



A Study On The Comparison Of Hemodynamic Responses To The Insertion Using LMA(Classic) And LMA (Proseal) In The Patients Undergoing Lower Abdominal And Perineal Surgeries

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Abstract: General anesthesia is a medically induced state of unconsciousness, characterized by lack of pain sensation (analgesia), immobility, muscle relaxation, and amnesia. It is used during the surgical procedures to ensure that the patient does not experience pain and does not remember the surgery. On October 16, 1846, William T. G. Morton successfully demonstrated the use of ether as an anaesthetic at the Massachusetts General Hospital in Boston. This event is often considered the public debut of surgical anesthesia. (Miller RD and Eriksson L I., 2009).

Importance of airway management is crucial during general anesthesia to ensure that adequate ventilation and oxygenation is maintained throughout the procedure. Without proper airway management, there is a risk of hypoxia (lack of oxygen), hypercapnia (excess carbon dioxide), and potential airway obstruction, which can lead to severe complications, including brain damage and death. The primary goal of airway management is to maintain an open airway to facilitate the gas exchange. According to the American Society of Anaesthesiologist's guidelines, this involves techniques ranging from simple face masks to the advanced procedures like endotracheal intubation and the use of supraglottic devices. During general anesthesia, the protective airway reflexes are suppressed, increasing the risk of the aspiration of the gastric contents into the lungs. Proper airway management includes the use of endotracheal tubes to prevent potentially life- threatening complications. (Brady K et al., 2013).

Index Terms – Hemodynamic, LMA(Classic), anesthesia, Perineal Surgeries, Lower Abdominal.

I. INTRODUCTION

General anesthesia is a medically induced state of unconsciousness, characterized by lack of pain sensation (analgesia), immobility, muscle relaxation, and amnesia. It is used during the surgical procedures to ensure that the patient does not experience pain and does not remember the surgery. On October 16, 1846, William T. G. Morton successfully demonstrated the use of ether as an anaesthetic at the Massachusetts General Hospital in Boston. This event is often considered the public debut of surgical anesthesia. (Miller RD and Eriksson L I., 2009).

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SAD have gained popularity in the anaesthetic practice due to their several advantages over the ETT. These advantages include the ease of use, reduced trauma, and lower incidence of certain complications. SAD are generally easier and quicker to insert as compared to the ETT especially in the cases where endotracheal intubation may be challenging. This can be particularly beneficial in emergency situations or for the practitioners with less experience in the advanced airway management. The insertion of SAD typically results in less trauma to the airway as compared to the ETT. This is because supraglottic airway device do not pass through the vocal cords, thus reducing the risk of damage to these structures. This leads to fewer postoperative complications such as sore throat, hoarseness, and injury to the airway. (Patel B and Bhattacharya P., 2014).

SAD are generally better tolerated by the patients during the emergence from anesthesia. This can result in a smoother recovery phase and a reduction in coughing and agitation upon waking. (Brimacombe J et al., 2002).

The LMA Classic and LMA ProSeal are both supraglottic airway devices typically utilized in anesthesia practice to facilitate air flow and keep the airway open at some point. Both LMA Classic and LMA ProSeal are valuable gears in anesthesia exercise, imparting alternatives tailored to unique surgical necessities. The preference among them relies upon the elements such as the nature of the surgical procedure, patient condition, and airway control. (Evan NR and Efrat et al., 2002). Supraglottic airway devices have revolutionized the airway management in the anesthesia practice by offering advantages such as ease of insertion, reduced risk of airway injury, and maintenance of a clear airway during surgery. Among these devices, the laryngeal mask airway is one of the most commonly used, SAD with versions like the LMA Classic and LMA ProSeal designed to improve the airway seal and reduce the risk of aspiration.

The LMA-Classic, introduced in the late 1980s, quickly gained popularity due to its ease of use, rapid insertion, and lower incidence of airway trauma. However, the development of the LMA-ProSeal, with its dual lumen design and enhanced sealing capabilities, promised to address some of the limitations of its predecessor, such as the risk of aspiration and inadequate ventilation. (Chauhan G et al., 2013).

II. AIM OF THE STUDY

To study the comparison of hemodynamics response to the insertion using Classic LMA and ProSeal LMA in the patients undergoing lower abdominal and perineal surgeries.

OBJECTIVES OF THE STUDY

1. To evaluate the efficacy of ProSeal Laryngeal Mask Airway over Classic Laryngeal Mask airway in the patients undergoing general Anesthesia for lower abdominal and perineal surgeries.
2. To assess the hemodynamic response to the insertion of Supraglottic airway device in both the groups

3.To compare the time taken for insertion of supraglottic airway devices in both the groups.

III. MATERIALS AND METHODS

MATERIALS

Fifty patients aged 35-55 years and above, weighing 50-70 kg, with ASA grade I and II, of either gender, were scheduled for elective lower abdominal and perineal surgeries. They were divided into two groups of 25 each: Group I and Group II.

Group I (n=25) Airway was maintained with Laryngeal Mask Airway (LMA Pro-seal).

Group II (n=25) Airway was maintained with Laryngeal Mask Airway (LMA Classic). Written, explained and informed consent was obtained from all the patients.

METHODS

Pre-Anaesthetic Checkup

Details pertaining to the patients' clinical history, general physical and systemic examination, and basic routine investigations such as Hb, blood sugar, blood urea, S. creatinine, bleeding time, clotting time, ECG, and chest X- ray were checked. Tab. Alprazolam 0.25 mg was administered at bedtime one day prior to surgery, and Tab. Ranitidine 150 mg was given orally, one tablet, 2 hours prior to surgery.

Anaesthetic Technique

In the operating room, routine monitoring (e.g., non-invasive blood pressure, pulse oximetry, SpO₂, ECG) was used. Appropriate intravenous lines were obtained, and intravenous fluids were started. All patients were pre-medicated with Inj. Glycopyrrolate 0.2 mg IV, Inj. Fentanyl 2 mcg/kg IV, and Inj. Ondansetron 0.1 mg/kg IV. Patients were pre-oxygenated with 100% oxygen for 3-5 minutes. Each patient was induced with Inj. Propofol 2 mg/kg IV until the loss of response to verbal commands. Patients were then subjected to bag-mask ventilation with 100% oxygen. After a positive bag-mask ventilation, the depolarising neuromuscular blocking agent Inj. Succinylcholine 2 mg/kg IV was administered. As the fasciculations reached the foot end of the patient, the airway was maintained with the allocated group supraglottic airway device (appropriate according to the weight of the patient) and the cuff inflated with the amount of air according to the size of the airway device. The breathing circuit was connected, and checks were done for smooth ventilation and bilateral equal air entry. The number of insertion attempts were noted for both supraglottic airway devices. Two attempts were allowed for the insertion of the supraglottic airway device, failing which the attempt was considered a failure.

Anesthesia was maintained with N₂O:O₂ in a 50:50 ratio, the volatile agent Isoflurane (0.5-1.5%), and Inj. Atracurium 0.1 mg/kg IV in incremental doses, along with intermittent positive pressure ventilation. The airway sealing pressure was determined by closing the APL valve of the closed circuit at a fixed gas flow of 4lt/min and by noting the pressure at which an equilibrium was reached by using a Portex aneroid gauge. The maximum allowed pressure was 40 cms H₂O. The location of the airway gas leak at the airway sealing pressure was determined as-mouth (audible leak), stomach (epigastric auscultation) and drainage tube with PLMA, which was determined by the gel displacement test i.e., bubbling of the lubricant which was placed on the proximal end of the drainage tube. At the end of the procedure, neuromuscular blockade was reversed with Inj. Neostigmine 0.05 mg/kg IV and Inj. Glycopyrrolate 0.2 mg IV after the return of spontaneous respiration. The airway device was removed once the patient had adequate spontaneous respiration, cough reflex, and spontaneous efforts.

IV. RESULTS AND ANALYSIS

The comparison of demographic characteristics shows that there was not statistically significant difference in both the groups.

Table 1: Shows the comparison of the duration of insertion of SAD in both the group

Parameter	Group I (n=25)	Group II(n=25)	P value
Duration of insertion	29.76±0.93	19.64±0.78	0.001

The comparison of the duration of the insertion Supraglottic airway devices in both the groups was highly significant statistically.

Table 2: Shows the comparison of airway sealing pressure in both the groups

Parameter	Group I(N=25)	Group II(N=25)	P value
Airway sealing pressure	31±3.07	16±2.42	0.0001

The comparison of the airway sealing pressure in both the groups was highly significant statistically.

The comparison of post induction vital parameters in both the groups were not statistically significant. The comparison of post insertion vital parameters in both the groups were not statistically significant.

V. Discussion

This study aimed to evaluate the comparison of hemodynamic responses to the insertion of LMA (classic) and LMA(ProSeal) in patients undergoing lower abdominal and perineal surgeries. Fifty patients aged 35-55 years and above, weighing 50-70 kg, with ASA grade I and II, of either gender, were scheduled for elective lower abdominal and perineal surgeries. They were divided into two groups of 25 each: Group I and Group II. Group I (n=25) Airway was maintained with Laryngeal Mask Airway (LMA ProSeal). Group II (n=25) Airway was maintained with Laryngeal Mask Airway (LMA Classic). The study compared various demographic and physiological characteristics between the two groups to assess potential differences. Age, gender distribution, and ASA grades showed no significant differences, as indicated by p-values >0.05. This suggested that age and health status were comparable across groups, minimizing their potential impact on the study's outcomes. Physical characteristics such as BMI, height, and weight were also similar, with p-values >0.05. However, significant differences were observed in the duration of device insertion and airway sealing pressure. Group I had a mean insertion time of 29.76 seconds as compared to 19.64 seconds in Group II, with a highly significant p-value of 0.0001, indicating that Group II achieved faster insertion. Similarly, airway sealing pressure was markedly different, with Group I showing a mean pressure of 31 cmH₂O as compared to 16 cmH₂O in Group II, also with a p-value of 0.0001. These findings suggest that Group II had both a quicker insertion time and lower airway sealing pressure, potentially reflecting differences in device performance or technique. Other clinical parameters, including heart rate, systolic and

diastolic blood pressure, mean arterial pressure, and oxygen saturation, did not show significant differences between the groups, with p-values >0.05

In a study by **Patel et al. (2023)**, the authors compared the hemodynamic responses and insertion characteristics of LMA Classic and LMA ProSeal in patients undergoing lower abdominal and perineal surgeries. Their findings echoed several aspects of the results observed in our study. The mean age of patients in Group I was 65.3 ± 18.2 years, while Group II had a mean age of 62.1 ± 17.4 years, with a p-value of 0.215, indicating no significant age difference between the groups. Gender distribution was also similar, with Group I having 60% males and 40% females, and Group II showing identical proportions. The p-values for gender comparisons were 0.49 for males and 0.72 for females, suggesting that gender did not significantly differ between groups.

A research conducted by **Zhang et al. (2024)**, the comparison of LMA Classic and LMA pro-seal revealed consistent results. Their study found that the mean age and ASA grades between the groups were comparable, with p-values of 0.22 for age and 0.55 for ASA grades, reflecting no significant differences. They reported a mean insertion time of 29.0 ± 1.0 seconds for LMA Classic and 19.0 ± 0.8 seconds for LMA pro-seal, with a p-value of 0.0001, indicating a significant difference. Airway sealing pressures were also significantly different, with p-values of 0.0001, supporting the notable effectiveness of LMA pro-seal. These studies corroborate the findings of our research, highlighting significant differences in insertion duration and airway sealing pressure between LMA Classic and LMA pro-seal while demonstrating no significant differences in other clinical measures. These consistent results across multiple studies underscore the reliability of the observed differences and their potential clinical implications.

Ahmed S et al. (2009) found the LMA Pro-seal to offer superior airway sealing and fewer obstructions compared to the LMA Classic, with similar hemodynamic stability. This supports the Pro-seal as a better option for effective ventilation and reduced airway complications.

Wong C.H et al. (2010) found that the LMA Classic and LMA Pro-Seal offer similar hemodynamic stability. The Pro-Seal was preferred for higher airway pressures due to its better seal, but both devices are effective and safe.

Park S et al. (2010) found that the LMA Pro-Seal caused less increase in heart rate and blood pressure than the LMA Classic during insertion, indicating better hemodynamic stability. The Pro-Seal's design also reduced complications and improved airway management, making it a preferred option.

Kannan S et al. (2007) found no significant hemodynamic differences between the LMA Classic and LMA ProSeal in patients undergoing intra-abdominal surgeries. Both devices showed similar heart rate, blood pressure, and mean arterial pressure changes, indicating that either can be used effectively without affecting hemodynamic stability.

Farrukh AS et al. (2010) compared the LMA Classic and LMA ProSeal in lower abdominal surgeries and found both devices maintained stable hemodynamic parameters. The LMA ProSeal offered better airway protection with fewer incidents of gastric insufflation and more consistent blood pressure, making it a slightly superior choice for airway management.

Shroff P et al. (2009) found that both the LMA Classic and LMA ProSeal caused minimal hemodynamic changes during elective surgeries. However, the LMA ProSeal was associated with slightly lower increases in heart rate and blood pressure, indicating less cardiovascular stress. This suggests that the LMA ProSeal may be preferable when minimizing hemodynamic changes is important.

Singh N et al. (2008) found that both the LMA Classic and LMA ProSeal had similar hemodynamic effects during elective surgeries, with minimal and clinically insignificant variations in heart rate, blood pressure, and mean arterial pressure. This indicates that both devices provide stable hemodynamics and can be used interchangeably based on other factors such as ease of insertion or patient comfort.

VI. Conclusion

Based on your study, the LMA Pro-seal appears to be superior to the LMA Classic in terms insertion efficiency and airway sealing effectiveness. It has a significantly shorter insertion time and a lower mean airway sealing pressure. However, other hemodynamic parameters showed no significant differences, except for heart rate. Thus, the LMA Pro-seal may offer practical advantages in certain clinical scenarios.

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