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Baska mask, I-Gel supraglottic airway device and LMA-proseal in spontaneously breathing, anaesthetised children during elective surgeries: Ease of insertion of the three devices

[1]Dr. Paramanand Reddy, [2]Dr. Shivakumara KC, [3]Dr. Madhu M, [4]Dr. Minna Osheen J

[1]Assistant Professor, Department of Anaesthesiology, Gadag Institute of Medical Sciences, Gadag, Karnataka, India
[2]Assistant Professor, Department of Anaesthesiology, Basaveshwara Medical College and Hospital, Chitradurga, Karnataka, India
[3]Consultant Anesthesiologist, Department of Anaesthesiology, S.N.R. District Hospital, Kolar, Karnataka, India
[4]Senior Resident, Department of Anaesthesiology, Karnataka Institute of Medical Sciences, Hubballi, Karnataka, India
Corresponding Author: Dr. Minna Osheen J

Abstract
Laryngeal mask airways are supraglottic airway devices designed to provide and maintain a seal around the laryngeal inlet and are effective alternatives to endotracheal tubes. The relatively newer second generation supraglottic airway devices, LMA-ProSeal, I-Gel & Baska mask have been safely used in children during spontaneous or controlled ventilation without complications. A total number of 90 paediatric patients of ASA grade I and II, weighing 10-25 kg, of either sex, posted for elective surgeries under general anaesthesia and satisfying the inclusion criteria were enrolled in the study after obtaining informed, written, valid consent from their parents/guardian. According to our observations, mean insertion time taken for group B was 15.8 seconds with a standard deviation of 0.9, 10.6 seconds with a standard deviation of 1.1 for group I and 13.5 seconds with a standard deviation of 0.9 for group P. On analysis by ANOVA test, p value obtained is 0.001 (significant, <0.05) which implies that insertion time taken for group B is significantly greater than that of group P and group I.
Keywords: Baska mask, I-Gel supraglottic airway device, LMA-proseal

Introduction

Securement and maintenance of a patent airway is the primary responsibility of every anesthesiologist and endotracheal intubation is the most definitive methodforthesame[1].But paediatricairwayhasspecificcharacteristicswhichmakesitmuchdistinctfromadult airway and much more prone to develop complications from laryngoscopy and intubation[2].The advent of supraglottic airway devices has made airway management in paediatric anaesthesia easier and safer. They produce lesser sympathetic stimulation and airway irritability andarewell tolerated. Due to their large calibre, airway resistance is lesser and work of breathing is reduced during spontaneous ventilation under anaesthesia[3].

Laryngeal mask airways are supraglottic airway devices designed to provide and maintain a seal around the laryngeal inlet and are effective alternatives to endotracheal tubes. The relatively newer second generation supraglottic airway devices, LMA-ProSeal, I-Gel & Baska mask have been safely used in children during spontaneous or controlled ventilation without complications[4].

LMA-ProSeal is a specialized laryngeal mask device with an integral biteblock and two cuffs.

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The cuff design is modified so as to improve the laryngeal seal, which allows ventilation at much higher airway pressures. In paediatric sizes, there is no second dorsal cuff but mask profile has been modified to improve the seal. It has an oesophageal drainage tube lateral to the main airway tube which reduces the risk of pulmonary aspiration and gastric insufflation[5].

I-Gel, a novel supraglottic airway device with a non-inflatable cuff, composed of transparent, soft gel like, thermoplastic elastomer. The cuff shapeandcontour accurately fit the peri-laryngeal structures to attain a perfect seal.Airway seal tends to improve with timedue to warming of the thermoplastic cuff to body temperature. It has been used in surgeries and also as a rescue device in difficult, failed intubations and resuscitation[6].

The Baska Mask is a newer supraglottic device with a number of innovations. Each size has a colour code, unlike other devices. It has a non-inflatable cuff, continuous with the central channel of the device, moulded to take up the shape of the supraglottic airway, potentially reducing the risk of tissue damage. With positive pressure ventilation, the cuff gets inflated itself, thereby improving the seal and reducing leak. The mask has an upper oesophageal inlet, and the dorsal surface of the cuff is moulded to direct any oropharyngeal contents away from the glottis towards the side channels, to which suction can be attached, thus reducing the riskof pulmonary aspiration. Also, there is an integrated bite-block and an extended hand-tab attached to the cuff that permits the operator to control the degree of flexion of the device during insertion. Lastly, it can be inserted in neutral head position, reducing the need for neck manipulation.

On literature search, there are very few controlled randomized studies comparing Baska mask with I-Gel and LMA-ProSeal in children. We chose to compare the Baska mask with I- Gel and LMA-ProSeal as the former has several novel features, although all the three maintaina good airway seal. So, a prospective randomized single blinded study was designed to compare them with respect to ease of insertion, insertion time, ease of gastric tube insertion, airway seal pressure and possible post-insertion complications in paediatric elective surgeries undergeneral anaesthesia.

Methodology

After approval by the ethical committee, a single blinded randomised comparative study was planned, i.e., patients were blinded to the type of device used for them. A total number of 90 paediatric patients of ASA grade I and II, weighing 10-25 kg, of either sex, posted for elective surgeries under general anaesthesia and satisfying the inclusion criteria were enrolled in the study after obtaining informed, written, valid consent from their parents/guardian. Then the patients were randomised into three groups:

Group B(n=30): Patients maintained with Baska mask Group I (n=30): patients with I-gel.

Group P(n=30): Patients with LMA-Proseal.

All patients in each group were maintained on nil per oral as per standard guidelines prior to surgery and pre-medicated with Tab. Ranitidine 1.5mg/kg the night before surgery.

Half an hour before surgery, patients were premedicated with midazolam atomised intranasal spray 0.2 mg/kg. After shifting the patients into the Operation theatre, an intravenous line was secured using a 22/24-gauge IV cannula on the non-dominant hand and an appropriate intravenous fluid was connected to the same. Intravenous fluid was given according to the deficit, maintenance and intraoperative loss requirement calculated per kg body weight.Patients were also connected to a multiparameter monitor and baseline pulse oximetry (SpO_2), non-invasive blood pressure (NIBP), pulse rate and electrocardiography (ECG) were noted.

Patients were pre-medicated with Inj. Glycopyrrolate 0.004 mg/kg and Inj. Fentanyl 2 mcg/kg intravenously followed by preoxygenation with 100% Oxygen for 3 minutes, and then induced with Inj. Propofol 2 mg/kg intravenously. This was followed by facemask ventilation with 100% oxygen until optimal conditions for supraglottic device insertion were attained,

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i.e., eyelash and airway reflexes disappear[6].

Airway was then secured by an experienced anesthesiologist with an appropriately sized supraglottic device as per manufacturer's recommendation of weight-based estimate and clinical judgement while the investigator recorded the duration and ease of insertion, post-insertion airway seal pressure, ease of insertion of gastric tube, hemodynamic parameters and post-operative laryngopharyngeal morbidity.

For insertion, the supraglottic device was lubricated with lignocaine-gel and inserted bypushing past the front teeth towards the hard palate, avoiding the tongue and then slid downwards and backwards until a definitive resistance isencountered. Before insertion,cuff of LMA-ProSeal was fully deflated. While inserting Baska mask, the tab of the mask was used to help negotiate the palatopharyngeal curve when it was fully within the mouth.

An effective airway was confirmed by bilateral symmetrical chest movement on manual ventilation, square wave capnography, absence of audible leak of gas and lack of gastric insufflations. In case of failure of insertion of device or ventilation through it, two more attempts of insertion were allowed. If placement failed even after third attempt, the airway was to be secured through another suitable airway device and the case excluded from our study.

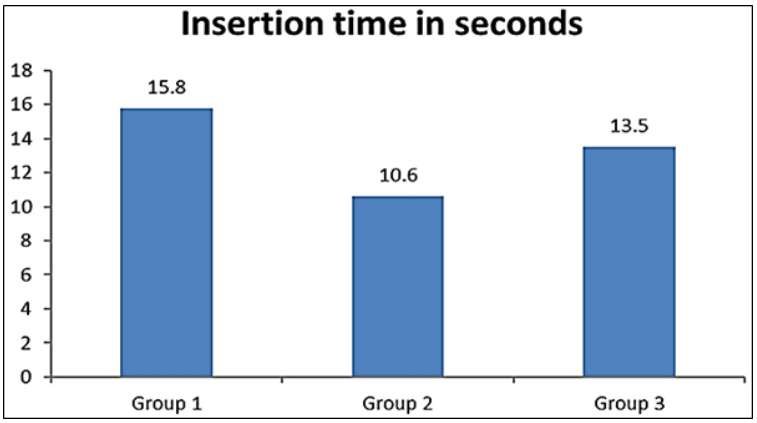
After securing the device in place, an appropriately sized well lubricated gastric tube was introduced into the stomach through the gastric drainage port. Anaesthesia was maintained using 66% nitrous oxide and 33% oxygen with 1.5-2% sevoflurane and patients were allowedto breathe spontaneously through a Jackson-Rees circuit.

At the end of operation, anaesthetic agents were discontinued and patients were ventilated with 100% Oxygen. At a lighter plane, when patient started responding to pain stimuli, the supraglottic airway device was removed and inspected for any bloodstaining.

Table 2: Comparison of insertion time in seconds of study participants (Group B: Baska mask, Group I: I Gel and Group P: LMA ProSeal)

Features	Group B(N=30)		Group I(N=30)		Group P(N=30)		p value#
	Mean	SD	Mean	SD	Mean	SD	
Insertion time inseconds	15.8	0.9	10.6	1.1	13.5	0.9	0.001*

Note: # p value based on ANOVA test, SD-Standard deviation.



Graph 1: Comparison of insertion time in seconds of study participants (Group-1: Baska mask, Group-2: I Gel and Group-3: LMA Proseal)

According to our observations, mean insertion time taken for group B was 15.8 seconds with a standard deviation of 0.9, 10.6 seconds with a standard deviation of1.1 for group I and 13.5 seconds with a standard deviation of 0.9 for group P. On analysis by ANOVA test, p value obtained is 0.001 (significant, <0.05) which implies that insertion time taken for group B is significantly greater than that of group P and group I.

Discussion

The primary objective of our study was comparison of time taken for insertion of the three devices. As per our observations, mean insertion time taken in group B was 15.8 ± 0.9 seconds,

10.6 ± 1.1 seconds in group I and 13.5 ± 0.9 seconds in group P giving a p value of 0.001 (significant, <0.05) on analysis by ANOVA test which implies that insertion time taken for group B is significantly greater than that of group P and group I. This is comparable to thestudy by Shanmugavelu G *et al*. [7] on the performance of I-gel vs. Baska mask on sixty adults undergoing laparoscopic surgeries under controlled ventilation which concluded that insertion time was shorter for I-gel (12.3 ± 3.8 seconds) than Baska mask (20.1 ± 8.1Seconds) and KaraD *et al*. [8] which recorded the median insertion time for Baska and I-gel groups as 14 (6-25) and 7 (5-12) seconds, respectively (P < 0.001) but contrary to Al-Rawahi SA *et al*.[9]who concluded that Baska mask had shorter placement time than LMA ProSeal (16.43 ± 4.54 vs. 21.45 ± 6.13 seconds, p=0.001) in 52 adults studied. But the latter study itself claims that a difference of 5 seconds is of minimal clinical significance.

Comparison of airway seal pressure among the three study groups by ANOVA test gave significant results with a p value of 0.001. Mean airway seal pressure recorded in group B was

25.8 ± 1.6 cm H_2O, 22.4 ± 1.1 cm H_2O in group I and 24.4 ± 1.1 cm H_2O in group P. Results are in concordance with Shanmugavelu G *et al*. 7 (26 ± 5.8 cm H_2O in Baska mask group vs 22± 4.1 cm H_2O in igel group), Al-Rawahi SA *et al*.[9](29.98 ± 8.51 cm H_2O in Baska mask group vs. 24.5 ± 6.19 cm H_2O in LMA ProSeal group), Wheeler M *et al*. [10](mean leak pressure for paediatric size LMA Proseal as 24.5 cm H_2O) Ali Sarfraz Siddiqui *et al*.[11](reported mean airway seal pressure for I Gel as 22.48 ± 2.07 cm H_2O).

As per results of our study, all three devices (Baska mask, igel 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, in accordance with Zundert Tv *et al*. [12](first attempt success rate of 88% with ease of insertion graded as “easy” to “very easy” in 92% for Baska mask) and Goyal R *et al*. (first attempt success rate marked as 95% for I-Gel and 90% for LMA-Proseal). Ease of insertion of gastric tube was also graded as “easy” for all patientsin all three of our study groups in agreement with Mitra S *et al*. [4].

Conclusion

According to our observations, mean insertion time taken for group B was 15.8 seconds with a standard deviation of 0.9, 10.6 seconds with a standard deviation of 1.1 for group I and 13.5 seconds with a standard deviation of 0.9 for group P.

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