Original Research

A STUDY COMPARING CLONIDINE WITH PROPOFOL AND FENTANYL WITH PROPOFOL FOR HEMODYNAMIC AND RESPIRATORY RESPONSES DURING AMBU LMA INSERTION

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ABSTRACT

Background: Insertion of supraglottic airway devices such as AMBU LMA requires adequate anaesthetic depth to suppress airway reflexes while maintaining stable hemodynamics and respiratory function. Propofol is commonly used for this purpose, but adjuvants such as fentanyl and clonidine are frequently added to improve insertion conditions and reduce adverse effects. This study compares clonidine–propofol and fentanyl–propofol combinations.

Methodology: This prospective randomized study was conducted in patients undergoing elective surgery requiring AMBU LMA insertion. Patients were allocated into two groups: Group F received fentanyl with propofol and Group D received clonidine with propofol. Standard monitoring was applied, and induction was achieved with propofol after administration of the study drug. Hemodynamic parameters (heart rate and mean arterial pressure), respiratory parameters (SpO_2), and ease of LMA insertion were recorded and analysed using appropriate statistical methods.

Results: Clonidine–propofol provided better heart rate control and more stable mean arterial pressure compared to fentanyl–propofol, with statistically significant differences at multiple time points. Oxygen saturation remained stable and comparable in both groups. Hemodynamic fluctuations were lower in the clonidine group, indicating better sympatholytic response during induction and LMA insertion.

Conclusion: Clonidine–propofol combination offers superior hemodynamic stability compared to fentanyl–propofol for AMBU LMA insertion, with comparable respiratory safety.

Keywords: Ambu Lma, Clonidine, Fentanyl, Propofol, Hemodynamic Stability, Airway Management.

INTRODUCTION

The laryngeal mask airway (LMA) has become an important advancement in modern anaesthetic practice, offering a less invasive alternative to endotracheal intubation while providing effective ventilation during general anaesthesia. It allows both spontaneous and controlled positive pressure ventilation, typically at airway pressures below 15 cm H_2O, making it suitable for a wide range of elective surgical procedures.[1] Compared to face mask ventilation, the AMBU LMA provides a more secure airway with improved ventilation stability and reduced risk of airway obstruction.

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Insertion of the AMBU LMA requires a lighter plane of anaesthesia compared to tracheal intubation, but still demands adequate suppression of airway reflexes such as coughing, gagging, and laryngospasm.[13] Successful placement depends on achieving optimal jaw relaxation and sufficient depth of anaesthesia without compromising haemodynamic stability or causing respiratory depression. Therefore, identifying an ideal anaesthetic combination that ensures smooth insertion conditions remains an area of ongoing clinical interest.

Intravenous anaesthetic agents are generally preferred over inhalational techniques for LMA insertion due to faster onset, better patient acceptance, and more predictable conditions.[4] Among intravenous agents, propofol is widely regarded as the agent of choice because of its potent suppression of upper airway reflexes and favourable insertion conditions.[3] However, when used alone, propofol may not always provide satisfactory insertion conditions and is frequently associated

with dose-dependent cardiovascular and respiratory depression.[67]

To overcome these limitations, various adjuvant drugs have been studied to reduce the required dose of propofol and improve insertion conditions. Opioids and neuromuscular blockers have been used for this purpose, but muscle relaxants have not consistently improved outcomes and may increase the risk of aspiration in certain patients.[89] Opioids such as fentanyl and remifentanil have been shown to facilitate LMA insertion; however, their use is associated with an increased incidence of apnoea and prolonged respiratory depression.[610]

Clonidine, a selective alpha-2 adrenergic agonist, has emerged as a useful alternative adjuvant due to its sedative, analgesic, and sympatholytic properties. Alpha-2 receptors are widely distributed in the central nervous system, particularly in the locus coeruleus, which plays a key role in arousal and respiratory regulation. Clonidine exerts its sedative effect through inhibition of this pathway, producing calm sedation without significant respiratory depression.[11] Moreover, clonidine has been shown to attenuate haemodynamic responses during airway manipulation, thereby providing greater cardiovascular stability during induction and emergence.[12]

Given the need for an optimal balance between smooth LMA insertion, stable haemodynamics, and minimal respiratory depression, the present study was designed to compare the hemodynamic and respiratory effects of clonidine–propofol versus fentanyl–propofol combinations for AMBU LMA insertion. The study aims to determine which adjuvant provides better insertion conditions while maintaining safety and stability during anaesthesia induction.

Aim

To compare the hemodynamic and respiratory effects of clonidine–propofol versus fentanyl–propofol combinations for insertion of AMBU laryngeal mask airway.

Objectives

1. To assess and compare the ease and conditions of AMBU LMA insertion between clonidine–propofol and fentanyl–propofol groups.
2. To evaluate and compare hemodynamic parameters (heart rate and blood pressure) during induction and LMA insertion in both groups.

METHEDOLOGY

This prospective randomized comparative study was conducted in the Department of Anaesthesiology at Sree Mookambika Institute of Medical Sciences, Kulasekharam, during the period from May 2025 to December 2026 after obtaining institutional ethical committee approval and written informed consent from all patients. Patients with known allergy to the study drugs were excluded. All patients were kept nil per oral overnight as per standard fasting guidelines and were premedicated with a single dose of oral alprazolam 0.25 mg, ranitidine 150 mg, and metoclopramide 10 mg with sips of water 2 hours prior to surgery. On arrival to the operating room, standard monitoring including electrocardiography (ECG), non-invasive blood pressure (NIBP), and pulse oximetry (SpO_2) was established. Intravenous access was secured using an 18G cannula under local anaesthesia.

Preoxygenation was performed for 3 minutes with 100% oxygen at a flow rate of 8 L/min via face mask. Patients were randomly allocated into two groups. In Group F, fentanyl 1 µg/kg diluted in 10 mL normal saline was administered intravenously over 2 minutes. In Group D, clonidine 1 µg/kg diluted in 10 mL normal saline was administered in a similar manner over 2 minutes. After 30 seconds of administration of the study drug, all patients received intravenous propofol 2 mg/kg for induction of anaesthesia. Anaesthesia was maintained using a mixture of 50% nitrous oxide and oxygen with sevoflurane 1–1.5% in a fresh gas flow of 8 L/min. Patients were ventilated manually using a face mask when required, while spontaneous ventilation was otherwise allowed.

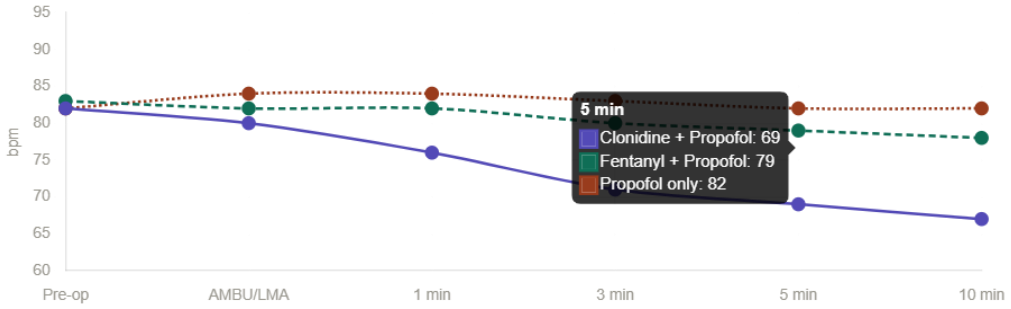
Ninety seconds after propofol administration, AMBU laryngeal mask airway (LMA) of appropriate size was inserted and correct placement was confirmed by capnography. In cases of failed first attempt, a second attempt was made after administering an additional dose of intravenous propofol (0.5 mg/kg). Hemodynamic parameters (heart rate, blood pressure, and SpO_2), respiratory variables, and ease of LMA insertion were recorded at predefined intervals.

Data were entered into Microsoft Excel and analysed using SPSS software version 22.0. Continuous variables were expressed as mean ± standard deviation and compared using unpaired Student's t-test. Categorical variables were expressed as frequency and percentage and analysed using Chi-square test or Fisher's exact test as appropriate. A p-value of less than 0.05 was considered statistically significant.

RESULT

The MeanAge ofpatientswho received Clonidine and Propofolis30±7 Years, the Mean Age of patients who received Fentanyl and Propofol is 31 ±7 Years and the Mean Age of patients who received only Propofol is 30±6 Years. Male female ratio was 1:0.9.The mean Heart rate in patients who received combination of Clonidine and Propofol drugs has better

control over in patients who received Fentanyl and Propofol and patients who received only Propofol and this difference observed is statistically significant at the 3min, 5 min and 10 min though at the beginning it is not statistically significant.The Mean Arterial pressure is initially high who received combination of Clonidine and Propofol drugs atpre operativelylater on dip atAMBU



LMA insertion and later on during 1min, 3 min , 5min and 10 min time frame this group has lesser Mean Arterial pressure compared to those who received Fentanyl and Propofol and this difference is statistically significant at all-time intervals. The saturation remained nearly similar at all-time intervals with Clonidine and Propofol group, Fentanyl and Propofol group andpatients who received only Propofol.

DISCUSSION

In the present study, the hemodynamic and respiratory effects of clonidine–propofol were compared with fentanyl–propofol combination for AMBU LMA insertion. The mean age of patients receiving fentanyl with propofol was 31 ± 7 years, while those receiving clonidine with propofol had a mean age of 30 ± 6 years, indicating a comparable demographic profile between groups. The male-to-female ratio was nearly equal (1:0.9), suggesting adequate randomization and homogeneity of study population.

Hemodynamic parameters demonstrated that the clonidine–propofol group had significantly better heart rate control compared to the fentanyl–propofol group. The difference in heart rate became statistically significant at 3, 5, and 10 minutes, although baseline values were comparable. This observation is consistent with the known pharmacological profile of clonidine, which acts as an alpha-2 adrenergic agonist, reducing sympathetic outflow and stabilizing peri-induction tachycardia.[13] Fentanyl, although effective in blunting airway reflexes, may cause variable cardiovascular responses depending on dosage and individual sensitivity.

Similarly, mean arterial pressure (MAP) was initially slightly higher in the clonidine group at baseline but showed a gradual and significant reduction after induction, resulting in better hemodynamic stability compared to the fentanyl–propofol group. The differences in MAP were statistically significant at all recorded time intervals. This indicates that clonidine provides a smoother attenuation of pressor responses during airway manipulation and LMA insertion.[14] These findings are in agreement with previous studies that have demonstrated the sympatholytic effect of alpha-2 agonists in reducing perioperative hemodynamic fluctuations.

In contrast, oxygen saturation remained stable and comparable across all groups throughout the study period. This suggests that both drug combinations were effective in maintaining adequate oxygenation during induction and LMA insertion. The absence of significant desaturation events indicates that both regimens are safe from a respiratory standpoint when administered under controlled anaesthetic conditions.

The LMA, originally conceptualized by Archie Brain in 1981, has become a widely accepted supraglottic airway device due to its ability to provide effective ventilation without the need for laryngoscopy.[15] Its successful insertion depends on adequate suppression of airway reflexes, for which propofol remains the most commonly used induction agent due to its rapid onset and superior suppression of upper airway reflexes. However, propofol alone is associated with dose-dependent hypotension and respiratory depression, necessitating the use of adjuvants.

The addition of fentanyl or clonidine to propofol aims to improve insertion conditions and reduce adverse responses. Fentanyl provides analgesia and blunts sympathetic responses, but may be associated with respiratory depression and apnea. Clonidine, on the other hand, provides sedation, analgesia, and sympatholysis without significant respiratory compromise, making it a potentially safer alternative for LMA insertion.[16]

Overall, the findings of this study suggest that clonidine–propofol combination offers superior

hemodynamic stability compared to fentanyl–propofol, while maintaining comparable respiratory safety and oxygenation. This makes clonidine a useful adjuvant for improving conditions during AMBU LMA insertion in day-care anaesthesia settings.

CONCLUSION

The present study concludes that both clonidine–propofol and fentanyl–propofol combinations are effective for AMBU LMA insertion; however, clonidine–propofol provides better peri-induction hemodynamic stability compared to fentanyl–propofol. Heart rate and mean arterial pressure were more effectively controlled in the clonidine group without compromising oxygen saturation or respiratory safety. Both regimens were comparable in maintaining adequate oxygenation during induction and LMA insertion. Overall, clonidine appears to be a superior adjuvant to propofol by providing smoother hemodynamic responses and stable clinical conditions during AMBU LMA placement, making it a preferable choice in day-care anaesthesia practice.

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