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Original Research Article

A COMPARISON OF MIDAZOLAM AND MINI DOSE SUXAMETHONIUM TO FACILITATE LARYNGEAL MASK AIRWAY INSERTION DURING PROPOFOL ANESTHESIA

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Abstract: *This study aimed to compare the effectiveness of two different drug combinations used for general anesthesia during laryngeal mask airway (LMA) insertion. One group received Propofol-Midazolam (PM), and the other Propofol-Suxamethonium (PS). The study assessed pre-insertion conditions like mouth opening, gagging, coughing, patient movements, and laryngospasm, as well as hemodynamic parameters such as systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP) and heart rate (HR) in both groups. It also studied patient responses after LMA insertion, including apnea, cyanosis, desaturation (SpO_2 < 90%), aspiration/regurgitation, and airway injury. The primary objectives of the study were to compare the ease and success of LMA insertion when using Propofol with Midazolam and Propofol with low-dose suxamethonium and to compare variations in hemodynamic and the occurrence of complications during and after LMA insertion. The study included 110 male and female patients aged 18-40, classified as ASA 1 & 2, and scheduled for surgery under general anesthesia. The patients were randomly assigned to the PM and PS groups, and non-probability sampling was employed. In the PM group, patients were given intravenous midazolam (0.04 mg/kg) four minutes before induction with propofol (2.5 mg/kg), while in the PS group, patients received suxamethonium (0.1 mg/kg) 30 seconds after induction with propofol (2.5 mg/kg). Nalbuphine (0.1 mg/kg) was administered to all patients as an analgesic before surgery. The adequacy of anesthesia was assessed by the loss of response to verbal commands and the absence of excitatory movements. Patients were evaluated for their response to LMA insertion attempts, including the absence of excitatory movements, mouth opening, and the number of attempts required. Patient responses to gagging, coughing, movements, laryngospasm, desaturation, and apnea duration were noted. Hemodynamic changes before induction, as well as before and after LMA insertion, were recorded. Data was entered into SPSS version 15, and the mean standard deviation was calculated for age, weight, SBP, DBP, MAP, HR, SpO_2, and apnea duration. Qualitative and quantitative data were analyzed using the chi-square test and t-test, respectively, with significance set at a p-value < 0.05. Laryngeal masks were successfully inserted into the hypopharynx in the first attempt in 100% of patients in both the PM and PS groups. Gagging and patient movements were observed in only 4 (7.27%) out of 55 patients in the PM group. Hemodynamic variations more significant than 20% from baseline (before anesthesia induction) were compared before and after LMA insertion. Significant differences between the PM and PS groups were observed in SBP, DBP, MAP, and HR ($p < 0.05$). The apnea duration was 2.10 ± 1.51 minutes in the PM group and 1.01 ± 0.49 minutes in the PS group, with a significant p-value of 0.044. However, there were no cases of SpO_2 falling below 90% in either group. The study concluded that midazolam and a small dose of suxamethonium during propofol anesthesia were comparable in terms of ease and success of LMA insertion. The PM group exhibited better hemodynamic stability than the PS group, except for apnea duration, which was shorter in the PS group. There was no significant difference in SpO_2 levels between the two groups.*

Keywords: Propofol, Laryngeal Mask Airway (LMA), Midazolam, Suxamethonium, Hemodynamic Parameters

Introduction

Drug combinations are commonly used in clinical anesthesia to broaden the spectrum of anesthesia and reduce side effects, ultimately improving its quality (Lopez, 2018). Proper mouth opening, reduction of upper airway reflexes, prevention of desaturation, and minimizing hemodynamic changes are crucial for successful LMA insertion. Propofol is commonly used to aid LMA placement due to its superior suppression of airway reflexes (Hugar, 2019).

To mitigate undesired effects associated with propofol usage, various methods such as premedication techniques, admixtures, and alternative co-induction drugs are being investigated. In this study, we specifically examined the combination of midazolam (0.04 mg/kg) with propofol (2.5 mg/kg) versus a small dose of suxamethonium (0.1 mg/kg) with propofol (2.5 mg/kg) to determine which combination yields better results (Akila, 2016; George, 2015). Midazolam is a widely used adjuvant drug in intravenous anesthesia known for its synergistic effect, enhancing the central effects of propofol by acting on GABA receptors via benzodiazepine receptors (Cornett et al., 2018; Zencirci, 2014). On the other hand, suxamethonium is a neuromuscular blocking drug that has additive effects on the central effects of propofol, resulting in more efficient mouth opening and attenuation of airway reflexes, ultimately reducing patient movements (Dean and Wolf, 2014).

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This study also investigates the effects of these drug combinations on hemodynamic stability. Various parameters, including mouth opening and jaw relaxation, apnea period, desaturation (SpO2 ≤ 90%), cyanosis, upper airway injury, and post-LMA insertion complications such as aspiration, laryngospasm, and fasciculations, were compared between the two groups. Thus, this study aims to compare the effectiveness of two drug combinations in facilitating the insertion of a Laryngeal Mask Airway (LMA).

Methodology

This study is designed as non-purposive, comparative, and quasi-experimental. The study was conducted at the Department of Anaesthesiology, Services Hospital, Lahore, a tertiary care hospital affiliated with the Services Institute of Medical Sciences. The study was conducted over two years, covering planning, clinical data collection, analysis, and thesis writing. The sample consisted of a total of 110 patients, both male and female, who were divided into two groups: the midazolam group (PM) receiving propofol and midazolam, and the suxamethonium group (PS) receiving propofol and suxamethonium. Each group comprised of 55 patients. Patients without systemic illness, falling under the American Society of Anesthesiologists (ASA) classifications I and II, aged between 18 and 40 years, and scheduled for elective surgery were included in the study.

Patients who had eaten a meal within six hours before the procedure, pregnant patients, obese patients (body mass index > 30 Kg/m²), patients with oropharyngeal pathology, pharyngeal trauma, or distorted upper airway were excluded. Patients undergoing oral and maxillofacial or head and neck surgery were also excluded due to contraindications for using the laryngeal mask.

Convenient non-probability sampling was used for patient selection.

Patients were randomly assigned to either the midazolam group (PM) or suxamethonium group (PS) using a random number table to ensure proper randomization. Only cases requiring a single insertion attempt were included in the study.

Background Information: Demographic information, including name, age, sex, body weight, address, purpose of hospital admission, type of surgical procedure, and admission records, were recorded. Patients' past or present medical conditions were assessed according to ASA classification.

No premedication was given. Patients were pre-oxygenated with 100% oxygen for 3 to 5 minutes before anesthesia induction. Electrocardiogram, heart rate, blood pressure, mean arterial pressure, and oxygen saturation were monitored and recorded before anesthesia induction, immediately before LMA insertion, and after LMA insertion.

In the midazolam group (PM), patients received intravenous midazolam (0.04 mg/kg) three minutes before anesthesia induction with propofol (2.5 mg/kg). In the suxamethonium group (PS), patients received suxamethonium (0.1 mg/kg) 30 seconds after propofol (2.5 mg/kg) for anesthesia induction. The adequacy of anesthesia was assessed by the loss of corneal and palpebral reflexes, indicating the desired anesthetic depth.

Data on ease of LMA insertion and successful insertion were collected, including the number of insertion attempts, chest movement, air entry in the lungs, oxygen saturation, and any complications.

After successful LMA insertion, anesthesia was maintained using volatile anesthetic agents or positive pressure ventilation with nitrous oxide and oxygen. Intravenous muscle relaxants were also used as needed.

The primary outcome measure was the ease of LMA insertion, assessed quantitatively by the number of insertion attempts and qualitatively by chest movement, air entry, oxygen saturation, and complications. Hemodynamic variations were also evaluated. All collected data were entered into prescribed forms and subsequently transferred to tables for comparison between the two groups. Data analysis was performed using SPSS version 14. Statistical methods such as Chi-square and Fisher's exact tests were employed to assess the significance of differences, with p-values <0.05 considered statistically significant.

Results

One hundred ten patients were enrolled in the Anesthesia Department at Services Hospital Lahore for a medical program. The patients were randomly divided into PM and PS groups, each consisting of 55 patients. Both groups were comparable in age, gender, and weight. The PM group was given midazolam and propofol for anesthesia induction, while the PS group was given micro dosage suxamethonium and propofol. Of the 110 patients, 65 (59%) were men, and 45 (41%) were women, all aged between 18 to 40 years. The average age of patients in both groups was 28.85 ± 8.31 and 28.85 ± 8.89 in the PM and PS groups, respectively. The weight of patients in the PM group was 62.58 ± 9.41 kilograms, while those in the PS group weighed 63.11 ± 10.67 kilograms. In the PM group, 78.18% were ASA I and 21.82% were ASA II, while in the PS group, 74.54% were ASA I and 25.46% were ASA II. The particular kind of treatment was not confined to a specific operation, nor was the surgery's duration. The research included patients scheduled for general surgery, orthopedic surgery, urology, lower-extremity surgery, genital surgery, debridements, cystoscopies, surgical incision and drainage of abscesses, surgery on the breast, and limb amputation. The data was appropriately incorporated into pre-existing proformas. The study was unaffected by the time or manner of maintaining anesthesia throughout the surgical operation. The study examined the first trial to achieve a positive insertion rate between the PM and PS groups. Laryngeal masks were successfully inserted into the hypopharynx in 100% of PM and PS patients on the first try, and there was no difference in successful insertion in both groups. The conditions of LMA implantation were evaluated, and there was no significant distinction in mouth opening (jaw relaxation) between the two groups of patients. Sufficient mouth opening was detected in 54 (98.18%) of the PM and 55 (100%) PS patients. Gagging was noted in 4 (7.27%) participants and coughing in 1 (1.82%) individuals in the PM group but not in any patient in the PS group. The patient movement was seen in 4 (7.27%) of the PM patients but not in any PS patients. Laryngospasm was not detected in the PM or PS groups, as shown in Table 1.

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Table 1: Demographic data

Variable	PM GROUP N=55	PS GROUP N=55	P value
Age	25.58±8.31	25.85±8.89	-
Weight	62.95±9.41	63.11±10.67	-
ASA I/II	41/14	43/12	-
Conditions during LMA insertion			
Mouth opening			
Adequate	54	55	0.50
In adequate	1	0	
Gagging			
No	51	55	0.06
Yes	4	0	
Coughing			
No	54	55	0.5
Yes	1	0	
Laryngospasm			
No	55	55	-
Yes	0	0	
Patients movement			
No	51	54	0.18
Yes	4	1	

The fluctuation in systolic BP, diastolic BP, MAP, and heart rate of more than 20% from baseline (before induction of anesthesia) was compared, and the "t" test was used to obtain p values. Table 2 compares systolic blood pressure, diastolic blood pressure, and mean arterial pressure (MAP) between the PM and PS groups. The mean ± standard deviation of systolic BP, diastolic BP, and MAP was displayed during three stages of the study: before induction of anesthesia, before LMA insertion, and after LMA insertion. Systolic blood pressure before induction of anesthesia vs. before insertion of LMA was examined in both PM and PS groups, with p values of 0.001 and 0.002 being significant, respectively. Similarly, the analysis of diastolic blood pressure for both study groups before induction of anesthesia vs. before insertion of LMA yielded p values of 0.007 and 0.043, respectively, which were found significant MAP in the PM and PS groups had p values of 0.001 and 0.004 for before induction of anesthesia compared before and after LMA placement, respectively, and was shown to be significant. Table 3 shows the mean± standard deviation of heart rate for the PM and PS groups. When the PM and PS groups were compared for HR before anesthesia induction vs before and after LMA placement, the p-value was 0.001 for both situations and was very significant.

Table 2: variations of different variables concerning induction of anesthesia before and after the insertion of LMA

Variable	PM GROUP N=55	PS GROUP N=55	P value
Variation of diastolic BP more significant than 20			
Before **induction of anesthesia vs. before insertion of LMA**	14(25.45%)	23(41.82%)	0.007
Before induction of anesthesia vs. after insertion of LMA	17(30.91%)	24(43.64%)	0.043
Variation of systolic BP more significant than 20			
Before induction of anesthesia vs. before insertion of LMA	13(23.64%)	18(32.73%)	0.001
Before induction of anesthesia vs. after insertion of LMA	16(29.09%)	16(29.09%)	0.002
Variation of MAP greater than 20			
Before induction of anesthesia vs. before insertion of LMA	12(21.82%)	21(38.18%)	0.001
Before induction of anesthesia vs. after insertion of LMA	13(23.64%)	23(41.82%)	0.004
Variation of HR greater than 20			
Before induction of anesthesia vs. before insertion of LMA	10(18.18%)	9(16.36%)	< 0.001
Before induction of anesthesia vs. after insertion of LMA	8(14.55%)	13(23.64%)	< 0.001

Sp02% is displayed with mean ± standard deviation before anesthesia induction and before and after LMA placement. The significant decrease in Sp02% was 90%, which did not occur in any patient, while the least reported Sp02% was 93%. As a result, there was no significant difference in Sp02% between the PM and PS groups. There was no

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evidence of laryngospasm, cyanosis, aspiration/regurgitation, or upper airway damage in any research group. Fasciculation was noted in 6 (10.91%) patients of the PS group. The average apnea time (in minutes) was 2.10 ± 1.51 in the PM group and 1.01± 0.49 in the PS group, with a significant p-value of 0.044.

Table 3: Response of patients after LMA insertion

Variable	PM GROUP (N=55)	PS GROUP (N=55)
Laryngospasm	0	0
Desaturation	0	0
Cyanosis	0	0
Aspiration	0	0
Injury to upper airway	0	0
Fasciculation	0	6 (10.91%)
Patient response to apnea		
Average time in mins	2.10	1.01

Discussion

The use of LMA in anesthetic practice is widely established. In some daycare procedures, LMA allows anesthesiologists to have both hands free and eliminates the necessity for tracheal intubation. The use of LMA soon after induction and before the administration of volatile drugs is preferable since it shortens the induction period and improves patient turnaround. The unpleasant reaction to LMA insertion, such as gagging, coughing, and laryngospasm, may make optimal placement difficult, if not impossible (Naguib et al., 2003).

During propofol anesthesia, the comfort and efficacy of LMA insertion with midazolam and a modest dosage of suxamethonium were shown to be equivalent in our study. This confirms previous findings that low-dose suxamethonium increases tolerance to LMA implantation without producing complete muscular paralysis. Jain and Parikh discovered that with propofol plus suxamethonium, the probability of good to satisfactory overall placement state was 88%, while it was 52% in the propofol-only group, $p< 0.05$ (Jain and Parikh, 2015). Suxamethonium, in modest doses, can treat laryngospasm without inducing extended apnea (Chung and Rowbottom, 1993). It presumably promotes LMA insertion by relaxing the laryngeal muscles, which improves mouth opening and reduces choking, coughing, and swallowing. Suxamethonium duration of effect is dosage-dependent; decreasing the dose allows for a faster recovery of spontaneous breathing and airway reflexes.

According to Stonhem Bree and Sneyd, straightforward insertion of LMA was noted in only around 62% of patients with propofol anesthesia, indicating that the use of propofol alone does not always ensure effective insertion of LMA, which is in line with the results obtained in our study (Stoneham et al., 1995). Yoshino et al. evaluated different dosages of suxamethonium (0.25mg/kg, 0.5mg/kg) with thiopentone for LMA insertion and found that suxamethonium 0.5mg/kg provided considerably superior insertion circumstances, comparable to our study (Yoshino et al., 1999).

Ho and Chui compared 0.1 mg/kg succinylcholine to placebo while utilizing a high dosage of propofol 2.5 mg/kg without an opioid during induction and discovered that it was superior, with fewer insertion attempts. According to our study's results, the total dosage of propofol required to implant LMA was significantly reduced when low-dose succinylcholine was utilized. (Ho and Chui, 1999)

Comparably, Aghamohammadi et al., when comparing 0.1 mg/kg succinylcholine to placebo at induction using a typical dose of propofol 2 mg/kg together with midazolam 0.01 mg/kg, discovered more straightforward insertion circumstances with this mini dose of succinylcholine, with a drop in total amount of propofol required to insert LMA (Gharaei et al., 2011).

These findings are congruent with those of George and colleagues, who evaluated two doses of succinylcholine to placebo and discovered that the average number of placement attempts was subjectively higher but not statistically significant in the placebo group. Although the hemodynamic stability remained comparable in both groups, total propofol intake was considerably higher in the placebo group (George et al., 2017).

LMA insertion was equally effective when our study used midazolam and propofol, which is similar to the results obtained by Dhamotharan et al. They discovered that LMA insertion was simple in 80% of patients who received 0.05 mg/kg of midazolam in conjunction with propofol, whereas it was difficult in 33.33% of patients who received propofol alone (Dhamotharan et al., 2014).

Conclusion

During propofol anesthesia, the comfort and effectiveness of LMA insertion with midazolam and a modest dosage of suxamethonium were equivalent without any significant difference between the two groups. Apart from apnea length, which was shot in the PS group, the PM group had more excellent hemodynamic stability than the PS group. There was no significant difference in SpO2 values between the two groups.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate
Approved by the department Concerned.

Consent for publication
Approved

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Conflict of interest

The authors declared absence of conflict of interest.

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