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***Original Research Article***

# COMPARISON OF TOPICAL AND INTRAVENOUS LIGNOCAINE IN PATIENTS UNDERGOING LARYNGEAL MASK AIRWAY INSERTION UNDER PROPOFOL: A RANDOMIZED CONTROLLED TRIAL

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**Abstract:** *Laryngeal mask airway (LMA) insertion is a common technique used in general anesthesia, but it may induce airway reflexes such as coughing, gagging, and laryngospasm. Lignocaine, whether administered topically or intravenously, is often used to suppress these reflexes. However, the comparative efficacy of these two routes remains unclear.* ***Objective:*** *This study aims to compare the effectiveness of topical versus intravenous lignocaine in facilitating LMA insertion and minimizing airway complications in patients undergoing propofol anesthesia.* ***Methods:*** *A randomized controlled trial was conducted on 62 patients undergoing elective surgeries under general anesthesia at a tertiary care hospital. Patients were randomly assigned into two groups: Group A (n = 31) received 40 mg of topical lignocaine aerosol, while Group B (n = 31) received intravenous lignocaine 1.5 mg/kg. Both groups were induced with propofol (2 mg/kg) prior to LMA insertion. Primary outcomes included the number of LMA insertion attempts, airway responses (coughing, gagging, laryngospasm), and hemodynamic parameters (systolic blood pressure, diastolic blood pressure, and heart rate) recorded at baseline and 1, 2, and 3 minutes post-insertion.* ***Results:*** *LMA insertion on the first attempt was successful in 93.5% of patients in the topical lignocaine group compared to 74.2% in the intravenous group (p = 0.03). Airway reflexes were significantly lower in the topical group, with coughing, gagging, and laryngospasm rates of 6.5%, 16.1%, and 9.7%, respectively, compared to 32.3%, 45.2%, and 29.0% in the intravenous group (p < 0.05). Hemodynamic parameters, including systolic and diastolic blood pressure and heart rate, showed no significant differences between the two groups at baseline or post-insertion.* ***Conclusion:*** *Topical lignocaine significantly improves conditions for LMA insertion compared to intravenous lignocaine, resulting in fewer airway complications while maintaining similar hemodynamic stability. Therefore, topical lignocaine is recommended for optimizing LMA insertion during propofol anesthesia.*

**Keywords:** Laryngeal mask airway, topical lignocaine, intravenous lignocaine, propofol anesthesia, airway reflexes, hemodynamic response

## Introduction

Laryngeal mask airways (LMA) are supraglottic airway devices that can be used temporarily to keep the airway open during anaesthesia or as an emergency measure in cases of a challenging or unsuccessful airway, as described in the challenging airway algorithm released by various anesthesiology societies globally (1). LMAs are simpler and more efficient than a bag-valve-mask when operated by basic life support providers. Additionally, advanced life support professionals may employ LMAs as a substitute for intubation. Certain models can serve as a means for assisting endotracheal intubation. The user's text consists of a single reference marker (2, 3).

Historically, LMA insertion has been performed with neuromuscular blocking medications that induce complete relaxation of the skeletal muscles. Avoiding the use of succinylcholine in daycare anesthesia is highly desirable due to its association with painful muscle pains. The introduction of induction drugs such as propofol and ultra-short-acting opioids like remifentanil has greatly improved the process of LMA insertion by creating optimal conditions (4). Propofol is commonly used as an induction agent to aid with the placement of an LMA due to its excellent suppression of airway reflexes and ability to enable early recovery (5).

An optimal propofol dosage of 2.5 to 3 mg/kg-1 is advised for LMA placement. However, inserting the device may not always be seamless in patients without premedication (6). Higher doses of propofol have the potential danger of causing cardiorespiratory depression (7). This is due to propofol's enhanced ability to relax the jaw and its more substantial suppressive impact on airway reflexes. The patient's reaction to the insertion of the LMA during propofol induction is influenced by various factors, including the method of administration, dosage, injection speed, and the use of additional drugs (8). Other factors that play a role include the time that has passed since propofol administration and the concentrations of propofol in the bloodstream and at the site of action at the moment of LMA insertion (9). Intravenous administration of lidocaine is recognized for inhibiting cough reflexes and decreasing

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cardiovascular reactions linked to tracheal intubation. Prior use of it has been documented to enhance the conditions for inserting LMA. However, it does not diminish the amount of propofol needed (10). When lidocaine is administered intravenously, it has been found that spraying topical lidocaine on the posterior pharyngeal wall reduces the occurrence of airway events and failures in inserting a laryngeal mask airway (LMA) in patients who are given thiopental for the induction agent (11, 12).

LMA insertion, although less invasive than endotracheal intubation, can still provoke significant airway reflexes and discomfort, potentially impacting patient safety and recovery. Comparing topical and intravenous lignocaine in laryngeal mask airway insertion under propofol can provide insights into their relative efficacy in reducing laryngeal reflexes and discomfort, potentially leading to improved procedural outcomes and patient experiences.

**Methodology**

This randomized controlled trial was conducted at the Department of Anesthesia from February 2024 to August 2024 at Hayatabad Medical, Complex Peshawar, after obtaining ethical approval from the hospital. Sixty-two patients aged > 18 years of either gender, categorized as ASA grade I or II, undergoing elective surgeries under general anesthesia were selected. Patients with a history of cardiovascular, respiratory, or neurological disorders, as well as those with a known allergy to lignocaine, were excluded from the study. Patients were randomly assigned into two groups, each consisting of 31 patients; group A patients received 40 mg of lignocaine aerosol (10% lignocaine spray) applied to the posterior oropharynx three minutes before the administration of propofol while group B patients received intravenous lignocaine 1.5 mg/kg over 30 seconds, administered 30 seconds before the propofol induction. Upon entering the operating room, patients were connected to standard monitoring equipment, including pulse oximetry ($SpO_2$), electrocardiogram (ECG), and non-invasive blood pressure (NIBP). After three minutes of preoxygenation with 100% oxygen, all patients were induced with intravenous propofol at 2 mg/kg. In Group A, lignocaine spray was applied to the posterior pharynx before propofol administration, while in Group B, intravenous lignocaine was administered before propofol induction. Once the patients lost consciousness, an appropriately sized laryngeal mask airway (LMA) was inserted. The primary variables measured were LMA insertion attempts. Airway responses during LMA insertion, such as coughing, gagging, and laryngospasm and Hemodynamic parameters, including systolic BP, diastolic BP, and heart rate, were recorded at different intervals (baseline and 1, 2, and 3 minutes) after LMA insertion. The results were reanalyzed using the statistical software SPSS 24. We used the Chi-Square and Independent Samples T-test to assess the variables between the groups, keeping the P value notable at $< 0.05$.

**Results**

This study, 62 patients were divided into two groups: Group A, receiving topical lignocaine, and Group B, receiving intravenous lignocaine. The average age of patients in Group A was 38.48 ± 12.71 years, while in Group B, it was 40.61 ± 11.73 years. The body mass index (BMI) for Group A averaged 27.05 ± 1.80 kg/m² while for Group B, 26.59 ± 1.89 kg/m². Gender distribution was similar between the groups, with 32.3% males and 67.7% females in Group A while 38.7% males and 61.3% females in Group B (Figure 1).

Regarding airway management, the first attempt at laryngeal mask airway (LMA) insertion was successful in 29 (93.5%) of patients in Group A and 23 (74.2%) in Group B ($p = 0.03$). Coughing occurred in 2 (6.5%) of Group A and 10 (32.3%) of Group B ($p = 0.01$). Gagging was observed in 5 (16.1%) of Group A and 14 (45.2%) of Group B ($p = 0.01$), while laryngospasm occurred in 3 (9.7%) of Group A and 9 (29.0%) of Group B ($p = 0.05$) (Table 1).

Regarding hemodynamics, Group A had a baseline heart rate of 71.23 ± 4.54 beats per minute (bpm), while Group B's was 73.72 ± 4.41 bpm ($p = 0.03$). At 1 minute, heart rates were 90.09 ± 2.25 bpm for Group A and 90.90 ± 2.73 bpm for Group B ($p = 0.21$). At 2 minutes, no notable difference was seen between both groups. By 3 minutes, heart rates dropped to 84.55 ± 2.00 bpm for Group A and 85.94 ± 1.46 bpm for Group B ($p = 0.003$) (Table 2). For systolic blood pressure (SBP), the baseline mean for Group A (Topical Lignocaine) was 122.53 ± 8.12 mmHg, while for Group B (Intravenous Lignocaine) it was 125.25 ± 9.61 mmHg ($p = 0.23$). At 1 minute, SBP was 120.36 ± 9.40 mmHg in Group A and 120.81 ± 7.25 mmHg in Group B ($p = 0.83$). At 2 minutes, SBP values were 123.93 ± 5.12 mmHg for Group A and 122.87 ± 9.01 mmHg for Group B ($p = 0.57$). By 3 minutes, the SBP in Group A rose to 125.85 ± 8.67 mmHg, compared to 124.43 ± 6.29 mmHg in Group B ($p = 0.46$) (Table 3). For diastolic blood pressure (DBP), baseline values were 78.24 ± 4.05 mmHg for Group A and 77.38 ± 3.50 mmHg for Group B ($p = 0.37$). At 1 minute, DBP was 79.53 ± 4.25 mmHg in Group A and 80.45 ± 4.75 mmHg in Group B ($p = 0.42$). At 2 minutes, DBP was 85.46 ± 6.12 mmHg in Group A and 84.61 ± 4.82 mmHg in Group B ($p = 0.54$). By 3 minutes, DBP measured 84.35 ± 5.68 mmHg for Group A and 85.01 ± 5.44 mmHg for Group B ($p = 0.64$). Systolic blood pressure (SBP) and diastolic blood pressure (DBP) did not show notable differences between the groups at baseline or 1, 2, or 3 minutes post-insertion (Table 4)

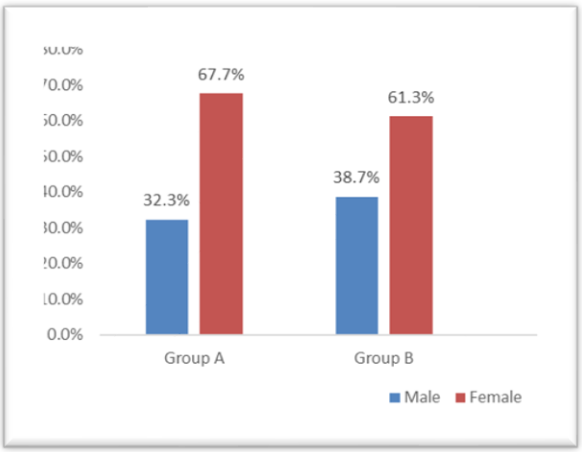


**Figure 1: Gender Distribution**

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**Table 1 Comparison of hemodynamic attributes between both groups Figure 1 Gender distribution**

| Airway attributes | | Groups | | | | |
|---|---|---|---|---|---|---|
| | | Group A (Topical lignocaine) | | Group B (Intravenous lignocaine) | | P value |
| | | N | % | N | % | |
| Number of LMA Insertion Attempts | First attempt | 29 | 93.5% | 23 | 74.2% | 0.03 |
| | Second attempt | 2 | 6.5% | 8 | 25.8% | |
| Coughing | Yes | 2 | 6.5% | 10 | 32.3% | 0.01 |
| | No | 29 | 93.5% | 21 | 67.7% | |
| Gagging | Yes | 5 | 16.1% | 14 | 45.2% | 0.01 |
| | No | 26 | 83.9% | 17 | 54.8% | |
| Laryngospasm | Yes | 3 | 9.7% | 9 | 29.0% | 0.05 |
| | No | 28 | 90.3% | 22 | 71.0% | |

**Table 2 Comparison of heart rate at different intervals between both groups**

| Heart rate (BPM) | Groups | N | Mean | Std. Deviation | P value |
|---|---|---|---|---|---|
| Mean Heart Rate (HR) baseline | Group A (Topical lignocaine) | 31 | 71.239032 | 4.5489804 | 0.03 |
| | Group B (Intravenous lignocaine) | 31 | 73.727742 | 4.4143536 | |
| HR at 1 min | Group A (Topical lignocaine) | 31 | 90.096774 | 2.2561743 | 0.21 |
| | Group B (Intravenous lignocaine) | 31 | 90.903226 | 2.7368454 | |
| HR at 2 min | Group A (Topical lignocaine) | 31 | 89.096774 | 2.1657153 | 0.15 |
| | Group B (Intravenous lignocaine) | 31 | 88.387097 | 1.7258316 | |
| HR at 3 min | Group A (Topical lignocaine) | 31 | 84.548387 | 1.9973100 | 0.003 |
| | Group B (Intravenous lignocaine) | 31 | 85.935484 | 1.4591204 | |

**Table 3 Comparison of Systolic blood pressure at different intervals between both groups**

| Systolic blood pressure (mmHg) | Groups | N | Mean | Std. Deviation | P value |
|---|---|---|---|---|---|
| Systolic Blood Pressure (SBP) Baseline | Group A (Topical lignocaine) | 31 | 122.5268 | 8.12342 | 0.23 |
| | Group B (Intravenous lignocaine) | 31 | 125.2461 | 9.61403 | |
| SBP at 1 min | Group A (Topical lignocaine) | 31 | 120.358065 | 9.4027466 | 0.83 |
| | Group B (Intravenous lignocaine) | 31 | 120.807742 | 7.2542069 | |
| SBP at 2 min | Group A (Topical lignocaine) | 31 | 123.9326 | 5.11605 | 0.57 |
| | Group B (Intravenous lignocaine) | 31 | 122.8706 | 9.00862 | |
| SBP at 3 min | Group A (Topical lignocaine) | 31 | 125.8500 | 8.67187 | 0.46 |
| | Group B (Intravenous lignocaine) | 31 | 124.4303 | 6.28514 | |

**Table 4 Comparison of Diastolic blood pressure at different intervals between both groups**

| Diastolic blood pressure (mmHg) | Groups | N | Mean | Std. Deviation | P value |
|---|---|---|---|---|---|
| Diastolic Blood Pressure (DBP) Baseline | Group A (Topical lignocaine) | 31 | 78.244839 | 4.0483518 | 0.37 |
| | Group B (Intravenous lignocaine) | 31 | 77.384516 | 3.5025551 | |
| DBP at 1 min | Group A (Topical lignocaine) | 31 | 79.533871 | 4.2493370 | 0.42 |
| | Group B (Intravenous lignocaine) | 31 | 80.452581 | 4.7491852 | |
| DBP at 2 min | Group A (Topical lignocaine) | 31 | 85.463548 | 6.1151394 | 0.54 |
| | Group B (Intravenous lignocaine) | 31 | 84.612258 | 4.8200254 | |
| DBP at 3 min | Group A (Topical lignocaine) | 31 | 84.345806 | 5.6808771 | 0.64 |
| | Group B (Intravenous lignocaine) | 31 | 85.010323 | 5.4359541 | |

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## Discussion

The success rate of LMA insertion was notably higher with topical lignocaine than with intravenous lignocaine, as observed in our study, where 93.5% of patients in the topical group had a successful first insertion attempt compared to 74.2% in the intravenous group ($p = 0.03$). This is similar to the findings of Ahmed S et al., who reported that topical lignocaine had superior insertion conditions than intravenous lignocaine, with a significant reduction in gagging, coughing, and laryngospasm during LMA insertion (13). Similarly, Shahzad M et al. found that topical lignocaine was associated with fewer airway complications such as coughing and gagging compared to intravenous lignocaine, resulting in more acceptable insertion conditions in their study (98% vs. 89%) (14).We found that mean heart rate increased significantly after LMA insertion but returned to baseline by the third minute in both groups, with slightly higher rates in the intravenous group at 1 minute (90.90 ± 2.74 bpm) compared to the topical group (90.09 ± 2.25 bpm). This reflects the findings by Kulkarni S et al., who also reported transient increases in heart rate and blood pressure after LMA insertion. However, these changes were not statistically significant between the groups[15]. Similarly, in our study, systolic and diastolic blood pressures showed no significant differences between the groups at baseline or post-insertion, which matches the findings of other studies, including Ahmed S et al., who found that both systolic and diastolic pressures remained stable after LMA insertion regardless of the lignocaine route used (13). Reducing complications such as gagging and coughing is particularly significant in the topical group. In our study, coughing was observed in 32.3% of patients in the intravenous group, compared to only 6.5% in the topical group ($p = 0.01$), a result that is echoed by Shazad M et al., who found a statistically significant reduction in gagging and coughing when topical lignocaine was used compared to intravenous lignocaine (14). Moreover, laryngospasm, a serious airway complication, was more frequent in the intravenous group in our study (29.0%) than in the topical group (9.7%), with a similar pattern noted by Kulkarni S et al., where topical lignocaine reduced the occurrence of laryngospasm to nearly zero (15).These findings collectively suggest that topical lignocaine provides superior conditions for LMA insertion compared to intravenous lignocaine, particularly in reducing airway reflexes and improving insertion success rates. However, the physiological stability observed with both methods indicates that either approach can maintain adequate hemodynamic control. This aligns with the conclusions of both Ahmed S et al. and Shazad M et al., who both recommended the use of topical lignocaine for airway management, especially in patients with heightened airway sensitivity (13, 14).In terms of study design, the randomized control methodology of this study matches that of other prominent trials, ensuring the reliability of the results. One limitation in our study, shared with similar studies such as Kulkarni S et al., was the relatively small sample size, which may restrict the generalizability of the findings (15). Nonetheless, the consistency of results across different studies strengthens the conclusion that topical lignocaine should be preferred for optimizing conditions during LMA insertion under propofol anesthesia. Future research may focus on expanding patient populations and exploring additional co-induction agents to refine airway management strategies during anesthesia further.Thus, the current study supports the broader body of literature, demonstrating that topical lignocaine offers better conditions for LMA insertion with fewer airway complications and comparable hemodynamic stability to intravenous lignocaine.

## Conclusion

In conclusion, this study demonstrates that topical lignocaine provides significantly better laryngeal mask airway (LMA) insertion conditions than intravenous lignocaine in patients undergoing propofol anesthesia. Topical lignocaine reduced the incidence of airway reflexes, such as coughing, gagging, and laryngospasm, leading to higher success rates for first-attempt LMA insertion. Hemodynamic stability was maintained similarly in both groups.

## Declarations

**Data Availability statement**
All data generated or analyzed during the study are included in the manuscript.
**Ethics approval and consent to participate**
Approved by the department concerned. (IRBEC-HMCI-93/23)

**Consent for publication**
Approved
**Funding**
Not applicable

## Conflict of interest

The authors declared the absence of a conflict of interest.

## Author Contribution

***AMINA SULTAN (Junior Consultant Anesthetist)***
*Coordination of collaborative efforts, Study Design, and Review of Literature.*
***ARSHAD ALI (Assistant Anesthetist)***
*Conception of Study, Development of Research Methodology, manuscript Review, and final approval of manuscript.*
***EASA HAMAD HAMEED ALSAADI (Consultant Anesthesia)***
*Manuscript revisions, critical input, Coordination of collaborative efforts.*
***MUHAMMAD AASAM MASOOM MAAN (Assistant Professor Anesthesia)***
*Data acquisition and analysis, Manuscript drafting.*
***RIZQA NASEEM (Post-Rn Nurse Anesthesia)***
*Data entry and data analysis, as well as drafting the article.*
***SAJID HUSSAIN***
*Data acquisition and analysis Coordination of collaborative efforts.*

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