in Nalbuphine group (25%). Chestnutt et al. [19] also showed smooth hemodynamic response with intravenous Nalbuphine.

Our study has some limitations. First, our study did not distinguish between central and peripheral apnea in both groups. Second, we cannot exclude that pre-anesthetic medication (midazolam) might modulate respiratory reflex responses either directly or through interactions with our investigated drugs. However, our rationale behind using Midazolam is it represents a standard anesthetic practice. There was no study protocol deviation and all patients successfully completed the study protocol. Surgical procedures were performed uneventfully with no surgical or anaesthetic complications.

To conclude, the addition of nalbuphine to Propofol for cLMA insertion provides absolute jaw relaxation and excellent insertion conditions with stable haemodynamics and also side effects like coughing, gagging, movements and laryngospasm were lower as compared to fentanyl. So, nalbuphine is a good adjuvant with propofol for LMA insertion.

Financial support and sponsorship: Nil.

Conflicts of interest: No.

References

[1] Dorsch JA, Dorsch SE. Face Mask and Airways in Understanding Anaesthetic Equipment. 3rd ed. Baltimore: William and Wilkins; 1994.
[2] Lamb K, James MF, Janicke PK. LMA for intra-ocular surgery. Effects on intra-ocular pressure and stress responses. Br J Anaesth 1992; 69: 143-47.
[3] Yoshino A, Hashimoto Y, Hirashima J, Hakoda T, Yamada R, Uchiyama M. Low-dose succinylcholine facilitates laryngeal mask airway insertion during thiopental anaesthesia. Br J Anaesth 1999; 83:279-83.
[4] Salem WT. Comparison of midazolam and mini-dose succinylcholine to aid LMA insertion during propofolanaesthesia. J Egypt Natl Cancer Inst 2000; 12:65-9.
[5] Wilkins CJ, Cramp PG, Staples J, Stevens WC. Comparisonof the anesthetic requirement for tolerance of laryngeal mask airway and endotracheal tube. AnesthAnalg 1992; 75:794-7.
[6] Scanlon P, Carey M, Power M, Kirby F. Patient response to laryngeal mask insertion after induction of anaesthesia with propofol or thiopentone. Can J Anaesth 1993; 40:816-8.
[7] Goh PK, Chiu CL, Wang CY, Chan YK, Loo PL. Randomized double-blind comparison of ketamine-propofol, fentanyl-propofol and propofol-saline on haemodynamics and laryngeal mask airway insertion conditions. Anaesth Intensive Care 2005; 33:223-8.
[8] Gupta A, Kaur S, Attri JP, Saini N. Comparative evaluation of ketamine – Propofol, fentanyl – Propofol and butorphanol-propofol on haemodynamics and laryngeal mask airway insertion conditions. J AnaesthesiolClinPharmacol2011; 27:74-8.
[9] Tan AS, Wang CY. Fentanyl dose for the insertion of classic laryngeal mask airways in non-paralysed patients induced with propofol 2.5 mg/kg. Anaesth Intensive Care 2010; 38:65-9.
[10] Chawda PM, Pareek MK, Mehta KD. Effect of nalbuphine on haemodynamic response to orotracheal intubation. J Anaesthesiol Clin Pharmacol 2010; 26:458-60.
[11] Young HAS, Clark RSJ, Dunder JW. Intubating condition with Ah8165 and suxamethonium. Anaesthesia 1975; 30: 30-33.
[12] Lund I, Stovener J. Dose responses curves for tubocurarine; alcuronium and pancuronium. ActaAnaesthesiolScand 1970; 37: 238-42.
[13] Singh R, Arora M, Vajifdar H. Randomized double-blindcomparison of ketamine-propofol and fentanyl-propofol for the insertion of laryngeal mask airway in children. J Anaesthesiol Clin Pharmacol 2011; 27:91-6.
[14] Tagaito Y, Isono S, Nishino T. Upper airway reflexes during a combination of Propofol and Fentanyl anesthesia. Anesthesiology 1998; 88:1459–66.
[15] Brown GW, Patel N, Ellis FR. Comparison of Propofoland thiopentone for laryngeal mask insertion. Anaesthesia1991; 46:771-2.
[16] Salman OH. A controlled double blind study of addingnalbuphine to Propofol for laryngeal mask insertion conditionsand hemodynamics in adults. Egypt J Anaesth 2015; 31:277-81.
[17] Uzümcügil F, Canbay O, Celebi N, Karagoz AH, Ozgen S. Comparison of dexmedetomidine-propofol vs. fentanyl-propofolfor laryngeal mask insertion. Eur J Anaesthesiol 2008; 25:675-80.
[18] Khan FA, Hameedullah. Comparison of fentanyl and nalbuphine in total intravenous anaesthesia (TIVA). J Pak Med Assoc 2002; 52:459–65.
[19] Chestuntt WN, Clarke RSJ, Dundee JW. Comparison of Nalbuphine, Pethidine and Placebo as premedication for minor gynecological surgery. Br. J. Anaesth 1987; 59:576–80