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Comparative Study Of Proseal Laryngeal Mask Airway Versus Cuffed Endotracheal Tube In Patietns Undergoing Laparoscopic Cholecystectomy Under General Anesthesia

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Abstract:
Background*: LC is a surgical technique that uses a set of cameras and specially designed instruments to remove the gallbladder through a series of small abdominal incisions. Due to their low invasive nature, laparoscopic surgeries are considered day care procedures. As a result, patients undergoing laparoscopic procedures now get less invasive airway management, such as PLMA, rather than ETT. Nowadays, SADs are frequently employed in the control of airways, falling somewhere among tracheal tubes and face masks both in terms of structural placement and degree of invasiveness. These devices provide a hands-free approach to seal an airway against gas. The two most often utilized methods for managing airways are endotracheal intubation and LMA ProSeal The present study aimed to compare the efficacy and safety of ProSeal LMA with Endotracheal Tube in patients undergoing Laparoscopic Cholecystectomy under general anaesthesia. To compare ProSeal LMA and Endotracheal tube with respect to intra-operative haemodynamic responses in patients undergoing laparoscopic cholecystectomy under general anaesthesia.*
Materials and Methods*: The study was carried out at the Department of Anaesthesiology, Katihar Medical College & Hospital, Katihar, Bihar, study was done for 1 Year, 60 individuals were enrolled, Group S (Study Group) with 30 patients received ProSeal LMA (PLMA) with an introducer and Group C (Control Group) with 30 patients received a cuffed Endotracheal Tube (ETT). Every variable was subjected to statistical analysis within the same individual and between 2 treatment categories using a suitable biostatistical methodology.*
Results*:. The PLMA required fewer attempts for successful insertion compared to ETT (1.63±0.49 vs 2.03±0.89, p=0.034). NGT insertion was quicker with PLMA compared to ETT. The PLMA group showed lower EtCO2 levels at multiple time points compared to the ETT group. The PLMA group had a lower incidence of sore throat and nausea but a higher incidence of airway trauma compared to the ETT group. The PLMA group had a higher rate of device removal without complications (93.3% vs 80%) and smooth postoperative recovery (90% vs 80%) compared to the ETT group.*
Conclusion: *In conclusion, our study demonstrates that the ProSeal Laryngeal Mask Airway (PLMA) offers several advantages over the conventional cuffed Endotracheal Tube (ETT) in patients undergoing laparoscopic cholecystectomy under general anesthesia. The PLMA was associated with easier insertion, more stable hemodynamics, effective ventilation, and a smoother postoperative course.*
Key Word: *Endotracheal Tube, ProSeal Laryngeal Mask Airway, PLMA, SAD, Supraglottic Airway Device*

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I. Introduction

LC is a surgical technique that uses a set of cameras and specially designed instruments to remove the gallbladder through a series of small abdominal incisions. For gallbladder-related conditions, this minimally invasive method is now the accepted standard of care[1]. It is really the most often performed laparoscopic procedure and is regarded as considered one of the most frequently performed surgical techniques globally.In the US, more than a million cholecystectomies are done every year, and more than 96% of them are done laparoscopically [2].

For benign biliary illness, laparoscopic cholecystectomy is the least intrusive surgical method available [3]. Currently, gallstone pancreatitis, biliary dyskinesia, acalculous cholecystitis, acute or chronic bowel obstruction, and polyps or gallbladder tumors can all be treated with LC [4]. Major biliary damage resulting from laparoscopic cholecystectomy had a death incidence of 0.3 percent to 0.5 percent [5].

The many benefits of laparoscopic surgery (LC) include several tiny incisions that are more aesthetically pleasing than the big incision used in a standard cholecystectomy. After surgery, the patient is typically able to leave the hospital the same day or the day after, and they can resume their regular activities in a few days. The procedure's overall cost is lowered as a result of these variables [6]. Laparoscopic surgery has many benefits, but

it also has drawbacks because of particular pathophysiological alterations. The circulatory and respiratory systems can be seriously hampered by patient posture (including reverse and Trendelenburg), a rise in intra-abdominal pressure (IAP), and CO2-induced pneumoperitoneum [7]. Securing the airway is necessary when administering anesthesia during laparoscopic procedures because many physiological changes are anticipated, such as respiratory and cardiac compliance, insufficient ventilation, and the possibility of regurgitation and aspiration from peritoneal insufflation [8].

Pneumoperitoneum following laparoscopic procedures is linked to higher intraabdominal pressure, which raises the possibility of pulmonary aspiration [9].Since general anesthesia (GA) removes the discomfort associated with pneumoperitoneum and shifts in the patient's position on the surgical table, it is the only procedure of choice for LC patients. Furthermore, tracheal intubation, which lowers the danger of bronchoaspiration, and more precise CO2 analysis are made possible by GA [10].Aside from this, the LC approach has had other modifications and alterations. In an effort to enhance cosmetic and postoperative results, a number of surgeons have attempted to decrease the size and quantity of ports, creating their own unique variations [11].

Airway Management:

A popular surgical treatment that calls for general anesthesia is laparoscopic cholecystectomy [12]. Despite considerbale advancements in modern anesthetic treatment, anesthesiologists still place a high priority on managing the airway [10]. Nowadays, SADs are frequently employed in the control of airways, falling somewhere among tracheal tubes and face masks both in terms of structural placement and degree of invasiveness. These devices provide a hands-free approach to seal an airway against gas. The LMA classic was the first supraglottic airway device to be successful; it was originally made accessible in 1989 and initially explained by Archie Brain [11]. Since it can impact patient outcomes, the choice of airway management approach is crucial. The two most often utilized methods for managing airways are endotracheal intubation and LMA ProSeal [12].

OBJECTIVES: Primary To compare ProSeal LMA and Endotracheal tube with respect to intra-operative haemodynamic responses in patients undergoing laparoscopic cholecystectomy under general anaesthesia.

Secondary:
- Comparison of ease of Insertion of device
- Comparison of ease of insertion of NG Tube
- Comparison of Gastric Aspirate
- Comparison of Post-operative complications like nausea, sore throat, cough, Airway trauma, vomiting

II. Material And Methods

This prospective randomized controlled double blind study was carried out on patients of Department of general anesthesia at Katihar Medical College, Katihar, Bihar for 1 year after the approval from ethical committee. A total 60 adult subjects (both male and females) of aged ≥ 18, years were enrolled for in this study.

Study Design: Prospective randomized controlled study

Study Location: This was a tertiary care teaching hospital based study done in Department of general anesthesia at Katihar Medical College, Katihar, Bihar.

Study Duration: 12 Months, March 2023- February 2024.

Sample size: 60 patients.

Sample size calculation: Sample size was calculated based on a study by Sellamuthu gunalan, rajagopalan vanketraman and paneerselvam Sundaretl in which mean arterial blood pressure just after intubation in dexmetomidine was 95.2+-16.92 and 109+-20.36 with alpha value of 5%, beta value of 20%(80%) and it was found to be 29 in each group so, 30 patients were included in each group.

Subjects & selection method: The study population was drawn from patients who presented to of general anesthesia at Katihar Medical College, Katihar, Bihar between from March 2023- February 2024. Patients were divided into two groups (each group had 30 patients).
- Group S (Study Group): 30 patients received ProSeal LMA (PLMA) with an introducer.
- Group C (Control Group): 30 patients received a cuffed Endotracheal Tube (ETT).

Inclusion criteria:
The following criteria were included in the study:
1.Patients undergoing elective surgeries under general anaesthesia
2.Age >18years to 60 years
3.Those who gave informed and written consent to be part of the study
4.ASA Grade I, II
5. Mallampati grade 1 and 2

Exclusion criteria:
The following criteria were excluded from the study:
1.Those who refused consent
2.Age <18years
3.ASA Grade II or above
4.Patients allergic to any of the drug used.
5. Individuals with pregnancy, hiatus hernia, and gastric reflux disease who are at a greater risk of aspiration.
5. Subjects having BMI is more than 30 kg/m2.

Procedure methodology

Select individuals who have appointments for elective Laparoscopic procedures under general anesthesia will be chosen following clearance from the Ethics Committee. The individuals' informed written consents will be obtained.

Postoperative Protocol:

A comprehensive pre-anesthetic examination was carried out the day preceding the procedure. The night prior to surgery, individuals were given an oral tablet containing half a milligram of alprazolam, and they were held at zero percent oral for 12 hours before surgery.

Intraoperative Management:

As soon as they reached the operating room, standard monitoring was connected, consisting a three-lead ECG, pulse oximeter and non-invasive blood pressure. Ringer's lactate infusion was initiated after an intravenous (IV) access point was created using an 18-gauge cannula.

Several medications were administered intravenously:
- 0.2 mg glycopyrrolate injection
- 0.05 mg/kg midazolam injection
- 1 µg/kg fentanyl injection
- 4 mg ondansetron injection
- 40 mg pantoprazole injection

Following the administration of these medications, for three minutes, each person received 100% oxygen preoxygenation.

Anesthesia Induction
Anesthesia was induced using the following:
- IV injection of 2.5 mg/kg propofol
- IV injection of succinyl choline at a dose of 1 mg/kg for neurological blockage Participants received oxygen and 0.8% isoflurane ventilation for three minutes. Trained anesthetic practitioners then proceeded to insert airway devices.

Device Placement and Ventilation

Square wave capnography, auscultation, and manual ventilation were used to verify that the airway device was positioned correctly. Positive-pressure breathing with a tidal capacity of 8 ml/kg was initiated after the placement was confirmed. A soda lime breathing apparatus was installed in a closed circuit. The insertion of an airway device was permitted to be done in three different ways. To avoid changes in hemodynamic parameters, patients who needed more than three tries were not included in the study. The device's ease of insertion will be recorded.

Ryle's Tube Insertion and Maintenance

Ryle's tube will be implanted. Air injection and epigastric auscultation will be used to verify that the Ryle's tube is positioned correctly. The amount of stomach aspiration will be measured both intraoperatively and shortly after Ryle's tube placement. Air: O2 (60%:40%), Isoflurane 0.5%–1.2%, coupled to a Continuous Flow Anaesthesia workstation machine, set to volume mode, and injectable vecuronium 0.02 mg/kg for blockade maintenance will be used to maintain anesthesia. IV crystalloids will be given once the Holliday-Segar formula has been used to determine fluid requirements.

Monitoring and Complications

CO2 flow rates and pressures were kept within the range of 200 to 400 ml/min and 10 to 15 mmHg, respectively. MBP and HR were measured prior to induction, one and five minutes after the device was inserted, during CO2 insufflation, every fifteen minutes during the procedure, and five minutes after the airway device was removed. In a similar manner, end- tidal CO2 (ETCO2) readings were tracked. Among the intraoperative issues that were monitored were recurrence-aspiration, a lack of oxygen, hypercarbia, airway occlusion, bronchospasm pneumothorax and stomach insufflation.

Postoperative Care

Isoflurane was stopped at the termination of the procedure. Remaining neuromuscular blockade was restored with injections of glycopyrrolate (0.008 mg/kg) and neostigmine (0.05 mg/kg). The patient received a 75 mg intravenous injection of diclofenac sodium to be used for anesthesia after surgery. After completing the Ryle's tube surgery and an oral suction, the airway equipment was removed. It was noted whether there was any blood or fluids on the instrument. Following surgery, patients' vital signs, nausea, vomiting, sore throats, and oral injuries were all observed.

Statistical analysis

Every variable was subjected to statistical analysis within the same individual and between 2 treatment categories using a suitable biostatistical methodology. The paired t-test and other appropriate tests were employed to assess whether there was considerable variation in the outcome variable between the two categories. P-values less than 0.05 are deemed statistically relevant for the duration of the investigation.

III. Result

In, group S (Study Group) the mean age is 40.63 years with a standard deviation of 13.03 years. The ages range from 18 to 58 years and in group C (Control Group) the mean age is 43.30 years with a standard deviation of 10.89 years. The ages range from 19 to 58 years. The age distribution between the two groups appears to be relatively similar, with Group C having a slightly higher mean age and a slightly lower standard deviation, indicating a somewhat more consistent age range among its participants. In Group S (PLMA), the mean weight is 71.03 kg with a standard deviation of 6.38 kg, the mean height is 164.20 cm with a standard deviation of 8.52 cm and the mean BMI is 26.34. In Group C (ETT), the mean weight is 70.67 kg with a standard deviation of 6.56 kg, the mean height is 164.93 cm with a standard deviation of 8.46 cm and the mean BMI is 25.95. There is a higher number of male patients (35) compared to female patients (25). The PLMA group had more males (20) than females (10), while the ETT group had an equal distribution of males and females (15 each).

Table no 1: Distribution of patients according to Device insertion, NGT insertion time and number of attempts.

Group	**Group S (PLMA) N = 30**	**Group C (ETT) N = 30**	**P value**
	Mean±SD	**Mean±SD**	
Device insertion Attempts	1.63±0.49	2.03±0.89	0.034
Device insertion time (in sec)	14.87±2.79	16.03±3.24	0.141
NGT Insertion time (in sec)	7.63±1.54	9.70±1.56	0.001

Device Insertion Attempts: The mean number of attempts for device insertion was significantly lower in the ProSeal LMA (PLMA) group (1.63±0.49) compared to the Endotracheal Tube (ETT) group (2.03±0.89), with a p-value of 0.034. This indicates that the PLMA required fewer attempts for successful insertion.

Device Insertion Time: The mean time for device insertion was slightly lower in the PLMA group (14.87±2.79 seconds) compared to the ETT group (16.03±3.24 seconds). However, this difference was not statistically significant, with a p-value of 0.141.

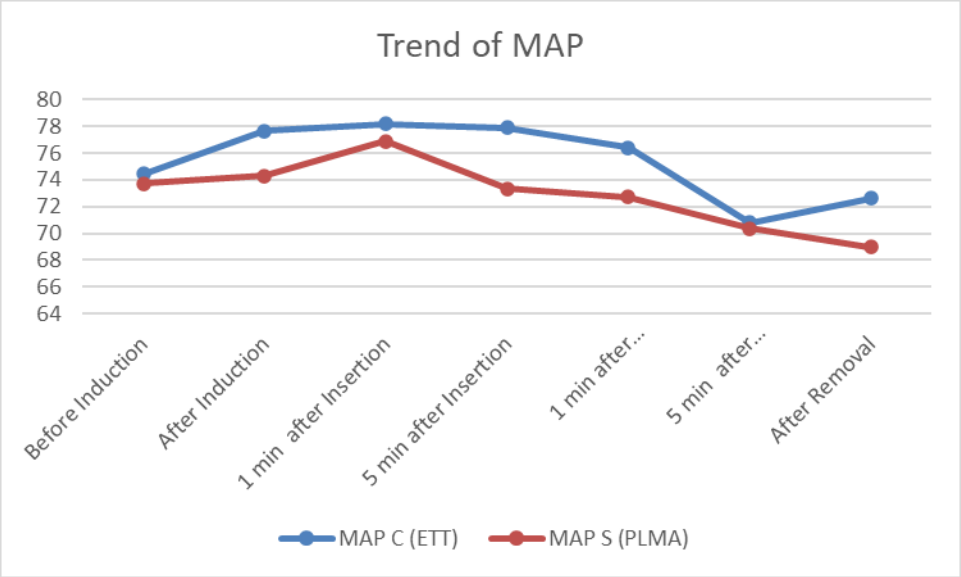
Nasogastric Tube (NGT) Insertion Time: The mean time for NGT insertion was significantly lower in the PLMA group (7.63±1.54 seconds) compared to the ETT group (9.70±1.56 seconds), with a p-value of 0.001. This suggests that NGT insertion was quicker with the PLMA. (Table 1)

Table no 2: Distribution of patients according to Pulse rate at different time points.

Pulse rate at different time points	Group S (PLMA) N = 30	Group C (ETT) N = 30	P value
	Mean±SD	Mean±SD	
Pulse rate before induction	74.83±2.91	75.73±2.84	0.231
Pulse rate after induction	81.90±1.72	82.87±1.87	0.141
Pulse rate 1 min after insertion	90.77±2.86	99.90±5.98	0.001
Pulse rate 5 min after insertion	77.87±1.87	79.87±3.19	0.001
Pulse rate 1 min after pneumoperitoneum	84.80±3.34	95.37±3.22	0.004
Pulse rate 5 min after pneumoperitoneum	82.53±1.61	87.53±1.74	0.001
Pulse rate after removal	82.67±1.77	90.23±3.17	0.001

In summary, the ProSeal LMA (PLMA) group consistently showed lower pulse rates at various time points compared to the Endotracheal Tube (ETT) group, with significant differences observed at 1 minute and 5 minutes after insertion, 1 minute and 5 minutes after pneumoperitoneum, and after removal. This suggests that the PLMA may be associated with a more stable hemodynamic profile during and after the procedure. (Table 2)

Figure 1: Line diagram showing trend of MAP among study participants



In summary, the ProSeal LMA (PLMA) group consistently showed lower mean arterial pressure at various time points compared to the Endotracheal Tube (ETT) group, with significant differences observed after induction, 1 minute and 5 minutes after insertion, 1 minute after pneumoperitoneum, and after removal. This suggests that the PLMA may be associated with more stable mean arterial pressure during and after the procedure. (Figure 1)

Table no 3: Distribution of patients according to end-tidal carbon dioxide (EtCO2) at different time points.

$EtCO_2$ at different time points	Group S (PLMA) N = 30	Group C (ETT) N = 30	P value
	Mean±SD	Mean±SD	
ETCO2 before induction	32.37±1.45	31.63±1.37	0.049
ETCO2 after induction	31.90±1.49	32.93±0.87	0.002
ETCO2 1 min after insertion	32.70±1.15	33.30±1.09	0.042
ETCO2 5 min after insertion	33.67±1.12	34.80±1.07	0.001
ETCO2 1 min after pneumoperitoneum	34.27±1.08	36.50±1.20	0.001
ETCO2 5 min after pneumoperitoneum	33.67±0.84	34.50±1.17	0.002
ETCO2 after removal	32.93±1.74	32.13±1.41	0.055

In summary, the ProSeal LMA (PLMA) group consistently showed lower EtCO2 levels at various time points compared to the Endotracheal Tube (ETT) group, with significant differences observed after induction, 1 minute and 5 minutes after insertion, and 1 minute and 5 minutes after pneumoperitoneum. This suggests that the PLMA may be associated with better ventilation efficiency during and after the procedure. (Table 3)

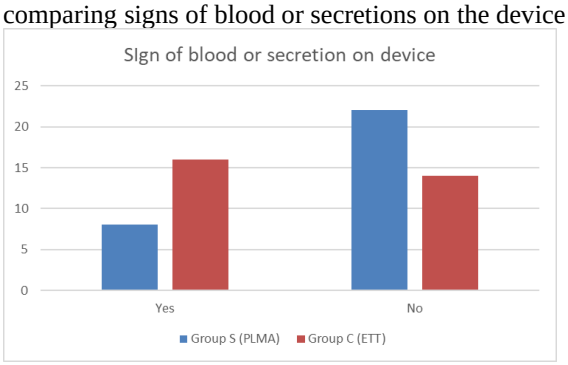
Table no 4: Distribution of patients according to post operative complications.

Post operative complications	Group S (PLMA)	Group C (ETT)	Total
Airway trauma	6	3	9
Nausea	3	5	8
Sore throat	3	6	9
Vomiting	5	5	10
None	13	11	24
Total	30	30	60

Airway Trauma: There were 6 cases of airway trauma in the PLMA group and 3 cases in the ETT group, totaling 9 cases. Nausea: There were 3 cases of nausea in the PLMA group and 5 cases in the ETT group, totaling 8 cases. Sore Throat: There were 3 cases of sore throat in the PLMA group and 6 cases in the ETT group, totaling 9 cases. Vomiting: Both groups had 5 cases of vomiting each, totaling 10 cases. None: There were 13 patients in the PLMA group and 11 patients in the ETT group who did not experience any postoperative complications, totaling 24 patients.

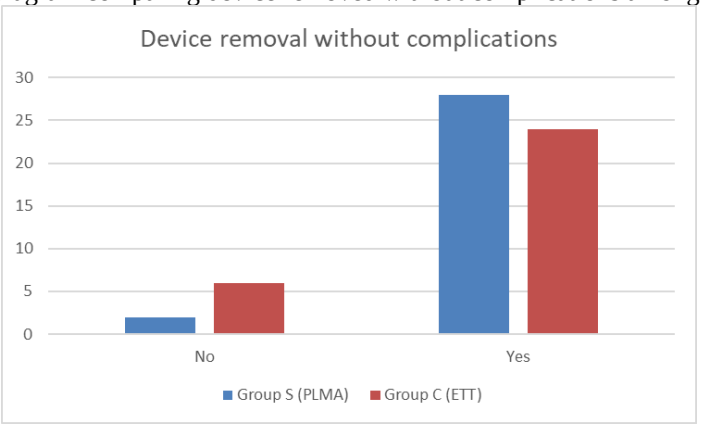
The ProSeal LMA (PLMA) group had a higher incidence of airway trauma but fewer cases of nausea and sore throat compared to the Endotracheal Tube (ETT) group. Both groups had an equal number of vomiting cases. Additionally, a slightly higher number of patients in the PLMA group experienced no postoperative complications compared to the ETT group. This data provides insight into the different postoperative outcomes associated with each airway management device. (Table 4)

Figure no 2: Bar diagram comparing signs of blood or secretions on the device among study participants



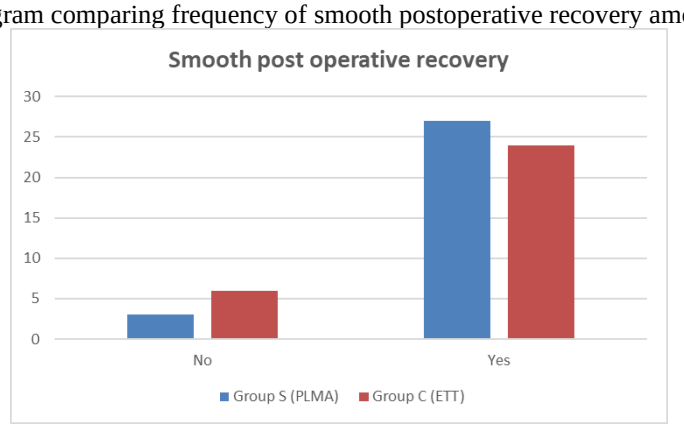
Group S (PLMA): Out of 30 patients, 8 had signs of blood or secretions on the device, while 22 did not. Group C (ETT): Out of 30 patients, 16 had signs of blood or secretions on the device, while 14 did not. In total, across both groups, there were 24 patients with signs of blood or secretions on the device and 36 patients without, making a total of 60 patients. The ProSeal LMA (PLMA) group had fewer instances of blood or secretions on the device compared to the Endotracheal Tube (ETT) group. This suggests that the PLMA may be associated with a lower incidence of airway trauma or irritation, contributing to a smoother postoperative recovery. (Figure 2)

Figure no 3: Bar diagram comparing device removed without complications among study participants



Group S (PLMA): Out of 30 patients, 28 had the device removed without complications, while 2 experienced complications. Group C (ETT): Out of 30 patients, 24 had the device removed without complications, while 6 experienced complications. In total, across both groups, 52 patients had the device removed without complications, and 8 experienced complications, making a total of 60 patients.. (Figure 3)

Figure no 4: Bar diagram comparing frequency of smooth postoperative recovery among study participants



The ProSeal LMA (PLMA) group had a higher rate of smooth postoperative recovery compared to the Endotracheal Tube (ETT) group. This suggests that the PLMA may be associated with better overall postoperative outcomes, contributing to a more favorable recovery experience for patients. (Figure 4)

IV. Discussion

Laparoscopic cholecystectomy has become the gold standard for gallbladder removal, offering patients reduced postoperative pain, shorter hospital stays, and quicker recovery times compared to open cholecystectomy as per study by Bajwa et al [13]. However, the choice of airway management during this procedure remains a topic of debate among anesthesiologists. Traditionally, endotracheal intubation has been the preferred method due to its ability to secure the airway and facilitate controlled ventilation according to the study by Brimacombe J et al [14]. In recent years, the ProSeal Laryngeal Mask Airway (PLMA) has emerged as a potential alternative, offering potential benefits such as reduced airway trauma and improved hemodynamic stability as per Sprung J et al [15].

This study aimed to compare the efficacy and safety of the ProSeal LMA (PLMA) with the conventional cuffed Endotracheal Tube (ETT) in patients undergoing laparoscopic cholecystectomy under general anesthesia. By examining various parameters including ease of insertion, hemodynamic responses, and postoperative complications, we sought to provide evidence-based insights to guide airway management choices in this common surgical procedure.

Interpretation of Results

Demographics and Patient Characteristics

The study groups were well-matched in terms of age, weight, height, and BMI, which strengthens the validity of our comparisons. The mean age in the PLMA group was 40.63±13.03 years, while in the ETT group it was 43.30±10.89 years. This similarity in age distribution minimizes the potential confounding effect of age-related differences in airway anatomy or physiological responses to anesthesia [15].

The gender distribution showed a higher proportion of males in the PLMA group (20 males, 10 females) compared to an equal distribution in the ETT group (15 males, 15 females). While this difference in gender distribution could potentially influence some outcomes, previous studies like Sprung J et al that by have not shown significant gender-based differences in the performance of supraglottic airway devices or endotracheal tubes in laparoscopic procedures [16].

The ASA physical status classification of patients was relatively evenly distributed between ASA I and II in both groups, indicating that the study population consisted of generally healthy individuals or those with mild systemic diseases. This distribution is representative of the typical patient population and similar to findings of Saito T et al for the patients undergoing elective laparoscopic cholecystectomy [17].

Device Insertion and NGT Placement

The significantly lower number of insertion attempts required for the PLMA (1.63±0.49 vs 2.03±0.89, p=0.034) suggests that it may be easier to place correctly compared to the ETT. This finding aligns with previous studies that have reported high first-attempt success rates with the PLMA in various surgical procedures like

Gurusamy KS et al [18]. The ease of insertion could be attributed to the PLMA's design, which allows for digital or introducer-guided placement without the need for laryngoscopy similar to the findings of Lim Y et al [19].

The quicker nasogastric tube insertion time observed with the PLMA (7.63±1.54 vs 9.70±1.56 seconds, p=0.001) is a notable advantage. This finding can be explained by the PLMA's dedicated gastric access channel, which facilitates easy passage of the NGT also observed in the study by Cook TM et al [20]. In contrast, NGT insertion with an ETT in place often requires more manipulation and can be more time-consuming as shown by Lu PP et al [21]. Faster NGT placement not only saves time but may also reduce the risk of trauma to the nasopharyngeal structures as seen by Moharari RS et al [22].

Hemodynamic Responses

One of the most striking findings of our study was the consistently lower pulse rates and blood pressure measurements in the PLMA group compared to the ETT group, particularly after device insertion and during pneumoperitoneum. For instance, the mean pulse rate 1 minute after insertion was significantly lower in the PLMA group (90.77±2.86 vs 99.90±5.98, p=0.001). Similarly, systolic blood pressure 1 minute after insertion was markedly lower in the PLMA group (124.93±3.27 vs 140.13±5.51, p=0.001).

These hemodynamic differences can be attributed to the reduced airway stimulation associated with the PLMA compared to endotracheal intubation. The process of laryngoscopy and tracheal intubation is known to provoke a more intense sympathoadrenal response, leading to tachycardia and hypertension similar to the findings of Chen KT et al [23]. In contrast, the PLMA, being a supraglottic device, bypasses the trachea and causes less stimulation of the upper airway reflexes also seen in study by Shribman AJ et al [24].

The attenuated hemodynamic response observed with the PLMA is particularly advantageous in laparoscopic cholecystectomy, where pneumoperitoneum itself causes an increase in systemic vascular resistance and mean arterial pressure similar to observations of Dahaba AA et al [25]. By minimizing the additional cardiovascular stress associated with airway management, the PLMA may contribute to improved hemodynamic stability throughout the procedure.

Ventilatory Parameters

The lower end-tidal CO2 (EtCO2) levels observed in the PLMA group at various time points, particularly during pneumoperitoneum, are noteworthy. For example, 1 minute after pneumoperitoneum, the mean EtCO2 was significantly lower in the PLMA group (34.27±1.08 vs 36.50±1.20, p=0.001). This finding suggests that the PLMA provided adequate ventilation and CO2 elimination, even in the face of increased intra-abdominal pressure due to pneumoperitoneum.

The effective CO2 elimination with the PLMA can be attributed to its design features, including the larger ventilatory conduit and the ability to achieve a good pharyngeal seal as seen by Joris JL et al also [26]. As per Brimacombe J et al findings, these characteristics allow for efficient positive pressure ventilation, which is crucial during laparoscopic procedures where respiratory mechanics are altered due to pneumoperitoneum and the Trendelenburg position [27].

It's important to note that while the differences in EtCO2 were statistically significant, they remained within clinically acceptable ranges for both groups. This indicates that both the PLMA and ETT can provide adequate ventilation for laparoscopic cholecystectomy, with the PLMA potentially offering a slight advantage in CO2 elimination.

Postoperative Complications

The pattern of postoperative complications observed in our study provides valuable insights into the relative merits of each airway device. The lower incidence of sore throat in the PLMA group (3 cases vs 6 cases) aligns with previous research of Ogunnaike BO et al demonstrating reduced pharyngolaryngeal morbidity with supraglottic airway devices compared to endotracheal tubes [28]. This can be attributed to the PLMA's softer material and the absence of direct contact with the tracheal mucosa as seen in the study by Higgins PP et al [29].

However, the higher incidence of airway trauma in the PLMA group (6 cases vs 3 cases) was an unexpected finding. This could potentially be related to the insertion technique or the learning curve associated with PLMA placement similar to McHardy FE et al observations [30]. It's worth noting that the definition and assessment of "airway trauma" may vary, and minor mucosal injuries during PLMA insertion might have been more readily observable compared to potential tracheal injuries from ETT placement.

The lower incidence of nausea in the PLMA group (3 cases vs 5 cases) is a positive finding, as postoperative nausea and vomiting (PONV) can significantly impact patient satisfaction and recovery as observed by Keller C et al too [31]. The reduced incidence of PONV with PLMA could be due to less stimulation of the tracheal and laryngeal reflexes, which are known to contribute to these symptoms also seen by Apfel CC et al [32].

Device Removal and Postoperative Recovery

The higher rate of device removal without complications in the PLMA group (93.3% vs 80%) is a significant advantage. This smooth removal process can be attributed to the PLMA's design, which allows for easy deflation and gentle extraction without the need for deep anesthesia or neuromuscular blockade reversal, as is often required for ETT removal as observed by Hohlrieder M et al too[33].

The higher proportion of patients experiencing smooth postoperative recovery in the PLMA group (90% vs 80%) is particularly noteworthy. This could be a cumulative effect of the reduced hemodynamic stress during the procedure, lower incidence of sore throat and nausea, and the smoother emergence associated with PLMA use also noticed by Keller C et al [34]. The absence of endotracheal intubation may also contribute to reduced airway irritation and a lower risk of laryngospasm during emergence, factors that can influence the quality of recovery similar to Maltby JR et al findings[35].

V. Conclusion

In conclusion, our study demonstrates that the ProSeal Laryngeal Mask Airway (PLMA) offers several advantages over the conventional cuffed Endotracheal Tube (ETT) in patients undergoing laparoscopic cholecystectomy under general anesthesia. The PLMA was associated with easier insertion, more stable hemodynamics, effective ventilation, and a smoother postoperative course.

The attenuated hemodynamic response observed with the PLMA is particularly beneficial in the context of laparoscopic surgery, where pneumoperitoneum already poses cardiovascular challenges. The lower incidence of sore throat and nausea, coupled with the higher rate of smooth postoperative recovery, suggests that the PLMA may contribute to improved patient comfort and satisfaction.

However, the higher incidence of airway trauma with the PLMA underscores the importance of proper technique and adequate training in its use. This finding also highlights the need for careful patient selection and individualized decision-making when choosing between PLMA and ETT.

While our study provides valuable insights, larger multicenter trials are needed to confirm these findings and explore their applicability across diverse patient populations and clinical settings. Future research should also focus on long-term outcomes, cost-effectiveness, and optimization of PLMA use in laparoscopic procedures.

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