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COMPARATIVE EVALUATION OF BASKA MASK™ AND PROSEAL LARYNGEAL MASK AIRWAY™ FOR EFFICACY IN AIRWAY MAINTENANCE DURING POSITIVE PRESSURE VENTILATION IN PATIENTS UNDER GENERAL ANAESTHESIA

Anaesthesiology

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ABSTRACT

Background: Supraglottic airway devices (SGDs) have transformed airway management in anaesthesia. The Baska Mask™ and ProSeal Laryngeal Mask Airway™ (PLMA) are second and third-generation SGDs, respectively. This study compares their efficacy for airway maintenance during general anaesthesia. **Methods:** Sixty patients were randomised into two groups: Group B (Baska Mask™) and Group P (ProSeal LMA™). Parameters evaluated included oropharyngeal leak pressure (OLP) at 5 and 30 min, fibreoptic bronchoscope (FOB) scores, insertion time, and haemodynamic changes. **Results**: Group B had significantly higher OLP at 5 and 30 min ($p<0.0001$). A fibreoptic score of 4 was achieved in 90% of Group B vs. 33.3% in Group P. Insertion time was shorter and ease of insertion was better in Group B. Haemodynamic parameters were comparable. **Conclusion:** Baska Mask™ provided superior sealing and glottic alignment with similar haemodynamic safety. It may be preferable to ProSeal LMA™ for elective cases requiring controlled ventilation.

KEYWORDS

Baska Mask™, ProSeal LMA™, supraglottic airway device, oropharyngeal leak pressure, fibreoptic bronchoscope

INTRODUCTION

Airway management remains a fundamental skill in anaesthesia and critical care, with direct implications for patient safety and surgical outcomes. While endotracheal intubation has traditionally been the gold standard for securing the airway, supraglottic airway devices (SGDs) have emerged as reliable alternatives, particularly in elective surgeries involving general anaesthesia with spontaneous or controlled ventilation.1,2

Supraglottic devices are now recognised not merely as rescue options but as primary airway management tools in a range of surgical scenarios. Their benefits include reduced haemodynamic stress, easier insertion without laryngoscopy, and lower risk of airway trauma or sore throat.3,4 Among SGDs, continuous evolution in design has resulted in improved sealing pressures, reduced aspiration risk, and enhanced anatomical conformation to the laryngeal inlet.5

The ProSeal™ Laryngeal Mask Airway (PLMA), a second-generation SGD introduced in the early 2000s, features a drain tube to permit gastric decompression and to reduce the risk of aspiration. It also incorporates a deeper bowl and a dorsal cuff that increases oropharyngeal seal pressure. Numerous studies have demonstrated its utility in maintaining effective ventilation in patients undergoing positive pressure ventilation.6,7

In contrast, the Baska Mask™, a third-generation SGD, represents a further advancement in airway design. Developed by Kanag et al., it employs a self-energising sealing mechanism and a non-inflatable cuff, which adapts dynamically to positive pressure ventilation.8,9 The Baska Mask™ also incorporates dual drainage channels for regurgitated material and allows high peak airway pressures without leak. This makes it particularly advantageous in patients requiring higher ventilatory pressures, such as in obesity, laparoscopic procedures, or limited lung compliance.10

Prior comparative studies between PLMA and Baska Mask™ have reported conflicting results, with some demonstrating better oropharyngeal leak pressures (OLP) with the Baska device, while others show no significant difference.11–13 The variability in findings may reflect differences in insertion technique, patient characteristics, or the learning curve associated with novel devices. Moreover, few studies have incorporated fibreoptic bronchoscope (FOB) scoring to objectively evaluate anatomical alignment of the airway device, an important determinant of ventilation efficiency and complication rates.14

This study aims to compare the Baska Mask™ and ProSeal™ LMA with regard to multiple parameters of clinical performance.

METHODS

Study Design And Setting

This study was conducted as a prospective, randomised, parallel-group, comparative clinical trial at a tertiary care teaching hospital in North India. The study was conducted over a period of 18 months and registered prospectively with the Clinical Trials Registry of India (CTRI).

Study Population

The study enrolled 60 adult patients (aged 18–60 years) of American Society of Anesthesiologists (ASA) physical status I or II, scheduled for elective surgical procedures under general anaesthesia requiring controlled ventilation with a supraglottic airway device. Written informed consent was obtained from all participants prior to surgery.

Exclusion Criteria

- Body mass index (BMI) > 35 kg/m²
- Anticipated difficult airway (Mallampati Grade ≥ III, limited mouth opening < 2 cm, restricted neck mobility)
- Gastroesophageal reflux disease (GERD) or known risk of aspiration
- Pregnancy
- ASA physical status III or IV
- Emergency surgery
- Patients with active respiratory tract infections

Participants were randomised using a computer-generated random number table into two groups of 30 each:

- **Group B:** Airway secured with Baska Mask™
- **Group P:** Airway secured with ProSeal™ LMA

Allocation concealment was achieved using sealed opaque envelopes. The anaesthesiologist performing the airway insertion was aware of group allocation, but outcome assessors were blinded.

Device Specifications

The ProSeal LMA™ (Teleflex Medical) is a second-generation reusable SGD that incorporates a drain tube, deeper cuff bowl, and integrated bite block. It requires cuff inflation with air to achieve a seal. The Baska Mask™ (Logikal Health Products) is a third-generation device made of silicone and features a self-energizing seal without the need for cuff inflation. It also contains dual gastric drainage channels

and a low-resistance flexible airway stem.

Anaesthesia Protocol

All patients were fasted for at least 6 hours and received premedication with oral ranitidine (150 mg) and metoclopramide (10 mg) 2 hours prior to surgery. Upon arrival in the operating room, standard monitors were applied.

Anaesthesia was induced with intravenous fentanyl (2 µg/kg), propofol (2–2.5 mg/kg), and vecuronium bromide (0.1 mg/kg) to facilitate device insertion. After achieving adequate depth of anaesthesia (assessed by loss of verbal response and eyelash reflex), the allocated device was inserted by an experienced anaesthesiologist with more than 50 prior insertions of each device.

A standard size 3 or 4 was selected for female and male patients, respectively, based on weight and manufacturer's recommendations. Proper positioning was confirmed by square-wave capnography and adequate chest rise.

Study Parameters

Primary Outcome

- Oropharyngeal Leak Pressure (OLP) measured at 5 and 30 minutes post-insertion using the manometric stability method: the adjustable pressure-limiting (APL) valve was closed at 40 cmH_2O with fresh gas flow of 3 L/min; the pressure at which gas leakage was first detected (audible at the mouth or stethoscopically over the neck) was recorded.

Secondary Outcomes

- Insertion time: Time from picking up the device to appearance of the first capnograph waveform
- Ease of insertion: Scored on a 4-point scale (1: very easy, 2: easy, 3: difficult, 4: failed)
- Number of insertion attempts (max 2 attempts allowed)

- **Fibreoptic Bronchoscopy (FOB) scoring:**

Score 4 – Vocal cords fully visible
Score 3 – Vocal cords partially visible
Score 2 – Only epiglottis visible
Score 1 – Glottic structures not visible

- **Haemodynamic Parameters:** Heart rate, systolic and diastolic blood pressure, mean arterial pressure (MAP) were recorded at baseline, post-insertion (1, 5, and 10 min), and every 15 min intraoperatively.

Sample Size Calculation

Based on a previous study (Singh et al., 2020), assuming a mean difference in OLP of 6 cmH_2O between Baska and ProSeal groups, with a standard deviation of 5.5, a power of 80%, and a significance level (α) of 0.05, a minimum sample size of 26 patients per group was calculated. To account for potential dropouts or failed insertions, 30 patients were recruited in each group.

Statistical Analysis

Data were entered into Microsoft Excel and analysed using SPSS version 26.0 (IBM Corp., Armonk, NY). Continuous variables were expressed as mean ± standard deviation and compared using unpaired Student's t-test. Categorical variables were expressed as frequency and percentage, and analysed using Chi-square or Fisher's exact test. A p-value of <0.05 was considered statistically significant.

RESULTS

Sixty patients were enrolled and evenly randomised into two groups: Group B (Baska Mask™, n=30) and Group P (ProSeal LMA™, n=30). Baseline demographic variables such as age, weight, height, and ASA physical status were comparable between the groups, and all device insertions were successful within two attempts.

Table 1. Demographic Characteristics Of Patients

Parameter	Group B (Mean ± SD)	Group P (Mean ± SD)	p-value
Age (years)	34.2 ± 7.8	35.6 ± 8.1	0.54
Weight (kg)	66.1 ± 9.3	65.7 ± 8.9	0.83
Height (cm)	164.3 ± 5.7	165.1 ± 6.1	0.62
ASA I / II	18 / 12	17 / 13	0.79

Insertion Characteristics

The Baska Mask™ was associated with a significantly shorter insertion time than PLMA (18.2 ± 2.3 vs 22.9 ± 3.1 seconds; $p < 0.001$). First-attempt success rates were slightly higher in Group B (93.3%) versus Group P (86.7%).

Table 2. Insertion Time and Success Rate

Parameter	Group B	Group P	p-value
Mean insertion time (sec)	18.2 ± 2.3	22.9 ± 3.1	<0.001
First-attempt success	28 (93.3%)	26 (86.7%)	0.67

Oropharyngeal Leak Pressure (OLP)

At both 5 and 30 minutes post-insertion, the Baska Mask™ exhibited significantly higher OLP values compared to PLMA.

Table 3. Oropharyngeal Leak Pressure (cmH_2O)

Time Point	Group B (Mean ± SD)	Group P (Mean ± SD)	p-value
5 min	38.27 ± 2.15	31.10 ± 2.90	<0.0001
30 min	38.87 ± 1.63	31.97 ± 2.17	<0.0001

Fibreoptic Bronchoscope (FOB) Scores

The quality of anatomical alignment was better with the Baska Mask™, as evidenced by a higher proportion of patients with a fibreoptic score of 4 (full view of vocal cords).

Table 4. Fibreoptic View Scores

Score	Description	Group B (n=30)	Group P (n=30)
4	Vocal cords fully visible	27 (90%)	10 (33.3%)
3	Partially visible	2 (6.7%)	14 (46.7%)
2	Only epiglottis visible	1 (3.3%)	5 (16.7%)
1	Glottis not visible	0	1 (3.3%)

Haemodynamic Stability

Both groups exhibited comparable heart rate and mean arterial pressure (MAP) at baseline and post-insertion time intervals. There were no statistically significant changes in haemodynamics attributable to either device.

Table 5. Haemodynamic Parameters Summary

Time	Heart Rate (bpm)	MAP (mmHg)
Baseline	B: 78.4 ± 7.5, P: 79.1 ± 6.9	B: 92.7 ± 6.4, P: 91.9 ± 7.2
1 min post	B: 79.6 ± 8.2, P: 80.2 ± 7.8	B: 93.8 ± 6.9, P: 93.1 ± 6.6
5 min post	B: 76.8 ± 7.1, P: 77.4 ± 6.7	B: 91.1 ± 5.8, P: 91.4 ± 5.9
10 min post	B: 75.7 ± 7.3, P: 76.1 ± 7.0	B: 89.7 ± 6.1, P: 89.3 ± 6.2

Summary Of Key Findings

- Baska Mask™ yielded higher OLP and better glottic alignment.
- It required less time for insertion and had slightly higher first-attempt success.
- Haemodynamic parameters were stable and comparable in both groups.

DISCUSSION

This prospective, randomised study compared the Baska Mask™ and the ProSeal Laryngeal Mask Airway™ (PLMA) in adult patients undergoing elective surgery under general anaesthesia. Our findings demonstrate that the Baska Mask™ outperformed PLMA in several key performance domains, including oropharyngeal leak pressure (OLP), fibreoptic alignment score, and insertion time, while haemodynamic stability remained comparable between groups.

Oropharyngeal leak pressure (OLP) is an important surrogate for the efficacy and safety of supraglottic airway devices, particularly during controlled ventilation. In our study, the Baska Mask™ achieved significantly higher OLP at both 5 minutes (38.27 ± 2.15 cmH_2O vs 31.10 ± 2.90 cmH_2O) and 30 minutes (38.87 ± 1.63 cmH_2O vs 31.97 ± 2.17 cmH_2O), with p-values <0.0001. These findings are consistent with those of Singh et al., who reported a mean OLP of 35–39 cmH_2O for the Baska Mask™ compared to 28–32 cmH_2O for PLMA.1 Higher OLP implies a better airway seal, which is critical for preventing air leaks, maintaining adequate ventilation, and reducing the risk of gastric insufflation and aspiration—especially in laparoscopic or obese patients.2

The improved seal in the Baska Mask™ can be attributed to its self-

sealing variable-pressure cuffless design, which dynamically adjusts to positive pressure ventilation. Unlike PLMA, which relies on air-inflated cuffs that may lose seal over time, the Baska Mask™ maintains its seal without requiring cuff pressure monitoring.3 Additionally, the dual drainage channels of the Baska Mask™ provide enhanced protection against aspiration by actively diverting regurgitated contents away from the airway.4

Anatomical alignment is another crucial parameter in assessing the effectiveness of SGDs. Fibreoptic scoring allows visual confirmation of device position relative to the glottis. In this study, a fibreoptic score of 4 (vocal cords fully visible) was achieved in 90% of patients using the Baska Mask™ versus only 33.3% using the PLMA. These results suggest superior alignment and lower risk of malposition with the Baska Mask™, which is corroborated by Jose et al., who reported significantly better glottic visualization with the Baska device.5

Ease of insertion and time to secure the airway are vital in both elective and emergency settings. The Baska Mask™ demonstrated a significantly shorter mean insertion time (18.2 ± 2.3 seconds) compared to the PLMA (22.9 ± 3.1 seconds). This can be attributed to the absence of a need for cuff inflation, the soft silicone body, and better device ergonomics. Moreover, 93.3% of insertions with the Baska Mask™ were successful on the first attempt versus 86.7% for PLMA, though this difference was not statistically significant.

Haemodynamic parameters (heart rate and MAP) remained stable and comparable between both groups throughout the perioperative period. This finding indicates that neither device caused significant sympathetic stimulation, airway irritation, or cardiovascular stress during insertion or maintenance. These results are in line with those of Sharma et al., who found no difference in heart rate or blood pressure following insertion of PLMA versus newer SGDs.6

Despite these advantages, the Baska Mask™ is not without limitations. Its relatively higher cost and requirement for user familiarity may limit widespread use in some resource-constrained settings. Additionally, while the device performed well in ASA I and II patients undergoing elective surgery, its efficacy in higher-risk populations (e.g., obstetric, trauma, obese, or patients with restricted mouth opening) remains to be validated.

The study has several strengths, including a randomised design, clearly defined outcomes, use of objective fibreoptic grading, and standardisation of anaesthetic protocols. All insertions were performed by experienced anaesthesiologists, reducing operator-related variability. However, some limitations must be acknowledged. First, the study was conducted at a single centre with a modest sample size of 60 patients, which may limit generalisability. Second, patients with difficult airways and comorbidities were excluded, precluding broader applicability. Third, long-term complications (e.g., sore throat, dysphonia, mucosal trauma) were not assessed.

Future research should examine the utility of the Baska Mask™ in obese patients, paediatric populations, and emergency surgeries. Comparative studies with other third-generation SGDs such as i-gel™ and LMA Supreme™ could further delineate the relative advantages of these devices.

CONCLUSION

This prospective, randomised study provides compelling evidence that the Baska Mask™ offers superior performance compared to the ProSeal™ Laryngeal Mask Airway (PLMA) in adult patients undergoing elective surgery under general anaesthesia. The Baska Mask™ demonstrated significantly higher oropharyngeal leak pressures (OLP) both at early (5 minutes) and sustained (30 minutes) time points, which reflects a more effective airway seal and the potential for enhanced safety during positive pressure ventilation.

Additionally, the Baska Mask™ achieved better anatomical alignment with the glottis, as evidenced by a higher fibreoptic bronchoscopy (FOB) score. It was also associated with a shorter insertion time and slightly better ease-of-insertion profile. These findings are clinically significant, particularly in high-demand operative settings requiring rapid airway control with minimal manipulation. Importantly, both devices maintained stable perioperative haemodynamic profiles, underscoring their safety in routine use.

The self-energising sealing mechanism, cuffless design, and dual drainage channels of the Baska Mask™ confer several advantages over conventional devices like PLMA. While familiarity and cost remain considerations for broader adoption, its performance characteristics support its use as a first-line supraglottic airway device for controlled ventilation.

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