Efficacy of Baska Mask for Airway Management During General Anaesthesia for Flexible Bronchoscopy - A Prospective Analytical Study

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Abstract

Background and Aim: A study on the efficacy of the Baska Mask, a third-generation supraglottic airway device, for airway management during flexible bronchoscopy under general anaesthesia. Flexible bronchoscopy is used for both diagnostic and therapeutic purposes. The transition from local anaesthesia to general anaesthesia for flexible bronchoscopy has become common, particularly for more complex procedures and high-risk patients. The primary outcome was the ease of manipulation of flexible bronchoscope through the Baska Mask, scored by a pulmonologist, while secondary outcomes included the bronchoscopic view of the glottis and perioperative complications.

Methods: After institutional ethics committee approval, this prospective analytical study was performed in 50 adult patients undergoing flexible bronchoscopy under general anaesthesia using Baska Mask for airway management.

Results: The study found that the Baska Mask was easy to manipulate, with most patients scoring a 1 (no resistance) or 2 on a 10-point scale. After manipulation, the percentage of glottis opening (POGO) score improved significantly, with 98% of patients achieving a score of 100% (entire glottis structure visible). Hemodynamic parameters remained almost stable throughout the procedure, and there were no significant complications such as spasm or desaturation. However, there were instances of device dislodgement and sore throat, with the former being more common in patients with a higher BMI.

Conclusion: The study concluded that the Baska Mask is a safe and efficient alternative to endotracheal intubation for flexible bronchoscopy procedures, offering advantages such as reduced hemodynamic stress, easier manipulation of endobronchial devices and a high success rate in maintaining the airway.

***Keywords*:** Baska Mask, supraglottic airway devices, general anaesthesia, laryngeal mask airway, flexible bronchoscopy, complications.

INTRODUCTION

Flexible bronchoscopy (FB) has been employed in the field of interventional pulmonology (IP) for both therapeutic and diagnostic procedures.[1] Anaesthesia for FB has transitioned from administering local anaesthetic with sedation to general anaesthesia (GA). GA becomes necessary for more intricate or prolonged procedures, patients who are unwell or uncooperative, and individuals with significant coexisting health conditions or lung issues.[2]

During FB procedures, both anaesthesiologists and pulmonologists share the same airway, presenting challenges in maintaining oxygenation, ventilation, optimizing airway management and ensuring safety.

To address these challenges, recent years have seen the development of newer airway management tools and supraglottic airway devices (SADs). The utilization of SADs has been increasing due to their ease of insertion and minimal complications. These devices come in various models with different sealing mechanisms and designs for aspiration protection.[3]

Among the newer SADs is the Baska Mask (Logikal Health Products PTY Ltd., Morisset, Australia), a third-generation SAD developed by Australian anaesthetists Kanag and Meena Baska.[4] It has a non-inflatable, self-sealing, silicone cuff and a soft, malleable mask piece at the distal end. The drain tubes open to the tip of the mask on either side and posterior to it. It has an integrated, strong bite block, a standard 15-mm connector and an inbuilt hand-tab. Four sizes are available 3, 4, 5, and 6 for patients weighing from 30-50 kg, 50-70 kg, 70-100 kg and >100 kg respectively.[5]

To the best of literature search, there is no study evaluating Baska Mask for airway management during GA for FB procedure. Hence the study is designed to estimate the efficacy of Baska Mask for airway management during general anaesthesia for flexible bronchoscopy.

MATERIALS AND METHODS

It was a prospective analytical study conducted at Sri Manakula Vinayagar Medical College and Hospital [SMVMCH] under the department of anaesthesiology, Kalitheerthalkuppam, Puducherry after the approval of the institutional research and ethics committee. The study was registered in Clinical Trials Registry of India (CTRI/2023/08/056391). Based on the previous year records it was found that 17 - 20 cases have been registered in 6 months. Hence during the study period of 18 months it is possible to collect data from 50 cases. Consecutive sampling technique was followed. Participants were selected as per the inclusion criteria and enrolled in the study. Study was conducted on 50 patients of either sex, belonging to ASA PS I, II and III, between the age group of 18 to 70 years, who were undergoing flexible bronchoscopy requiring general anaesthesia**.** Patients between the age < 18 years and age > 70 years, pregnant or lactating women, body mass index > 35, those with pre-existing altered airway anatomy, difficult airway and refusal for participation were excluded from the study.

STUDY PROCEDURE

A thorough preoperative assessment was done and those who met the inclusion criteria were only included in the study. Patients were explained about the nature of the study and after obtaining written informed valid consent, patients were enrolled in the study. Night before the procedure all patients were pre-medicated with anxiolytics and proton pump inhibitor as per institutional protocol. Patients were instructed about the fasting status according to ASA standards.

On day of procedure, the enrolled patient was shifted to the operation theatre (OT), standard ASA monitors [SPO2, ECG, NIBP] were attached and baseline parameters noted. An intravenous line was secured and intravenous fluids started. Anaesthetic drugs for induction, muscle relaxants, opioids were used according to discretion of the consultant anaesthesiologist in charge of the OT. A well lubricated SAD (Baska Mask) was inserted. The size of Baska Mask used for the first attempt was based on the patient's weight as per the manufacturer's instructions.

Successful device placement will be confirmed by the appearance of a square wave capnograph trace and bilateral chest movements on ventilation. The device was either reinserted or higher device size was inserted if an obvious leak was observed. If the insertion fails even after three attempts, and alternative way of airway management was made ready and the patient will be excluded from the study.

Figure1: Ventilation via Baska Mask

Anaesthesia was maintained with oxygen, air, sevoflurane or isoflurane. Then the patient was

connected to ventilator with tidal volume of 8-10 ml/Kg and respiratory rate adjusted to maintain ETCO2 of 35-40 mm Hg. Presence of palpable leak in the neck will be assessed immediately after insertion and during the procedure.

Bronchoscopy was performed by senior consultant who has 5 years of experience in performing bronchoscopy procedures. Lubricating gel was applied to the insertion cord before inserting the flexible bronchoscope. The pulmonologist was asked to score the ease of insertion of bronchoscopy in device and manipulation of bronchoscopy via Baska Mask during the procedure. A scale numbered from 1-10 with 1 being no resistance and 10 indicates difficult to manipulate (high resistance) will be used.

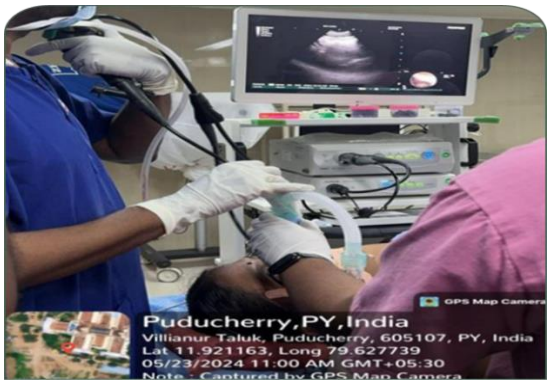


Figure 2: Demonstration of flexible bronchoscopy via Baska Mask

Once the insertion cord reaches the SAD tip, percentage of glottis opening (POGO) score was assessed (100% - entire glottis structure visible, 33% - only lower third of vocal cord and arytenoid visible and 0% - no glottis structure visible). If entire glottic structure was not visualised, the device is manipulated and POGO scoring was recorded again.

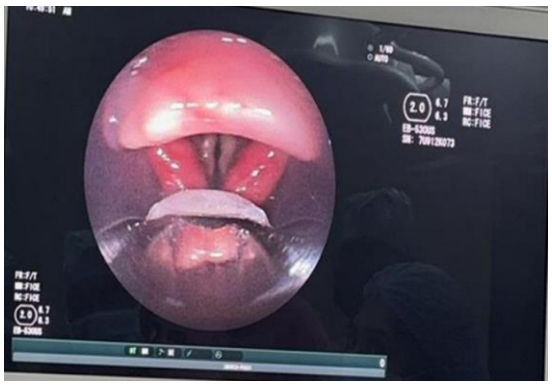


Figure 3: Bronchoscopic view of glottis from the supraglottic airway tip

At the end of procedure, the effects of neuromuscular blocking drug were reversed with Inj.Neostigmine 0.05 mg/kg and Inj.Glycopyrolate 10mcg/kg and device removed after complete neuromuscular recovery of the patient.

After removal of the device, presence of blood in the device, occurrence of laryngospasm/ bronchospasm was noted. In PACU, patient was asked for presence of sore throat 4 hours after the procedure. Throughout the procedure HR, NIBP, SpO2 recorded every 5 minutes. Any change in the hemodynamic parameter and desaturation if any is noted.

Analysis plan- statistical analysis

The data will be collected using the proforma and entered in Microsoft excel sheets and analysed using statistical package for the social sciences (SPSS) 24th version. The data which follow normal distribution will be expressed as mean and standard deviation and analysed using parametric test. The data which follow non-normal distribution will be expressed as median and interquartile range and analysed using non-parametric test. Categorical data will be expressed as proportions and frequency and analysed using Chi square test. All statistical tests will be considered significant if $p < 0.05$.

RESULTS:

TABLE 1: Distribution of study participants based on ease of insertion and manipulation of flexible bronchoscopy

EASE OF INSERTION AND MANIPULATION OF FB		(n,%)
SCORE (1-10) CATEGORY	1	34 (68%)
	2	14 (28%)
	7	1 (2%)
	8	1 (2%)

TABLE 2: Distribution of study participants based on POGO SCORE

POGO SCORE	BEFORE MANIPULATION (n,%)	AFTER MANIPULATION (n,%)
0%	1 (2%)	0
33%	15 (30%)	1(2%)
100%	34 (68%)	49 (98%)

POGO score before manipulation; 34 participants were scored 100%, 15 participants were scored 33%. After manipulation 98% of participants were scored 100%.

TABLE 3: Distribution of study participants based on complications

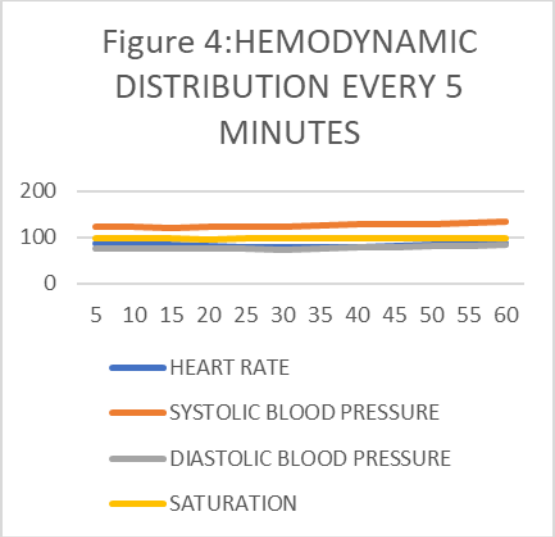
COMPLICATION	PRESENT (n,%)	ABSENT (n,%)
PALPABLE LEAK	6 (12%)	44 (88%)
DEVICE DISLODGEMENT	2 (4%)	48 (96%)
SPASM	0	50 (100%)
DESATURATION	2 (4%)	48 (96%)
SORE THROAT	8 (16%)	42 (84%)

TABLE 4: Association between ease of insertion and manipulation of flexible bronchoscopy with device dislodgement, desaturation, sorethroat and BMI

EASE OF INSERTION AND MANIPULATION OF FB VIA BASKA MASK	DEVICE DISLODGEMENT DURING PROCEDURE	DESATURATION	SORETHROAT	BMI
1	0	0	5	0
2	0	0	2	0
7	1	1	0	1
8	2	1	1	1

Association between ease of insertion, manipulation of flexible bronchoscopy with device dislodgement during procedure (complications) was found to be statistically significant using chi square test with the p-value of (<0.01).

Device dislodgement were found among 2 patients with BMI >30. Association between BMI and



Device dislodgement during procedure found to be statistically significant with the p-value of (<0.01).

Association between the ease of insertion and manipulation of FB, manipulation of Baska Mask and desaturation was found to be statistically significant with the p-value of (<0.01) based on chi-square test.

HR, SBP, DBP and SpO2 were monitored every five minutes once from 0 to 60 minutes during procedure and were analysed with mean and standard deviation and found to be almost constant.

DISCUSSION:

Instrumentation of the airway is one of the most noxious procedures. Bronchoscopic procedures are at risk of developing perioperative complications and most of the patients are already ill. Hypertension, tachycardia, elevated cardiac output, laryngospasm, bronchospasm, retching, and vomiting are the physiological response following bronchoscopy. To perform bronchoscopy procedures in a safe and efficient manner without much of cardiorespiratory stress anaesthesia must be administered.[6] In clinical practice, fiberoptic bronchoscopes can be inserted through the nasal channel or by an ETT.

LMA is a very useful SAD employed as a conduit for FB procedures have the lowest complication rates and shortest procedure time during bronchoscopy when compared to other methods.[7] When compared to endotracheal tube (ETT), the use of SADs has advantages such as (1) simpler and faster placement, (2) decreased use of neuromuscular blocking drugs, (3) preservation of

laryngeal competence and mucociliary function, (4) decrease in residual paralysis, (5) minimal hemodynamic variability, (6) less anaesthetic requirement for device placement, (7) lesser emergence coughing and (8) decreased subglottic trauma.[7] Using SAD for IP procedures provides greater versatility than an ETT.[8] In this study we used a third generation SAD, Baska Mask which offers a non-invasive alternative to the ETT and allows passage of larger flexible bronchoscopes with better images and working channels.

Baker PA, Brunette KE, Byrnes CA, Thompson JM conducted a study comparing different SADs for FB in children and scored the ease of manipulation of bronchoscope among different SADs. They found that the cLMA is superior to PVC Ambu, Portex Soft Seal, and LMA Unique to manipulate the bronchoscope within the airway device.[9] Similarly, the ease of insertion and manipulation of FB via the Baska Mask was scored. In our study, 68.0% of participants had a score of 1 and 28.0% of the participants had a score of 2. A very least number of participants 4% were scored 7 and 8. Association between ease of insertion and manipulation of flexible bronchoscopy and Device dislodgement during procedure was found to be statistically significant. Device dislodgement were found among two patients with BMI more than 30. Device dislodgement was confirmed by inability to ventilate despite adequate manipulation and those two cases were excluded from the study. Bronchoscopy was continued with GA using endotracheal intubation.

Park S et al conducted a study to examine the effects of neutral and sniffing positions for vocal cord view and concluded that POGO score was higher with neutral position.[10] Based on this, we placed all the patients in neutral position while assessing the POGO score. POGO score of 100% (the entire glottic structure visible) observed in 98% of the study population after manipulation. In remaining 2%, POGO was 33% (only the lower third of the vocal cord and arytenoid visible). The soft, membranous portion of the cuff occasionally wrinkles over the epiglottis, although this has no effect on the anaesthetic effectiveness or airway patency.

In our study palpable leak from Baska Mask was found during insertion in most of the patients. But only six patients (12%), had a persistent leak. This is probably because the glottis aperture and cuff seal improves with positive pressure inflation. Baska Mask has the capability to achieve an adequate seal, which is crucial for effective ventilation.

HR, SBP, DBP and SpO2 monitored every five minutes once from 0 to 60 minutes. The mean HR, SBP, DBP and SpO2 of the study participants were almost constant and not much difference was found. Baska Mask helps the patient to maintain hemodynamic stability. Tosh P, Kumar RB, Sahay N, Suman S, Bhadani UK conducted a study comparing Baska Mask and ETT in patients requiring GA and found that Baska Mask insertion was associated with attenuated hemodynamic responses compared to endotracheal intubation.[11]

In our study, sore throat observed in 8 patients, 4 hours after procedure. It doesn't have any significant association. Since all the cases were related to respiratory diseases, some of them had pre-existing sore throat which is a confounding factor. Van Zundert T and Gatt S conducted a study where airway complications (sore throat, dysphagia) 2 hours after surgery using Baska Mask recorded and concluded there were only a few minor complications when Baska Mask is used.[12]

Even though complications occurred, it was easy to be manipulated and rectified. Patient cooperation and compliance were found to be more. The findings from the current study emphasized that Baska Mask is more efficient and has better compliance. Hence it can be used in routine bronchoscopic procedures. The findings from this current study emphasized that Baska Mask is more efficient for FB procedures.

STRENGTH AND LIMITATIONS:

Very limited studies have been done in India regarding the efficacy of Baska Mask for bronchoscopy procedure. Standard procedure has been followed in the study. A validated scoring system, percentage of glottic opening (POGO) score is used. Systematic follow-up done. It serves as a base for understanding the effects of Baska Mask as an alternative to ETT for FB procedures. It helps us to frame a protocol for airway management during flexible bronchoscopic procedures. The study has few limitations. Since the sample size fits to the category of pilot study findings cannot be generalised. As it is a single-centred hospital-based study, the study findings cannot be extrapolated to a huge population. Patients sociodemographic

background and confounding factors were not captured in this study.

CONCLUSION:

In the present hospital based prospective analytical study it is found that the Baska Mask can effectively be used for airway management during general anaesthesia for flexible bronchoscopic procedures. To extrapolate the findings, studies with larger sample size and multi-centric studies are needed in the future.

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