Original Research Article

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Comparative Evaluation of two Different Intravenous Doses of Midazolam to Aid the Insertion of LMA Classic as Adjuvants to Propofol Anaesthesia

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Abstract

Background: Propofol is a widely accepted medication for the successful insertion of laryngeal mask airway, but as a sole induction agent, it has a very low success rate. A number of co-induction agents have been used with propofol to increase the success rate of LMA insertion. *Aim and Objectives:* To evaluate the efficacy of two different doses of midazolam i.e. 0.05 mg/kg and 0.08 mg/kg intravenously when used with propofol versus propofol alone for LMA insertion. To find the appropriate dose of midazolam that provides ideal condition and maximum haemodynamic stability. *Material & Methods:* 75 adult patients of ASA I & II grade randomly divided into 3 groups. Group P: Propofol + Saline Group PM1: Midazolam 0.05 mg/kg 3 minutes before propofol + Propofol Group PM2: Midazolam 0.08 mg/kg 3 minutes before propofol + Propofol. LMA insertion attempted 1 minute after the administration of Propofol. Total dose of propofol used, the insertion conditions and haemodynamic changes were noted. *Results*: There was no statistical difference in demographic profile. Haemodynamically patients were more stable in group PM1 & PM2 than in group P. Dose of propofol used in PM2 (2.05+0.21 in mg/kg) & PM1 (2.38+0.21) was less than in Group P (2.84 mg/kg). 100% success rate in LMA insertion was observed in group PM1 & PM2 in first attempt whereas it was 80% in group P. 88% in group PM2, 60% in group PM1 & only 32% patients in group P had excellent insertion conditions. *Conclusion:* Propofol as a sole agent does not provide LMA insertion conditions. Midazolam when used with propofol provides adequate conditions for LMA insertion in a dose dependent manner.

Keyword: Laryngeal mask airway; Midazolam; Propofol.

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Introduction

The two fundamental requirements of general anaesthesia are to maintain the patency of the airway and to ensure adequate ventilation. Endotracheal intubation, the gold standard for securing the airway, being an invasive measure, is associated with greater haemodynamic alterations [1]. Laryngeal Mask Airway (LMA) serves as a bridge between the facemask and endotracheal tube. It is a good alternative to intubation in short duration procedures, being less invasive and less stimulating, thus, Preventing stress response [2].

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However, airway reflexes have to be obtunded by general/topical anaesthesia or muscle relaxants before LMA insertion to prevent the patient movements, coughing, gagging and laryngeal spasm [2,3]. Hence, an adequate depth of anaesthesia and muscle relaxation have to be ensured. Propofol is the best known induction agent for LMA insertion, as it effectively suppresses the oro-pharyngeal reflexes, cough reflex and sensitivity of upper airway [4]. When used as a sole induction agent, much larger doses are required to achieve the desired end points, which can precipitate hypotension, respiratory depression and delayed awakening [3].

Many drugs such as- opioids [5,6,7], clonidine [11], midazolam [8,9], dexmedetomidine, lignocaine [12] and succinylcholine [9,10] have been employed as co-induction agents to decrease the induction dose of propofol, so as to get a better success rate, allowing early recovery with minimal side effects. Though, an adjuvant is yet to be found [4]. Opioids are the most commonly used adjuvants with propofol to aid LMA insertion, but respiratory depression, apnoea and chest rigidity are commonly encountered side effects [5]. Benzodiazepines, like midazolam, when given intravenously produce significant depression of the upper airway sensitivity but without haemodynamic instability and other side effects of opioids. Midazolam also reduces the induction dose of propofol, via a synergistic action and improves the LMA insertion conditions than propofol alone [5].

In this study, we evaluated the effect of different doses of Midazolam premedication i.e 0.05 and 0.08 mg/kg I/V with propofol versus propofol alone for LMA insertion and associated Haemodynamic changes before, during and after LMA insertion. The primary objective was to find out the appropriate dose of midazolam that provides the ideal condition for LMA insertion with maximum haemodynamic stability when used along with propofol.

Material and Methods

After obtaining the approval from institutional ethics committee, the present trial was conducted on 75 patients, aged 20-60 years, of either sex, belonging to ASA grade I and II, undergoing elective surgical procedures of short duration. Informed consent was obtained in written from all the patients after explaining the procedure and were divided into three groups of 25 each by computer generated random number slips. Unwilling uncooperative patients, patients at risk of aspiration (hiatus hernia, pregnancy, full stomach, intestinal obstruction etc.), patients with low pulmonary compliance- obesity, patients with pre op sore throat and URI, patients with oral pathology and patients allergic to the study drug were excluded from the study.

Patients were kept NPO for at least 6 hours prior to surgery. Tablet pantoprazole 40 mg was given orally to all the patients a night before surgery. The study drug solution was prepared with normal saline upto total volume of 5 ml by an anaesthesiologist not involved in this study and dispensed in unlabelled syringe. Group P was given Propofol and normal saline (control group). Group PM_1 was given Midazolam 0.05 mg/kg with propofol and group PM2 received midazolam 0.08mg/kg IV with propofol IV. Electrocardiogram, NIBP and pulse oximetry were used for monitoring and mean arterial blood pressure, oxygen saturation and heart rate were recorded pre-induction, after induction of anaesthesia and after laryngeal mask insertion. Injection glycopyrrolate 0.2 mg intravenously was given before induction. After pre-oxygenation with 100% oxygen for 3 minutes, the patients were given their assigned drug solution over 10 seconds by an observer not involved in the study. 3 minutes after giving the study drug, the initial dose of Propofol was injected with IV at a constant rate over 30 seconds. Desired end points chosen to assess the adequacy of anesthesia were the loss of response to verbal commands and loss of eyelash reflex. If required, further boluses of propofol 0.2 mg/kg IV were given every 15 seconds and the total dose of propofol was calculated.

LMA insertion was attempted 30 seconds after the loss of eyelash reflex in all the patients using the technique described in Intravent laryngeal mask instruction manual. Jaw relaxation before LMA insertion was assessed and graded as (according to Young's criteria [13]):

Grade I: Absolutely relaxed jaw with no muscle tone.

Grade II: Moderately relaxed jaw with some degree of muscle tone.

Grade III: Poorly relaxed jaw with full muscle tone.

Incidence of gagging and coughing [14] was also graded on a 4 point scale with Grade I being no gagging / coughing and Grade IV being the most severe.

Overall insertion conditions were assessed according to the modified scheme of Lund and Stovener [15] as- Excellent, Good, Poor or

Unacceptable. If failed on first attempt, additional bolus dose of propofol 0.5 mg/kg was given. Insertion of LMA was attempted to a maximum of three attempts and patients were intubated if third attempt did not succeed. After securely positioning the LMA, patients were kept on spontaneous respiration using isoflurane and 66% N_2O with O_2. No further data was collected. Only the patients with first successful attempt of LMA insertion were taken for comparing the haemodynamic changes and LMA insertion conditions.

Statistical Analysis: The data from the present study was systematically collected, compiled and statistically analyzed to draw conclusions. Chi square test, student t test and ANOVA test were applied and p value < 0.05 was taken as significant.

Results

Demographic data, such as age, weight and duration of surgery were comparable in all the three groups (p>0.05) [Table 1]. Total induction dose of propofol was significantly reduced in group PM_1 and PM_2 as compared group P (p< 0.001), with group PM_2 having the least requirement (p< 0.001) [Table 2], [Figure 1]. In group PM1, total dose was 2.38 ± 0.21 mg /kg while in group PM2 it was 2.05 ± 0.21 mg/kg [Table 2], [Figure 2]. Increasing the dose of midazolam further decreased the propofol requirement. There was 16% reduction in propofol

Table 1: Demographic Data:

Group	Age (in years)	Weight (in kg)	Duration of surgery (in minutes)
I	31.56 ± 8.47	54.88 ± 6.38	26.40 ± 6.21
II	34.56 ± 11.53	56.20 ± 4.86	27.40 ± 5.02
III	29.88 ± 11.94	56.28 ± 4.78	30.00 ± 6.12

Table 2: Dose of Propofol used in mg:

	P	PM1	PM2
Total Dose of propofol (mg)	155.8 ± 17.54	132.20 ± 15.28	109.80 ± 24.56
Dose in Propofol (mg/kg)	2.84 ± 0.14	2.38 ± 0.21	2.05 ± 0.21

Table 3: Jaw relaxation:

Group	p value
I & II	p<0.05
I & II	p<0.001
II & III	p<0.01

Table 4: Incidence of gagging and coughing

Group	p value
I & II	p<0.05
I & III	p<0.001
II & III	p<0.001

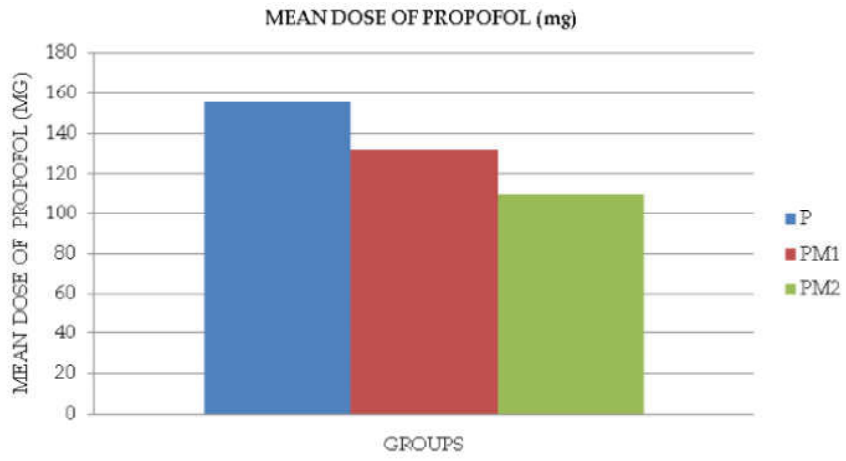


Fig. 1:

dose required in group PM1 and 27% reduction in group PM2. LMA was successfully inserted in the first attempt in 100% patients in group PM_1 and PM_2, whereas More than one attempt were required in group P [Figure 3].

Ten (10)% patients in group PM_2 had absolute grade-I jaw relaxation while 70% patients in group PM_1 and only 40% group P had the absolute jaw relaxation [Figure 4]. This difference in all the three groups was highly significant ($p<0.001$) [Table 3].

The number of patients with no gagging, coughing or movements was significantly higher in group PM_2 (88%) and PM_1 (60%) as compared to group P (32%) [Table 4]. 24% patients in group P experienced severe gagging, while it was not seen in other two groups [Figure 5]. The overall insertion conditions were graded excellent in 88% patients in group PM_2, 60% patients in group PM_1, with a

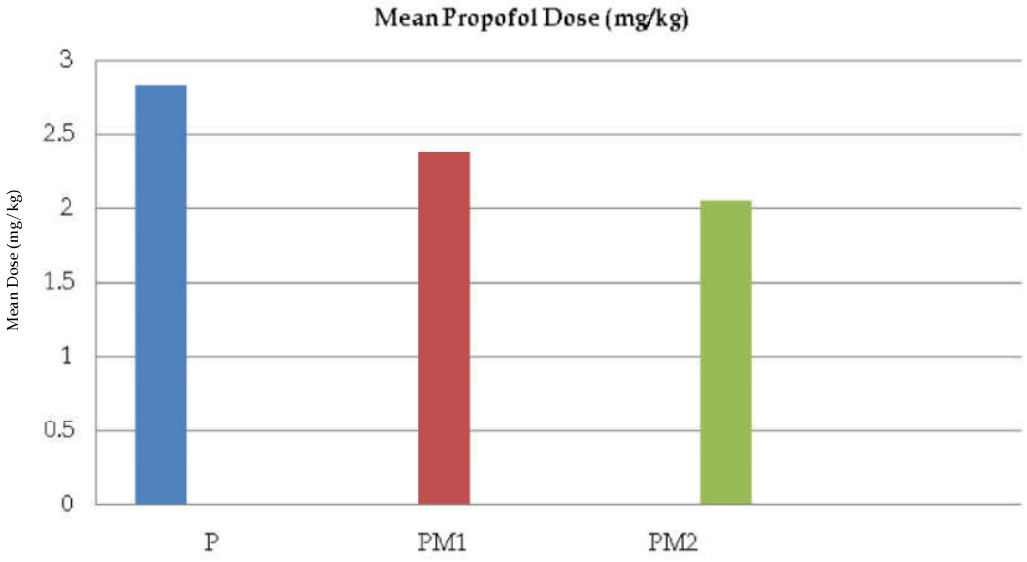


Fig. 2:

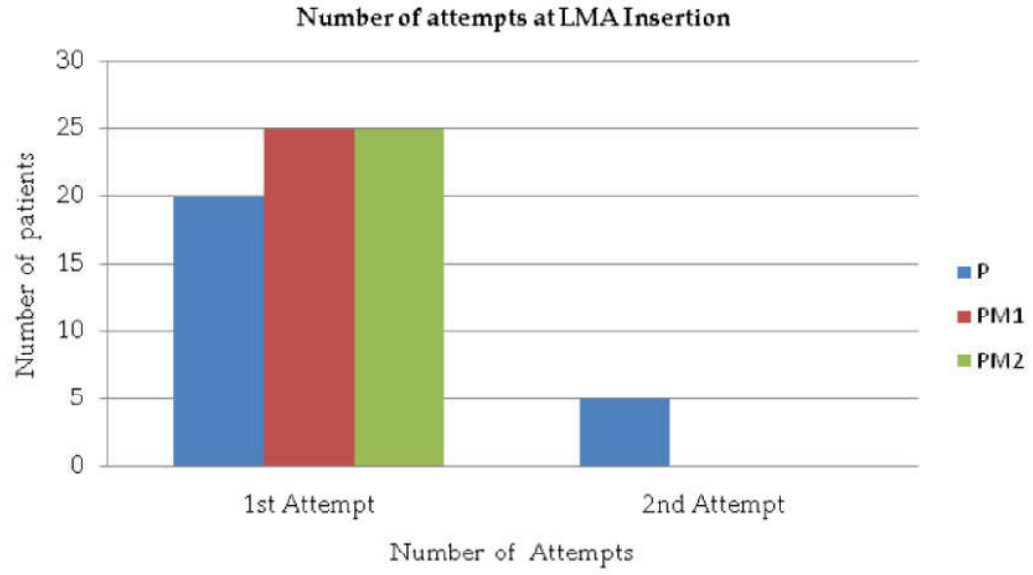
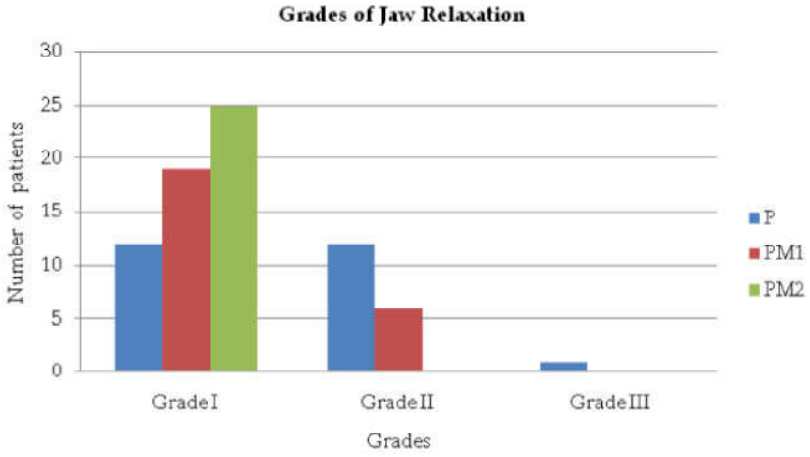


Fig. 3:

highly significant ($p<0.001$) difference. Group P had the least optimal conditions for insertion in only 32% patients, with highly significant difference from other two groups [Figure 6].

A significant fall in mean arterial pressure was seen in all the three groups after induction. However, maximum decrease occurred in group P as compared to group PM_1, which was more than in group PM_2 [Figure 7]. Post induction increase in heart rate was observed in all the three groups but it increased only minimally in group III [Figure 8]. A significant reduction in SpO_2 trends was seen after LMA insertion in group P but it remained



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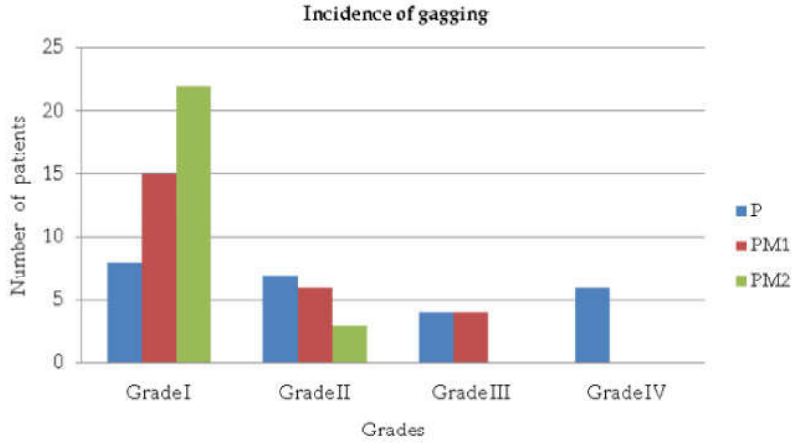

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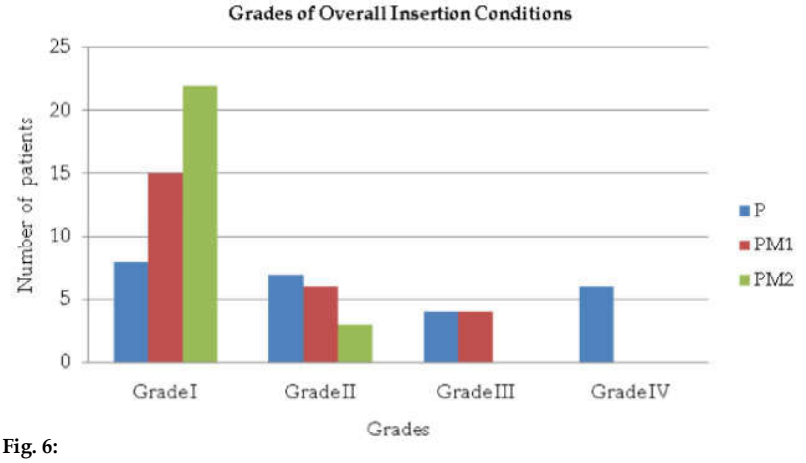

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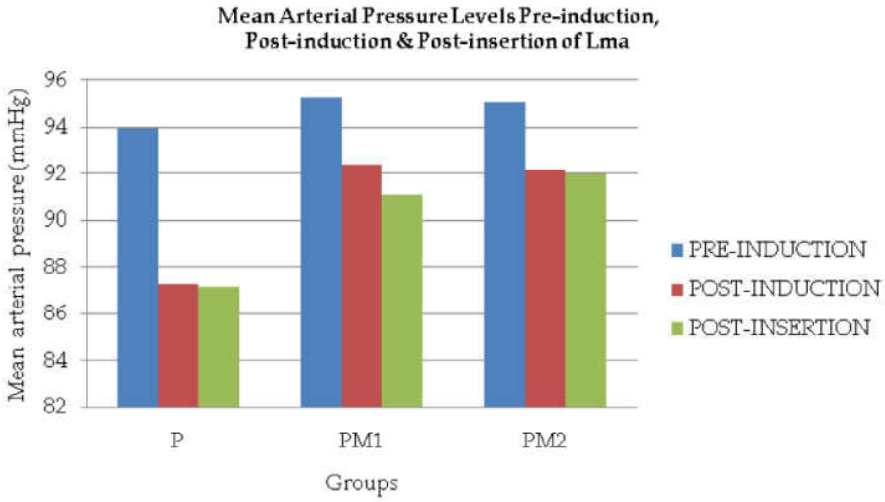

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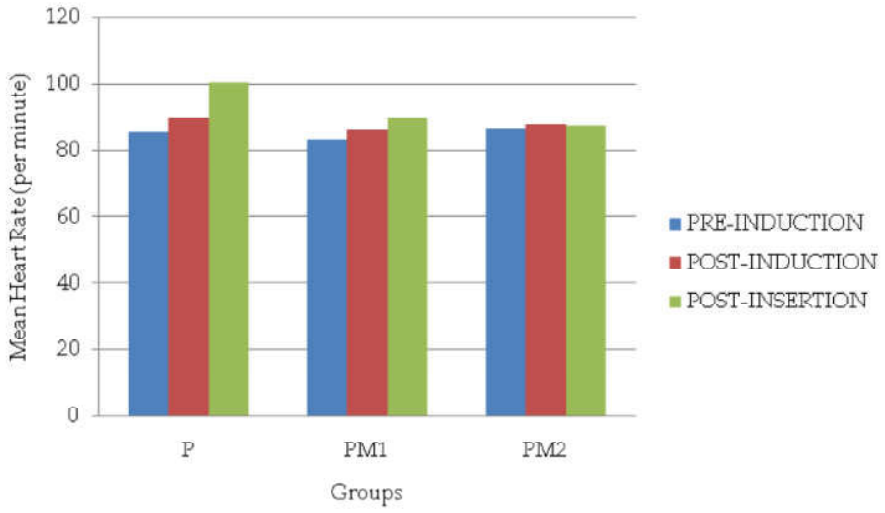

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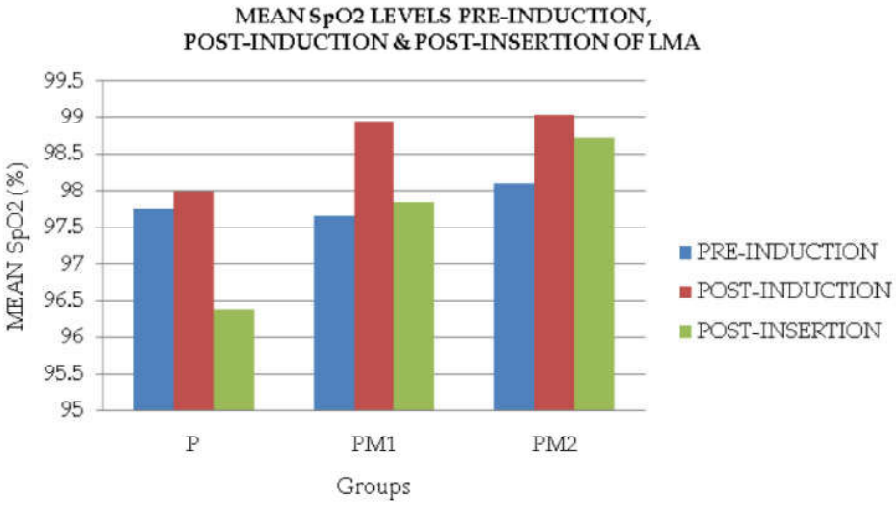

Fig. 9:

near pre induction levels in group PM_1 and PM_2 [Figure 9]. Successful LMA insertion in first attempt was seen in 100% patients in group PM_1 & PM_2 whereas in group P, it was successful in 80% patients in first attempt.

Discussion

Use of LMA has gained wide acceptance for routine airway management, difficult airways and in emergency situations, owing to its ease of insertion. LMA is well tolerated at lower anaesthetic concentrations than the endotracheal tube, which allows earlier emergence from anaesthesia, making it a suitable option for day care procedures [16]. LMA insertion does not require neuromuscular blockade provided the depth of anaesthesia is adequate with obtundation of airway reflexes. Although, propofol is an ideal induction agent for LMA insertion [1], but when used alone larger does are required adversely causing cardio- respiratory depression [3].

In the present study, the mean dose of propofol required for LMA insertion was found to be 2.84 ± 0.14 mg/kg with the incidence of successful insertion of LMA in first attempt was 80% patients. Excellent insertion conditions were found in 32% patients. Jain Namrata et al. [18] found that 3.1 mg/kg of propofol was required with the incidence of successful insertion in first attempt in only 50% patients with side effects like coughing, gagging, head/limb movements, hypotension and prolonged apnoea. Wafaa TS et al. [9] too found that with the dose of 3.0 mg/kg propofol, successful insertion was seen only in 60% patients with significant fall in MAP and increase in Heart Rate in post induction period with excellent insertion conditions in 20% patients only. To overcome these limitations of propofol, it is being used in combination with drugs like benzodiazepines [8,9], opioids [5,6,7], intravenous or topical lignocaine [12] and muscle relaxants [9,10].

Benzodiazepines are known to reduce upper airway reflexes, besides providing excellent anxiolytic, sedative and amnesic properties. Midazolam is being extensively used in operating room because of its rapid onset of action and brief half life. When used as a premedication, midazolam is known to decrease the dose of propofol and the incidence of adverse haemodynamic effects [19,20,21]. Further addition of midazolam to propofol improves the insertion conditions for LMA [9,18]. In the present study, we compared the conditions for LMA insertion and haemodynamic changes using propofol alone and in combination with two different doses of midazolam- 0.05 mg/kg I/V and 0.08 mg /kg I/V.

Dose of propofol decreased by 16% in group PM_1 and by 27% in group PM_2. Several authors have published similar results. Short and Chui [19] suggested that the dose of propofol was reduced to 52% whe midazolam was used with propofol. Bhasker, et al. [22] also found that the dose of propofol was decreased with use of midazolam.

Absolute jaw relaxation was observed in 100% patients in group PM2 while 76% patients in PM1 and 48% in group P had absolute jaw relaxation. None of the patients in group PM1 and PM2 had grade 4 gagging while 24% experienced it in group P. The incidence of gagging and coughing was even Lower in PM2 than PM 1 (40%). The insertion conditions were the best in group PM2 where midazolam was used in Dose of 0.08mg/kg with 83% patients in Group PM2, 60% in group PM1 and only 32% in group P had excellent insertion conditions. Similar findings were reported by Dhamotharan et al. [22]. They found that LMA insertion was easy in 80% patients where midazolam 0.05 mg/kg was used with in combination with propofol however it was 33.33% in patients where propofol was used alone. Salem [9] too found that LMA was successfully inserted in first attempt in 95% patients and insertion conditions were excellent in 100% patients in propofol-midazolam group.

The patients receiving midazolam propofol combination could have been more deeply anaesthetized or more likely this combination could depress airway reflexes to greater degree.

We observed that increasing the dose of midazolam from 0.05 mg /kg to 0.08 mg /kg further improved the conditions for LMA insertion. This could be attributed to dose dependent depression of upper airway reflexes by midazolam. MAP in all three groups decreased after induction from the pre-induction levels with 7% decrease in group P, 3% in PM1 and 2.8% in PM2 respectively. After LMA insertion, MAP was lower in all the groups but this decrease was comparable in group P and PM1 whereas in group PM2 the fall was not much. Heart rate increased in post induction and post insertion period in all the groups. This increase was max in group P. Group PM1 had modest increase in heart rate while in group PM2 there was least variation. There was a trend towards decrease in saturation after LMA insertion in group P but it remained stable in group PM1 and PM2. Our study shows that

the use of midazolam with propofol results in better hemodynamic stability than when propofol is used alone to insert the LMA. This finding is consistent with previous studies where midazolam has been shown to improve haemodynamic stability when used with propofol [9,18,20].

Conclusion

Propofol when used alone does not provide ideal conditions for LMA insertion. The use of midazolam as co-induction agent with propofol provides excellent insertion conditions with Stable Haemodynamics in a dose dependent manner. It also decreases the incidence of side effects like coughing, gagging and laryngospasm.

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