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Original Research Article

COMPARISON OF THE BASKA MASK AND I-GEL IN SHORT SURGICAL PROCEDURES

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Abstract

Background: Minor surgical procedures under general anaesthesia require a patent airway without the use of muscle relaxant. Being a contemporary, untrodden device, possessing the Baska mask® in one's armamentarium can serve a diversified use in spontaneous and controlled ventilation. However, this invention is still in its early roots, and its competence on various fronts has to be evaluated. We aim to compare the Baska mask and I-gel in short surgical procedures. Our other objectives were to compare the sealing pressure, ease of insertion, number of attempts, insertion time, removal and the complications after removal of the device. **Materials and Methods:** It is a randomised single-blinded study, conducted on 50 American Society of Anesthesiologists' physical status I and II female patients aged 18–40 years who underwent short surgical procedures. Patients were randomly categorized into two groups of 40 each; group Baska® mask and group I-gel, to compare the sealing pressure, ease of insertion, number of attempts, insertion time, removal and the complications after removal of the device. The results were analysed using unpaired t-test, Mann-Whitney U test, Chi-square test and ANOVA. A p value <0.05 was considered to be statistically significant. **Result:** There was no significant difference among the age and weight of patients in both groups. The Mallampati grading was comparable between both the groups. The number of attempts taken to insert the device were similar in both Baska mask and I-gel group. The first-time insertion success rate was 95% in both the groups. No significant difference in the time taken to insert the device. The mean sealing pressure with Baska mask was found to be 32.7±5.0 and that with I-gel was 28.5±6.2 cmH2O. There was no significant difference in the hemodynamic changes after insertion and removal of both the devices except that the mean arterial pressure after removal of Baska mask was higher (88.1±11.2 mmHg) than that after removal of I-gel (81.3±11.8 mmHg). After removal of the device, complications like cough, sore throat, blood stains and signs of aspiration were compared between the two groups and no significant difference was found. **Conclusion:** We conclude that both I-gel and Baska mask are easy to insert, but the Baska mask is superior in terms of sealing pressure without increase in the laryngopharyngeal morbidity.

INTRODUCTION

The major responsibility of an anaesthesiologist is management of airway so as to provide adequate ventilation to the patient by securing an unobstructed airway when general anaesthesia is administered. As such, no anaesthesia is safe unless diligent efforts are devoted to maintain an intact functional airway. Although endotracheal intubation is the gold standard for airway management, it is being replaced by supraglottic airway devices because they are easy to introduce, better tolerated and results in a lesser haemodynamic response.[1,2] Endotracheal intubation requires time, a skilled anaesthesiologist or appropriate instruments and adequate circumstances with respect to space and illumination. Minor surgical procedures under general anaesthesia require a patent airway without the use of muscle relaxant. For such procedures, various supraglottic airway devices have been designed and are being used

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exceedingly. Further these devices have lesser implications on airway and respiratory mechanics.

Various types of supraglottic airway devices have been developed so far. Devices with gastric tube are more advantageous in positive pressure ventilation. Baska mask and I-gel are two different SGADs used in daily anaesthesia practice.[3] They are equipped with a gastric tube, non-inflatable cuff and integrated bite-block. Baska mask fits the anatomy of the supraglottic area through the self-inflation of its cuff during positive pressure ventilation. Non-inflatable cuff of Baska mask is continuous with the central channel of the device. I-gel provides thermal adaptation to the airway through its thermoplastic elastomeric composition. Hence, they reduce potential oropharyngeal tissue and/or nerve damage. While these devices reduce the risk of pulmonary aspiration through the gastric tube available, Baska mask is equipped with side channels that provides aspiration of the secretions and gastric content that accumulates in the supraglottic area. The extended hand-tab on the Baska mask helps to control the flexion of the device during insertion.

MATERIALS AND METHODS

The study protocol was approved by the Institutional Ethics Committee of Osmania Medical College and Hospital, Hyderabad. Patients coming to the hospital and accepted for the study were of American society of Anaesthesiology grade I and II, admitted for elective short surgical procedures of duration less than 90 minutes. A written informed consent was taken from all the patients. A clinical study was undertaken to compare Baska mask and I-gel in short surgical procedures.

80 selected patients were randomly allocated to one of the two groups. 40 patients were assigned to Group I (I-gel was used) and the other 40 to group B (Baska mask was used).

Inclusion Criteria

ASA grade I or II, 18 to 50 years of age, MPG I, II or III, Mouth opening > 2.5 centimetres, BMI < 30, Patients who gave informed written consent, Patients scheduled to undergo elective short surgical procedures.

Exclusion Criteria

Mouth opening < 2.5 centimetres, BMI > 30, Patients with neck pathologies, anticipated difficult airway, pregnant women and patients at risk of aspiration, Patients refusing the study technique.

Pre anaesthetic evaluation / data collection

All the patients were fasted 8 hours pre-operatively for solids and 2 hours for clear liquids. The surgical procedures of less than 90 minutes duration were selected for the study. After shifting to the operation theatre, standard monitors which included pulse oximeter, non-invasive blood pressure and ECG were connected, and the baseline values recorded.

The patients were premedicated with Inj. Glycopyrrolate 0.02mg/kg iv, Inj. Ondansetron 0.10-0.15 mg/kg iv, Inj. Midazolam 0.05-0.1 mg/kg iv and Inj. Fentanyl 2 mcg/kg iv. Preoxygenation was done with 100% oxygen for 3 minutes.

Induction was achieved with Inj. Propofol 2 mg/kg iv. Face mask ventilation with Sevoflurane 2% and oxygen was done until optimal conditions for supraglottic device insertion were attained. All the supra glottic airway device insertions were done by the same anaesthesiologist. Standard insertion technique recommended by the manufacturer was followed. After insertion, adequate airway was assessed from, bilateral symmetrical movement of the chest, normal thoracoabdominal movements, square waveform on capnograph with no audible oropharyngeal leak and stable oxygen saturation. After confirming the correct placement, the device was secured over the maxilla. An appropriate size gastric tube was introduced through the drain port. Correct placement of the gastric tube into the stomach was confirmed by insufflation of air heard on auscultation over the epigastrium or aspiration of gastric contents. The number of attempts for insertion and time taken for insertion of the device were noted. Ease of gastric tube insertion was graded as easy, difficult or impossible. Anaesthesia was maintained with Sevoflurane 2% in a mixture of 60% N2O and 40% oxygen. All patients were allowed to breathe spontaneously throughout the procedure. Sealing pressure was measured and noted. The heart rate and mean arterial pressure were observed before and after induction, every minute after inserting the device till 5 minutes and every 5 minutes till 25 minutes.

The following Parameters were observed:

1) Number of attempts: Number of attempts taken for insertion was noted as first attempt/ second attempt/ third attempt. “Failure” of supraglottic airway device was identified as three unsuccessful insertion attempts.
2) Insertion time: The time from removal of face mask to the confirmation of airway patency with supraglottic airway device in place by auscultation.
3) Ease of insertion of gastric tube: The gastric tube insertion was termed “easy” if it was passed in the first attempt and termed “difficult” if it was passed in the second attempt and was termed “failure” if it could not be passed in two attempts.
4) Airway seal pressure:

Test 1: Minimal airway pressure at which an audible noise detected, lateral to the thyroid cartilage in the neck by auscultation using a stethoscope.

Test 2: A cuff pressure monitor was attached at the proximal end of supraglottic airway device, and the APL valve was completely closed for 3 seconds. This denotes the airway pressure was in equilibrium with the fresh gas flow. The maximum pressure obtained was noted down as the sealing pressure.

The anaesthetic gas flow was terminated at the end of the operation and patients were ventilated with 100% O2. The Supraglottic airway device was removed in deep plane and ventilation was supported with a facemask after inserting an oropharyngeal airway till

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recovery of the patient. Vitals after removing the device and after recovery observed. Supraglottic airway device was inspected for blood staining and patient inspected for complications as described below.

Complications

Postoperatively, complications like cough, signs of regurgitation, signs of aspiration, trauma, dysphagia and sore throat were documented if present.

Statistical Analysis

Data was analyzed by Microsoft excel and statistical software. Data was summarized by Mean ± SD for continuous data and % for categorical data. The comparison between the two groups was done by unpaired t-test for continuous data and Mann Whitney U test for continuous non normal data. The comparison between two groups was done by chi-square test/Fisher's exact test for categorical data. All p-values less than 0.05 were considered as statistically significant.

RESULTS

The minimum and maximum age was 18 years and 45 years in group B, the Mean ± SD of age was 28.4 ± 7.7 years in 'B' group. The minimum and maximum age was 18 years and 50 years, the Mean ± SD of age was 27.1 ± 7.0 years in 'I' group. There was no significant difference in the age between 'B' and 'I' groups. The minimum and maximum weight in 'B' group was 43 and 75 kgs and that in 'I' group was 40 and 80 kgs respectively. The Mean ± SD of weight in 'B' group is 54.4 ± 7.9 kgs whereas the Mean ± SD of weight is 54.2 ± 9.5 kg in 'I' group. There was no significant difference in the mean weight of cases between 'B' and 'I' groups. In group 'B' the no. of patients having MPG of I was 22 (55%), II was 15 (37.5%), III was 3 (7.5%), In group 'I' the no. of patients having MPG of I was 16 (40%), II was 21 (52.5%), III was 3 (7.5%). There was no significant difference in terms of airway (MPG) between B and I groups.

In both groups the device was inserted in the first attempt in 38 cases (95%) and in the second attempt in 2 cases (5%). There was no significant difference between the two groups in no. of attempts required to insert the device.

Table 1: Comparison of insertion time and sealing pressure between groups

Insertion time (seconds)	Minimum	Maximum	Mean	SD	P-Value
B	4	12	7.5	1.4	0.181
I	5	10	7.9	1.3	
Sealing pressure (cmH2O)					
B	25	50	32.7	5.0	0.001
I	16	44	28.5	6.2	

The minimum and maximum time taken for insertion of the device was 4 and 12 seconds in 'B' group, and that in 'I' group was 5 and 10 seconds. The Mean ± SD of Insertion Time was 7.5 ± 1.4 seconds in 'B' group and was 7.9 ± 1.3 seconds in 'I' group. There was no significant difference between 'B' and 'I' groups in the time taken to insert the device.

The minimum and maximum sealing pressure (cm H2O) was 25 and 50 in 'B' group, 16 and 44 in the 'I' group respectively. The Mean ± SD sealing pressure (cm H2O) was 32.7±5.0 in 'B' group and 28.5±6.2 in the 'I' group. There was a significant difference in the sealing pressure (cm H2O) among both the groups.

Table 2: Comparison of heart rate (bpm) between groups

Time Points	Groups	Minimum	Maximum	Mean	SD	P-Value
T1	B	72	125	88.3	11.1	0.103
	I	64	150	93.9	16.5	
T2	B	70	148	94.1	15.8	0.606
	I	76	141	95.9	15.3	
T3	B	64	125	90.3	15.1	0.055
	I	74	131	96.7	14.3	
T4	B	62	130	88.9	13.1	0.178
	I	68	136	93.2	15.2	
T5	B	72	130	94.6	11.2	0.684
	I	68	129	93.5	12.9	

There was no significant difference in the heart rate between 'B' and 'I' groups at all time points.

Table 3: Comparison of Mean arterial pressure between groups

Time Points	Groups	Minimum	Maximum	Mean	SD	P-Value
T1	B	70	112	89.7	10.2	0.411
	I	70	106	87.9	9.2	
T2	B	60	129	84.0	15.8	0.894
	I	67	129	84.4	12.5	
T3	B	58	112	81.4	13.3	0.686

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	I	60	112	80.3	11.4	
T4	B	60	95	77.3	9.3	0.584
	I	66	100	78.4	8.2	
T5	B	68	111	88.1	11.2	0.010
	I	68	110	81.3	11.8	

There is no significant difference between 'B' and 'I' groups in Mean arterial pressure at T1, T2, T3, T4 time points. There is significant difference between 'B' and 'I' groups in Mean arterial pressure at T5.

Table 4: Comparison of ease of gastric tube insertion between groups

Groups	Ease of Gastric Tube Insertion		P-value
	Easy	Difficult	
B	40	0	1.000
I	39	1	

Insertion of gastric tube was easy in all 40 cases (100%) in group 'B' and 39 cases (97.5%) of group 'I'. It was difficult only in one case (2.5%) of group 'I'.

There was no significant difference between 'B' and 'I' groups in the ease of gastric tube insertion.

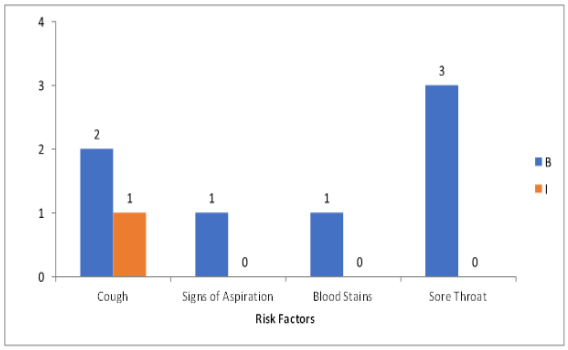

Figure 1: Comparison of complications between 'B' and 'I' groups

After removal of the device, in group 'B', 2 patients (5%) had cough, 1 (2.5%) showed signs of aspiration and blood stains, and 3 patients (7.5 %) experienced sore throat. In group 'I' only 1 patient (2.5%) had cough and no other complication was seen.

There was no significant difference between 'B' and 'I' groups in the occurrence of complications after removal of the device.

DISCUSSION

Supraglottic airway devices have become a standard fixture in airway management, filling a niche between the facemask and tracheal tube in terms of both anatomical position and degree of invasiveness. These devices are being increasingly used in short surgical procedures. Both Baska mask and I-gel being devoid of an inflatable cuff, the time to inflate the cuff and volume adjustment as required in cuffed Supraglottic airway devices, is not needed.

Our study was aimed to compare the Baska mask and I-gel in short surgical procedures. Our other objectives were to compare the sealing pressure, ease of insertion, number of attempts, insertion time, removal and the complications after removal of the device. There was no significant difference among the age and weight of patients in both groups. The Mallampati grading was comparable between both the groups. The number of attempts taken to insert the device were similar in both Baska mask and I-gel group. The first-time insertion success rate was 95% in both the groups. Second attempt was required only in 2 cases in each group. This was on contrary to the study done by Anjeleena Kumar Gupta, Nithin V Krishnan et al4 where the first-time successful placement of Baska mask was 66.66% and that of I-gel was 86.66%. This might be due to the fact that I-gel is less bulky as compared to Baska mask making it a more handy device to insert and remove. But in the study by Al-Rawahi SAS, Aziz H, Malik AM3 noted that the number of attempts needed to place the device correctly, were similar in Baska mask and LMA Proseal groups. They inferred that the short learning curve of 15 Baska mask placements is sufficient for its correct placement.

The mean device insertion time was 7.5 ± 1.4 seconds in 'B' group and 7.9 ± 1.3 seconds in 'I' group. We did not find a significant difference in the time taken to insert the device. But in the study by Usha Kumari Chaudhary, Som Raj Mahajan et al,[5] they observed that insertion of the device was significantly very easy in 58% of patients in Baska mask group as compared to 76% patients in I-gel group. But we observed that while using the Baska mask any difficulty in negotiation of the oropharyngeal curve could be easily overcome by pulling the tab of the Baska mask, which increases its distal curvature.

In our study, the mean sealing pressure with Baska mask was found to be 32.7±5.0 and that with I-gel was 28.5±6.2 cmH2O. The Baska mask had a greater sealing pressure than I-gel which was also observed in the study by Roopa Sachidananda, Safiya I Shaikh, Milon Vasant Mitragotri et al.[6] In their study, the mean sealing pressure of the Baska mask was 28.9±3.5 cm H2O vs. 25.9±2.5 cm H2O of I-gel. The better maintenance of sealing pressure with Baska mask is due to the cuff of the Baska mask, a recoilable membrane that inflates and deflates with the respiratory cycle. The lesser leak may also contribute to less operative room pollution.

The heart rate and mean arterial pressure were compared before and after insertion of the device, at 5 and 10 minutes after insertion and immediately after removal of the device.

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There was no significant difference in the hemodynamic changes after insertion and removal of both the devices except that the mean arterial pressure after removal of Baska mask was higher (88.1±11.2 mmHg) than that after removal of I-gel (81.3±11.8 mmHg). Insertion of gastric tube was easy in all 40 cases (100%) in group 'B' and 39 cases (97.5%) of group 'I'. It was difficult only in one case (2.5%) of group 'I'. Though ease to put the gastric tube was comparable in both the devices. Baska mask has a wider sump that allowed the insertion of larger suction catheter of size 10 Fr in size 3 and 12 Fr in Baska mask of size 4, whereas I-gel allowed the insertion of smaller sized suction catheter of size 8 in size 3 and 10 Fr in size 4. These findings were consistent with the study of Usha Kumari Chaudhary, Som Raj Mahajan et al.[5]

Baska mask has wider sump which allows the passage of a larger orogastric tube insertion. It provides rapid and adequate sump clearance. There is a dual drainage system (one with elbow connector for suction) for pharyngeal contents along with a sump reservoir and a bigger distal 70 gastric opening, although there was no difference in the incidence of inadequate sump clearance in both the groups.

After removal of the device, complications like cough, sore throat, blood stains and signs of aspiration were compared between the two groups and no significant difference was found. The incidence of complications was very less in both the groups. Pressure on the surrounding tissues is never more than the peak airway pressure in case of Baska mask because of its membranous cuff, thus decreasing the laryngopharyngeal morbidity as observed in the study by V Alexiev, A Ochana, D Abdelrahman et al.[1] I-gel is a cuffless device of soft consistency with reduced trauma to perilaryngeal tissue thus leading to less laryngopharyngeal morbidity as reported by the study of Bhandari G et al.[7]

In the study by Al-Rawahi et al,[3] 43.3% of patients had sore throat, and 20% of patients had hoarseness of voice with the use of the Baska mask®. In another study, 1% of patients had laryngospasm on emergence and 18% had blood staining on the Baska mask® on removal.[1]

Fasciculations induced by succinylcholine could increase the incidence of sore throat. However, a recent study reported similar incidences of sore throat with the use of succinylcholine and rocuronium.[8]

The incidence of sore throat was comparatively lower in various studies using the I-gel, which is probably due to the absence of inflatable cuff.[9-11]

There were few limitations of our study, patients with Mallampati grade IV were excluded so the authenticity of these devices in those patients cannot be predicted. We did not observe the sealing pressure in different positions of the patient. We did not confirm the anatomical position of the devices with a fibreoptic bronchoscope.[12]

CONCLUSION

Based on the results of our study, we conclude that both I-gel and Baska mask are easy to insert, but the Baska mask is superior in terms of sealing pressure without increase in the laryngopharyngeal morbidity. The dual drainage system in Baska mask allows passage of a larger orogastric tube insertion and rapid clearance. Baska mask has also been used as an alternative to endotracheal intubation in laparoscopic surgeries and is associated with attenuated hemodynamic response. Both I-gel and Baska mask can safely be used in elective short surgeries.

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