COMPARISON OF BASKA MASK VERSUS PROSEAL LARYNGEAL MASK AIRWAY IN ELECTIVE SURGERIES UNDER GENERAL ANESTHESIA-A RANDOMIZED CLINICAL TRIAL

By

Dr.JOPHY.JOSE

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Dr. K.NIRMALADEVI

PROFESSOR

DEPARTMENT OF ANESTHESIOLOGY

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ABBREVIATIONS

SAD	Supraglottic Airway device
LMA	Laryngeal Mask Airway
PLMA	Proseal Laryngeal Mask Airway
ETT	Endotracheal tube
IPPV	Intermittent Positive Pressure Ventilation
BM	Baska mask
Ppl	Pleural pressure
Ptp	Transpulmonary pressure
FRC	Functional Residual Capacity
PA or Paw	Alveolar Pressure
Pa	Pulmonary Arterial Pressure
Pv	Pulmonary venous pressure
PEEP	Positive End expiratory pressure
Clma	Classic Laryngeal Mask Airway
S-LMA	LMA supreme
fLMA	fastrach LMA
ALMA	Ambu LMA
DT	Drainage Tube
OGT	Orogastric tube

UES	Upper esophageal Sphincter
V/Q ratio	Ventilation to Perfusion ratio
BM	Baska mask
airQ – SP	airq self-pressurizing
SLIPA	Streamlined liner of the pharynx airway
Cobra PLA	cobra perilaryngeal airway
LT	Laryngeal tube
LTS	Laryngeal tubes
OSP	oropharyngeal seal pressure

ABSTRACT

Background and aims

Securing the airway is an important step in anesthesia, which controls patient safety and outcome. Supraglottic Airway Devices (SAD) are crucial for maintaining a patent upper airway. Baska mask is the most recent addition into SAD for ensuring airway. This study aimed to compare the benefits of using Baska mask over Proseal LMA in surgeries done under general anesthesia and lasting < 2 hours based on several factors such as time of insertion, ease of insertion, Number of attempts, oropharyngeal seal pressure and any complications.

Methods

In this prospective randomised clinical trial, 64 patients, aged 20 to 60 years who were admitted for elective surgeries under General Anesthesia with ASA Grade I & II were randomly divided into two groups with 32 patients in the Proseal LMA group (Group A) and 32 patients in the Baska group (Group B). The primary objective was to compare the time taken for and ease of insertion between the two groups. Secondary objectives include comparison of oropharyngeal seal pressure, number of attempts and incidence of complications between the two groups.

Result

Demographic profile regarding age, gender, BMI, ASA grade and duration of surgery in both the groups were comparable, however showed no significant results. Regarding time and ease of insertion, Baska mask group was superior to Proseal LMA group. Baska mask could be inserted in lesser time (24 $\pm$ 1.136 sec) compared to Proseal LMA (28.59 $\pm$ 1.682 sec),with high success rate in first attempt(90% Vs 64%) which was statistically significant ($p<0.05$). In terms of Oropharyngeal seal pressure, the study showed significant results with higher OSP in Baska mask (31.34 $\pm$1.638 cm H_2O) compared to Proseal LMA (24.81 $\pm$ 1.469 cm

H_2O). In terms of complications associated with insertion trauma to lip, blood staining, aspiration and sore throat were more in Proseal LMA (15.6%, 15.6 %, 9.4%) compared to patients inserted with Baska mask (6.3%, 3.1%, 3.1%). These results were however, statistically insignificant.

Conclusion

In our study, Baska mask provided higher OSP, was easier to insert; hence took less time for insertion and less number of attempts for insertion compared to Proseal LMA. Complications of blood staining, trauma to lip and sore throat were more in Proseal LMA group compared to Baska mask group. The study therefore, emphasizes the benefits of Baska mask over Proseal LMA.

Keywords-

Baska mask, Proseal LMA, Oropharyngeal seal pressure

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INTRODUCTION

Securing the airway is an important step in anaesthesia, which controls patient safety and outcome. Supraglottic Airway Devices (SAD) are crucial for maintaining a patent upper airway. They have noticeably altered the ways of airway management in patients undergoing anaesthesia. Several second-generation SAD have been designed that can increase patient safety during surgery by offering an improved airway seal, protective bite blocks, and gastric drainage tubes[1].

Archie Brain in the year 1981 had revolutionized the approach towards securing the airway with extra glottic devices which allows both maintenance of oxygen saturation and patent airway. Different versions of SAD have been produced over time to precisely fit the airway passage's anatomy. The several advantages of using LMA includes it being a less invasive method of stabilizing airway, being highly tolerated by patients, and simpler insertion, but it also comes with an inherent complication of aspiration.[2]

Proseal Laryngeal Mask Airway (PLMA) introduced by Teleflex corporation Ltd, USA is a device which can be used several times. It has an extra dorsal cuff, an additional bite block and a gastric drainage tube which provides an alternative passageway for regurgitated gastric contents. It is taken to be the "gold standard" SAD for evaluating the competency of other LMAs. For securing the airway, it has been considered as an acceptable substitute for the endotracheal tube (ETT). It is an LMA with two cuffs and two lumens. The dual-tube arrangement creates a barrier between the digestive and respiratory tracts, allowing for different channel for regurgitated fluids. Additionally, the two cuffs of proseal LMA improves the seal around the glottis, permitting the use of intermittent positive pressure ventilation (IPPV). These characteristics encourage use in patients who have higher chances to develop aspiration of regurgitated fluid[3]. Endotracheal tube, although has always been a time tested and remarkable airway securing device, has its own draw backs which includes vocal cord trauma and trauma to

structures of the oral cavity, pressor response and sore throat that are troublesome for the anesthesiologist[3].

However, the PLMA has certain drawbacks of its own, such as the overinflation of its cuff, which can cause LMA to change its position, and the passage of nitrous oxide gas into the cuff by diffusion while administering anaesthesia, which could elevate the intracuff pressure and possibly result in laryngo-pharyngeal morbidity[4].

The Baska Mask introduced by the Baska Versatile Laryngeal Mask (BVLM) Pvt Ltd, Strathfield NSW, Australia, is a new generation SAD composed of silicone[4]. It is the most recent addition into SAD for ensuring airway. There are now four sizes available for patients weighing between 30 and 100 kg: 3, 4, 5, and 6. It has four distinguishing attributes that favor its superiority to ProSeal LMA. These consist of:

1. A membranous bowl with no cuff which expands and shrinks with each positive pressure inspiration and expiration respectively during IPPV.
2. A built-in "tab" that increases the angle for easier oropharyngeal curvature accommodation during placement.
3. A drainage system with two tubes for the removal of pharyngeal secretions and gastric secretions.
4. A bite block[1].

Rise in pressure within the airway during positive pressure ventilation (PPV) also raises the oropharyngeal seal pressures. But in the case of PLMA, it worsens the leak. The Baska mask has a built-in "tab" to make insertion easier, and it also contains a gastric reflux high flow suction system to remove secretions from the stomach and pharynx. Studies related to Baska mask are limited. However, they reported rate of successful insertion to be between 96 to 100% and oropharyngeal seal pressures of greater than 30 mm Hg. However, these investigations have not been validated against well-known devices like PLMA[4].

Previous researches have shown that the Baska mask is the best option for maintaining patient's airway during surgery for up to two hours when endotracheal intubation was not required. We have designed this study to compare the efficacy of Baska mask versus Proseal LMA in elective surgeries under general anaesthesia due to the dearth of case reports and articles demonstrating the supremacy of Baska mask over Proseal LMA in terms of fast airway stabilization with fewer attempts as well as lesser numbers of laryngopharyngeal injuries[1].

AIMS AND OBJECTIVES

AIM: To compare the advantages of Baska mask over Proseal LMA in surgeries under general anesthesia lasting < 2 hours.

OBJECTIVES:

Primary Objective:

1) Comparison of time taken for insertion between two groups.
2) Comparison of ease of insertion between two groups.

Secondary Objectives:

1) Comparison of oropharyngeal seal pressure between two groups.
2) To compare the number of attempts for successful insertion of Baska mask versus Proseal LMA.
3) Complications like Trauma to lip, Bloodstaining, Sorethroat, Dysphagia, Hoarsness of voice.

Main observational indicators and their definitions:

- **Ease of insertion:** Under sufficient depth of anesthesia, the mask's proximal part was compressed between the thumb and two fingers, and was moved towards the hard and soft palate till resistance was experienced. Ease of insertion is divided into three grades based on the resistance the anesthetist encountered:
  - Grade I – No insertion resistance.
  - Grade II – mild insertion resistance.

- Grade III – moderate insertion resistance.
- Grade IV – high insertion resistance/impossible insertion.

- **Oropharyngeal seal pressure**: It is the pressure at which leak begins. It is measured in cm of H_2O at 5 mins after placement of Supraglottic Airway devices. This is calculated as the plateau airway pressure that is attained with a fresh gas flow of 6L/min and pressure adjustment valve set at 60 cm H_2O.
- **Insertion Time**: It is the time recorded in seconds from the moment the SAD comes in contact with the teeth to the moment where the first recorded near rectangular capnogram curve was obtained. Only time taken for successful attempt was noted.

REVIEW OF LITERATURE

- ✓ **Tom van Zundert and Stephen Gatt (2012)[7]** This study was done to evaluate the performance of Baska mask in adult patients undergoing a variety of surgical interventions. This was done amongst 50 patients with American Society of Anesthesiologists (ASA) physical status I–III. The "first attempt" success rate was high (88%) and "overall insertion" success rates was considered "easy" to "very easy" in 92% of patients. Removal of the device was considered easy in all cases. The oropharyngeal leak pressure was above 30 cm H2O in all patients and a maximum of 40 cm H2O was achieved in 82 % of the patients. They could conclude that Baska mask could improve safety when used in both spontaneously breathing and IPPV anesthesia.
- ✓ **V. Alexiev, A. Salim (2012)[11]** This study was done on 30 low risk female patients with ASA physical status I - III aged 18 years or older, who were deemed to be at low risk for difficult tracheal intubation on pre-operative assessment. The overall success rate for Baska mask insertion was 96.7% while the success rate for the first insertion attempt was 76.7%. The mean OSP was 35.7 cm H2O. The incidence of throat pain, dysphonia and dysphagia was low in Baska mask[11]

- ✓ **Sharifa Ali Sabeeh Al-Rawahi, Haris Aziz (2013)[6]** It was a prospective randomized interventional study done amongst 52 adult patients in Khoula Hospital, Muscat (Oman). The mean insertion time was significantly shorter in the BM group as compared to the PLM group (16.43 ± 4.54 vs. 21.45 ± 6.13) with mean oropharyngeal sealing pressure significantly higher in the BM group (29.98 ± 8.51 vs. 24.50 ± 6.19). There was no difference between the leak fractions of the two devices BM took significantly shorter placement time and provided a better seal as compared to PLM[6].

- ✓ **Ebenezer Joel Kumar E, G Vijay Anand, Aldona Shaji R (2019)[5]** This was a randomized prospective single-blinded study amongst a study group of 40 female patients posted for short gynecological procedure were divided into 2 groups: Group I (BM) with 20 patients and Group II (Proseal LMA -PLM) with 20 patients. The mean time for

insertion of Baska mask was 13.3 sec while it was 19.7 sec for PLM. The mean airway sealing pressure was significantly higher in the BM group with the seal pressure ranging from 20 -29 and 24 -37 in group I and II respectively. There was no significant post-operative laryngopharyngeal morbidity in both groups[5].

- ✓ **Ranjith Kumar Kachakayala, Parmeet Bhatia (2019)[8]** This study was performed amongst 100 patients between 18 to 60 years of age divided into 2 groups (BM vs PLM), undergoing short gynaecological procedures. There was no significant difference in terms of ease of insertion and number of attempts of both devices. When compared to PLMA, the time required for insertion of BM was significantly less in duration (20.9 sec vs. 16 sec) with better oropharyngeal seal. There was no significant difference in reduction of laryngopharyngeal complications[8].

- ✓ **S. Garpagalakshmi (2019)[9]** This study was done amongst 70 ASA I-II patients at Department of Anesthesia, Stanley Medical College, Chennai where the patients were randomized into 2 groups. They found that 91.4% of BM patients had successful single attempt SAD insertion in comparison to 82.9% (29 out of 35 patients) of PLM patients. Patients in PLM group had higher number of manipulations of SAD (34.2%) whereas in BM group only 14.3% of patients required manipulations while inserting SAD. There were no complications during insertion in both the groups. In the study it was found that 85.7% of patients (n=30 out of 35) in BM group had easy insertion of SAD while only 65.7% (n=23 out of 35) patients had easy insertion in PLM group. The incidence of slight difficult insertion was higher in PLM group. The primary outcome of mean airway sealing pressure was significantly higher in BM group compared to PLM group[9].

- ✓ **Ramkumar Dhanasekaran, Gautam Dilip Mehta, Aruna Parameswari (2019)[10]** This was a study done on 90 patients ASA physical status I-II planned for laparoscopic cholecystectomy randomized into three groups (Baska mask, I gel and Proseal LMA) of 30 each. The oropharyngeal leak pressure at five minutes post insertion was 38.33 ± 4.353 cm of H_2O for group Baska, 30.57 ± 2.174 cm of H_2O for group I gel, 29.36 ±

2.706 cm of H_2O for group Proseal LMA. Hence, Baska mask provided higher orpharyngeal leak pressure as compared to the other two supraglottic devices[10].

- ✓ **Balwinderjit Singh, Arwinder Pal Singh, and Joginder Pal Attri (2020)[2]** This was a randomized prospective open-label study which was done on 60 adult patients between the age groups of 18 to 60 years The patients were randomly divided into two groups: Group I where Baska mask (BM) was inserted after induction of general anesthesia and Group II where PLMA was inserted after induction. The study showed the number of attempts needed to insert BM was 1.40 + 0.31 as compared to 1.51 + 0.25 in the PLMA agroup, however this result was statistically insignificant. In terms of mean insertion time, BM was found to have a shorter insertion time; BM 14.25 + 3.82 sec vs. PLMA 22.01 + 2.64 attributed to its cuffless membrane and second oropharyngeal curve that could be easily negotiated by pulling the tab of BM, which increases its distal curvature as compared to PLMA. The mean airway sealing pressure in the study for BM was 30.25 ± 8.34 cm H2O and for PLMA, it was 23.50 ± 4.05 cm H2O. However, they had statistically insignificant results in terms of laryngopharyngeal morbidity between the two groups. The study, thereby favored BM as to having shorter placement time and providing a better seal as compared to PLMA airway[2].

- ✓ **Dr. Paramanand Reddy, Dr. Shivakumara KC (2022)[12]** This study was done on 90 pediatric patients of ASA grade I and II, posted for elective surgeries under general Anesthesia. According to their observations, mean insertion time taken for group B (Baska mask) was 15.8 seconds and 13.5 seconds for group P (Proseal LMA). Mean airway seal pressure recorded in group B was 25.8 ± 1.6 cm H_2O and 24.4 ± 1.1 cm H_2O in group P. Baska mask and LMA ProSeal were successfully inserted at first attempt with their ease of insertion recorded as “very easy” (grade 1) for all patients studied in respective groups[12].

- ✓ **Darvish Hussain, Raksha Kundal (2022)[13]** This was a prospective, randomized, single-blinded interventional study performed on 60 adult patients of both genders at the Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi who were

posted for laparoscopic cholecystectomy under General Anesthesia. There were no significant results with regard to number of attempts of insertion, ease of insertion, and laryngeal morbidity between the Baska mask and Proseal LMA groups. The mean OSP at five minutes was 31.55 ±2.23 cm H_2O in the BM group, whereas in the Proseal LMA group, it was 24.17 ±3.74 cm H_20. In the study, the OSP continued to rise in the BM group more than in the PLMA group during the operation.

ANATOMY AND PHYSIOLOGY OF UPPER AIRWAY

The respiratory system is divided functionally into 2 zones:

1) Conducting zone (nose to bronchioles) which acts as a pathway for inhaled gases
2) Respiratory zone extending from the alveolar duct to the alveoli where exchange of gases occurs.

Anatomical classification of the respiratory tract includes:

- upper tract which includes nose, pharynx and larynx.
- lower tract which includes trachea, bronchi, bronchioles, alveolar duct and alveoli.

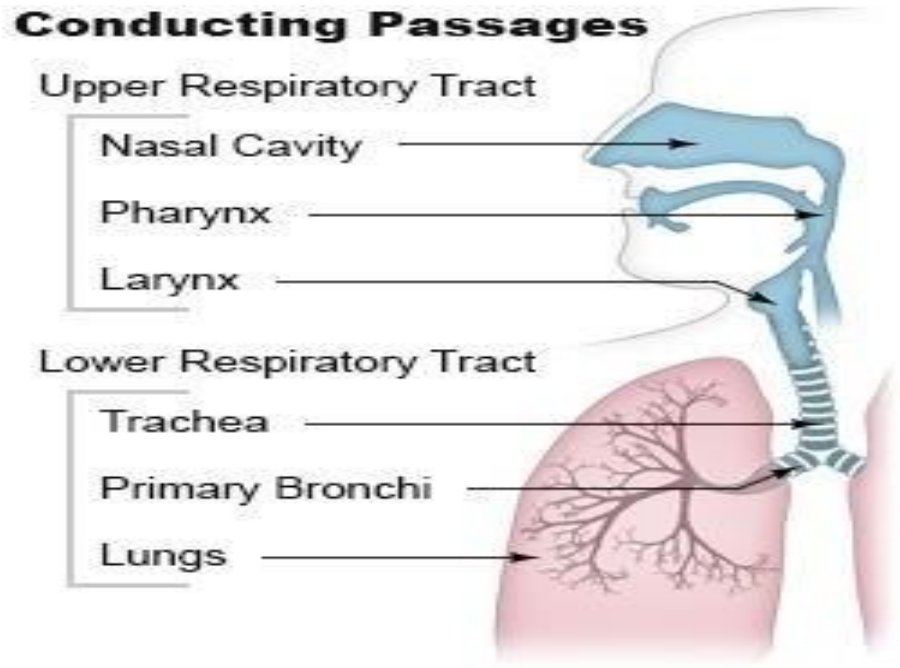


Figure 1: Anatomical structures in upper and lower airway

Nose and Nasal cavity

The nasal septum divides the nasal cavity into two parts. Three turbinates or conchae (superior, middle and inferior) are present along the lateral wall of the nose. The passageway below the inferior turbinate is the inferior meatus which is a favoured passage for nasotracheal intubation. The pharynx is a tube-like pathway that connects the nasal and oral cavities posteriorly to the larynx and further on, to the esophagus. It is divided into nasopharynx, oropharynx and laryngopharynx. The three narrowest portions of pharynx include passages behind the: 1) soft palate 2) tongue and 3) epiglottis. These spaces significantly reduce in dimensions following anaesthesia and sedation which in turn leads to obstruction of upper airway.

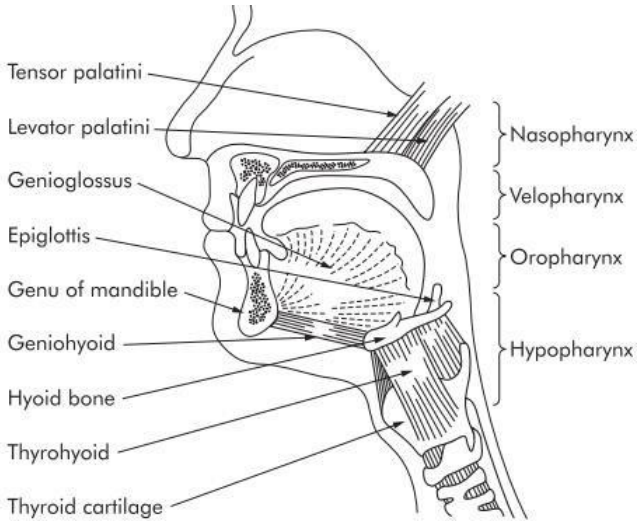


Figure 2 - Anatomical illustration of the upper airway and significant airway patency-regulating muscles

The following anatomical characteristics affect pharyngeal patency:

Ineffective pharyngeal dilator muscle contraction - 1) The tensor palatine muscle pulls the soft palate away from the posterior pharyngeal wall, keeping the airway open. 2)The tongue is moved forwards by the genioglossus to create the retroglossal gap.

3) The hyoid moves forwards and stabilizes the retro epiglottic laryngopharynx thanks to the hyoid muscles (geniohyoid, sternohyoid, and thyrohyoid).

Oropharyngeal soft tissue anatomical imbalance - An enlarged tongue in the normal or smaller bony enclosure of the oropharynx (receding mandible in the event of acromegaly or obesity).

Tracheal tug - Constant pull on the trachea, pharynx, and larynx during breathing in due to negative intrathoracic pressure, lengthens the pharynx and in turn reduces the pharyngeal lumen in obese patients.

Larynx- It functions as a regulator, regulating air flow from the naso-oro-pharynx to the trachea[14].

Tracheobronchial system

It is a complicated pathway through which gases pass from the trachea to the acini, the lung's smallest unit where gaseous exchange occurs. It has 23 generations, beginning with the trachea (0^{th} generation) and ending with the last order of terminal bronchioles (23^{rd} generation). Each airway divides into two smaller airways at each generation. The airways are purely conducting passages from the trachea till the terminal bronchioles ($15\text{-}16^{th}$ generation). As there is no exchange of gases within this region, the volume in these passages is known as dead space volume which averages to about 150 ml. The terminal bronchioles (16^{th} generation) having alveoli on their wall's further branches into respiratory bronchioles or transitional bronchioles ($17\text{-}19^{th}$ generations).

The respiratory bronchioles branch further to form alveolar ducts, which belong to 20-22nd generations and are entirely lined with alveoli. The 16–23rd generation is known as acinus. This is composed of respiratory airways and lung tissues that are functional, that is, they take part in gaseous exchange. Small tubes known as alveolar ducts are held together by a dense elastic and collagen fiber matrix. The alveolar ducts at their terminal ends open into the alveolar sac, which is turn composed of multiple alveoli.

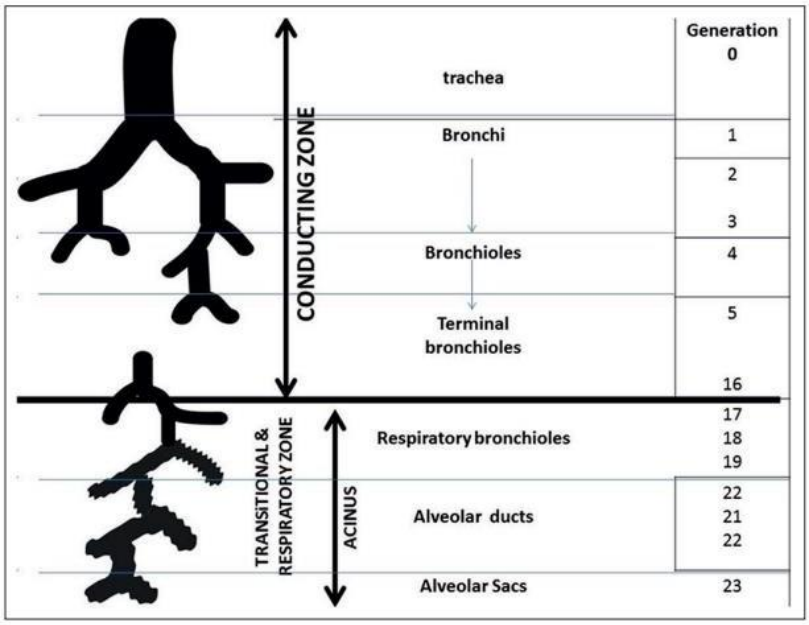


Figure 3: Divisions of Tracheobronchial tree

Trachea and Bronchi

It is a hollow tube that transports bronchial secretions and gases. The trachea begins from the level of C6 vertebral level (cricoid cartilage) to carinal level, which is approximately at T4-T5 vertebra. It measures about 11-13 cm in length in adults. About 2-4 cm of the tube is extra thoracic, and has about 16 to 22 C shaped cartilages around it. The trachealis muscle provides a support posteriorly for the trachea where there is no cartilaginous support. Depending on the stage of inspiration, the posterior tracheal wall may become flat, convex, or

slightly concave. During expiration however, the posterior wall either flattens or bows slightly forward.

As the trachea reaches the level of carina, it is slightly displaced posteriorly and to the right. The tracheal bifurcation angle (carinal/subcarinal angle) is 73° (35-90°). Wider carinal angle is seen in patients with an enlarged left atrium, females, and in those who are obese. The trachea is divided into the right and left main bronchus at the level of carina. The length between the carina and the teeth changes significantly with changes in neck position (with tracheal length varying by about 2 cm), body and diaphragm positions. This is also another reason for changing the position of the endotracheal tube when the patient's position or neck flexion - extension changes.

The right main stem bronchus follows a more vertical path, is shorter, and starts to ramify earlier than the left main stem bronchus. This increases the likelihood of endobronchial intubation into the right main bronchus. The right main stem bronchus further branches into the right upper lobe bronchus and the bronchus intermedius, which further ramifies into the right middle and lower lobe bronchus (secondary bronchi). The left bronchus departs from the vertical axis at a greater angle than the right bronchus. The secondary bronchi of the left main stem bronchus include the left upper and lower lobe bronchi**.**

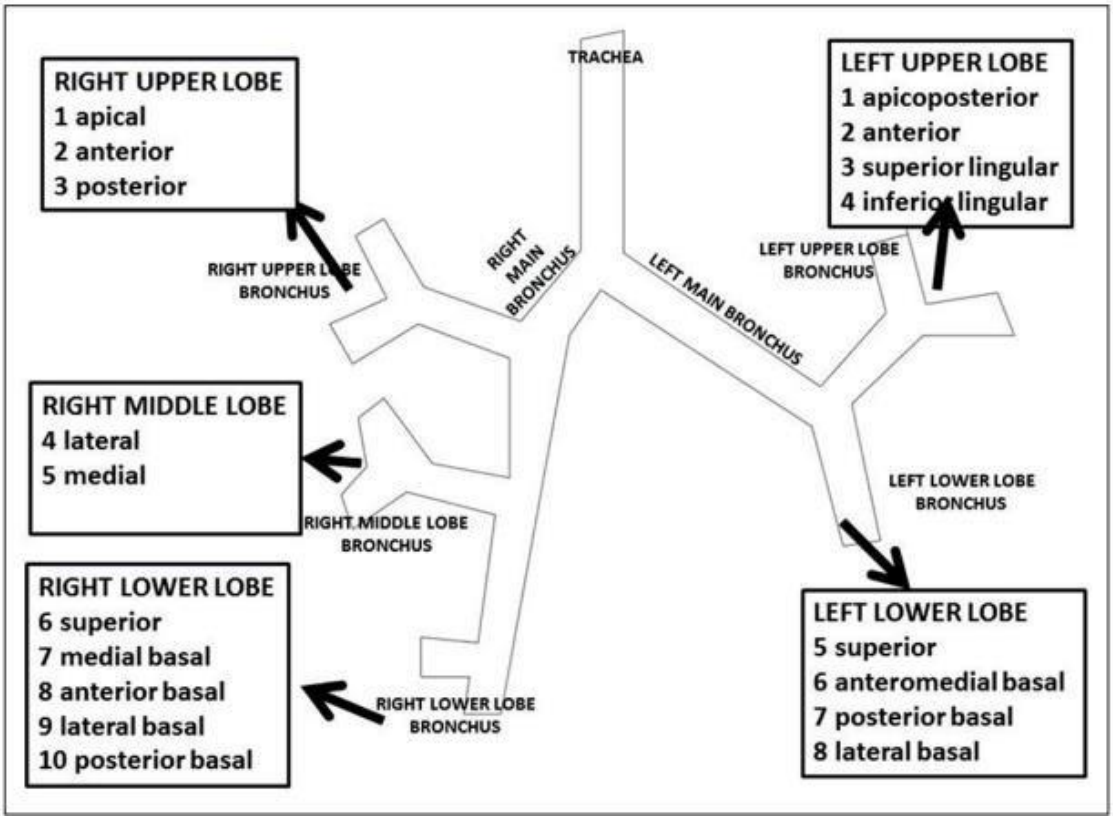


Figure 4: Bronchopulmonary segments on the Tracheobronchial tree

Bronchopulmonary segments

They serve as the bronchus' distribution hubs. Each lobar bronchus separates into segmental bronchi (tertiary bronchi), each of which supplies a single bronchopulmonary segment. Technically, each lung has ten bronchopulmonary segments, however in the left lung, some of the bronchopulmonary segments may combine, leaving only eight segments. The bronchi continue to ramify into even reduced size bronchi. As the size of the bronchi decreases, their anatomical structure alters:

- ✓ In the terminal bronchioles, there is a transformation from pseudostratified columnar to columnar to cuboidal.

- ✓ Cilia and cells that produce mucus are absent in the bronchioles.
- ✓ As the airway gets smaller, more smooth muscle is found in the tube wall.

The Tracheobronchial tree's dimensions

Anatomical differences: The prevalence of the tracheobronchial tree is 4%, and it exhibits a wide range of morphological changes. The two primary bronchus abnormalities that occur most frequently includes: -

(a) Tracheal bronchus: A bronchus that originates from the right side of the trachea above the level of carina within a range of 2-6 cm. Right tracheal bronchus occurs in 0.1-2% of patients, and left bronchus occurs in 0.3-1% patients. If the tracheal bronchus is obstructed or a tube enters it during intubation, it might cause problems of atelectasis or pneumothorax.

(b) Accessory cardiac bronchus: A congenital, short and lean bronchus that leads into the pericardium and may originate from the right or intermediate bronchus. It occurs in 0.08% of patients and may be associated with recurrent infections[14].

Table 1: Dimensions of the Tracheobronchial tree.

	Length	Coronal diameter	Sagittal diameter	Cross sectional area
Trachea	11-13 cm	13-25 mm in men 10-21 mm in women	13-27 mm in men 10-23 mm in women	3.2-3.5 cm^2
		Diameter		
Right main bronchus	1.5-3 cm	15 mm		2.2
Left main bronchus	4.5-5 cm	11.8-13 mm		2.1
Subcarinal angle	35-90° (average 73°)			

Respiratory System Physiology

Ventilation is the term given to the movement of gases into and out of the lung.

Lung Volumes:

Normal tidal ventilation of approximately 6–8 ml/kg can easily meet the normal requirements of the body When extra ventilation is needed, inspiratory and expiratory reserve volume (e.g., exercise) is provided to our bodies. After tidal expiration, an individual takes a full breath in succeeded by a breath out to provide a reserve volume, which is 4-5 L in an average 70 kg adult person. There is always some amount of air persisting in the alveoli to prevent their collapse. The volume of air that persists in the lungs after a vital capacity breath is known as residual volume. The combination of residual and expiratory reserve volume is known as functional residual capacity (FRC). FRC is the volume of air remaining in the lungs following a normal breath out. The gases that remain in the lungs after expiration not only helps to avoid alveoli form collapsing, but also oxygenate the pulmonary blood flowing through the capillaries. According to several studies, reported FRC values in standing position range between 2.8 and 3.1 L. FRC changes with body position, anesthesia, and body weight. This is also the reserve that allows non-hypoxic apnea to last longer. Alveolar ventilation is the fraction of minute ventilation that reaches up to the alveoli and involves in gaseous exchange. The normal value of alveolar ventilation is about 5 L/min, which is almost equivalent to the volume of blood passing through the lung (cardiac output is about 5 L/min), making the alveolar V/Q ratio about one.

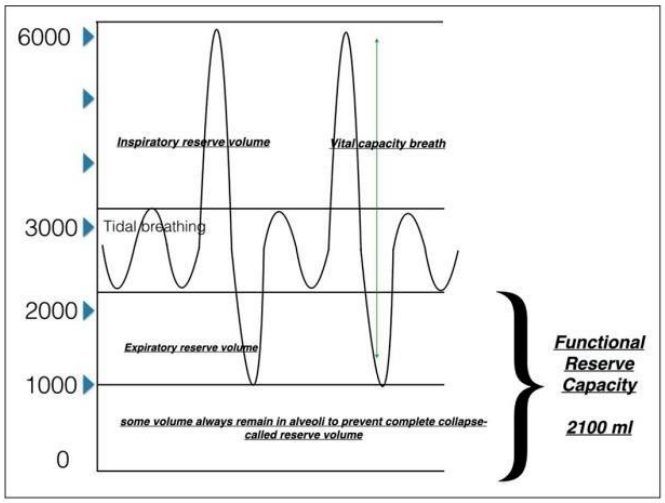


Figure 5: Lung volumes

Respiratory mechanics

Lungs are like balloons that expand due to positive and/or negative pressure created in the pleural space. Negative pleural pressure (Ppl) is enough to inflate the lungs during the inspiratory phase of normal respiration. The following equation represents extending pressure (transpulmonary pressure (Ptp)): Ptp = Paw – Ppl.

Lung compliance and ventilation

Lung compliance is defined as the amount of lung expansion for a given amount of transpulmonary pressure (Ptp) which is about 0.2 to 0.3 L/cm H2 O. It is dependent on the lung volume and is least at lowermost limits of FRC. It indicates that a completely inflated or deflated lung have a lower-than-normal capacity to distend to a given pressure. The intrapleural pressure (Ppl) shows variations from the apex to the base of the lungs in the upright position. Intra Ppl becomes positive by 0.2 cm H2O for every centimeter increase in distance from apex to the base of the lung. Due to the change in Ppl with gravity, ventilation alters with the position of the individual. Closure of air passages during expiration and reopening of airways during inspiration is a normal process. Closing volume is that volume that is slightly more than the residual volume when expiration below the FRC results of closure of some airways, and this volume is summated to the residual volume to calculate the closing capacity. In older individuals (65-70 years), closing capacity approaches FRC in upright position, resulting in airway passage closure even during normal tidal expiration.

The average lung height is approximately 35 cm. The intra Ppl at the apex of quiet breathing is about -8 cm of H2 O and at the base it is about -1.5 cm of H2 O. This implies that the distending pressure is higher at the apex (PAPpl = 8 cm H_2O) than at the base (PAPpl =1.5 cm H_2O). Because the alveoli have already expanded, the apical region of the lung becomes less compliant than the rest of the lung, resulting in preferential ventilation of the alveoli at the bases in upright posture.

FRC decreases when the position of the body changes from erect to supine, lateral, or prone. FRC reduction promotes closure of air passages in dependent parts of the lung. As a result, early closure of the air passages in turn reduces ventilation in the base of lungs. Because blood flow of lung preferentially flows towards dependent regions, the balance between oxygen supply and blood flow in the lungs is hampered[14].

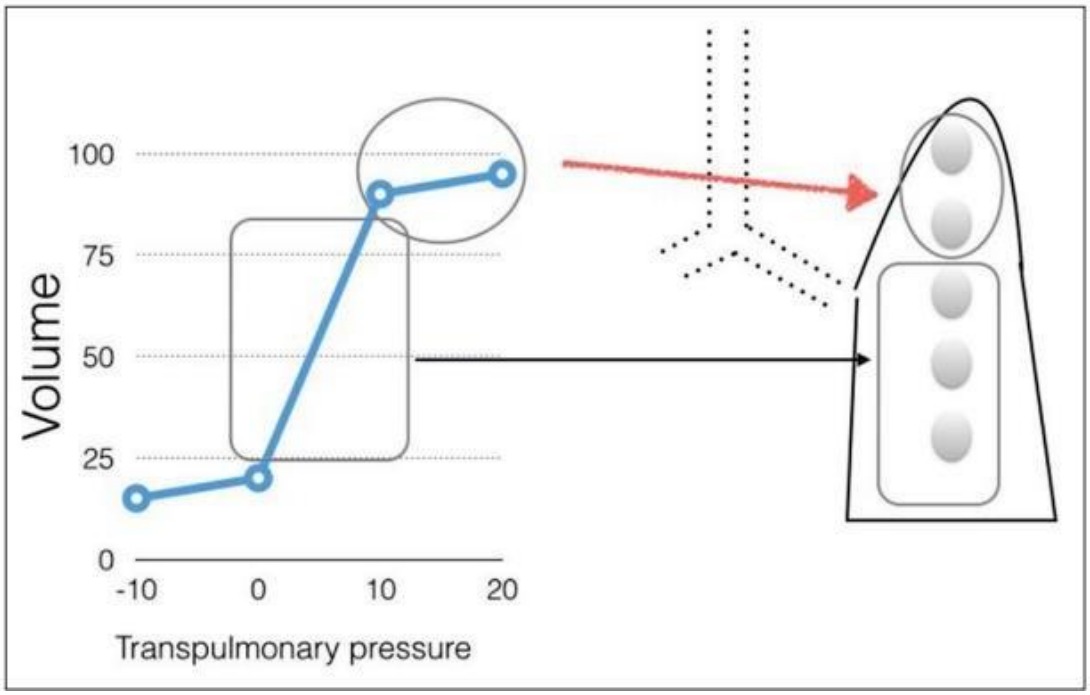


Figure 6: Transpulmonary pressure

Lung perfusion

Pulmonary circulation differs from systemic circulation. The pulmonary vessels are modified to have thinner walls and lesser musculature to permit faster diffusion of gases. They are also exposed to lesser pressure than the systemic circulation. The perfusion of the lung is classified into three zones based on the influence of gravity.

The flow of blood to these three zones is determined by three factors: (1) alveolar pressure (PA), (2) pulmonary arterial pressure (Pa), and (3) pulmonary venous pressure (Pv). Zone I is the apex where PA is greater than Pa and Pv. Because PA > Pa > Pv in zone I, no arterial blood flow is present and is known as physiological dead space. Under normal perfusion pressure, such a zone does not ideally exist in healthy subjects, but in pathological conditions of hemorrhage or PPV, zone I contributes to dead space ventilation. The difference in Pa to PA determines perfusion in the middle zone or zone II (Pa > PA > Pv), whereas the difference in Pa to Pv determines perfusion in the lower zone or zone III (Pa > Pv > PA). Some studies also include a fourth zone with lesser blood supply due to vessel compression as a result of weight of the lungs. These zones are entirely physiological rather than anatomical. The boundaries between zones shift in response to a variety of physiological and pathophysiological changes or conditions. During a quiet breath, paw changes are minimal, but more significant during speech, exercise, and other situations. Patients on PPV with positive end expiratory pressure (PEEP), due to the high Alveolar pressure, may have significant greater zone I. Pa changes in the presence of severe hemorrhage or during general anaesthesia simulating zone I conditions. During exercise, pulmonary artery pressure rises, converting any existing zone I into zone II and shifting the boundary between zones III and II up.

Ventilation and perfusion matching

The ratio of ventilation (V) to perfusion (P) determines the alveolar partial pressures of oxygen and carbon dioxide (Q). Both V and P increases from the apex to the base of the lungs, but perfusion rises more than ventilation. The V/Q ratio is higher in the upper part of the lung and lower in the lower part. Regardless of body position, the V/Q ratio changes in the vertical direction of lungs. (For example, if the patient is standing, the apex receives more oxygen supply while the base receives more blood flow.) If the patient is in a lateral decubitus position, the nondependent lung receives considerably more oxygen supply while the dependent lung receives greater blood flow[14].

SUPRAGLOTTIC AIRWAY DEVICES: AN OVERVIEW

These are airway gadgets that enable gases to enter and exit the airway through a tube that sits above the glottis [15]. Due to their adaptability and simplicity of use, first-generation SADs quickly took over ET intubation and face masks in > 40% of patients undergoing general anaesthesia. Specific design enhancements made to second-generation devices have increased their utility and efficiency even more. Individual second-generation SADs have a significantly lower risk of aspiration of gastric contents into lungs, allow for more reliable PPV, are constructed of reusable materials, have integrated bite blocks, and are more efficient in serving as tracheal tube passageways. In more than 90% of patients for whom mask ventilation or tracheal intubation was determined to be unfeasible, SADs are now helpful in successfully doing rescue ventilation.

There are still some issues with these devices, such as their inability to appropriately ventilate, their damage to the airways, and their increased propensity for aspirating gastrointestinal contents into the lungs. For these devices to be used successfully, great technical skills and careful patient selection are required[16].

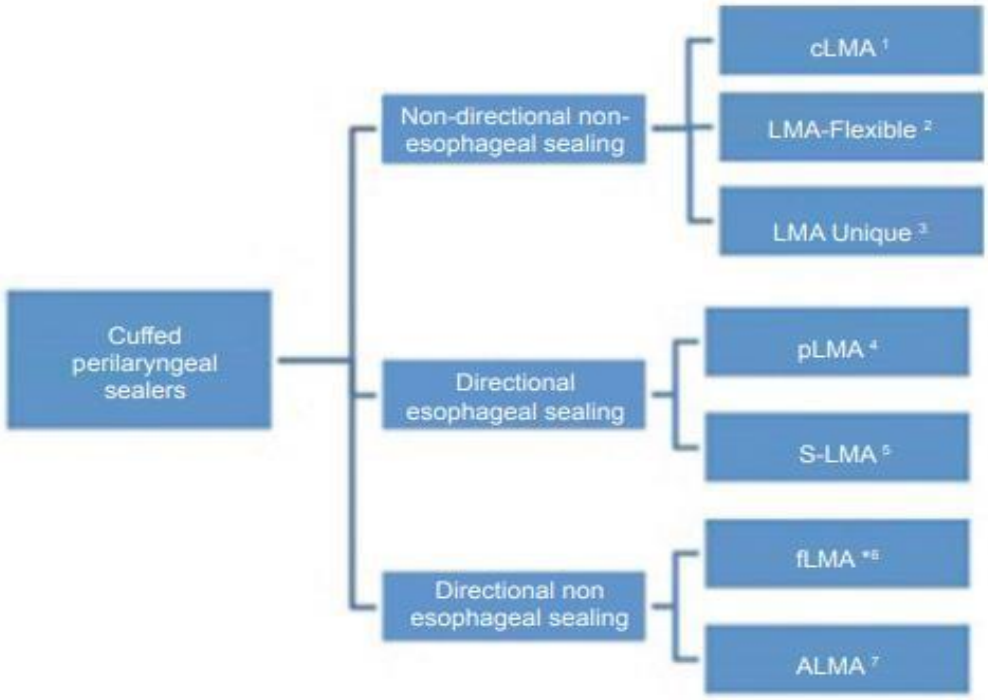
Classification of SADs:

SADs are classified into two types based on two key distinctions. The first is whether or not an inflatable cuff is present. Cuffless devices reduce the risk of cuff-related morbidity but may increase the risk of leaks and failure. Differentiation into first-generation and second-generation SADs is a more commonly used classification. First-generation devices are simple airway tubes with no special design features aimed at reducing the risk of aspiration of gastric contents into the lungs. Second-generation SADs have additional modifications that help improve PPV and lower the risk of aspiration into the lung[16].

Brimacombe suggested a classification of SADs which was based on the cuff's presence or absence and the location of the device’s distal end in the hypopharynx;

however, this proposed classification also includes devices that were designed to aid in airway clearance and/or make intubation easier.

A more widely accepted classification was suggested by Miller for SADs whose primary function is airway management under general anaesthesia. SADs were divided into categories according to the location of the device's cuff in the hypopharynx (and whether it is inflatable or anatomically preshaped), if it creates a seal, whether the effect of the seal is directed, and whether or not sealing of esophagus takes place[15].



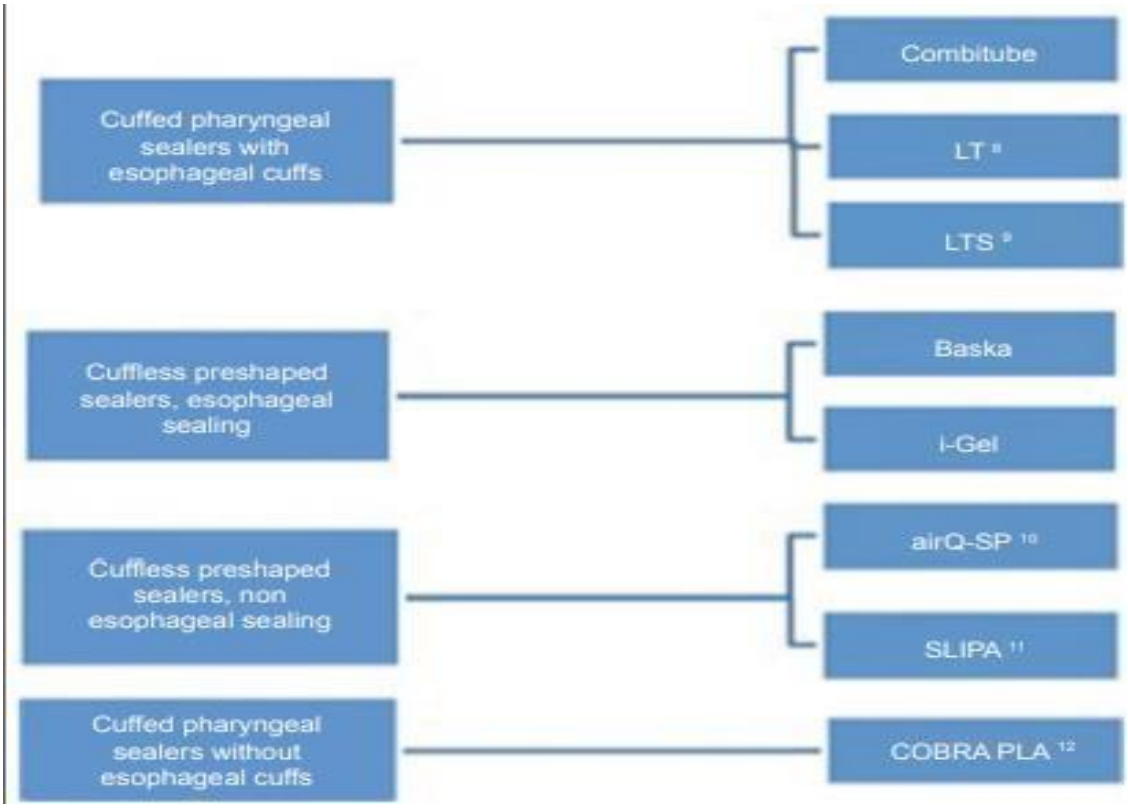


Figure 7: Supraglottic airway device classification

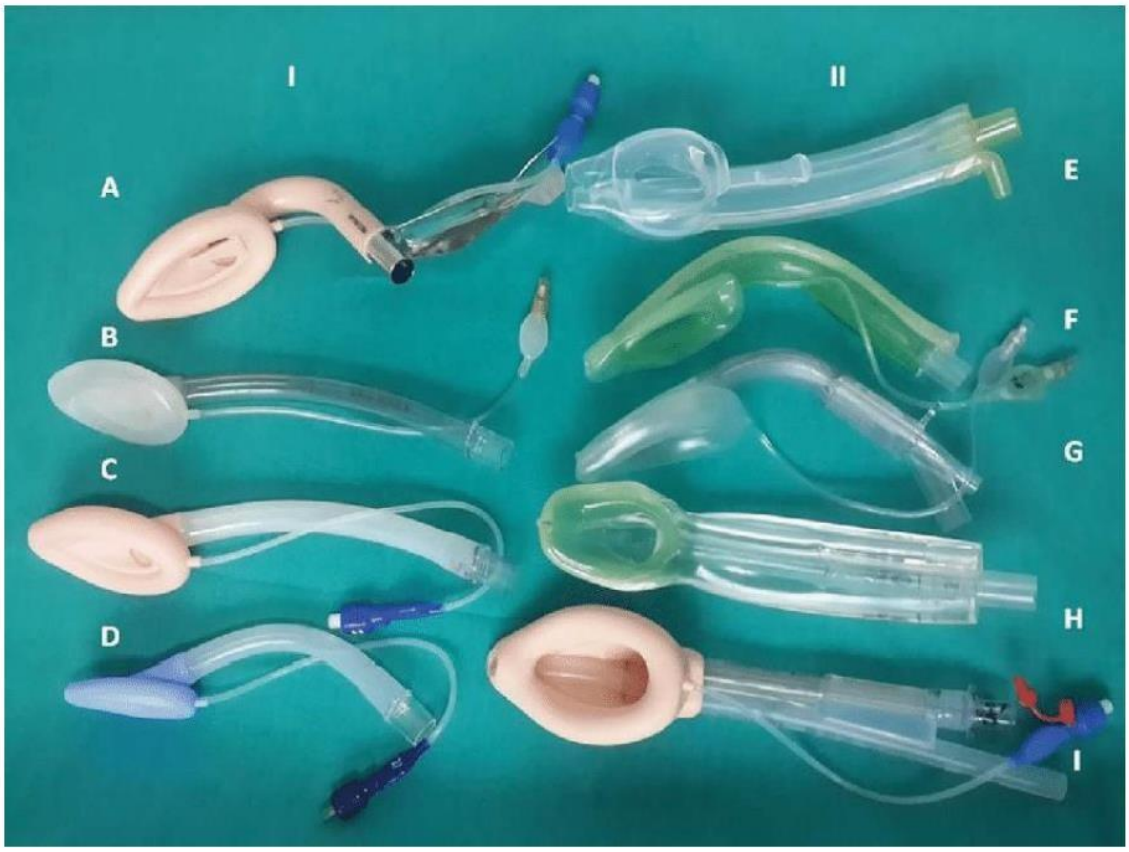


Figure 8: Different types of SADs:

(I) **SADs with an airway tube only:** (A) intubating LMA (B) LMA Unique, (C) cLMA and (D) disposable laryngeal mask.

(II) **SADs that have an airway and a drain tube**: (E) BM, (F) Ambu Aura Gain, (G) S-LMA, (H) i-gel (I) PLMA.

SAD	Location of sealing	Sealing mechanism	Aspiration protection	Single-use	Conduit for intubation
cLMA	Perilaryngeal	Inflatable cuff	No specific feature	No	No
LMA Unique	Perilaryngeal	Inflatable cuff	No specific feature	Yes	No
LMA Flexible	Perilaryngeal	Inflatable cuff	No specific feature	Yes	No
Intubating LMA	Perilaryngeal	Inflatable cuff	No specific feature	Yes	Yes
LMA ProSeal	Perilaryngeal	Inflatable cuff	Drainage channel	No	No
LMA Supreme	Perilaryngeal	Inflatable cuff	Drainage channel	Yes	No
Combitube	Base-of-tongue	Inflatable cuff	Drainage channel + Esophageal cuff	Yes	No
King LT	Base-of-tongue	Inflatable cuff	Esophageal cuff	Yes	No
King LTS-II	Base-of-tongue	Inflatable cuff	Drainage channel + Esophageal cuff	Yes	No
CobraPLA	Perilaryngeal	Inflatable cuff	No specific feature	Yes	Yes
SLIPA	Base-of-tongue	Pre-shaped	Storage chamber	Yes	No
i-Gel	Perilaryngeal	Pre-shaped	Drainage channel	Yes	Yes
Baska Mask	Perilaryngeal	Self-energizing	Drainage channel	Yes	No
3gLM	Perilaryngeal	Self-energizing	Drainage channel	Yes	No

Figure 9: Commonly available SAD features

Evolution of SADs

In 1981, Dr. Archie Brain is credited with inventing and developing the LMA. The prototype airway device consisted of a Goldman nasal mask connected to an endotracheal tube (ETT) that was cut obliquely. The goal of this mask was to provide an alternative for ETT insertion, reducing airway damages associated with tracheal intubation. Dr. Brain had tried LMA prototypes on 7,000 people before the first devices were available in the market in 1988. He also is said to have publicly demonstrated the use of local anesthesia to insert the LMA into his own pharynx. Dr. Chandy Verghese, along with Dr. Brain, was integral part in helping describe certain techniques and device alterations that have changed the clinical view of the LMA to reduce airway morbidity associated with tracheal intubation.

Advantages And Disadvantages of SADs:

Advantages:

➢ Easy placement.

➢ Smooth recovery.

➢ Tolerable at lower planes of anaesthesia, with less risk of spasm of bronchus, larynx and sore throat.

➢ Reduces the risk of intubation and problems encountered with face mask.

Benefits in comparison to an endotracheal tube:

1 Quicker learning curve and easier insertion.

2 It is not always necessary to use laryngoscopy or muscle relaxants.

3. Comparatively less hemodynamic disturbances.

4. Insertion takes less time.

5. Lesser incidence of sore throat.

6. less airway manipulations with a reactive airway compared to endotracheal tube.

Benefits in comparison to facemask:

1. Hands-free method.

2 LMA reduces the work of breathing.

3 A LMA provides an airtight seal.

4. Compared to a facemask, the airway is more protected against regurgitation.

5. Easier to fit in children, thereby helping to avoid oropharyngeal airway obstruction.

6. Because waste gases can be scavenged, operating rooms are less polluted [9].

Disadvantages:

• **Relative contraindications to LMA use** include situations where there is an increased risk of aspiration such as full stomach, previous history of gastric surgery, gastroesophageal reflex, diabetic gastroparesis, >14 weeks of gestation, dementia, trauma, opiate medications.

• **Patient suffering from glottic and supraglottic obstruction** – Pathologies in the supraglottic airway complicate SAD placement.

• **Paralysis or obtunded airway reflexes are required**: The jaw and pharynx must be completely relaxed before SADs can be inserted.

• **Less dependable airway**: Does not provide a definitive airway and chances of aspiration.

• **Drug administration is Unreliable** During resuscitation, drug administration via LMA is less reliable than via tracheal tube[9].

Supraglottic airway devices have a variety of applications:

- **In difficult face mask technique**, such as in edentulous patients, injuries to face, contour of faces that does not suit face masks, and facial burns without affecting upper airway.
- **Difficult or failed intubations** in cannot ventilate scenarios or in can't intubate like Pierre Robin or Teacher Collin syndrome, low neck movement, pressure of cervical collar.
- **Resuscitation**: Classic LMA and Fastrach LMA have been used for cardiac arrest in both adults and neonates, as well as in out-of-hospital situations such as air travel.
- **Ophthalmology surgeries** LMA insertion is associated with lower intraocular pressure in comparison to a tracheal tube, both during insertion and during emergence.
- **Tracheal surgery**: In cases of narrowing of the trachea by mediastinal masses, both mediastinoscopy and thoracotomy have been done using LMA and spontaneous ventilation.
- For transesophageal echocardiography, and endoscopic procedures.

➢ **Pediatric group**: Because of its superiority in sealing airways under high pressures, the PLMA is considered a reliable SAD in children. It can be used in children with URI, radiotherapy, Subglottic stenosis, MRI studies, and situations requiring multiple anaesthesia in a short period of time. Despite the fact that SAD is widely used, larger epiglottis increases the chances of obstructing the airway with SAD in children.

➢ **Regional block**: During partial block or when surgery lasts longer than a regional block, supplementation with SAD is opted for because it requires a lighter plane than a tracheal tube and less side effects [9].

Complications of SADs

- ✓ **Ventilatory failure –** This range from 0 to 41% for SADs which may be due to the specific design features of PLMA. Although the laryngeal tube is the simplest to insert, it has a

tendency to rotate along its long axis, resulting in misalignment of the laryngeal opening with the glottis and subsequent ventilatory failure.

- ✓ **Airway trauma-** Sore throat is seen in 0-70% of patients intubated with SAD postoperatively. Three factors that contribute to this complication (1) Device type and size, (2) insertion technique, and (3) cuff pressure. Proactive monitoring and lowering pressure of cuff to 60 cm H_2O have shown to reduce this complication. Congestion and swelling of tongue may also occur if the SAD is not inserted deeply enough or the cuff is overinflated. If the cuff is partially or fully inflated prior to insertion, this malposition is more likely to occur**.** Compression injuries to pharyngeal nerves, including the lingual, hypoglossal, and recurrent laryngeal nerves, have been described as neuropraxic in nature. In these cases, spontaneous recovery is expected. If the tongue becomes lodged in the bowl of the SAD, the frenulum of the tongue may also become avulsed.

- ✓ **Gastric contents aspirated into the lungs -** SADs may be associated with decreased lower esophageal sphincter tone in comparison to face mask ventilation. Studies of pulmonary aspiration rates during PPV showed lesser risk of aspiration with LMA use (3 per 35,630 procedures) in comparison to ETT (7 per 30,082 procedures). Specific design features of SADs contribute to the extremely reduced incidence of regurgitation and pulmonary aspiration of gastric contents. Most of the first-generation and second-generation SADs have extremely high esophageal seal pressures (50–60 cm H_2O). The esophageal seal pressure is the opening pressure of the esophagus which indicates the airway pressure at which there is leak of tidal volume into the atmosphere. Second-generation devices have also been shown to effectively vent gastric regurgitant fluid, thereby reducing the risk of aspiration[16].

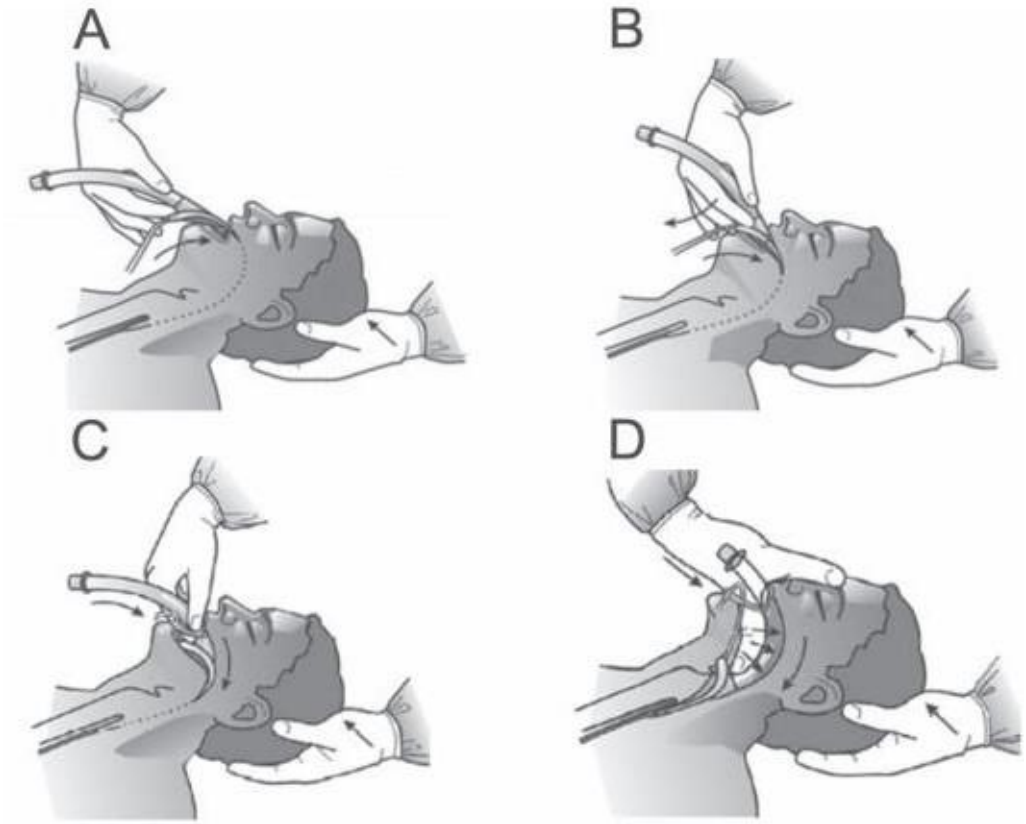


Figure 10: Traditional method of inserting a laryngeal mask airway (LMA) device. (A)Insertion of LMA into the mouth with head tilted and neck flexed. (B)The mask is forced into the mouth of the patient with the index finger while continuing to apply pressure to the palate. (C)The index finger should sustain pressure against the posterior pharyngeal wall as the mask is inserted to prevent touching the epiglottis. (D) During insertion, the index finger is entirely in the mouth. While the inserting finger is being taken out of the mouth, the other hand is holding the LMA. Without holding the tube, the cuff is inflated, allowing the device to position itself properly[16].

Criteria for Ideal SAD

- Should effectively serve as a ventilation bypass for the upper airway.
- For beginners, it should be simple to insert, with an easier learning curve.
- Effectiveness that is not severely affected by insufficient placement.
- Stable while in use, making it appropriate for "hands-free anesthesia."
- Excellent "accept-reject" profile.
- Low to no risk of aspiration.
- A good seal for the upper airway that allows for positive pressure ventilation.
- The pharynx is neither distorted or dented by the pressure and shape of the cuff, which are important for sealing.
- minimal airway morbidity.
- Excellent quality (i.e., no device failure/ malfunction)[17].

Classic LMA

In 1981 Dr.Archie Brain developed the LMA, and it was first made available in the United Kingdom in 1988 and the United States in 1991. The airway tube and the mask are the two components that make up the LMA. The purpose of reusable devices, which are made of medical-grade silicone, is to act as a sleeve joint at the upper esophagus and to create an oval seal around the laryngeal entrance. The mask has a cuff, a pilot tube, and a balloon that can be used for cuff inflation and check for cuff pressure. A 15 mm standard adapter is present at the proximal end of the shaft. The single use devices, as opposed to reusable LMAs, have a polyvinyl chloride cuff[15].

Figure 11: Classic LMA

Method of Insertion:

Insertion was designed to simulate deglutition. Before inserting, the tube's cuff must be completely deflated and should resemble the shape of a spoon. The distal part of the mask is pushed toward the larynx and pressed against the hard palate till the resistance is felt by the introducer**.** By doing this, the mask's bowl can slip posteriorly toward the epiglottis without being deflected downward across the glottis opening. The distal tip should be resting above the esophagus. The cuff pressure should be maintained below 60 cm H2O.Nitrous oxide increases the airway pressure intraoperatively leading to mucosal injuries.

Advantages:

- There were less changes noted in hemodynamics and intraocular pressures while insertion and removal.
- Preserves mucociliary function, laryngeal competence.
- Association with less laryngeal trauma.
- After the induction of anaesthesia, the cLMA can be inserted more quickly without the use of a laryngoscope or muscular paralysis.

- decrease in the likelihood of laryngospasm, bronchospasm, and sore throat; well tolerated at lesser planes of anaesthesia.

- Lower incidence of emergence phenomena and oxygen desaturation during emergence[15].

Complications:

- Aspiration of gastric contents.

- a rise in reflux to the middle to upper esophageal level.

In situations like “cannot intubate - cannot ventilate" scenario, the LMA is used as a rescue device. Even though they are most usually employed in sedated spontaneously breathing patients, the LMA does provide regulated mechanical ventilation in difficult surgical operations.[15]

Proseal LMA

The first-generation laryngeal mask airway (LMA) had many flaws because of it can’t withstand high airway pressures, it does not protect the lungs from regurgitation of gastric contents. The ProSeal LMA was developed by Henley-on-Thames resident of United Kingdom. It comes with better seal and gastric drainage port for aspiration [18].

Design

The PLMA is made of medical-grade silicone and offers several benefits as a result of the following new features:

(A) A ventral cuff which seals the peri glottic tissues which improves the seal.

(B) A gastric port for suctioning of gastric contents.

(C) an integrated bite blocks.

(D) The anterior distal tube is fitted with a locating strap which helps in avoiding the finger from slipping off the tube.

(E) A bigger ventral cuff that is restricted posteriorly by a bucket-shaped segment of the distal tube and increased proximally (to enhance seal by filling gaps).

(G) An accessory vent (which also serves as an extra ventilation port) is situated below the tubing in the bowl and prevents secretions from collecting.

(H) the configuration with two tubes (increases stability).

(I) An airway tube reinforced with wire (prevents the design from kinking).

Despite the fact that the gastric drainage tube increases the size of mask because the accessory vent, the PLMA lacks a semirigid shield and mask aperture bars [18].

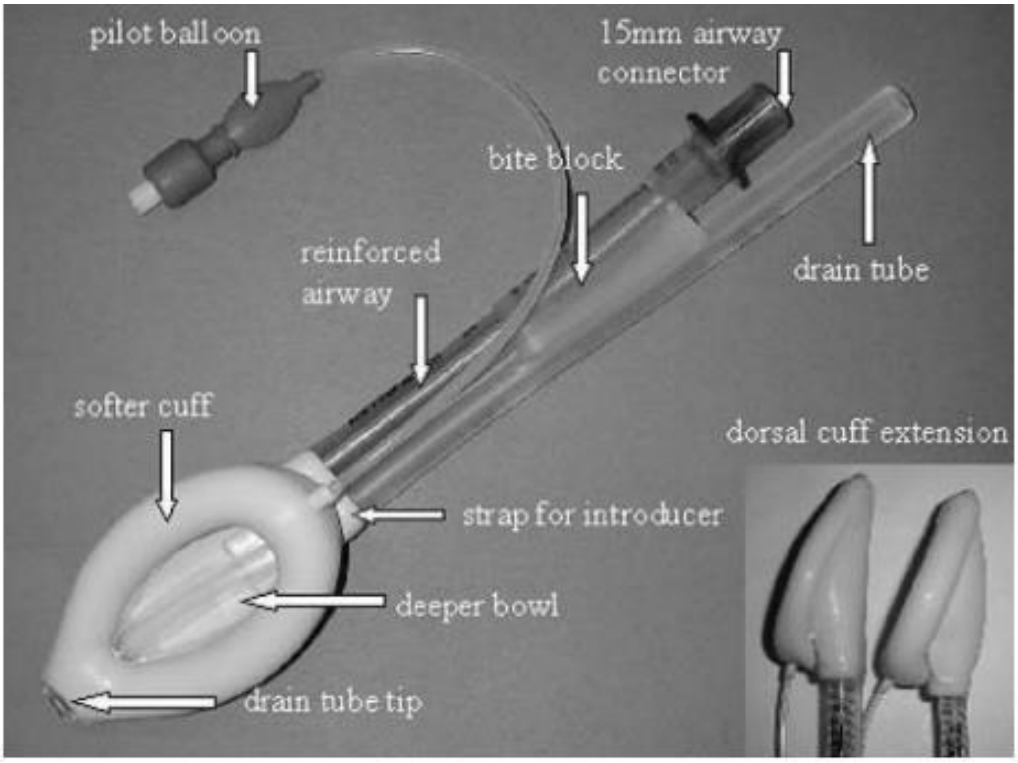


Figure 12: Proseal Laryngeal Mask Airway

Modifications in comparison to classic LMA are:

- A larger, deeper bowl with no grille.
- posterior mask cuff extension.
- A drainage tube exiting at the mask tip and running parallel to the airway tube
- A built-in silicone bite block.
- A pocket to contain a finger or introducer during insertion.

Size selection and practical aspects

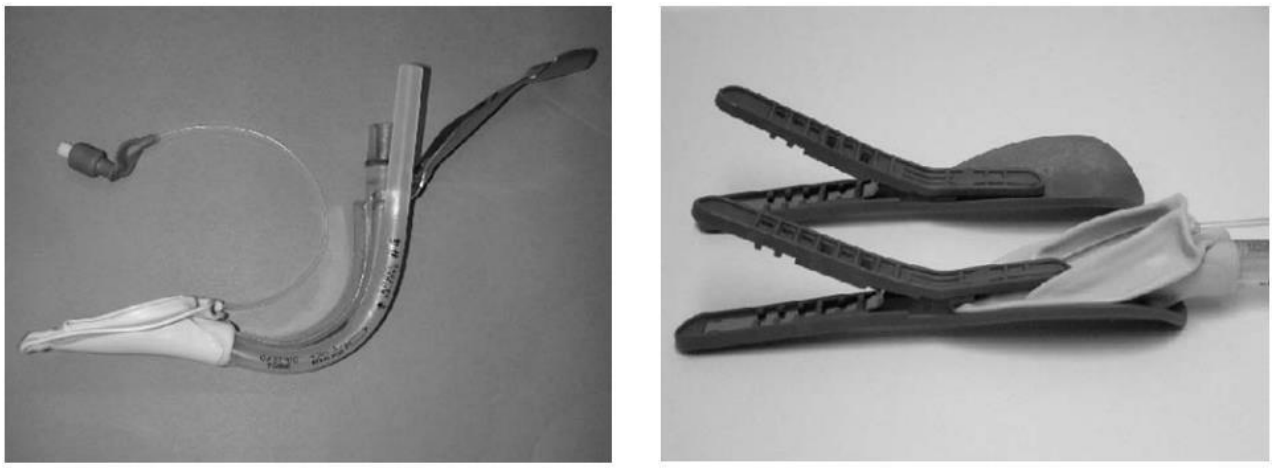
The PLMA airway orifice sits right above the glottis and gastric port is at the esophageal origin which provides separate passage to exterior of mouth.

Table 2: Different size and technical data for the PLMA

The PLMA can be used again and its product life is nearly 40 sterilisations. However, frequent cleaning of laryngeal masks cannot eliminate all protein debris, which theoretically increases the danger of cross-infection. Surprisingly, no reports of the reuse of a sterilised LMA transmitting bacteria, viruses, or past illnesses between patients have been documented. An insertion tool and cuff-deflator are included with the PLMA. To maximise the success rate of insertion, the cuff deflator aids in thoroughly deflating and flattening the device tip before insertion. A PLMA might cost between 110 and 130 percent more than a cLMA[19].

PLMA Size	*Patient size*	*Maximum cuff inflation volume*	*Median volume for 60 cm H_2O*	*Max diameter orogastric tube*	*Distance to tip of drain tube*
1½	5-10 kg	7	*	10	18.2 cm
2	10-20 kg	10	*	10	19.0 cm
2½	20-30 kg	14	*	14	23.0 cm
3	30-50 kg	20	*	16	26.5 cm
4	50-70 kg	30 mL	^26, 25^^, 28^^^ mL	16 Fr (5.5 mm)	27.5 cm
5	70-100 kg	40 mL	33^^,37^^^mL	18 Fr (6.0 mm)	28.5 cm

*No data available; PLMA = ProSeal laryngeal mask airway. ^(1); ^^(11); ^^^(12). LMA ProSeal instruction manual. Intavent Limited, 2002.



(a) **(b)**

Figure 13: a) Introducer and b) Tip flattener of Proseal LMA

Insertion of Proseal LMA

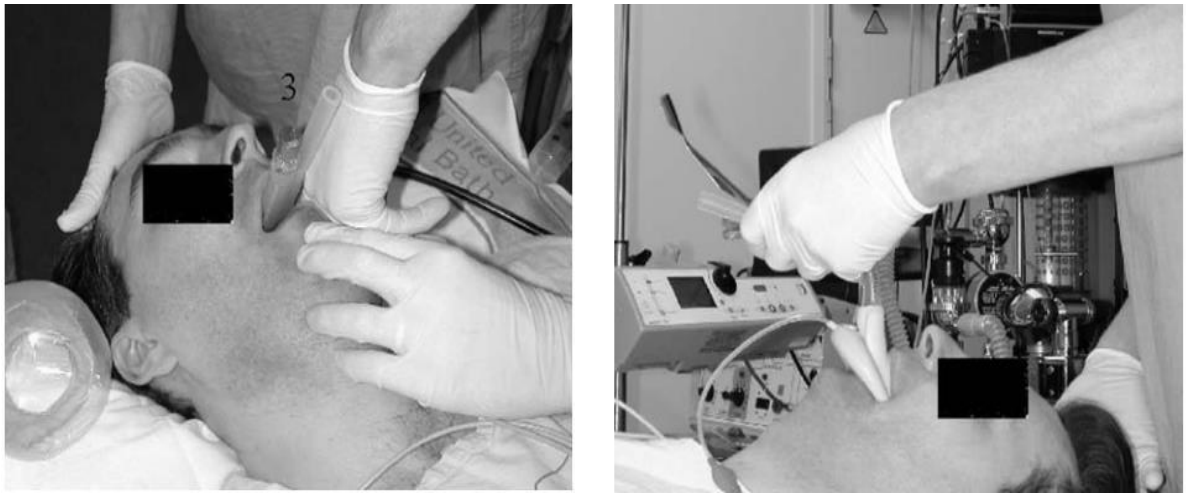
Depth of Anesthesia: When compared to cLMA, insertion of the PLMA requires an increase in plasma propofol concentration about 40% and sevoflurane concentration up to 20%.

Technique of insertion:

The most preferred position for insertion is head extension and neck flexion; an introducer may or may not be used. The index finger is used to insert the retention strap, which is made easier by compressing the lateral mask body, which causes the strap to bow outward. After insertion of LMA to mouth its directed towards the hard palate until resistance is felt. The PLMA come with a metal introducer which aids in insertion. The cuff is placed in the mouth, pushed up against the hard palate, then advanced with the handle until resistance is felt. In order to prevent dental injury, the introducer is then removed. Cuff is then inflated after insertion. A certain amount of air can be employed, however increasing the intracuff pressure to 60 cm H2O is not recommended because it lowers the pressure on the pharyngeal mucosa. A leak-free seal is created when the mask tip is properly positioned and pressed up against the UES-For proper positioning at least half of the bite block should be inside the upper incisors. If more than half of bite block is visible outside the mouth then chances of misplacement is high. Extrusion and misplacement are decreased while the PLMA is secured by applying inward force.

Techniques of insertion -

No research has found a discernible difference between the success of introducer and digital insertion rates. A laryngoscope can be used to insert a gum elastic bougie (GEB) into the oesophagus before the PLMA DT is passed over it. Thus, the likelihood of correctly positioning the PLMA is increased and the mask tip is prevented from folding[19].



(a) (b)

Figure14: (a) Digital Insertion (b) Introducer Insertion

1 2

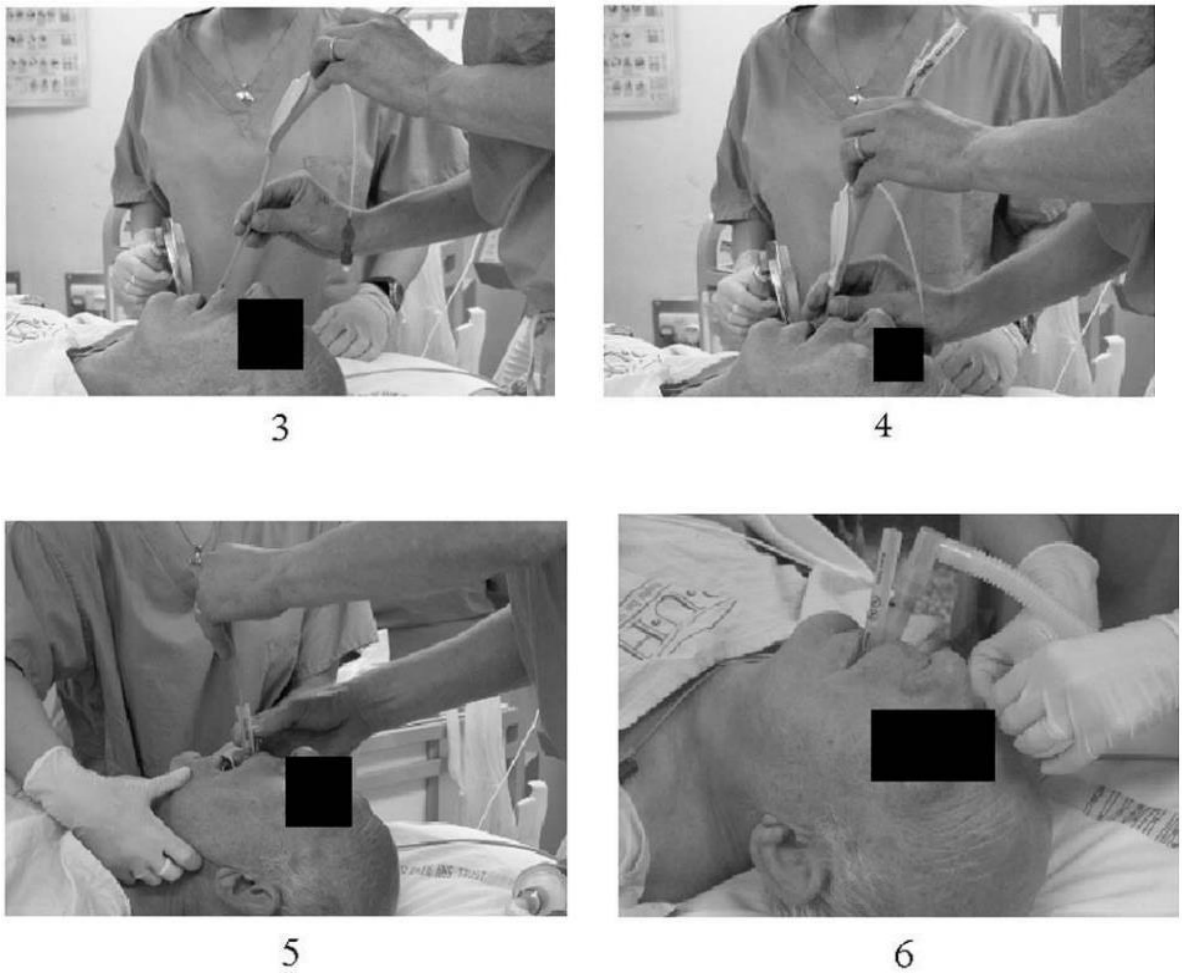


Figure 15: Gum-elastic-bougie guided insertion – 1. Bougie passed through Proseal LMA, 2. Using laryngoscope to visualize vocal cords, 3. Placement of bougie through vocal cords, 4. Rail roading of proseal LMA, 5. After correct placement of the LMA, bougie is withdrawn, 6. Connecting PLMA to ventilator after inflation of the cuff.

Airway mechanics - In comparison to the cLMA, the PLMA is reinforced with wire and of a similar diameter that of fLMA, the PLMA's airway tube is relatively shorter. No grills exist in the bowl. Compared to the cLMA, airway resistance is 20% higher, and it resembles then cLMA more.

OGT passage - Whenever necessary, a lubricated OGT can be passed through the DT. The OGT may encounter a little resistance when it passes through the DT's distal end and past the UES. Failure to pass an OGT is a sign of a misplaced mask**.**

Conformation of position using DT - A lubricant is placed over the DT exit allows for detection of malposition. Use of a meniscus of nontoxic liquid soap or a gel with a maximum depth of 5 mm helps reduce false negatives.

Misplacement of inserted PLMA: Tip should rest above the esophagus for proper placement of PLMA. Three major forms of misplacement occur:

1) mask tip folds leading to misplacement and DT malfunction.

2) Incorrect mask insertion: The DT tip is located close to the cricoid cartilage in the hypopharynx. As the ventilating gases exit the DT directly, the patient's ventilation ceases to be supportive.

3) Insertion in to the glottis: there will be obstruction in ventilation.

Organized placement checks aid in identifying correct placement and misplacement.

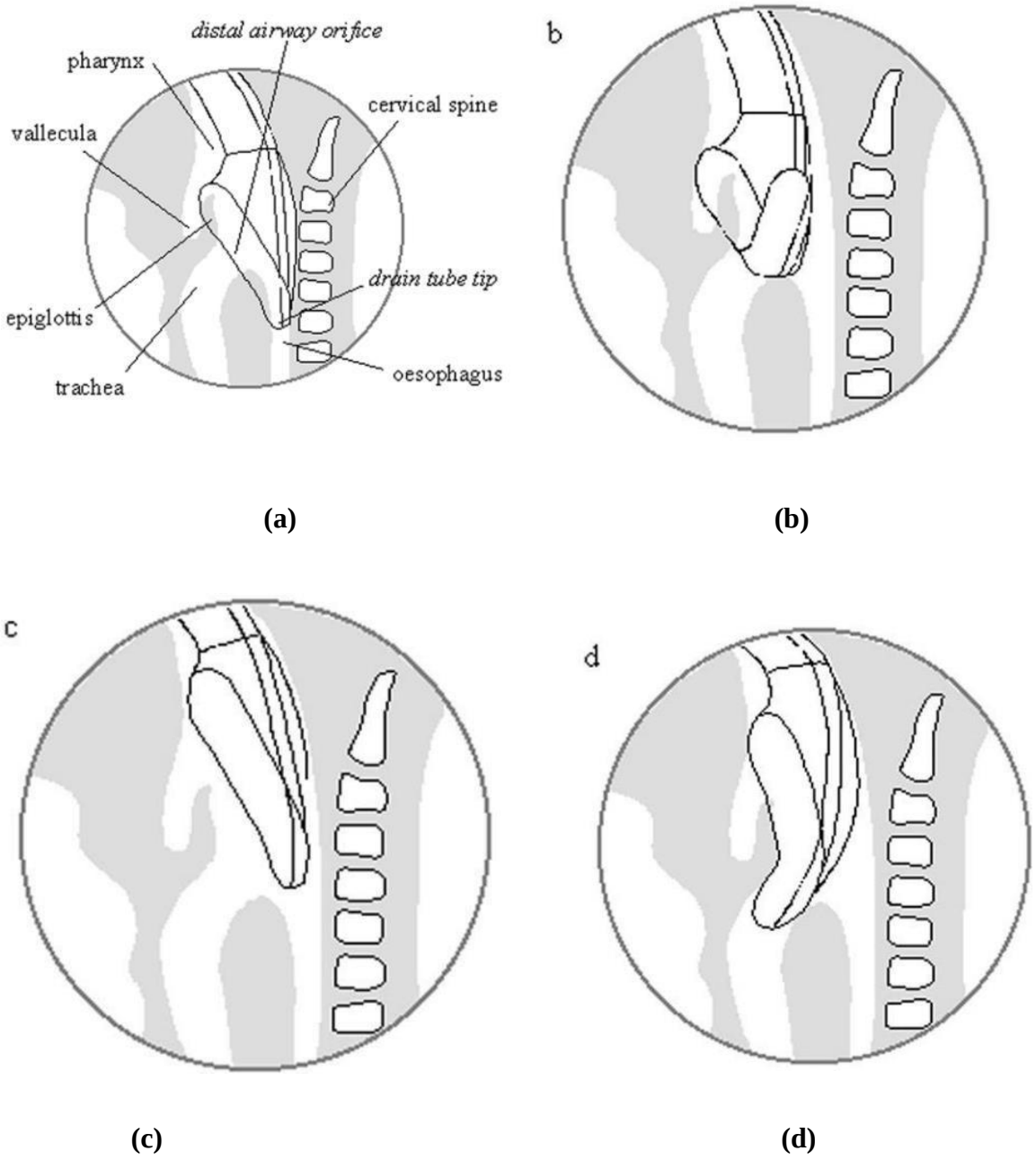


Figure 16:

a) showing correct placement;

b) misplacement 1 -folding at tip

c) misplacement 2-partial insertion;

d) misplacement 3 -inserted to glottis.

Misplacement 1 - Compared to the cLMA, the PLMA mask is less stiff and heavier. It is advised to provide digital pressure or utilize a cuff deflator during deflation since the tip, which is created by the distal DT, does not spontaneously collapse. A negative suprasternal notch test may aid in the diagnosis. The PLMA is not in the best position for ventilation if it is folded over, and the DT will not work which leads to gastric insufflation and aspiration**.**

MISPLACEMENTS 2 AND 3 - Good insertion technique helps to reduce the risk of extrusion by making sure the tip is fully deflated and flattened before insertion. A benefit of PLMA over cLMA is that the DT helps to detect misplacement early.

GEL TEST AND SOAP TESTS FOR DETECTION OF MALPOSITION –

In Brain's PLMA design the inclusion of the DT was primarily done to enable the identification of misplacement. Application of gel above the DT helps to identifying misplacement. According to the PLMA manufacturer. Movement of the bubble is more reliable for identifying misplacement, if the pressure changes are high the filmy soap bubble will blast. But if the pressure changes are low leads to indrawing of bubble. Minor airway gas movements caused by the cardiac oscillations may cause the soap bubble to oscillate when PLMA tip if correctly placed in the glottis. Due to forced expiration, pressure on the chest produces bubble formation.

Another test to confirm position is the suprasternal notch test which is based on the fact that when misplacement 1 happens the DT gets blocked and prevents the transmission of distal pressure changes to the proximal opening. A firm pressing on the suprasternal notch causes a soapy film to swell and travel to the DT tip through the upper esophagus. There will be no bulging if the tip has folded over. The reliability of these tests has not been formally evaluated and is unknown. Before attempting to insert in non-paralyzed patients, adequate depth of anaesthetic is necessary; the jaw must be completely relaxed[19].

Algorithm to test positioning of Proseal LMA -

1) Prior to insertion, adequate anaesthetic depth should be ensured.

2) Any resistance or obstruction of the mask during insertion should be documented. This can be a sign that the mask tip has folded over.

3) Cuff should be inflated below 60 cm of H2O.

4) for correct placement the PLMA is achieved when more than half the length of bite block passes the incisors.

5) Use capnometry and spirometry to evaluate free inspiratory and expiratory efforts. if any obstruction of the vocal cords may be indicated by poor compliance or diminished expiratory effort.

6) A soapy liquid film should be placed above the drainage tube.

(A) If this blows up right after ventilation, PLMA may be placed in the glottic opening. This is confirmed by pressure on the chest that causes bubbles to develop.

(B) The tube needs to be advanced farther if the soapy film increases in size at a pressure less than 20 cm H2O.

Table 3: PLMA misplacement Differential diagnosis.

Indicators of PLMA misplacement	*Probable position*	*Action*
Hold up during insertion High airway pressures Failed ventilation Inability to pass an OGT via the drain tube	Folding of tip	Remove PLMA and reinsert.
More than 50% of bite block protruding beyond the incisors	Proximal supra glottal placement	Attempt advancing to deeper position or reinsert
Blow off of gel (or soap) from the drain tube with an airway pressure of < 20 cm H_2O Oscillations or bubbles blown from the drain tube Chest pressure leads to bubble formation with soap	Supra glottal placement or sited in glottal opening	Remove PLMA and reinsert
Indrawing of drain port soap/gel with inspiration (spontaneous ventilation)	Dysfunctional upper esophageal seal-possible esophageal inflation	Leave OGT indwelling Controlled ventilation should eliminate risk

PLMA = ProSeal laryngeal mask airway; OGT = orogastric tube.

PLMA use in children - - On the usage of PLMA in children, there are few clinical data. The smaller PLMA which size ranges from 1½- 2½ does not come with a posterior cuff .In children the lungs has greater compliance low airways sealing pressure have less negative clinical effects.

Complications

SORE THROAT AND MUCOSAL INJURY - After 1,586 insertions of PLMA, the incidence of sore throat ranged from 2 to 49%, with a mean of 18%. The PLMA's high pressure on the pharyngeal mucosa is the reason for perioperative sore throat. In a study of 32 patients were divided into PLMA and CLMA with 32patients the association between cuff volume, mucosal, and airway seal pressures was investigated. PLMA could withstand high airway pressure with low cuff pressure.

1. **ASPIRATION, STOMACH INFLATION, AIRWAY PROTECTION –** In general, the PLMA's design and performance elements have been altered in comparison to the cLMA to lessen gastric inflation which leads to regurgitation, and finally pulmonary aspiration. In a stimulation study when 15ml/sec water in esophagus it did not lead to any aspiration but when 30 ml of water id being administered with DT closed then was reduced protection but better than cLMA. Gas leakage is less common when the PLMA

is used at high ventilation pressures. Therefore, where there is a higher risk of regurgitation or aspiration, the PLMA should not be considered to be completely safe. More significantly, for the drainage tube to work properly, the tip must be in the proper position.

2. **An Obstruction to airway –** it is due to 1) The tip of PLMA (and DT) entering the glottis; 2) there are larger cuff folds inward which leads to partial or complete obstruction to glottis 3) the PLMA causes rotation of arytenoid leading to shortening of vocal cords during positive pressure ventilation due to compression effect by the cuff on posterior larynx.

3. **Esophageal and Gastric Inflation –** Few cases of intermittent esophageal inflation were reported when the glottis is partially obstructed due to the low intrathoracic pressure when compared to atmospheric pressure; the air was drawn in through the DT during spontaneous respiration. It did not lead to any gastric inflation. The chances of gastric inflation complications are low when there is no supranormal inspiratory effort. The issue could be solved by paralysis, relocating the PLMA, or controlled ventilation. Negative intrathoracic pressure is restricted by the DT of PLMA, which offers protection against additional complications. Due to arytenoid dysfunction, glottic constriction, and paradoxical motion, esophageal and gastric inflation occurred during spontaneous respiration, leading to stridor. The inventor suggested using controlled ventilation rather than spontaneous ventilation[19].

Difficulties encountered with Proseal LMA:

- Proseal LMA's short airway tube prevents it from becoming an adequate intubating device, which is one of its challenges.
- Relatively more time is required to implant than in adults using classic LMA.

- For insertion, a deeper level of anaesthesia is needed.
- Malpositioning are more common.
- Shorter life span than classic LMA[9].

Baska mask

Classic LMA invented by Dr Archie Brain was a revolution in anesthesiology. There have been numerous new extra glottic airway devices developed since then (EADs). Sue to the drawbacks of first generation SAD's newer devices were developed to improve safety and prevent aspiration. Gastric emptying time was delayed in obese and pregnant patients leading to increased risk of aspiration of gastric contents [20].

The Baska Mask® was created by Australian anesthetists Kanag and Meena Baska (PROACT Medical Systems, French's Forest NSW, Australia). This was a brand-new EAD that was both single-use and multi-use and was CE-approved and internationally patented. The Baska® mask replaces the orogastric tube with a sump and two drains, doing away with the need for one. It combines the following features of the devices: (1) The LMA-ProSeal , which has a higher airway seal pressure, gastric drainage port, and a bite block that, in turn, help to facilitate ventilation, protect the airway, and minimize airway obstruction; (2) The LMA-Supreme has an oval-shape, airway tube which is curved anatomically and also has a gastric suction port; (3) the i-gel developed a new type of cuff which was non inflatable and takes the shape of airway; and (4) the Slipa, which is a cuffless, anatomically pre-shaped sealer with a sump reservoir. All the above-mentioned design has a bite block. The bite block of baska mask covers the entire curvature of airway tube. The mask is having similar oval shape of the mouth which prevents it from spinning in the pharynx[20].

Design

Medical grade silicon is used in Baska mask except for the 15mm connector and the 90-degree suction elbow.

There are several new improvements which include:

(1) A cuffless seal sealing recoiling membrane with is made of medical grade silicon which can withstand high airway pressures and provide better seal.

(2) A suction clearance system is made up of (a) a large diameter suction port placed at the esophagus, (b) two gastric channels place parallel to the airway tube in which one is attached to a high flow suction, and the other one is kept open to maintain the pressure difference between the atmosphere and sump cavity. It allows in faster removal of gastric fluids during peri-operative period[20].

(3) The curvature can be increased by using the tab to facilitate insertion.

(4) The 90^0 suction elbow connector which helps to clear the secretion's in sump area.

Table 4: Unique features of the Baska mask[20]

Cuff
No inflatable self-recoiling thin membranous cuff balloon
No pilot balloon/pilot tube
Pressure limited to maximum inspiratory pressure during IPPV; fluctuates with ventilator cycle
Soft – lower propensity for nerve damage or other trauma
Sump Area
Efficacy of clearance of gastric fluids.
Internal cricoid pressure provided by the inbuilt cushion device maintains communication between the sump area and the upper end of esophagus. Allowing efficient suction of fluid from the sump area via the two tubes built into the stem of the device alongside the airway.
Airway Tube
Efficacy of bite block.
Kink resistance.
Two tubes in the stem alongside the airway tube in the mask will function as additional airways to allow air entry and maintain oxygenation in the event of the mask being bitten while still in the mouth with the main airway opening blocked by the tongue.
Shape and Design
Made using a single injection molding process without any joints except for a 22mm connector inserted at top end.
Influence of shape and differential flexibility on ease of insertion.
No need for extension of head or neck for insertion.
Insertion in neutral position.
No need for the use of fingers for insertion and/or positioning.
Tab to make intubation easier and faster
Suction elbow integral on one port with second port acting as free airflow access point
Australian designed and manufactured mask

Figure 17: Baska mask[20]

Size	Weight of patients (kg)	Width of cuff (cm)
3	**30 - 50**	**5**
4	**50 - 70**	**5.5**
5	**70 - 100**	**6**
6	**> 100**	**6.5**

Insertion technique:

A standard protocol for anesthesia induction were followed. When the patients enter the operating room, they are connected up to standard monitoring equipment. After adequate preoxygenation for 3 minutes patient was administered with inj. Fentanyl 1-2 mcg/kg and propofol 2.5 mg/kg for induction. Adequate depth of anesthesia is assessed by 1) unresponsive patient 2) loss of eye lash reflex. if adequate depth of anesthesia is not achieved 0.5mg/kg propofol is administered. maintenance was done by oxygen, air and inhalation agents.

Between the thumb and two fingers the proximal part of baska mask is held pushed against the hard palate. The tab helps in aligning with the palate-pharyngeal curve. The tab is released when the distal part of mask has passed the anatomical curve. The mask is the advanced until resistance is felt, the mask's tip gets seated with the upper esophageal end.

After confirming the correct placement of the airway, the device is attached with the breathing circuit and secured with adhesive band. To aid patient recovery, the anesthetic gas mixture should be replaced with 100% oxygen at the end of surgery. The patient is extubated when complete reversal has achieved [20].

MATERIALS AND METHODS

SOURCE OF DATA: The study was conducted at the Department of Anaesthesiology, B.L.D.E. (Deemed to be university), Shri B. M. Patil Medical College, Hospital and Research Centre, Vijayapur, on patients admitted for elective surgeries under general anaesthesia lasting less than two hours.

METHOD OF COLLECTION OF DATA:

Study method: The study population of 64 patients was randomly divided into two groups with 32 patients in the Proseal LMA group and 32 patients in the Baska mask group included.

Study Design: Prospective randomized single blinded comparison study.

Study Period: One and half year from December 2020 to August 2022.

Sample Size: 64 of both genders randomly divided into two different groups which had 32 in each.

Statistical Data

- On the basis of a study the anticipated mean ± SD of Time of insertion LMA in group A(Baska mask) 13.3 ± 1.506 seconds and in group B(Proseal LMA) 19.7 ± 5.586 seconds respectively[5] the required minimum sample size was 32 per group (i.e. a total sample size of 64, assuming equal group sizes) for achieving a power of 99% and a level of significance of 2% (two sided), for detecting a true difference in means between two groups. The formula used was

$$N = 2\left[\frac{(Z_a + z_\beta) * S^2}{d}\right]$$

Z_a Level of significance=98%

Z_β--power of the study=99%

d=clinically significant difference between two parameters

SD= Common standard deviation

Statistical Analysis was entered in a Microsoft Excel sheet, and statistical analysis was performed using statistical package for the social sciences (Version 20).

- Results were presented as Mean ± SD, counts and percentages and diagrams.
- Mann Whitney U test was used to find significant difference of continuous variables between Proseal LMA and Baska mask.
- Categorical variables between Proseal LMA and Baska mask were compared using Chi square test.
- $p<0.05$ was considered statistically significant. All statistical tests were performed.

Randomization: The study population were assigned using computerized random number table into two different groups.

Group A – Proseal LMA group

Group B- Baska mask group

Results were recorded using a preset Performa.

STUDY POPULATION

This study was done in adult patients aged between 20 to 60 years undergoing various elective surgeries in general anesthesia.

INCLUSION CRITERIA

- Patients who are of age 20-60 years.
- Patients of both sexes.
- Elective surgeries including upper limb debridement, upper limb fracture reduction and plating, open/laparoscopic abdominal tubectomy, tympanoplasty, Laparoscopic appendicectomy.
- Patients admitted for elective surgeries under General Anesthesia with ASA Grade I & II.
- Patients with BMI<24.9kg/m^2.

EXCLUSION CRITERIA

- Patient refusal
- Restricted mouth opening
- Patients posted for emergency surgery under general anaesthesia.
- Burns and swellings in neck region
- Previous surgeries in neck
- Patients with a difficult airway and a high risk of aspiration
- Patients with poor pulmonary compliance.

METHODOLOGY:

Pre-anaesthetic examination: Patients were accepted for the trial after a thorough pre-operative evaluation that included the following.

History:

- **Physical examination:**

  Any previous history of underlying medical problems, surgery, anaesthetic exposure, or hospitalization was obtained.

1. General physical status of the patient.
2. Vital signs- heart rate, blood pressure, respiratory rate.
3. Height and weight.
4. Examination all system which included central nervous system, cardiovascular system and respiratory system.
5. Mallampatti grading, Thyro mental distance, Neck extension, Mandibular protrusion was used to assess the airway.

INVESTIGATIONS / INTERVENTIONS

The investigations done were the following Complete blood count, urine routine, ECG, chest X-ray PA view if indicated. The study did not include any animal experiments.

PROCEDURE:

Study was conducted in our institute in patients who were posted for elective surgeries lasting less than two hours;

The patients were randomly divided by computer generated table into two equal groups of 32 each.

Group A – Proseal LMA group
Group B - Baska mask group

Patient was explained about the procedure written Informed consent was taken.

Patients were kept fasting for six hours before surgery.

Technique of LMA Insertion:

- Patients were brought into the operating room, where baseline measurements were acquired using standard monitoring equipment like a pulse oximeter, sphygmomanometer cuff, ECG leads and EtCO2 after insertion of device.
- IV line was secured with 20G cannula and Inj. Ondansetron 0.15 mg/kg IV, Inj. glycopyrrolate 0.2mg IV, and Inj. Midazolam 0.01 mg/kg IV were used to premedicate the patient. For 3 minutes, with 100% oxygen was used to pre-oxygenate the patient According to body weight, the proper LMA size was chosen. According to the recommendations, size number 3 is for those who weigh 30 to 50 kg and size 4 is for people who weigh 50 to 70 kg.
- Following preoxygenation for 3 minutes, they were induced with Inj. propofol 2 -3 mg/kg IV and Inj. fentanyl 1-2 mcg/kg IV, Inj. Atracurium 0.5mg/kg to facilitate the SAD insertion.
- Both groups had a midline insertion procedure after 3 minutes, placing either of the devices in a neutral neck position.
- A Baska mask is held between the thumb and index finger while insertion. When resistance was encountered, the mask was pushed against the oropharyngeal curvature and hard palate. The device's angulation with the oropharyngeal curvature was altered using the tab for improved positioning.
- By holding the Proseal LMA between the thumb and index finger, it was inserted. LMA was inserted against the hard palate till the resistance was felt.
- Adequate ventilation was confirmed by chest movements and $EtCO_2$ waveforms.
- Each patient was attempted a maximum of three attempts with both SAD devices. Patients were intubated with a cuffed endotracheal tube if the third attempt failed.
- The cuff of PLMA was inflated with air after insertion and connected to a breathing circuit.

- The ability to obtain a square wave shape capnogram and also a tidal volume of at least 6–8 ml/kg proved the placement's success.
- Ease of insertion was assessed by the resistance felt by the anesthetist while insertion of device.
- An unblinded observer recorded the insertion time. The moment the device was taken into the operator's hands and successful ventilation was achieved is referred to as the time of insertion.
- The oropharyngeal air pressure was measured after five minutes post insertion of device. The fresh gas flow was kept 6L of oxygen and APL valve was closed, i.e., at 60cm of H2O. After a sufficient amount of muscle blockage reversal, both SAD devices were withdrawn when surgical procedure was over.
- Intra operatively the patient was monitored for associated complications such as a)inadequate ventilation which will reflect as poor chest expansion, absent or quiet breath sounds, absent or poor end tidal CO_2 trace fall in oxygen saturation b)aspiration was identified by recognition of gastric contents in oropharynx or airway, hypoxia, high airway pressures and coarse crepitation's on auscultation of chest and it was managed by giving head low position, through oral suctioning prior to application of positive pressure ventilation, administration of IV corticosteroids and IV antibiotic.
- Post-extubation, the patient was monitored for laryngospasm which presented as fall in saturation and stridor for which 100% oxygen was provided, IV corticosteroids were given and if required sub optimal dose of Inj. succinylcholine was given. In case of persistent laryngospasm, the patient was reintubated.
- Peri laryngeal morbidity was evaluated after recovery. It was passed by checking for staining of blood on device and oral cavity immediately after surgery. Any incidence of sore throat, hoarsens of voice and dysphagia was followed up at end of surgery till the next day.

(a)

(b)

(c)

Figure 18: Insertion of Proseal LMA – (a) Pre-oxygenation (b) Proseal LMA Holding manuver (c) Insertion

(a)

(b)

(c)

Figure 19: Insertion of Baska mask - (a) Pre-oxygenation (b) Baska mask (c) Insertion

STATISTICAL ANALYSIS

Categorical variables like number of attempts, gender distribution, ASA grade was depicted by using counts, and percentages. Demographic continuous variables such as age, BMI, duration of surgery, and Time of insertion and ease of insertion etc. were depicted using Mean ±SD and comparison between these variables was done using Mann Whitney U test. The Chi square test was used to find out significant difference between qualitative data. Results were presented using bar/line charts.

To compare Heart rate, mean arterial pressure and oxygen saturation from baseline to end of surgery, Friedman test with post hoc test was performed.

The formula used in the chi square test was:

$$\chi_c^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

The subscript "c" are the degrees of freedom. "O" is observed value and E is expected value. C= (number of rows-1) * (number of columns-1)

The formula for Mann -Whitney u test was

For large samples: When n_1 and n_2 given by >10, it is given by

$$Z = \frac{U - \mu_U}{\sigma_U}$$

$$\mu_U = \frac{n_1 n_2}{2}$$

$$\sigma_U = \sqrt{\{(n_1.n_2)\,(n_1 + n_2 + 1)\}/12}$$

$$U_1 = n_1.n_2 + \frac{n_1(n_1 + 1)}{2} - R_1$$

$$U_2 = n_1.n_2 + \frac{n_2\,(n_2 + 1)}{2} - R_2$$

For Friedmann test formula used is

$$H = [\frac{12}{Nk\ (k+1)} \sum_{i=1}^{n} \frac{R_i^2}{n_i}] - 3\ N\ (k+1)$$

The results were considered statistically significant if the p-value was 0.05; otherwise, they were considered not statistically significant. Microsoft Office 2010 and SPSS software version 20 were used to analyze the data.

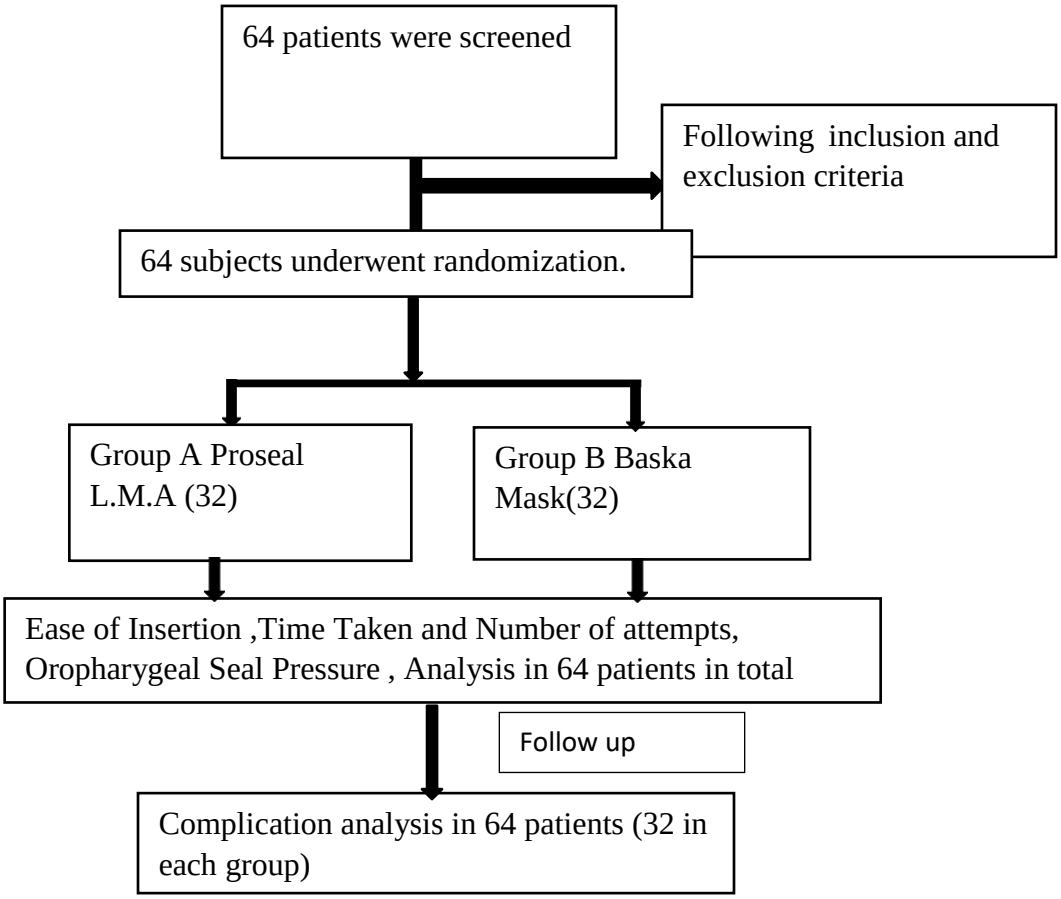


Figure 20: Flow chart illustrating patient inclusion.

OBSERVATIONS AND RESULTS

Table 5: Age-wise distribution of patients

Age (years)	Group-A		Group-B		Chi square test	P value
	N	%	N	%		
20-29	17	53.1	16	50	2.205	0.5310
30 – 39	7	21.9	11	34.4		
40 – 49	3	9.4	3	9.4		
50-60	5	15.6	2	6.3		
Total	32	100.0	32	100.0		
Statistically insignificant (p > 0.05)						

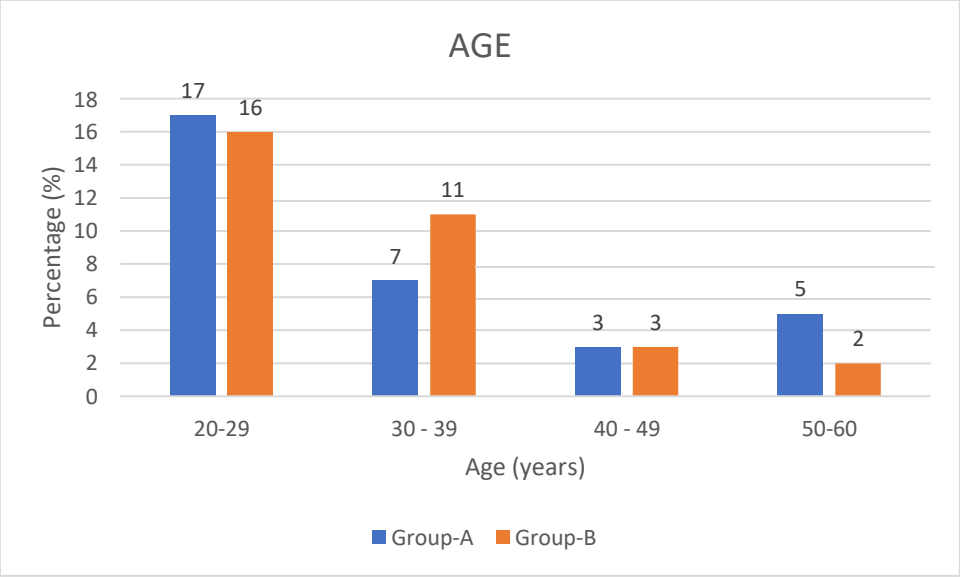


Figure 21: Graph showing age-wise distribution of patients

Table and bar graph shows maximum number of patients where Group-A (53.1%) and Group-B (50%) were used belonged to the < 30 years age group but clinically it was insignificant compared to other age groups. The results were however, statistically insignificant.

Table 6: Sex wise distribution of cases between the groups of A and B

SEX	Group-A		Group-B		Chi square test	P value
	N	%	N	%		
FEMALE	22	68.8	26	81.3	1.333	0.2482
MALE	10	31.3	6	18.8		
Total	32	100.0	32	100.0		
Statistically insignificant (p > 0.05)						

Table shows that in both the groups gender distribution was comparable which was clinically and statistically insignificant (p-value= 0.2482).

Table 7: ASA grading of cases between between the groups of A and B

ASA	Group-A		Group-B		Chi square test	P value
	N	%	N	%		
I	23	71.9	27	84.4	1.463	0.265
II	9	28.1	5	15.6		
Total	32	100.0	32	100.0		
Statistically insignificant (p > 0.05)						

In the study conducted, ASA grade I patients were a major proportion of the patients where Group-A and Group-B were used. These results were both clinically and statistically, insignificant.

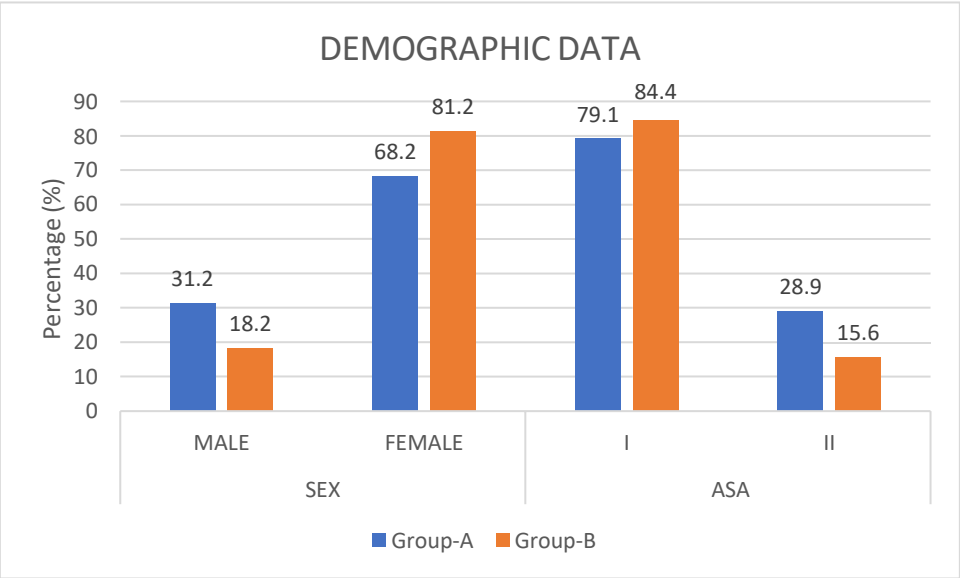


Figure 22: Graph showing sex distribution, and ASA grading of patients in both the groups.

Table 8: Comparison of Groups A and B based on age, BMI, and length of surgery.

DEMOGRAPHIC DATA	Group-A		Group-B		Mann Whitney U test	P value
	Mean	SD	Mean	SD		
Age(years)	34.19	11.544	30.84	10.568	413.000	0.183
BMI (kg/m^2)	22.2	1.65	21.59	1.47	381.1	0.125
DURATION OF SURGERY (mins)	59.38	28.65	53.13	25.708	441.500	0.334
Statistically Insignificant (p > 0.05)						

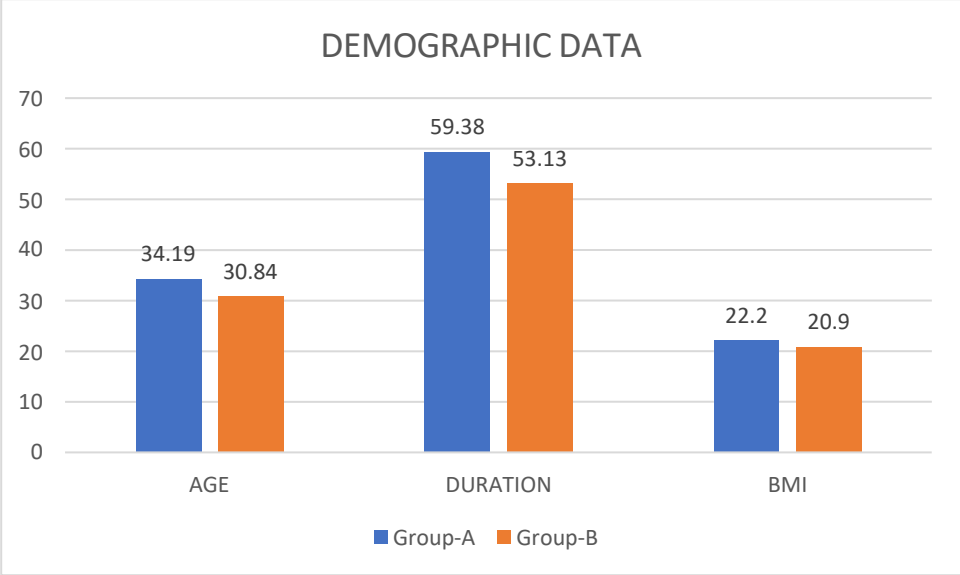


Figure 23: Graph comparing Groups A and B based on age, BMI, and duration of surgery.

Demographic data showed that patient's age, gender, BMI, ASA Grade and duration of surgery in both the groups were comparable, clinically and statistically insignificant.

Table 9: Time for insertion between the groups of A and B

Comparison between two groups	Group-A		Group-B		Mann Whitney U test	P value
	Mean	SD	Mean	SD		
TIME TAKEN FOR INSERTION (seconds)	28.59	1.682	24.00	1.136	4.500	0.001*
*** Statistically Significant (p < 0.05)**						

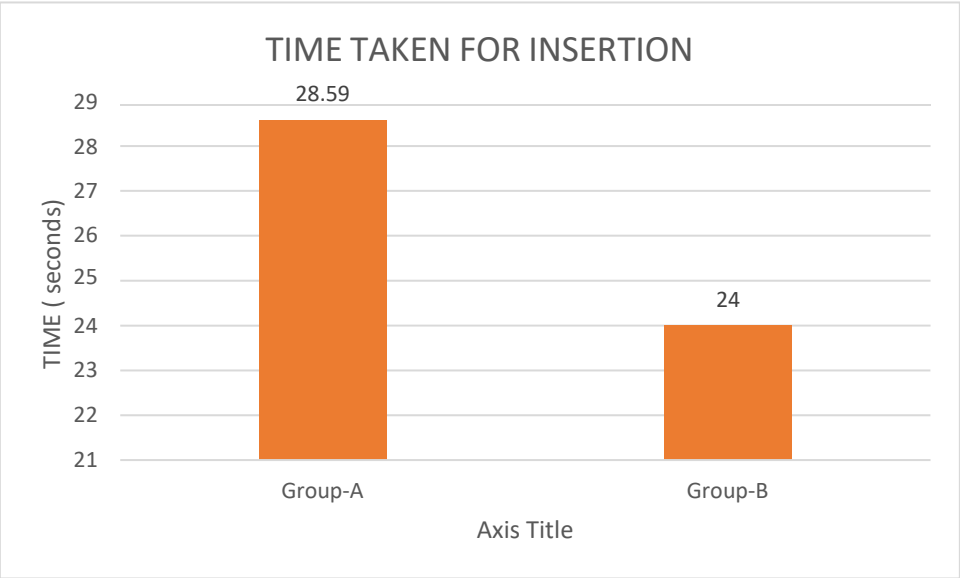


Figure 24: Graph comparing Time for insertion between the groups of A and B

Table and Bar graph shows comparison between the groups of A and B in view of Time taken for insertion of Baska mask was less time when compared to Proseal LMA, which was statistically highly significant.

Table 10: Comparison of number of attempts between the groups of A and B

Number Of Attempts	Group-A		Group-B		Chi square test	P value
	N	%	N	%		
1	22	68	29	90	4.730	0.0296*
2	10	32	3	10		
Total	32	100.0	32	100.0		
Statistically significant (p < 0.05)						

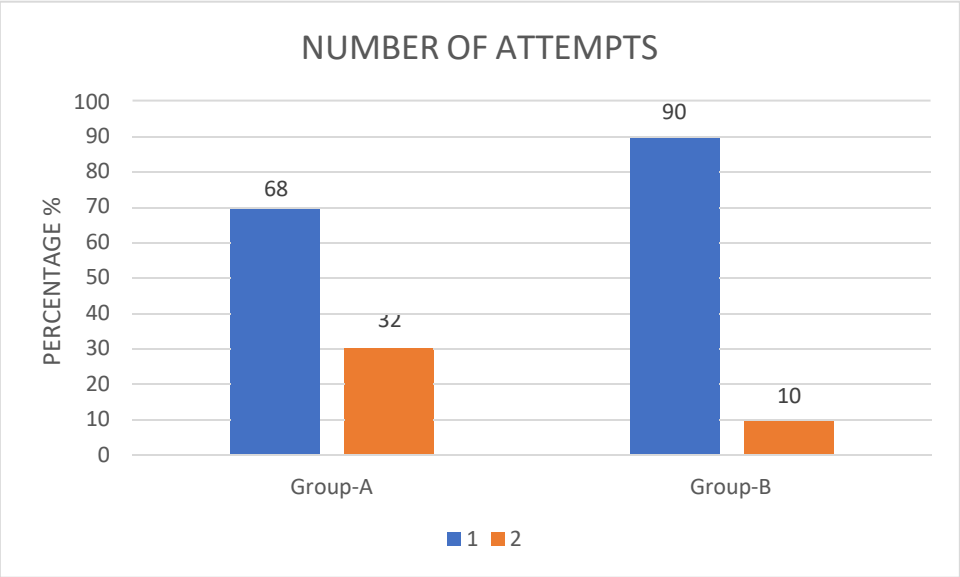


Figure 25: Graph comparing of number of attempts between the groups of A and B

Table and bar graph shows that Baska mask insertion was successful in first attempt in 90% of patients when compared to Proseal LMA in which success rate was 68%.

Table 11: Comparison with regard to ease of Insertion between the groups of A and B

Ease of insertion	Group-A		Group-B		Chi square test	P value
	N	%	N	%		
I	20	62.5	27	84.4	14.452	0.007*
II	8	25.0	5	15.6		
III	4	12.5	0	0		
Total	32	100.0	32	100.0		
***Statistically significant (p < 0.05)**						

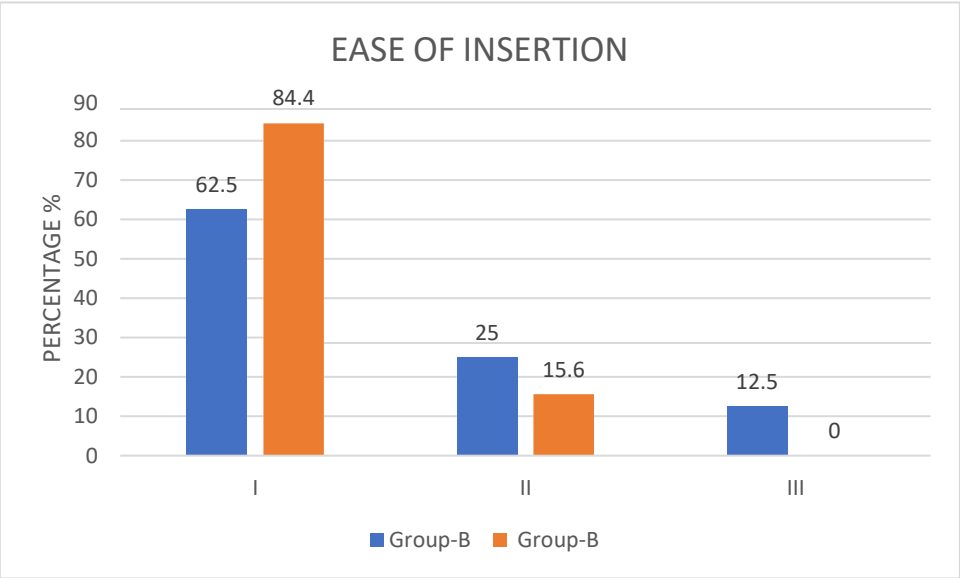


Figure 26: Graph comparing the ease of insertion between Group-A and Group-B.

Table and Bar graph depicts that easier insertion was noted amongst patients in Group-B compared to Group-A (84.4% Vs 62.5%).

TABLE 12: Comparision of oropharyngeal seal pressure between the groups of A and B

Oropharygeal seal pressure	Group-A		Group-B		Mann Whitney U test	P value
	Mean	SD	Mean	SD		
OSP Cm of H2O	24.81	1.469	31.34	1.638	3.000	0.001*
*** Statistically Significant (p > 0.05)**						

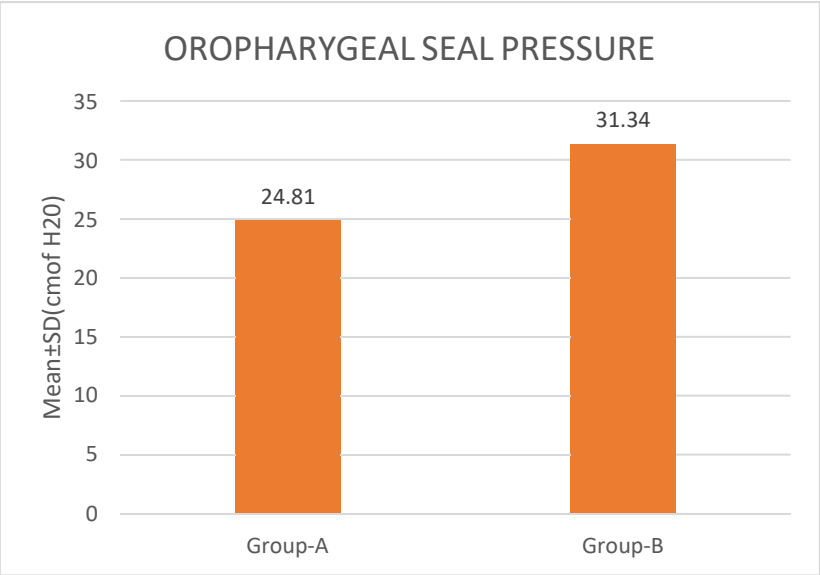


Figure 27: Graph comparing Oropharyngeal seal pressure in cm of H2O between Group A and Group B.

Table and Bar graph shows that patients in Group-B, had higher oropharyngeal seal pressure compared to Proseal LMA and hence Baska mask can withstand higher positive airway pressures.

Table 13: Distribution of cases between Group-A and Baska mask groups based on heart rate

HEART RATE (bpm)	Group-A Mean ± SD	Group-B Mean ± SD	Mann-Whitney Test	P value
Baseline	78.32±4.385	76.90±5.338	392	0.209
5 minutes	83.81±4.453	82.26± 4.123	389	0.193
15 minutes	78.13±4.129	76.84±5.905	412	0.331
30 minutes	78.65±5.122	77.42±5.870	402	0.266
End of surgery	79.42±4.296	77.87±5.058	385	0.174
Statistically insignificant				

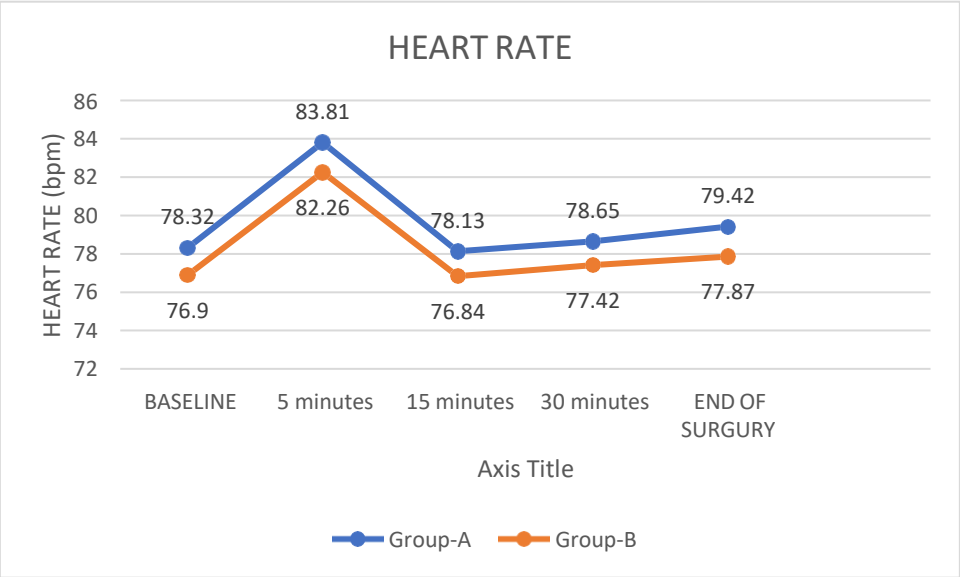


Figure 28: Line graph showing distribution of cases between the groups of A and B based on heart rate

Table and Line graph shows mean heart rate in both the groups it was raised 5 minutes after insertion and which was clinically and statistically insignificant.

Table 14: Distribution of cases between the groups of Groups A and B based on Mean Arterial Pressure

Mean Arterial Blood Pressure (mm Hg)	Group-A Mean ± SD	Group-B Mean ± SD	Mann-Whitney Test	P value
Baseline	73.71±3.857	73.94±4.066	467	0.848
5 minutes	67.58±3.922	67.74±3.732	474	0.926
15 minutes	73.71±3.926	74.06±3.966	463	0.810
30 minutes	74.55±3.576	74.55±3.576	467	0.848
End of surgery	74.61±30138	75.19±3.420	428	0.458
Statistically insignificant (p > 0.05)				

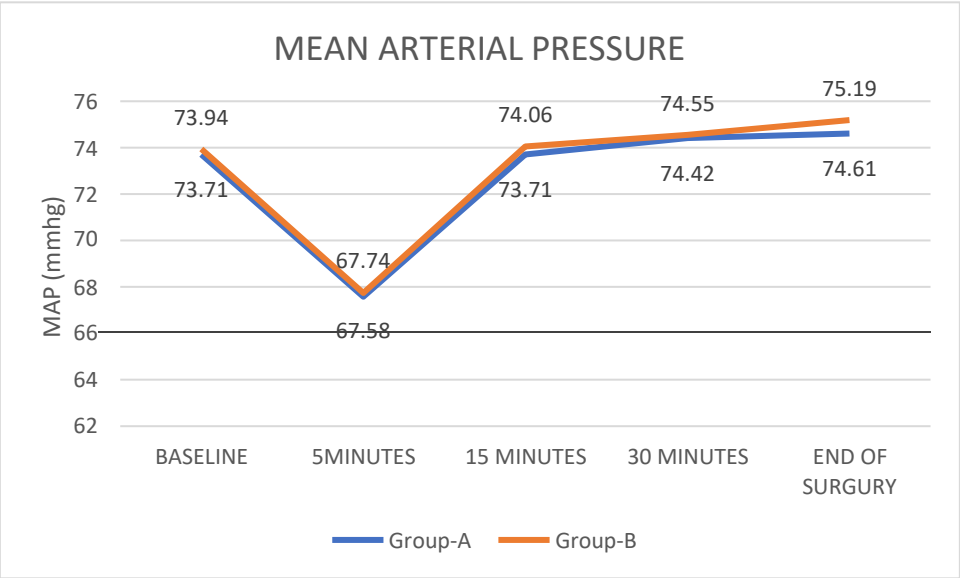


Figure 29: Line graph showing distribution of cases between Group-A and Group-B groups based on Mean Arterial Pressure.

Table and Line graph shows that there was a drop from baseline at 5 minutes in mean arterial pressure and return to baseline at 15 minutes and maintained throughout the surgury in patients inserted with Proseal LMA and Baska mask.

Table 15: Distribution of cases between the groups of A and B based on Oxygen saturation

Oxygen saturation (%)	Group-A Mean ± SD	Group-B Mean ± SD	Mann-Whitney Test	P value
Baseline	99.45±0.505	99.41±0.56	472	0.9124
5 minutes	99.45±0.505	99.41±0.56	472	0.9124
15 minutes	99.45±0.505	99.41±0.56	472	0.9124
30 minutes	99.45±0.505	99.41±0.56	472	0.9124
End of surgery	99.45±0.505	99.41±0.56	472	0.9124
Statistically insignificant (p > 0.05)				

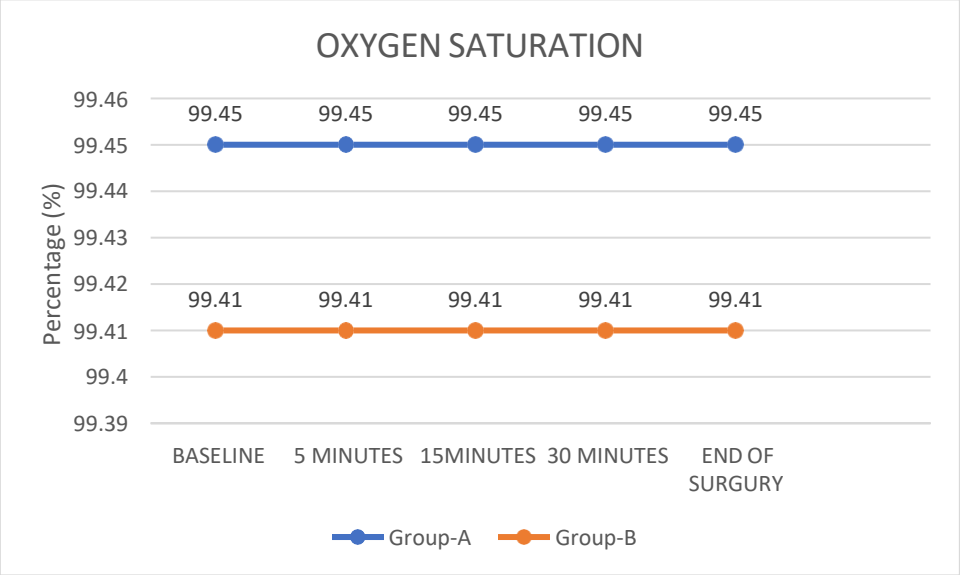


Figure 30: Line graph showing distribution of cases between Group-A and Group-B groups based on Oxygen saturation.

Table and line graph shows oxygen saturation was maintained in both groups throughout the procedure more or equal to 99%.

Table 16: Assessment of incidence of trauma to lip between the groups of Groups A and B

Trauma to lip	Group-A		Group-B		Chi square test	P value
	N	%	N	%		
NO	27	84.4	31	96.9	2.943	0.08
YES	5	15.6	1	3.1		
Total	32	100.0	32	100.0		
Statistically insignificant (p > 0.05)						

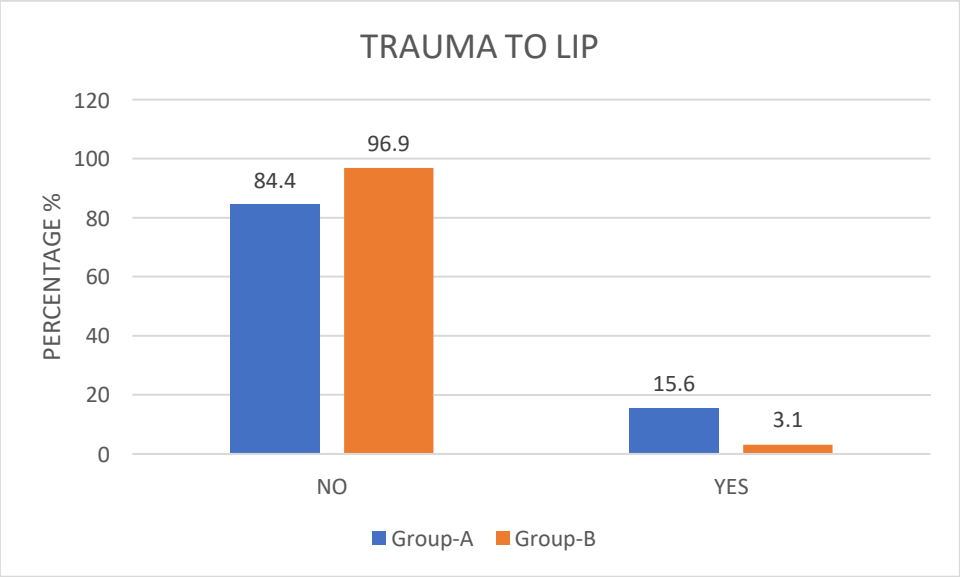


Figure 31: Bar graph showing assessment of incidence of trauma to lip between the groups of A and B

Table and bar graph shows higher incidence of trauma to lip amongst patients in Proseal LMA (96.9%) in comparison to patients in Baska mask (3.1%).

Table 17: Assessment of incidence of blood staining between the groups of A and B

BLOOD STAINING	Group-A		Group-B		Chi square test	P value
	N	%	N	%		
NO	27	84.4	30	93.7	1.444	0.2296
YES	5	15.6	2	6.3		
Total	32	100.0	32	100.0		
Statistically insignificant (p > 0.05)						

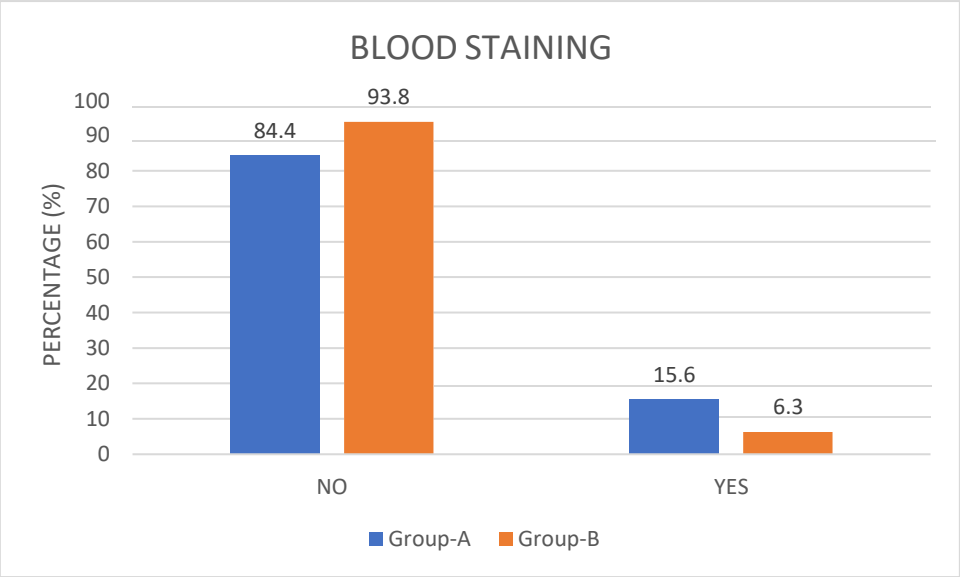


Figure 32: Bar graph showing assessment of incidence of blood staining between the groups of A and B

Table and bar graph shows higher incidence of blood staining amongst patients in Group-A (93.8%) in comparison to Group-B (6.3%).

Table 18: Assessment of incidence of sore throat between the groups of A and B

SORETHROAT	Group-A		Group-B		Chi square test	P value
	N	%	N	%		
NO	29	90.6	31	96.9	1.062	0.3017
YES	3	9.4	1	3.1		
Total	32	100.0	32	100.0		
Statistically insignificant (p > 0.05)						

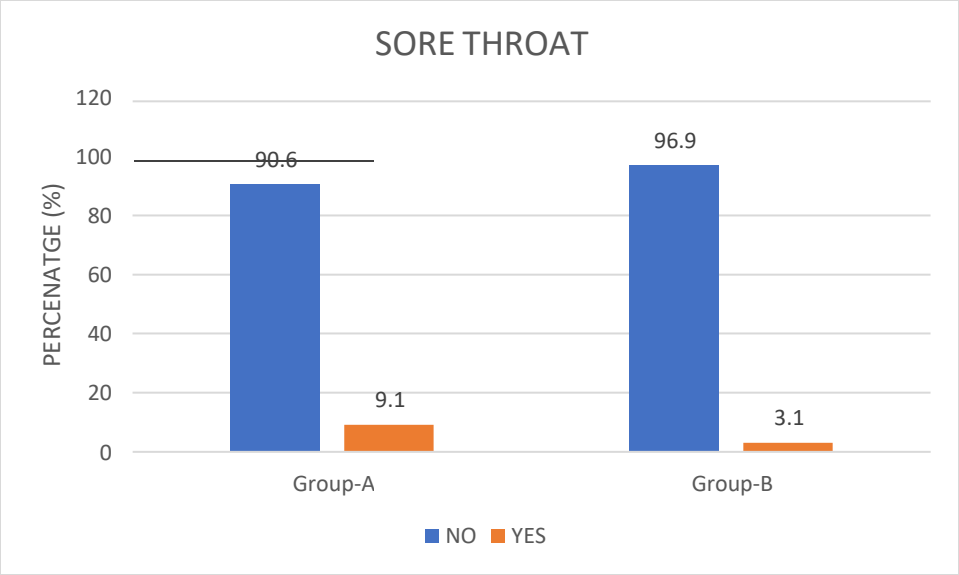


Figure 33: Bar graph showing assessment of incidence of sore throat between both Groups.

Table and bar graph shows higher incidence of sore throat amongst patients in Group A (9.1%) in comparison to Group B (3.1%).

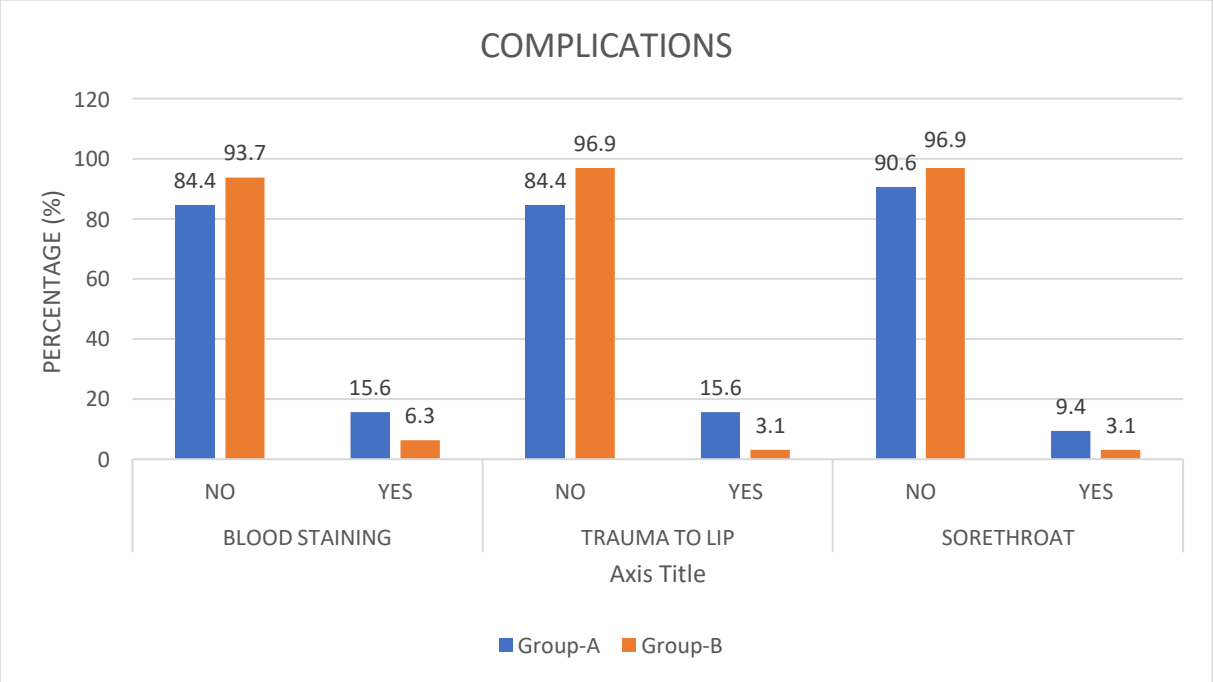


Figure 34: Bar graph showing assessment of incidence of complications between Group-A and Group-B groups

Bar graph shows higher incidence of complications like trauma to lip, blood staining, and sore throat were observed in Group-A in comparison to Group-B.

DISCUSSION

Due to their adaptability and simplicity of use, first-generation SADs have quickly taken the place of endotracheal intubation and face masks in most patients undergoing general anesthesia. By incorporating special design enhancements, second-generation devices have increased their efficacy and utility. The benefits of second-generation SAD are it can withstand higher airway pressure, made by disposable materials, bite block, the capacity to act as tracheal tube conduits, and a decreased risk of aspiration of gastric contents to lungs.

More than 90% of patients who cannot receive tracheal intubation or mask ventilation can receive successful rescue ventilation using SADs. However, these have a number of drawbacks, including as inadequate ventilation, injury to the airways, and an increased risk of pulmonary aspiration of gastric contents[16]. There are a variety of SADs that have been developed to noninvasively take the shape of the human airway, but invariably all these devices had a risk of aspiration[2]. The Baska masks the newest member of the SAD family, can endure high airway pressures while reducing aspiration[2] and laryngeal trauma.

This prospective randomized study was done amongst 64 patients in total divided into two groups with 32 patients each in Proseal LMA and Baska mask group, who were electively posted for surgeries under general anesthesia which was less than two hours of duration. The study's objective was to look for benefits of Baska mask and Proseal LMA in surgeries under general anesthesia.

Demographic profile regarding age, gender, BMI, ASA grade and duration of surgery in either of the groups was comparable, showed statistically no significant ($p>0.05$) results.

The main observation in our study was the time of insertion and ease of insertion which showed that Baska mask group was superior to Proseal LMA group. Baska mask could be inserted in lesser time (24 $\pm$ 1.136 sec) compared to Proseal LMA (28.59 $\pm$ 1.682

sec), which was statistically significant ($p<0.05$). In terms of ease of insertion, 84.4 % of patients could be inserted with no resistance (Grade I) in Baska mask group compared to 62.5 % patients in Proseal LMA group. As a result, higher success rate was observed in first attempt in Baska mask compared to Proseal LMA (90% Vs 64%). The factors that make it easier are as follows: 1) the cuffless design of Baska mask which takes lesser time in comparison to PLMA. 2) The Baska Mask's tab can be pulled to increase its distal curvature, making it easier to navigate the oropharyngeal curve[5]. Several studies were done over the years which supports our study. A study was done by Balwinderjit et al[2] amongst 60 adult patients between 18-60 years of age. They found that, in terms of mean insertion time, Baska mask (14.25 $\pm$ 3.82 sec) took lesser time to insert than Proseal LMA (22.01 $\pm$ 2.64 sec). In terms of number of attempts to insert, it took lesser number of turns for Baska mask compared to Proseal LMA (1.40 ± 0.31 versus 1.51 ± 0.25). All these findings were statistically significant in the study.In a study done by Tom van Zundert and Stephen Gatt (2012)[7] to evaluate the performance of Baska mask in adult patients undergoing a variety of surgical interventions. This was done amongst 50 patients with American Society of Anesthesiologists (ASA) physical status I–III. The “first attempt” success rate was high (88%) and “overall insertion” success rates was considered “easy” to “very easy” in 92% of patients which supported our study. A study done by Al Rawahi et al[6] which was done amongst 52 patients who were posted for non-head and neck surgeries also showed same results. There was significant difference between the two groups where Baska mask took lesser time to insert (16.43 ± 4.54 sec) than PLMA (21.45 ± 6.13 sec). However, there was no significant difference in terms of number of attempts for insertion. In another study by Kachakayala et al[8] done on 100 patients posted for short gynecological procedures, there was significant ($p<0.05$) results in terms of time of insertion between BM (16 sec) and PLMA (20.9 sec). However, there was no significant results in view of ease of insertion and attempts required for insertion. Another study by Ebenezer Joel Kumar et al [5] done with 40 patients showed significant results for time of insertion where Baska mask took lesser time (13.3 s) in comparison to PLM (19.7s). A study by Agrawal N[4] et al which was done amongst 80 patients between 18-60 years of age who underwent General Anesthesia, showed easy insertion in 100% in BM group versus 90% in PLM group. Another study by Zundert et al[7] done amongst 50 patients of ASA I-III showed that the

Baska mask showed success rate of 88% with "easy" and 92% with "very easy" insertion of total patients.

In terms of Oropharyngeal seal pressure (OSP), the study showed significant ($p < 0.05$) results with higher OSP in Baska mask (31.34 $\pm$1.638 cm H_2O) compared to Proseal LMA (24.81 $\pm$ 1.469 cm H_2O). A study by Balwinderjit Singh et al[2,] similar and significant results were obtained with 30.25 ± 8.34 cmH_2O for Baska mask and 23.50 ± 4.05 cmH_2O for PLMA. Another study by Al-Rawahi et al[6] also recorded similar results that is 29.98 ± 8.51 cmH_2O and 24.05 ± 6.19 cmH_2O for PLMA. These results were statistically significant. Ebenezer Joel Kumar et al [5] had done a study in 40 patients for elective procedures under general anesthesia. The seal pressure difference between the two groups were comparable and ranged between 20 -29 cmH_2O for BM and 24 -37 cmH_2O for PLM ($p<0.05$). Another study by Agrawal N at al[4] also was in agreement to our study with mean seal pressures of 37.6 ± 2.43 cmH_2O for BM and 30.82 ± 3.96 cmH_2O for PLM. Bask mask due to its recoiling cuff during each positive pressure ventilation it inflates and deflates, thereby increasing the seal pressure during positive pressure ventilation but in PLMA it merely increases the air leak contributing to more oropharyngeal seal pressure[4].

In both Groups hemodynamic parameter like Mean arterial pressure and Heart rate and Oxygen saturation were comparable and clinically and statistically not significant ($p >0.05$).

In terms of complications associated with insertion trauma to lip, blood staining and sore throat were more in Proseal LMA group (15.6%, 15.6 %, 9.4%) compared to patients inserted with Baska mask group (6.3%, 3.1%, 3.1%). These results were however, statistically insignificant p-value was greater than 0.05. Another study by Agrawal N[4] et al showed no adverse incidence like aspiration of gastric contents, staining of blood on removal of the SADs showing visible airway injury. This was due to the airway device being gently inserted by skilled anesthetists without applying excessive effort and the elimination of factors which predicted difficult airway. They also observed less perioperative laryngeal morbidity. This was due to the use of a jelly for lubricating the surface and the PLMA cuff pressure was kept below

60 cm H2O whole through the surgery. Another study by Zundert et al.[7] revealed that 2% of patients had lip damage and 8% of patients had blood stain on the Baska mask. Another study by Chauhan G[21] et al done on 80 patients between 18-65 years of age with ASA grade I/II showed 16 % cases of blood staining where Proseal LMA was used. Study by Al-Rawahi et al[6], however reported that there was higher occurrence of sore throat in both groups (Baska mask 43.3 % and Proseal LMA 45.5 %) possibly because no muscle relaxant was given to place the devices and slightly altered anatomical airway in obese patients. In our study we haven't observed any complications like dysphagia, hoarsness of voice or aspiration of gastric contents after removal of the LMA's.

This study however, had a few limitations. First, the study was done in a single center with limited number of patients. Second, the sample involved in this study were regional cases, so the anatomical data may vary due to differences in ethnicity. As a result, many more research may be required to complete the validation analysis based on the findings of this investigation. Third, the high cost of Baska mask limits its use in the regional population due to lack of affordability.

CONCLUSION

Benefits of laryngeal mask airway include quicker insertion, higher patient tolerance, and less invasive airway management, however there is a risk of aspiration[2.] New devices have been developed since the first-generation SADs to boost safety, and some of them offer characteristics that may lower the aspiration risk[.7]. The third generation Baska mask is the most recent entry to the SADs for handling the airway [2]. It presents with four distinctive features which includes:

1. A noninflatable, recoiling, selfsealing membrane cuff with variable pressure that increases seal pressure during IPPV.
2. High flow suction clearance mechanism for gastric suctioning.
3. To facilitate easy insertion a Tab is placed for manually curving the mask.
4. 90^{o} suction elbow[7].

The Baska mask combines elements from: (1) the LMA-ProSeal which provides greater oropharyngeal seal pressure, ports for gastric suctioning and bite block (2) the LMA-Supreme which includes a drain for gastric contents; (3) the i-gel and (4) the Slipa which has a sump reservoir.

In our study, Baska mask was easier to insert; hence took less time for insertion and less number of attempts for insertion and higher OSP compared to Proseal LMA. Complications of trauma to lip, blood staining and sore throat were more in Proseal LMA group compared to Baska mask group.

The study therefore, emphasizes the benefits of Baska mask over Proseal LMA and therefore its use should be encouraged.

SUMMARY

The study **"COMPARISON OF BASKA MASK VERSUS PROSEAL LARYNGEAL MASK AIRWAY IN ELECTIVE SURGERIES UNDER GENERAL ANAESTHESIA - A RANDOMIZED CLINICAL TRIAL"** was carried out in the Department of Anaesthesiology, B.L.D.E. (Deemed to be university) Shri B. M. Patil Medical College, Hospital and Research Centre, Vijayapura amongst patients admitted for elective surgeries under General Anesthesia lasting less than two hours. The goal of the study was to assess the benefits of Baska mask and Proseal LMA during general anesthetic procedures lasting under two hours. The primary objective of the study included 1) Comparison of time taken for insertion and 2) Comparison of ease of insertion between two groups. The secondary objectives of the study included: 1) Comparison of oropharyngeal seal pressure between two groups. 2) Comparison of number of attempts between two groups and 3) Assessment of complications like Trauma to lip, Bloodstaining, Sore throat, Dysphagia, Hoarseness of voice.

It was a prospective randomized comparison study done amongst 64 patients who were matched for age, weight and sex and was assigned using computerized random table number into two different groups of 32 patients each in Proseal LMA and 32 patients of Baska. This was done during a study period of one and half year from December 2020 to August 2022. The study population were assigned using computerized random number table in to Group-A and Group-B.

Group A – Proseal LMA

Group B- Baska mask

Results were recorded using a preset Performa. Preanesthetic evaluation was done, patients were kept fasting for 6 hours prior to surgery and were inserted with Proseal LMA and Baska mask based on the group they were assigned to base on inclusion criteria. Easiness of insertion was assessed by the resistance felt by the anesthetist during insertion. Unblinded observer recorded the insertion time. At 5 minutes after the Baska mask was placed, the airway sealing pressure was measured in cm H2O. Data was represented using Mean ±SD, percentages and diagrams. Statistical analysis was done and the results are as follows:

Age and sex-based classification of patients and duration of surgery in cases where intubation using Proseal LMA and Baska mask was required showed no significant results. Grading of patients based on Mallampati and ASA grading, intra-op monitoring of heart rate, oxygen saturation, mean arterial pressure were comparable in both the groups and clinically and statistically did not give significant results.

In terms of ease and time of insertion, Baska mask was superior to Proseal LMA. Baska mask could be inserted in lesser time with least resistance compared to Proseal LMA.
In terms of Oropharyngeal seal pressure, the study showed significant results with higher OSP in Baska mask (31.34 $\pm$1.638 cm H_2O) compared to Proseal LMA (24.81 $\pm$ 1.469 cm H_2O).
Complications of blood staining, trauma to lip and sore throat were observed more in patients inserted with Proseal LMA compared to patients inserted with Baska mask.

The study encourages the use of Baska mask due to its advantages and thus, emphasizes the superiority of Baska mask to Proseal LMA.

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ANNEXURE -1

IEC/No-09/2021
22-01-2021

B.L.D.E. (DEEMED TO BE UNIVERSITY)
(Declared vide notification No. F.9-37/2007-U.3 (A) Dated. 29-2-2008 of the MHRD, Government of India under Section 3 of the UGC Act, 1956)
The Constituent College
SHRI. B. M. PATIL MEDICAL COLLEGE, HOSPITAL AND RESEARCH CENTRE

INSTITUTIONAL ETHICAL CLEARANCE CERTIFICATE

The Institutional ethical committee of this college met on 11-01-2021 at 11 am to scrutinize the synopsis of Postgraduate students of this college from Ethical Clearance point of view. After scrutiny the following original/corrected and revised version synopsis of the Thesis has been accorded Ethical Clearance

Title: A randomized Comparison of Baska mask and pro seal laryngeal mask airway in elective surgeries under general Anaesthesia

Name of PG student: Dr Jophy Jose Department of Anaesthesiology

Name of Guide/Co-investigator: Dr K Nirmaladevi Associate Professor of Anaesthesiology

DR .S.V.PATIL
CHAIRMAN, IEC
Institutional Ethical Committee
B L D E (Deemed to be University)
Shri B.M. Patil Medical College,
VIJAYAPUR-586103 (Karnataka)

Following documents were placed before Ethical Committee for Scrutinization:

1. Copy of Synopsis / Research project
2. Copy of informed consent form
3. Any other relevant documents.

8

ETHICAL CLEARENCE CERTIFICATE

ANNEXURE – II

SAMPLE INFORMED CONSENT FORM

B.L.D.E.(DU)'S SHRI B.M. PATIL MEDICAL COLLEGE HOSPITAL AND RESEARCH CENTRE, VIJAYAPUR – 586103, KARNATAKA

TITLE OF THE PROJECT: "COMPARISON OF BASKA MASK VERSUS PROSEAL LARYNGEAL MASK AIRWAY IN ELECTIVE SURGERIES UNDER GENERAL ANAESTHESIA - A RANDOMIZED CLINICAL TRIAL"

PRINCIPAL INVESTIGATOR: Dr. JOPHY JOSE

Department of Anaesthesiology

BLDE (Deemed to be university)

Shri B.M. Patil Medical College Hospital &Research Centre,

Sholapur Road Vijayapur-586103

Email: drjophyjose@gmail.com

PG GUIDE: Dr K NIRMALA DEVI

Associate Professor

Department Of Anaesthesiology

BLDE (Deemed to be university) Shri B.M. Patil

Medical College Hospital & Research Centre, Sholapur Road Vijayapura.

Email: nirmalakagalkar77@gmail.com

PURPOSE OF RESEARCH:

I have been informed that this study is **"COMPARISON OF BASKA MASK VERSUS PROSEAL LARYNGEAL MASK AIRWAY IN ELECTIVE SURGERIES UNDER GENERAL ANAESTHESIA - A RANDOMIZED CLINICAL TRIAL"**

I have been explained about the reason for doing this study and selecting me/me ward as a subject for this study. I have also been given free choice for either being included or not in the study.

PROCEDURE:

I understand that I will be participating in the study: **"COMPARISON OF BASKA MASK VERSUS PROSEAL LARYNGEAL MASK AIRWAY IN ELECTIVE SURGERIES UNDER GENERAL ANAESTHESIA - A RANDOMIZED CLINICAL TRIAL"**

BENEFITS: I understand that my wards participation in this study will help in finding out: "**COMPARISON OF BASKA MASK VERSUS PROSEAL LARYNGEAL MASK AIRWAY IN ELECTIVE SURGERIES UNDER GENERAL ANAESTHESIA - A RANDOMIZED CLINICAL TRIAL"**

CONFIDENTIALITY:

I understand that medical information produced by this study will become a part of this Hospital records and will be subjected to the confidentiality and privacy regulation of this hospital. If the data are used for publication in the medical literature or for teaching purpose, no names will be used and other identifiers such as photographs and audio or video tapes will be used only with my special written permission. I understand that I may see the photograph and videotapes and hear audiotapes before giving this permission.

REQUEST FOR MORE INFORMATION:

I understand that I may ask more questions about the study at any time. **Dr. JOPHY JOSE** is available to answer my questions or concerns. I understand that I will be informed of any significant new findings discovered during the course of this study, which might influence my

continued participation. If during this study, or later, I wish to discuss my participation in or concerns regarding this study with a person not directly involved, I am aware that the social worker of the hospital is available to talk with me. And that a copy of this consent form will be given to me for keep for careful reading.

REFUSAL OR WITHDRAWAL OF PARTICIPATION:

I understand that my participation is voluntary and I may refuse to participate or may withdraw consent and discontinue participation in the study at any time without prejudice to my present or future care at this hospital.

I also understand that **Dr. JOPHY JOSE** will terminate my participation in this study at any time after he/she has explained the reasons for doing so and has helped arrange for my continued care by my own physician or therapist, if this is appropriate.

INJURY STATEMENT:

I understand that in the unlikely event of injury to me/my ward, resulting directly due to my participation in this study, such injury will be reported promptly, then medical treatment would be available to me, but no further compensation will be provided. I understand that by my agreement to participate in this study, I am not waiving any of my legal rights.

I have explained to_____the purpose of this research, the procedures required and the possible risks and benefits, to the best of my ability in patient's own language.

Date: **Dr. JOPHY JOSE**

(Investigator)

Patient's signature Witness to above signature

STUDY SUBJECT CONSENT STATEMENT:

I confirm that **Dr.JOPHY JOSE** has explained to me the purpose of this research, the study procedure that I will undergo and the possible discomforts and benefits that I may experience, in my own language.I have been explained all the above in detail in my own language and I understand the same. Therefore, I agree to give my consent to participate as a subject in this research project.

_____ _____

(Participant) Date

_____ _____

(Witness to above signature) Date

ANNEXURE – III

SCHEME OF CASE TAKING

PROFORMA

STUDY: "COMPARISON OF BASKA MASK VERSUS PROSEAL LARYNGEAL MASK AIRWAY IN ELECTIVE SURGERIES UNDER GENERAL ANAESTHESIA - A RANDOMIZED CLINICAL TRIAL"

PATIENT DETAILS: **DATE: -**

I. Name: Age/ Sex: I.P No:

Group allotted by randomization: Group A / Group B

II. 1. Type of the surgery:

2. Indication:

III. Significant History:

IV. General Physical Examination:

Pallor:

Icterus:

Cyanosis:

Clubbing:

Koilonychia:

Lymphadenopathy:

Oedema:

Teeth: Dentures:

V. Vital Parameters

Pulse: Blood Pressure:

Respiratory Rate: Temperature:

VI. Systemic Examination

1. CVS 2.RS:

3. CNS 4.Per Abdomen:

VII. Airway Assessment:

Mallampati Grade: Cervical Spine:

Mouth opening: Neck Movement:

VIII. ASA Grade:

IX. Investigation

Hemoglobin: TLC:

S. Urea: S. Creatinine:

RBS: Platelet count:

Urine Routine:

Chest Xray: ECG:

Table 1: -

Demographic data	**Group A**	**Group B**
Age		
Gender(Male/Female)		
Weight (Kg)		
ASA Grade (I/II)		
Duration of Surgery		

Table 2 :-

Comparison of efficacy of PLMA Vs Baska mask

	Group A	**Group B**	**p value**
Number of attempts			
Ease of insertion			
Time taken for insertion			
Oropharyngeal airway seal pressure			

Table 3: -

Complications:

Complication	**Group A**	**Group B**	**p value**
Blood staining after removal of device			
Trauma to tongue, teeth or lip			
Sore throat			
Hoarseness			
Dysphagia			

PRIMARY INVESTIGATOR SIGNATURE: -

GUIDE SIGNATURE: -

BIO-DATA OF THE GUIDE

GUIDE NAME : DR K NIRMALA DEVI

DATE OF BIRTH :24/04/1976

EDUCATION : MBBS (2000)
KURNOOL MEDICAL COLLEGE
KURNOOL, ANDRA PRADESH
: MD ANAESTHESIOLOGY (2005)
KURNOOL MEDICAL COLLEGE
KURNOOL, ANDRA PRADESH

DESIGNATION : ASSOCIATE PROFESSOR DEPARTMENT OF ANAESTHESIOLOGY

TEACHING : UG- 14 YEARS
PG - 14 YEARS

ADDRESS : ASSOCIATE PROFESSOR
DEPARTMENT OF ANAESTHESIOLOGY
B.L.D.E(Deemed to be university) SHRI B.M. PATIL MEDICAL COLLEGE AND RESEARCH CENTRE, VIJAYAPUR – 586103

MOBILE NO : 8217618954

EMAIL : nirmalakagalkar77@gmail.com

INVESTIGATOR

NAME	:	DR. JOPHY JOSE
QUALIFICATION	:	M.B.B.S., AL AMEEN MEDICALCOLLEGE, KARNATAKA,
TCMC REG. NO	:	60716
ADDRESS	:	DEPARTMENT OF ANAESTHESIOLOGY B.L.D.E. (Deemed to be university) SHRI B.M. PATIL MEDICAL COLLEGE HOSPITAL& RESEARCHCENTRE, VIJAYAPUR KARNATAKA
MOBILE NO	:	9972412969
EMAIL	:	drjophyjose@gmail.com

MASTERCHART

		Oropharygeal seal pr		Number Of Attempts		ease of insertion		TIME TAKEN FOR INS		BLOOD STAINING		SORETHROAT		TRAUMA TO LIP		HOARSENESS		DYSPHAGIA		AGE		SEX		ASA		DURATION		BMI (Kg/m2)	
SI NO		Group-A	Group-B	group A	group B	group A	Group B	Group A	Group B	GROUP A	Group B	GROUP A	Group B	GROUP A	Group B	GROUP A	Group B	GROUP A	Group B	GROUP A	Group B	GROUP A	Group B	GROUP A	Group B	GROUP A	Group B	Group A	Group B
1		24	29	1	1	I	I	29	24	-	-	-	-	-	-	-	-	-	-	25	34	M	M	II	I	60	50	23.5	20.6
2		23	29	2	1	II	I	28	25	-	-	-	-	-	-	-	-	-	-	50	31	M	F	II	I	50	40	22.5	21.6
3		26	30	1	1	I	I	28	25	-	-	-	-	-	-	-	-	-	-	34	28	M	F	I	I	90	80	20.4	20.2
4		22	31	2	1	III	I	31	24	+	-	+	-	-	-	-	-	-	-	24	38	M	M	II	II	50	120	24.4	20.6
5		22	29	1	1	I	I	29	23	-	-	-	-	+	-	-	-	-	-	32	60	M	M	I	II	120	100	22.4	20.3
6		24	33	1	2	I	II	27	26	-	-	-	-	-	-	-	-	-	-	60	22	M	F	II	I	60	40	24.4	23.8
7		26	31	2	1	II	II	28	26	-	+	-	+	-	-	-	-	-	-	25	20	F	F	I	I	40	120	22.4	21.6
8		25	29	1	1	I	I	29	24	-	-	-	-	-	-	-	-	-	-	28	22	F	M	I	I	50	80	22.6	24.8
9		24	32	1	1	I	I	27	24	-	-	-	-	-	-	-	-	-	-	28	24	F	M	I	I	40	90	23.6	21.4
10		26	31	1	1	I	I	27	25	-	-	-	-	-	-	-	-	-	-	23	18	F	F	I	I	45	30	21.8	20.4
11		25	33	2	1	III	I	32	24	+	-	+	-	-	-	-	-	-	-	26	31	F	F	I	I	40	30	23.6	23.4
12		25	33	1	1	I	I	29	24	-	-	-	-	-	-	-	-	-	-	60	20	M	F	II	I	120	40	21.4	20.4
13		24	32	2	1	II	I	30	25	-	-	-	-	+	-	-	-	-	-	28	48	F	F	I	I	40	60	18.4	19.4
14		23	34	1	1	I	I	28	25	-	-	-	-	-	-	-	-	-	-	26	25	F	F	I	I	40	40	19.8	20.6
15		25	30	2	1	III	I	31	23	+	-	+	-	-	-	-	-	-	-	26	36	F	F	I	I	30	80	20.8	21.8
16		24	31	1	1	I	I	28	22	-	-	-	-	-	-	-	-	-	-	26	32	F	F	II	I	30	40	22.4	20.6
17		25	29	1	1	I	I	29	23	-	-	-	-	-	-	-	-	-	-	46	58	F	F	II	II	40	30	24.2	23.5
18		26	30	1	1	I	I	27	23	-	-	-	-	-	-	-	-	-	-	25	32	F	F	I	I	25	40	24.1	20.6
19		24	34	2	2	II	II	29	25	-	-	-	-	+	-	-	-	-	-	30	34	F	F	I	I	30	40	21.6	23.4
20		29	33	1	1	I	I	27	24	-	-	-	-	-	-	-	-	-	-	48	29	M	F	I	II	60	50	22.6	20.5
21		26	31	2	1	III	I	32	22	+	-	-	-	+	-	-	-	-	-	28	28	M	F	I	I	110	50	23.6	21.4
22		24	30	1	1	II	I	29	22	-	-	-	-	-	-	-	-	-	-	27	31	F	F	I	I	80	30	24.2	21.2
23		25	29	1	1	I	I	26	23	-	-	-	-	-	-	-	-	-	-	38	22	F	F	I	II	60	30	24.2	22.6
24		26	30	1	2	I	II	26	25	-	-	-	-	+	-	-	-	-	-	55	47	F	F	II	I	80	30	20.3	21.4
25		28	32	1	1	II	I	29	24	-	-	-	-	-	-	-	-	-	-	43	31	F	F	I	I	30	50	24.4	23.4
26		24	32	1	1	I	I	29	24	-	-	-	-	-	-	-	-	-	-	33	35	M	M	I	I	120	60	22.1	23.4
27		25	33	1	1	I	I	27	23	-	-	-	-	-	-	-	-	-	-	55	22	F	F	II	I	100	40	22.8	23.1
28		26	32	1	1	I	II	26	26	-	+	-	-	-	-	-	-	-	-	26	20	F	F	I	I	40	30	19.8	18.6
29		25	32	2	1	II	I	31	25	-	-	-	-	-	-	-	-	-	-	36	40	F	F	I	I	60	40	19.8	20.2
30		24	34	2	1	II	I	31	24	+	-	-	-	-	-	-	-	-	-	35	22	F	F	I	I	40	60	21.1	21.3
31		25	33	1	1	I	I	28	23	-	-	-	-	-	-	-	-	-	-	23	24	F	F	I	I	80	40	20.4	21.6
32		24	32	1	1	I	I	28	23	-	-	-	-	-	-	-	-	-	-	25	23	F	F	I	I	40	40	22.6	23.4

	HEART RATE Bpm		BASELINE		5MIN		15MIN		30MIN		END OF SURGURY		BLOOD PI		BASELINE		5MIN		15		30		END OF SURGURY		SPO2		BASELINE		5MIN		15 MIN		30MIN		END OF SURGURY	
Sl NO	Group A	Group B	Group A	Group B	Group A	Group B	Group A	Group B	Group A	Group B	Group A	Group B	Group A	Group B	Group A	Group B	Group A	Group B	Group A	Group B	Group A	Group B	Group A	Group B	Group-A	Group-B	Group -A	Group-B	Group-A	Group-B	GroupA	Group-B	Group-A	Group-B
1	82	80	88	82	80	84	78	82	80	82	99	98	75	70	70	65	75	72	72	72	74	76	100	100	100	100	100	100	100	100	100	100	100	100
2	84	78	90	80	82	82	78	76	86	84	99	99	72	80	68	74	72	80	80	80	75	76	99	99	99	99	99	99	99	99	99	99	99	99
3	80	76	84	80	76	72	80	76	82	70	100	100	78	76	72	70	78	76	77	76	74	76	99	99	99	99	99	99	99	99	99	99	99	99
4	80	74	86	78	76	68	78	70	72	74	99	98	69	70	64	66	68	72	78	72	74	78	99	99	99	99	99	99	99	99	99	99	99	99
5	78	72	82	82	78	72	80	74	82	76	98	99	76	72	70	68	77	72	74	74	76	72	99	99	99	99	99	99	99	99	99	99	99	99
6	76	70	80	78	76	72	78	76	80	82	100	99	78	70	70	64	78	70	72	70	78	74	99	99	99	99	99	99	99	99	99	99	99	99
7	74	68	78	80	74	68	76	70	72	74	99	100	75	79	70	72	75	79	76	78	74	80	100	100	100	100	100	100	100	100	100	100	100	100
8	78	68	86	82	78	68	80	70	82	68	100	98	74	80	68	72	74	80	71	80	76	82	99	100	99	100	99	100	99	100	99	100	99	100
9	80	76	88	84	80	76	82	72	86	76	99	100	76	70	70	64	76	70	70	70	78	72	100	100	100	100	100	100	100	100	100	100	100	100
10	84	74	90	88	84	74	88	84	82	72	98	99	78	68	72	62	78	68	80	68	78	74	99	99	99	99	99	99	99	99	99	99	99	99
11	80	72	86	82	82	72	80	74	86	72	100	98	68	80	62	72	68	80	76	80	70	80	100	100	100	100	100	100	100	100	100	100	100	100
12	84	84	90	88	84	88	82	88	84	88	99	100	75	77	69	71	75	77	79	82	75	76	99	100	99	100	99	100	99	100	99	100	99	100
13	86	82	92	90	84	80	84	78	80	78	100	99	65	72	60	66	65	72	78	74	68	72	100	99	100	99	100	99	100	99	100	99	100	99
14	80	78	86	84	80	78	82	86	80	78	99	100	74	76	69	71	74	76	72	75	74	76	99	99	99	99	99	99	99	99	99	99	99	99
15	78	76	82	82	80	78	80	82	80	78	100	99	74	72	66	66	74	72	76	77	74	72	99	99	99	99	99	99	99	99	99	99	99	99
16	80	78	82	82	80	74	82	86	84	76	98	100	69	72	60	64	69	72	75	74	74	76	100	99	100	99	100	99	100	99	100	99	100	99
17	82	84	86	86	84	86	86	80	82	78	100	99	76	80	70	72	76	80	74	72	78	80	99	99	99	99	99	99	99	99	99	99	99	99
18	82	86	88	84	82	84	86	84	78	80	99	100	72	74	66	68	72	74	73	77	72	74	100	100	100	100	100	100	100	100	100	100	100	100
19	78	88	84	90	80	86	82	88	76	88	99	98	70	75	62	68	70	75	71	75	70	74	99	100	99	100	99	100	99	100	99	100	99	100
20	80	84	84	88	78	82	80	84	82	80	99	99	80	76	74	68	80	76	86	78	78	74	100	100	100	100	100	100	100	100	100	100	100	100
21	78	68	82	72	80	66	80	68	82	70	98	100	80	78	72	70	80	78	74	76	82	80	99	100	99	100	99	100	99	100	99	100	99	100
22	76	72	80	76	76	72	70	68	78	80	100	99	76	73	70	68	76	73	72	73	78	75	100	100	100	100	100	100	100	100	100	100	100	100
23	78	74	82	80	78	74	72	70	76	72	100	100	76	78	70	72	76	78	73	78	75	78	99	100	99	100	99	100	99	100	99	100	99	100
24	84	72	90	76	82	72	80	74	84	72	99	98	66	68	64	60	66	68	79	72	68	68	100	99	100	99	100	99	100	99	100	99	100	99
25	74	76	80	80	74	76	72	76	74	80	100	99	75	78	70	72	75	78	72	78	74	78	99	99	99	99	99	99	99	99	99	99	99	99
26	76	76	84	80	76	78	74	76	78	80	99	98	76	66	72	60	76	66	74	70	76	70	100	99	100	99	100	99	100	99	100	99	100	99
27	72	78	78	82	72	78	76	80	74	78	98	100	72	70	65	64	72	70	68	72	72	70	99	100	99	100	99	100	99	100	99	100	99	100
29	68	78	76	82	68	78	64	76	72	82	100	99	75	74	62	68	75	74	68	72	74	76	100	99	100	99	100	99	100	99	100	99	100	99
30	70	80	76	84	72	82	82	78	80	82	99	100	68	70	62	65	68	70	68	70	72	70	100	99	100	99	100	99	100	99	100	99	100	99
31	72	82	78	86	72	82	74	76	74	82	99	98	72	76	66	70	72	76	74	74	74	75	99	99	99	99	99	99	99	99	99	99	99	99
32	74	80	80	82	74	80	72	78	74	82	98	100	75	72	70	68	75	72	75	72	78	77	100	100	100	100	100	100	100	100	100	100	100	100

20BMANS007: COMPARISON OF BASKA MASK VERSUS PROSEAL LARYNGEAL MASK AIRWAY IN ELECTIVE SURGERIES UNDER GENERAL ANAESTHESIA - A RANDOMIZED CLINICAL TRIAL

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