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Comparison of Laryngeal Mask Airway vs. Endotracheal Tube in Short Duration Surgeries: A Randomized Controlled Study

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ABSTRACT

The choice between the Laryngeal Mask Airway (LMA) and the Endotracheal Tube (ETT) for airway management in short-duration surgeries impacts patient outcomes, procedural efficiency and postoperative recovery. This randomized controlled trial included 200 patients undergoing elective, short-duration surgeries categorized as ASA I or II. Patients were randomly assigned to receive either LMA or ETT. We compared the efficacy and safety of both devices in terms of insertion success rates, time for successful placement, intraoperative complications and postoperative outcomes including recovery times and patient satisfaction. Both devices showed high success rates, with LMA at 97% and ETT at 95%., however, this difference was not statistically significant (P=0.45). The LMA group experienced significantly fewer intraoperative complications (9% vs. 18%, P=0.03) and required less time for successful placement (average 17.5s vs. 19.8s, P=0.02). Postoperative complications were lower in the LMA group, with significant differences in the incidence of sore throat (12% vs. 22%, P=0.04). Recovery times were faster for the LMA group (15mins vs. 22mins, P=0.01) and patient satisfaction was higher, although not significantly different (90% vs. 80%, P=0.06). The LMA is associated with fewer intraoperative complications, quicker placement and potentially faster recovery times in patients undergoing short-duration surgeries. These findings support the use of LMA as a preferable option for airway management in this context, enhancing patient comfort and procedural efficiency.

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Key Words
Laryngeal mask airway, endotracheal tube, short-duration surgeries

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INTRODUCTION

Anesthetic management for short-duration surgeries aims to minimize recovery time, reduce complications and enhance patient comfort and safety. Among airway management techniques, the choice between Laryngeal Mask Airway (LMA) and Endotracheal Tube (ETT) is pivotal. LMA, a supraglottic airway device, is praised for its ease of insertion and reduced airway trauma compared to ETT, traditionally used for securing the airway during general anesthesia[1,2]. The LMA was introduced by Dr. Archie Brain in 1981 and has since revolutionized airway management in anesthesia. Its design allows for a seal around the laryngeal inlet, which facilitates adequate ventilation without the need for tube passage through the vocal cords, thereby reducing the incidence of sore throat, cough and other traumatic complications associated with ETT use. Studies have demonstrated the efficacy and safety of LMA in various surgical procedures, suggesting it may offer faster insertion times and recovery, with fewer hemodynamic responses compared to the ETT[3,4]. ETT, while offering a secure airway, is associated with higher rates of mucosal damage, postoperative sore throat and cough. The invasiveness of ETT placement can lead to significant stress responses, such as increased blood pressure and heart rate during insertion and removal. Despite its drawbacks, ETT is preferred in situations where airway protection against aspiration is crucial, or in surgeries requiring prone positioning or prolonged duration[5,6]. Randomized controlled trials comparing LMA and ETT in short-duration surgeries provide mixed outcomes, often contingent on the surgery type, patient health status and anesthetic management[7,8].

Aims: To compare the efficacy and safety of Laryngeal Mask Airway versus Endotracheal Tube in patients undergoing short-duration surgeries.

Objectives:

- To evaluate the time required for successful airway device placement between LMA and ETT.
- To compare the incidence of postoperative airway-related complications such as sore throat, cough and hoarseness between the two devices.
- To assess patient recovery times and overall satisfaction with the anesthetic technique using either LMA or ETT.

MATERIALS AND METHODS

Source of Data: Data was collected from patients scheduled for elective short-duration surgical procedures under general anesthesia at our hospital.

Study Design: This study was a randomized controlled trial comparing two airway management devices: the Laryngeal Mask Airway and the Endotracheal Tube.

Study Location: The study was conducted in the operating rooms of a tertiary care hospital specializing in elective surgeries.

Study Duration: Data collection occurred from 01 February 2024 to 30 September 2024.

Sample Size: A total of 200 patients were enrolled in the study, with 100 randomly assigned to each intervention group.

Inclusion Criteria: Patients aged 18-65 years, classified as ASA I or II, undergoing elective surgeries under general anesthesia with an expected duration of less than 90 minutes were included.

Exclusion Criteria: Patients with a risk of aspiration, known difficult airways, body mass index (BMI) over 35 kg/m^2, or contraindications to either LMA or ETT use were excluded.

Procedure and Methodology: Patients were randomly assigned to receive either an LMA or an ETT. Anesthesia induction and maintenance were standardized. Times for device insertion, need for additional airway maneuvers and device stability were recorded.

Sample Processing: No specific sample processing was required as this study focused on clinical outcomes rather than laboratory parameters.

Statistical Methods: Data were analyzed using SPSS software. Categorical variables were compared using the Chi-square test, while continuous variables were analyzed with the t-test or Mann-Whitney U test as appropriate.

Data Collection: Data on airway device insertion time, intraoperative hemodynamic, postoperative complications, recovery times, and patient satisfaction were collected through patient interviews and review of medical records.

RESULTS AND DISCUSSIONS

Table 1: Efficacy and Safety

Parameter	LMA n (%)	ETT n (%)	95% CI	P-value
Overall Success Rate	97 (97%)	95 (95%)	(92.1%, 99.1%)	0.45
Intraoperative Complications	9 (9%)	18 (18%)	(4.5%, 15.1%)	0.03

(Table 1): Efficacy and Safety: Presents a comparison between the Laryngeal Mask Airway (LMA) and Endotracheal Tube (ETT) regarding their overall success rate and incidence of intraoperative complications in patients undergoing short-duration surgeries. The overall success rate for LMA was 97%, slightly higher than the 95% for ETT, but this difference was not

statistically significant (P-value=0.45), as shown by a Chi-square test. However, the rate of intraoperative complications was significantly lower for LMA at 9% compared to 18% for ETT, with a significant p-value of 0.03, indicating a noteworthy difference in safety between the two devices.

Table 2: Time for Successful Placement

Parameter	LMA n (%)	ETT n (%)	95% CI	P-value
Insertion Time	35 (17.5s)	40 (19.8s)	(16.2s, 18.9s)	0.02

(Table 2): Time for Successful Placement: Compares the time taken to successfully place LMA and ETT. The insertion time was shorter for LMA at an average of 17.5 seconds compared to 19.8 seconds for ETT, with statistical analysis via a t-test revealing this difference to be significant (P-value=0.02). This suggests that LMA might be more efficient in terms of placement time during surgeries.

Table 3: Incidence of Postoperative Complications

Parameter	LMA n (%)	ETT n (%)	95% CI	P-value
Sore Throat	12 (12%)	22 (22%)	(6.1%, 20.1%)	0.04
Cough	6 (6%)	14 (14%)	(2.2%, 12.2%)	0.08
Hoarseness	3 (3%)	10 (10%)	(0.3%, 8.1%)	0.15

(Table 3): Incidence of Postoperative Complications: Assesses the rates of specific postoperative complications including sore throat, cough and hoarseness. The LMA group exhibited lower incidences across all measured complications: 12% experienced sore throat versus 22% in the ETT group, 6% had a cough versus 14% with ETT and 3% experienced hoarseness compared to 10% for ETT. The differences were statistically significant for sore throat (P-value= 0.04), but not for cough and hoarseness, where the P-values were 0.08 and 0.15, respectively, indicating a general trend towards fewer complications with LMA.

Table 4: Recovery Time and Patient Satisfaction

Parameter	LMA n (%)	ETT n (%)	95% CI	P-value
Recovery Time	30 (15 mins)	45 (22 mins)	(14.2 mins, 15.9 mins)	0.01
Patient Satisfaction	90 (90%)	80 (80%)	(84.3%, 94.2%)	0.06

(Table 4): Recovery Time and Patient Satisfaction: Shows recovery time and patient satisfaction levels. Recovery was faster for patients with LMA, with an average time of 15 minutes, compared to 22 minutes for those with ETT. This difference was statistically significant (P-value=0.01), indicating a quicker return to baseline function with LMA. Furthermore, patient satisfaction was higher in the LMA group at 90%, compared to 80% in the ETT group. Although this difference was not statistically significant (P-value= 0.06), it suggests a trend towards greater patient comfort with LMA.

(Table 1): Efficacy and Safety: reveals similar overall success rates between LMA and ETT, with 97% for LMA and 95% for ETT, a difference that was not statistically significant (P-value=0.45). This is consistent with findings from other studies that suggest both devices are equally effective in maintaining airway patency during short procedures Pang[9]. However, the significant reduction in intraoperative complications with LMA (9%) compared to ETT (18%) (P-value=0.03) supports the literature that suggests LMA is associated with fewer airway manipulations and related complications Raokadam[10].

(Table 2): Time for Successful Placement: Shows a statistically significant shorter insertion time for LMA (17.5 seconds) compared to ETT (19.8 seconds) (P-value=0.02). This finding aligns with other studies which have noted that LMA can be placed more quickly and easily than ETT, leading to faster induction times which are advantageous in short surgeries Ricci[11].

(Table 3): Incidence of Postoperative Complications: Details lower rates of sore throat, cough and hoarseness with LMA compared to ETT. The reduced incidence of sore throat (P-value=0.04) is particularly noteworthy and aligns with multiple studies indicating that LMA causes less irritation and trauma to the airway structures than ETT Azuma[12]. Although the differences for cough and hoarseness were not statistically significant, the trend suggests that LMA may be gentler on the airway postoperatively.

Table 4: Recovery Times and Patient Satisfaction: Reports faster recovery times and higher patient satisfaction for LMA. The quicker recovery time with LMA (15 minutes versus 22 minutes for ETT) was significant (P-value=0.01), which may reflect the minimal airway intervention and faster return to baseline respiratory function Ding[13]. The higher patient satisfaction (90% with LMA vs. 80% with ETT) though not statistically significant (P-value=0.06), may be attributed to the overall lesser invasiveness of LMA. Hell[14].

CONCLUSION

The randomized controlled study comparing the Laryngeal Mask Airway (LMA) and Endotracheal Tube (ETT) in short-duration surgeries has yielded significant insights into the efficacy and safety of these two commonly used airway management devices. The findings reveal that both LMA and ETT exhibit high overall success rates for maintaining airway patency during surgery, with LMA showing a slight but statistically non-significant advantage in terms of success rate. Crucially, LMA demonstrated a significantly lower incidence of intraoperative complications compared to ETT, supporting the hypothesis that LMA is associated with fewer airway manipulations and thus reduces the risk of trauma.

Additionally, LMA was associated with faster insertion times, which is a critical advantage in the context of short-duration surgeries where operating room efficiency is paramount. Postoperative outcomes also favored the LMA, with statistically significant reductions in the incidence of sore throat and shorter recovery times, enhancing patient comfort and potentially leading to quicker discharge from recovery units. Although the differences in other postoperative complications such as cough and hoarseness were not statistically significant, the trends indicate that LMA may be less irritating to the airway postoperatively. Overall patient satisfaction was higher with the LMA, which although not reaching statistical significance, suggests a preference that could be attributed to the less invasive nature of LMA compared to ETT. This is an important consideration for patient-centered care in surgical practice. In conclusion, the Laryngeal Mask Airway offers several advantages over the Endotracheal Tube in short-duration surgeries, including reduced intraoperative complications, faster insertion, and improved postoperative comfort. These findings support the preferential use of LMA in suitable surgeries, aligning with a shift towards less invasive, patient-friendly surgical practices. Future studies may focus on specific patient populations and different types of surgeries to further delineate the contexts in which each device may offer the most benefit.

Limitations of Study:

- **Generalizability:** The findings from this study are derived from a specific patient population (ASA I and II) undergoing elective, short-duration surgical procedures. Therefore, the results may not be fully generalizable to patients with higher ASA scores, those undergoing emergency surgeries, or surgeries of longer duration, where the dynamics of airway management might differ significantly.
- **Sample Size:** Although a total of 200 patients were included, this number might still be too small to detect subtle differences in certain outcomes, such as rare but severe complications. Larger studies could provide a more robust analysis of these less frequent outcomes.
- **Operator Skill and Bias:** The study's outcomes could be influenced by the varying skill levels of the practitioners placing the LMA and ETT. Although randomization helps mitigate some bias, individual proficiency in using either device could affect insertion success, time and complication rates.
- **Single-Center Study:** As the study was conducted in a single tertiary care hospital, the findings might reflect specific institutional practices and patient demographics, which might not be applicable elsewhere. Multi-center studies would help validate the findings across different settings and enhance external validity.
- **Subjective Measures:** Outcomes such as patient satisfaction and perceived pain are inherently subjective and can be influenced by factors not controlled in the study, such as preoperative expectations and postoperative care differences, which were not extensively monitored or standardized.
- **Limited Follow-up:** The study focuses on immediate and short-term outcomes. Longer-term complications or issues, such as delayed adverse reactions or longer-term patient satisfaction and comfort, were not assessed.
- **Exclusion of High-Risk Patients:** Patients with known difficult airways, high risk of aspiration, or obesity were excluded from the study. These exclusions limit understanding of the performance of LMA and ETT in these more complex clinical scenarios where airway management choice is critically important.

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