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COMPARISON OF STANDARD AND ROTATIONAL TECHNIQUE FOR EASE OF INSERTION OF LARYNGEAL MASK AIRWAY (LMA) IN ADULT PATIENTS

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Abstract

Background: *Laryngeal mask airway (LMA) is widely used for airway management during short elective surgical procedures. Ease of insertion is essential for successful placement and minimizing complications. Various insertion techniques have been described, including the standard Brain's technique and the rotational technique, with variable success rates reported in the literature. This study compared the frequency of ease of LMA insertion using standard and rotational techniques in local settings.*

Objective: *To compare the frequency of ease of LMA insertion using standard and rotational techniques in adult female patients undergoing laparoscopic gynecological surgery.*

Study Design: *Prospective randomized controlled trial.*

Setting: *Department of Anesthesiology, Hameed Latif Hospital, Lahore.*

Duration: *Four months w.e.f. 20-01-2025 to 20-05-2025*

Methodology: *A total of 124 adult female patients aged 20–40 years, ASA I–II, scheduled for laparoscopic gynecological surgery were enrolled. They were divided into two groups: Group A and Group B, with 62 patients in each group. Participants were randomly assigned using a lottery method. Group A underwent LMA insertion using the standard technique, while Group B underwent insertion using the rotational technique. Ease of insertion was defined as successful placement of LMA on the first attempt. Time taken for insertion and incidence of complications were also recorded. Data were analyzed using SPSS version 25. Chi-square test and independent sample t-test were applied, with $p \leq 0.05$ considered statistically significant.*

Results: *Both groups were comparable at baseline ($p>0.05$). Ease of insertion was achieved in 54 patients (87.1%) in standard group and 58 patients (93.5%) in rotational group ($p=0.224$). Mean insertion time was 8.03±4.70 seconds in standard group versus 8.73±4.35 seconds in rotational group ($p=0.395$). Sore*

throat occurred in 13 (21.0%) and 11 (17.7%) patients respectively (p=0.649). Dysphagia was reported in 0 vs. 1 patient (p=1.000). No intraoperative complications (desaturation, laryngospasm, mucosal trauma) were recorded in either group.

Conclusion: *Both standard and rotational techniques for LMA insertion demonstrate high success rates with comparable outcomes. The rotational technique does not confer significant advantage over standard technique in this low-risk patient population.*

INTRODUCTION

Airway management stands as the most important skill in anesthesiology, crucial in preventing major morbidities and mortalities linked to anesthesia[1]. The laryngeal mask airway (LMA) serves as a mainstay in modern anesthetic practice. It is frequently used in maintaining the airway for spontaneously breathing patients during short elective surgical procedures[2]. Utilizing controlled ventilation via LMA has proven successful at moderate airway pressure levels[3]. It is a popular choice as a backup device for emergency ventilation in challenging airway scenarios[4]. Proper positioning of the LMA is crucial, as incorrect insertion may lead to issues such as gas leakage, obstruction, and gastric insufflation[5].

Numerous techniques for LMA insertion have been tested regarding ease of application across all age groups. However, none have yet replaced the Brain's insertion technique as the standard[6]. Challenges often arise with Brain's technique, particularly in negotiating the insertion of the LMA tip into the posterior oropharynx, necessitating excessive force for proper placement. This can result in multiple insertion attempts, prolonged insertion time, airway trauma, and ultimately, failed LMA insertion[7].

Alternative insertion methods have been explored to ensure higher success rates[8]. Among these, the rotational technique, inspired by the back-to-front insertion method of the Guedel airway, has been widely used[9]. This approach involves initially inserting the LMA with a 90° or 180° rotation and then rotating it to its final position as it enters the hypopharynx. Notably, this technique evades the anterior pharyngeal structures and smoothly slides along the posterior palatopharyngeal curve, minimizing the risk of LMA tip deflection or buckling.

Reported success rates for initial LMA insertion attempts range from 67-90% with the standard technique[10]. In contrast, the rotational insertion technique boasts success rates of 86% in adults and an impressive 99% in children[11].

This study holds significant relevance in the field of airway management, where the optimization of techniques for LMA insertion is significant to ensure efficient and safe patient care. Despite encouraging evidence, local data comparing these techniques in adult patients undergoing laparoscopic gynecological surgery are limited. This study was therefore conducted to compare the ease of LMA insertion using standard and rotational techniques, focusing on first-attempt success, insertion time, and complications such as trauma, desaturation and laryngospasm.

METHODOLOGY

This prospective randomized controlled trial was conducted in the Department of Anesthesiology, Hameed Latif Hospital, Lahore, over a period of four months following ethical approval. A total of 124 adult female patients were enrolled using non-probability convenience sampling, divided into two groups: Group A and Group B. Each group had 62 patients, and the sample size was calculated using 80% power of test and 5% level of significance and frequency of ease of insertion of 67% in standard[10] and 86% in rotational technique[11].

Patients included in the study were females aged 20–40 years, American Society of Anesthesiologists (ASA) physical status I or II, Mallampati class I or II, undergoing elective

laparoscopic gynecological surgery under general anesthesia. Patients with cervical spine injury, limited mouth opening, known airway anomalies, coagulation disorders, or BMI greater than 30 kg/m² were excluded.

Following approval from the Hospital's Ethical Review Board, patients fulfilling the inclusion criteria were counseled about the study, and written informed consent was obtained. After obtaining consent, patients were randomly allocated into two equal groups using a lottery method. Group A underwent LMA insertion using the standard Brain's technique, while Group B underwent insertion using the rotational technique. All procedures were performed by experienced anesthesiologists following standardized anesthesia protocols.

Ease of insertion was defined as successful LMA placement on the first attempt. Time taken for insertion was measured from introduction of the LMA into the mouth until confirmation of effective ventilation. Complications such as mucosal trauma, desaturation, and laryngospasm were documented.

Data were analyzed using SPSS version 25. Quantitative variables such as BMI, age, time of insertion were expressed as mean ± standard deviation, while qualitative variables such as ease of insertion were expressed as frequency and percentage. Chi-square test and independent sample t-test were used for comparison, with $p \leq 0.05$ considered statistically significant. To address potential effect modifiers, data were further stratified by age and post-stratification analysis using Chi-square tests was conducted to determine the significance of differences between groups. This methodological approach ensured rigorous assessment of the relative effectiveness of standard and rotational methods of LMA insertion in female patients undergoing elective gynecological surgery while controlling for confounding factors and minimizing bias through randomization and standardized anesthesia procedures.

RESULTS

The study sample consisted of a total of 124 adult female patients undergoing laparoscopic gynecological surgery who were randomly allocated into two equal groups (n=62 each): Standard technique group and Rotational technique group. Both groups were comparable at baseline with statistically insignificant differences in age, BMI, ASA status, or Mallampati classification ($p > 0.05$), as shown in Table I. A small but statistically significant difference was noted in mouth opening (41.0±2.32 mm vs. 42.0±2.32 mm, p=0.047), though this 1 mm difference is clinically negligible.

Ease of LMA insertion, defined as successful placement of LMA on the first attempt, was achieved in 54 patients (87.1%) in the Standard technique group and 58 patients (93.5%) in the Rotational technique group. Although the rotational technique showed a numerically higher success rate, this difference did not reach statistical significance ($p = 0.224$). Overall, both techniques demonstrated high success rates more than the expected frequencies cited in literature (67% for standard and 86% for rotational techniques).[10, 11]

Insertion Time: The mean insertion time was 8.03 ± 4.70 seconds in the Standard group compared to 8.73 ± 4.35 seconds in the Rotational group. Contrary to expectations, the rotational technique took slightly longer (0.7 seconds), though this difference was statistically insignificant ($p = 0.395$).

Insertion Attempts: In the Standard group, 54 patients (87.1%) required a single attempt and 8 patients (12.9%) required two attempts. In the Rotational group, 58 patients (93.5%) required a single attempt and 4 patients (6.5%) required two attempts ($p = 0.224$).

Intraoperative Complications: No adverse events (mucosal trauma, desaturation, or laryngospasm) were recorded in either group.

- Sore throat: Reported in 13 patients (21.0%) in the Standard group and 11 patients (17.7%) in the Rotational group ($p = 0.649$)

- Dysphagia: Observed in 0 patients (0%) in the Standard group and 1 patient (1.6%) in the Rotational group (p = 1.000)
- Patient satisfaction score: Mean scores were also comparable between groups (Standard: 8.90 ± 1.11 vs. Rotational: 8.89 ± 1.01; p = 0.933)

When stratified by age group, ease of insertion remained comparable between techniques. In patients aged 20-30 years (n=56), success rates were 96.4% (27/28) in standard group vs. 92.9% (26/28) in rotational group (p=0.959). In patients aged 31-40 years (n=68), success rates were 78.8% (26/33) in standard group vs. 94.3% (33/35) in rotational group (p=0.141). Although the older age subgroup showed a trend favoring rotational technique, this did not achieve statistical significance.

Table I: Baseline Characteristics of Study Population (n=124).

Characteristic	Standard Technique (n=62)	Rotational Technique (n=62)	p-value
Age (years), mean ± SD	31.95 ± 4.56	31.74 ± 3.71	0.779
BMI (kg/m²), mean ± SD	26.12 ± 2.86	26.37 ± 2.54	0.609
Mouth opening (mm), mean ± SD	41.0 ± 2.32	42.0 ± 2.32	0.047*
ASA I / II (n)	40 / 22	46 / 16	0.243
Mallampati I / II (n)	30 / 32	33 / 29	0.592

*Clinically negligible difference of 1 mm

Table II: Comparison of Primary and Secondary Outcomes.

Outcome	Standard Technique (n=62)	Rotational Technique (n=62)	p-value
Ease of insertion (1st attempt), n (%)	54 (87.1%)	58 (93.5%)	0.224
Insertion time (seconds), mean ± SD	8.03 ± 4.70	8.73 ± 4.35	0.395
Insertion attempts: 1 / 2 (n)	54 / 8	58 / 4	0.224
Sore throat, n (%)	13 (21.0%)	11 (17.7%)	0.649
Dysphagia, n (%)	0 (0%)	1 (1.6%)	1.000
Patient satisfaction score, mean ±	8.90 ± 1.11	8.89 ± 1.01	0.933

Outcome	Standard Technique (n=62)	Rotational Technique (n=62)	p-value
SD			

DISCUSSION

This randomized controlled trial compared the two techniques for LMA insertion, standard and rotational, in adult female patients undergoing laparoscopic gynecological surgery. The most significant finding of our study is that both techniques demonstrated high success rates (>87%) with statistically insignificant difference in ease of insertion, insertion time, number of attempts, or postoperative complications.

Our findings vary from the expected success rates upon which our sample size was calculated. We anticipated success rates of 67% for the standard technique and 86% for the rotational technique based on previously published literature.[10], [11] However, considerably higher success rates were observed in both groups (87.1% and 93.5% respectively). The standard technique success rate in our study exceeded the 67-90% range reported in literature, [10] while the rotational technique success rate corresponded to the 86-99% range documented in previous research.[11]

The high success rates observed may be attributed to several factors: all insertions were performed by experienced anesthesia providers, the patient population comprised low-risk individuals (ASA I-II, Mallampati I-II) with favorable airway anatomy, and strict adherence to standardized insertion protocols. Additionally, the exclusion of patients with anticipated difficult airways (BMI >30, limited mouth opening, or airway anomalies) likely contributed to the uniformly high success rates across both groups.

Regarding insertion time, our finding that the rotational technique took slightly longer (8.73 vs. 8.03 seconds) contrasts with the theoretical advantage that rotational technique may be faster due to smoother passage along the posterior pharyngeal curve.[9] However, this difference of approximately 0.7 seconds is clinically insignificant and may reflect the additional time required to perform the rotational maneuver itself rather than any difficulty in insertion. This finding is consistent with some studies suggesting that any time difference between techniques is negligible in clinical practice.[12]

The absence of intraoperative complications (desaturation, laryngospasm, or mucosal trauma) in both groups highlights the safety profile of both techniques in appropriately selected patients. This finding is also comparable to the existing literature on LMA insertion in low-risk populations.[5]

The incidence of postoperative sore throat (17.7-21.0%) falls within the expected range of 10-30% reported for supraglottic airway devices[4] and did not differ between techniques. Similarly, the near-absence of dysphagia (one patient in rotational group) and high patient satisfaction scores (>8.8/10) indicate excellent overall tolerability of both techniques. All of these findings are in line with the outcomes reported in the recent studies examining LMA insertion techniques.[13], [14]

Our findings suggest that both standard and rotational techniques are highly effective for LMA insertion in adult female patients undergoing laparoscopic surgery. The choice between techniques may depend on operator familiarity and preference rather than relative efficacy. This is clinically reassuring, as it indicates that anesthesiologists can achieve excellent results with the technique they are most comfortable with, without compromising patient outcomes.

The comparable outcomes between techniques also suggest that factors such as patient selection, operator experience, and adherence to proper technique may be more important determinants

of successful LMA insertion than the specific technique employed. This aligns with current educational approaches that focus more on learning basic airway skills rather than technique-specific advantages.[15]

The strengths of this study include its randomized controlled design, adequate sample size based on power calculation, and comprehensive assessment of multiple clinically relevant outcomes including patient-centered measures such as satisfaction and sore throat.

However, several limitations should be acknowledged:

1. Sample size considerations: The observed success rates (87-94%) were significantly higher than those used for sample size calculation (67-86%), which potentially underpowered the study to detect differences between techniques. A post-hoc power analysis reveals that to detect a 6.4% difference (87.1% vs 93.5%) with 80% power, a sample size of approximately 450 patients per group would be required.
2. Generalizability: The study population was restricted to low-risk female patients (ASA I-II, Mallampati I-II, BMI <30), limiting generalizability to higher-risk populations including males, obese patients, or those with predicted difficult airways.
3. Single-center design: The single-center nature may limit external validity, though it ensured consistency in technique execution and data collection.
4. Operator expertise: All insertions were performed by experienced anesthesiologists; results may differ with less experienced providers or trainees.
5. Blinding: The absence of blinding among operators could introduce performance bias, though outcome assessment for postoperative complications was standardized.

CONCLUSION

Both standard and rotational techniques for LMA insertion demonstrate high success rates (>87%) with comparable outcomes in terms of insertion time, number of attempts, and postoperative complications in adult female patients undergoing laparoscopic gynecological surgery. The rotational technique does not confer a statistically significant advantage over the standard technique in this low-risk patient population. These findings suggest that anesthesiologists can employ any technique for LMA insertion based on their preference and skills without compromising the results and patients' outcomes.

Future research should compare these techniques in both genders as well as higher-risk populations, including patients with anticipated difficult airways, obesity (BMI >30), Mallampati III-IV classification. Studies comparing these techniques when performed by operators with varying skill levels (trainees vs. consultants) would provide valuable insights. Additionally, given the higher-than-expected success rates observed in both groups, future studies should consider larger sample sizes to detect smaller differences if they exist.

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Authors' Contribution:

Author 1:
Substantial contributions to study design, acquisition of data
Analysis & Interpretation of Data, Manuscript writing
Has given final approval of the version to be published

Author 2:
Substantial contributions to concept, study design
Data Analysis, Manuscript writing, Critical Review
Has given final approval of the version to be published

Author 3:
Statistical analysis, interpretation of results, critical review
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Author 4:
Data collection, literature review, manuscript drafting
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