Original Research Article

COMPARISON OF BASKA MASK WITH I-GEL IN ADULT PATIENTS UNDERGOING DAYCARE SURGERIES UNDER GENERAL ANESTHESIA

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ABSTRACT

INTRODUCTION
In daycare surgeries under general anaesthesia, securing a patent airway is crucial. Supraglottic airway devices (SADs), such as the Baska mask and I-Gel, offer advantages like ease of insertion and minimal airway trauma.

OBJECTIVE
Minor surgical procedures under general anaesthesia require a patent airway without the use of muscle relaxant. Supraglottic airway devices have been widely used for airway management. A study was undertaken to assess the efficacy and safety of Baska Mask and I-Gel in terms of airway sealing pressure, peak airway pressure, and hemodynamic changes, first-time insertion success rate, insertion time, sealing pressure and complications between the Baska® mask and I-gel.

METHODS
This randomized, prospective, single-blinded study (CTRI/2023/11/059853) was conducted at Dr. Moopen's Medical College, Wayanad, Kerala, on 88 ASA I/II patients aged 18-60 years undergoing minor surgeries. Patients were randomized into two groups of 44 each to receive either the Baska mask or I-Gel. Key parameters such as peak airway pressure, airway sealing pressure, and hemodynamic parameters were recorded. Insertion time, ease of insertion, number of attempts, and postoperative complications were also measured. Data were analyzed using SPSS version 26.0, with a p-value of less than 0.05 considered statistically significant.

RESULTS
The Baska mask showed higher airway sealing pressure (27.91 ± 1.344 cmH2O) and mean oropharyngeal leak pressures (23.802 ± 1.27 cmH2O) compared to the I-Gel, with significant p-values of < 0.001. The I-Gel exhibited a lower mean peak airway pressure (13.7 ± 0.765 cmH2O) compared to the Baska mask (15.48 ± 0.792 cmH2O), with a p-value of < 0.002. No significant differences were observed in tidal volumes or blood pressure measurements. The Baska mask had a higher proportion of easy insertions (93.2%) and required fewer attempts compared to the I-Gel. The I-Gel showed significantly shorter insertion times. The incidence of blood staining and sore throat was higher with the I-Gel, while dysphagia was more common with the Baska mask.

CONCLUSION
The Baska mask demonstrated higher ease of insertion and airway sealing pressures. The I-Gel had lower peak airway pressures. Both SADs are effective with distinct advantages, making them suitable for airway management in daycare surgeries.
KEYWORDS: I-Gel, Baska mask, airway sealing pressure, oropharyngeal leak pressure, SAD, peak airway pressure

INTRODUCTION
Securing the airway is a fundamental skill for anaesthesiologists, with endotracheal intubation being the most definitive method. Supraglottic airway devices (SADs) provide an intermediate solution, offering a hands-free approach compared to face masks.[1] Since their inception by Dr. Archie Brain in 1981, SADs have evolved to include advanced features like anatomical similarity, intubation capability, and increased cuff volume for better sealing pressure.[2,3,4,5] SADs are essential in airway management, especially in difficult airway scenarios due to their ease of insertion, better patient tolerance, minimal hemodynamic changes, favourable respiratory mechanics, and reduced airway morbidity.[6,7]

The laryngeal mask airway (LMA) seals over the laryngeal orifice and is commonly used to establish a secure airway during general anaesthesia, even serving as a conduit for tracheal intubation.[6,7] Recent LMA designs feature enhanced sealing pressure cuffs and the capability to vent gastric contents, making them suitable for high peak airway pressure procedures.[8,9]

The I-gel, developed by Intersurgical Ltd, is a notable SAD with an anatomically designed, non-inflatable mask. It includes a buccal cavity stabilizer and a separate channel for gastric tube insertion.[10] The Baska mask®, designed by Australian anaesthetists Kanag and Beena Baska, represents a third-generation SAD with a self-sealing membranous cuff that inflates during inspiration and deflates during expiration. It features an integrated bite block, an oesophageal drainage inlet, and a side channel for gastric content aspiration, enhancing its versatility.[11,12]

Daycare surgeries, or outpatient surgeries, have gained popularity due to advancements in surgical techniques and anaesthesia.[13] SADs are preferred in these settings for their ease of insertion, minimal airway trauma, and reduced postoperative complications.[14] Despite their widespread use, comparative research on the performance of different SADs in daycare surgeries is limited.[15]

This study aims to compare the Baska mask and the I-gel in adult patients undergoing daycare surgeries under general anaesthesia. By evaluating insertion characteristics, airway sealing properties, perioperative complications, and patient satisfaction, the study seeks to provide insights into the optimal choice of SAD for airway management in daycare surgeries.

METHODS
This randomized, prospective, single-blinded comparative study aimed to compare the efficacy of the Baska mask and I-Gel in adult patients undergoing minor and daycare surgeries. Institutional Ethical Committee clearance was obtained on 21/07/2022 (REF NO IEC/DMWIMS/JULY 2022-033), and the study was registered in the Clinical Trial Registry of India (CTRI Number: CTRI/2023/11/059853). The study was conducted in the Department of Anaesthesia, Dr. Moopen's Medical College, Wayanad.

The study included patients aged 18 to 60 years, classified as ASA class I or II, scheduled for elective day care surgeries at Dr. Moopen's Medical College, Wayanad. The study spanned from July 2022 to February 2024. Based on the article "Comparison of the Baska mask and the I-Gel supraglottic airway devices in patients undergoing elective surgery" by Thanesh Kumar Sinasamy, with a mean peak airway pressure of 12.7±1.8 for Baska Mask and 11.5±2.2 for I-Gel, the minimum required sample per group was determined to be 44, totalling 88 patients.

Inclusion Criteria were patients scheduled for elective day care surgeries, age 18 to 60 years, ASA class I-II. BMI less than 35 kg/m² and no relevant allergies. Exclusion Criteria were emergency surgeries, Neck pathology, dental and oral deformity, previous or anticipated upper airway or upper GI tract issues, predicted or documented difficult airway, pregnancy and increased risk for gastric aspiration. Included procedures were fibroadenoma excision, abscess I&D, lymph node biopsy, keloid and lipoma excisions, lacerated wound suturing, D&C, cervical cerclage, tubectomy, hysteroscopy, and laparoscopic sterilization.

Eligible patients were randomized into two groups using computer-generated randomization: Group Baska mask (n=44) and Group I-Gel (n=44). Randomization was concealed in sealed envelopes. Device insertions were performed by experienced anaesthesiologists, with the investigator anaesthesiologist blinded to the study group. All procedures were conducted with the patient's head in a neutral position.

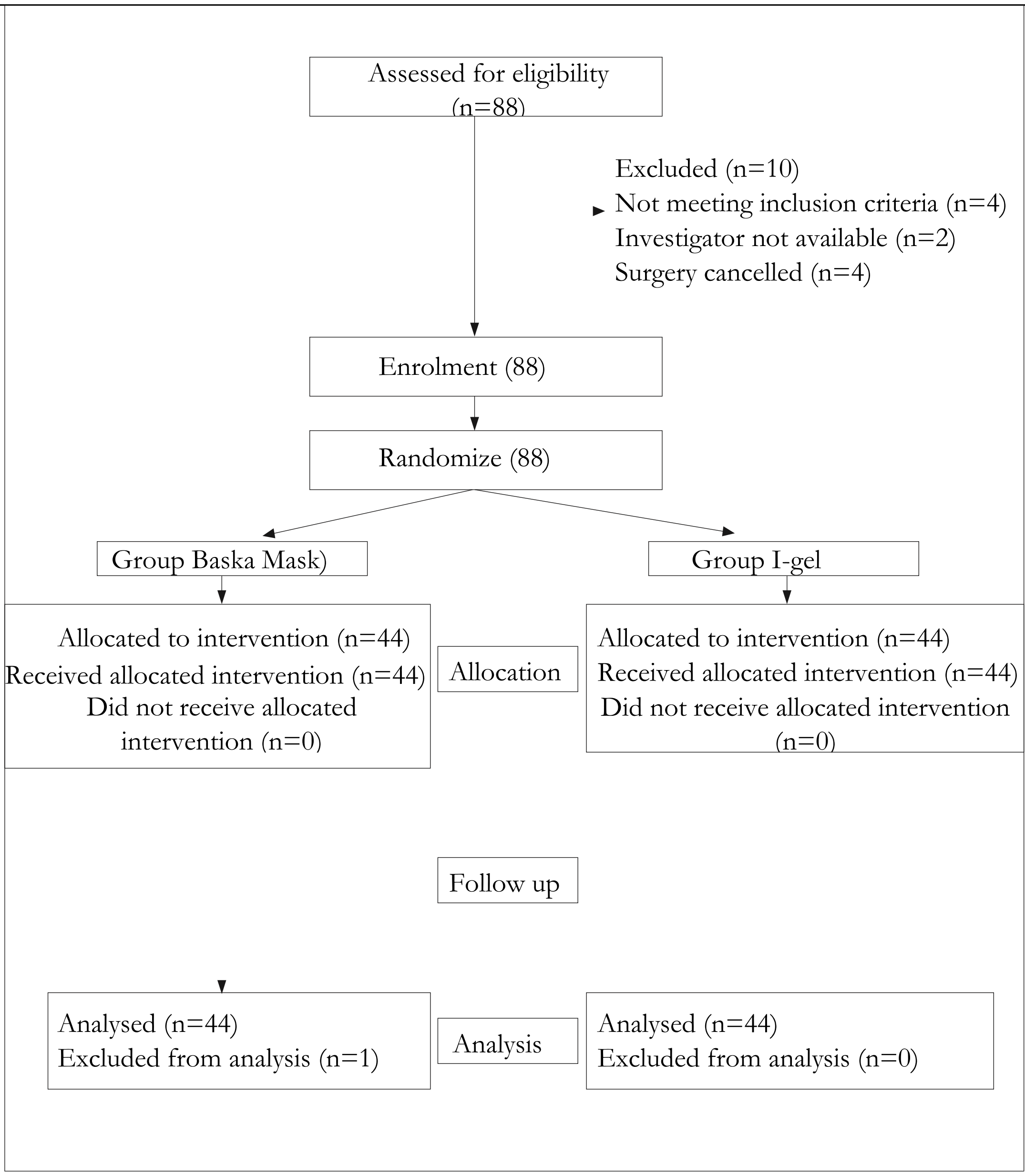

Figure 1. Consort flow chart

Patients were premedicated with IV midazolam (0.02 mg/kg) and glycopyrrolate (4 mcg/kg). Anaesthesia was induced with propofol (2 mg/kg) and fentanyl (1 mcg/kg) and maintained with 2% sevoflurane. Devices were lubricated and inserted per manufacturer's instructions. Correct placement was confirmed by bilateral chest expansion and a satisfactory end-tidal CO_2 waveform. Hemodynamic parameters (heart rate, systolic, diastolic, and mean arterial pressure, and oxygen saturation) were monitored at baseline, 1-, 3-, 5-, and 6-minutes post-insertion. Peak airway pressure (PAP), insertion time, and ease of insertion were recorded. Oropharyngeal leak pressure (OLP) was measured 5 minutes after insertion by increasing airway pressure with a maximum limit of 40 cm H_2O.

All patients received 1 g of IV paracetamol intraoperatively. Postoperative pain was managed per institutional protocol. Patients were monitored in the recovery bay, and complications like sore throat, dysphonia, and dysphagia were assessed. Complications such as tooth, gum, or tongue injury, blood staining on the SAD, and postoperative nausea or vomiting (PONV) were documented. Intraoperative and postoperative hemodynamic stability, oxygen desaturation, regurgitation, or aspiration were monitored. Any failure in device placement required endotracheal intubation.

Qualitative factors were represented with frequencies and percentages, while quantitative parameters were expressed as means and standard deviations. Independent samples t-test and Chi-square test were used for comparison. Data were analyzed using SPSS version 19.0, with p-values <0.05 considered significant.

Approval was obtained from the Institutional Ethics Committee, and written informed consent was collected from all participants. Participants could withdraw at any time without affecting their routine care. No additional costs were incurred by the patients or the institution.

Data were collected and stored using SPSS version 26.0 software, ensuring confidentiality and adherence to ethical standards throughout the study period from July 2022 to February 2024.

RESULTS

The data reveal significant associations between supraglottic airway device (SAD) types, specifically I-Gel and Baska mask, across various metrics. Baska masks show higher ease of insertion ratings (Chi-square = 33.83, $p < 0.001$), often requiring fewer attempts (Chi-square = 57.38, $p < 0.001$). Insertion durations significantly differ ($p < 0.001$), with Baska mask having longer durations. Oropharyngeal leak pressure is higher in Baska masks (23.802 cm H_2O) compared to I-Gel (22.673 cm H_2O), with a p-value < 0.001. Airway sealing pressures also favor Baska masks (27.91 mm Hg vs. 24.11 mm Hg, $p = 0.001$). Peak airway pressure is lower in I-Gel (11.57) than Baska mask (12.59, $p = 0.002$), but tidal volumes are similar between devices. Systolic and diastolic blood pressures show no significant differences across intervals. Heart rates post-insertion is slightly higher with Baska masks ($p = 0.047$), but not at other times. SpO2 is significantly different at several intervals, favoring both devices at different times. Complications such as displacement, dysphagia, blood staining, and sore throat occur more frequently with I-Gel, with significant p-values, while hoarseness shows no significant difference between devices.

Parameters	BASKA MASK(n=44)	I-GEL(n=44)	P value
Ease of insertion			0.29
Difficult	3	6	
Easy	41	38	
Number of attempts			0.001
First attempt	31	1	
Two attempts	9	26	
More than 2 attempts		17	
Failure of insertion	4	4	1
Airway sealing pressure (cm H2O)	27.91+/-1.344	24.11+/-1.401	<0.001
Peak airway pressure (cm H2O)	12.59+/-1.85	11.57+/-1.11	0.002
Oropharyngeal leak pressure (cm H2O)			<0.001
Inspiratory tidal volume(ml)	455.77+/-32.02	452.80+/-32.16	0.674
Expired tidal volume(ml)	456.41+/-27.97	432.20+/-26.87	0.324

Table 1. Ease of insertion, Device insertion attempts, airway sealing pressure, oropharyngeal leak pressure, peak airway pressure, inspiratory and expired tidal volume

Parameter	Type of SAD	N	Mean	Std. Deviation	P value
Systolic BP					
During SAD inse	I-GEL	44	118.86	10.165	0.06
During SAD inse	BASKA MASK	44	115	9.022	
Systolic BP					
After SAD inser	I-GEL	44	117.73	11.587	0.61
After SAD inser	BASKA MASK	44	118.86	9.205	
Systolic BP					
Intraoperative	I-GEL	44	122.27	12.174	0.72
Intraoperative	BASKA MASK	44	121.36	10.695	
Systolic BP					
After removal c	I-GEL	44	119.55	11.999	0.75
After removal c	BASKA MASK	44	120.23	8.209	
Systolic BP					
Postoperative	I-GEL	44	120.68	12.831	0.27
Postoperative	BASKA MASK	44	123.41	10.553	
Diastolic BP					
During SAD inse	I-GEL	44	76.14	4.925	0.15
During SAD inse	BASKA MASK	44	74.55	5.479	
Diastolic BP					
After SAD inser	I-GEL	44	75.23	5.053	0.69
After SAD inser	BASKA MASK	44	75.68	5.866	
Diastolic BP					
Intraoperative	I-GEL	44	75.91	4.974	0.33
Intraoperative	BASKA MASK	44	77.05	5.937	
Diastolic BP					
After removal c	I-GEL	44	75.68	5.011	0.84
After removal c	BASKA MASK	44	75.45	5.888	
Diastolic BP					
Postoperative	I-GEL	44	75.45	6.271	0.75
Postoperative	BASKA MASK	44	75.91	6.928	

Table 2: Comparison of mean systolic and diastolic BP at different time intervals

Complications		BASKA MASK(n==44)	I-Gel(n==44)	P value
Displacement	Absent	43	37	0.026
	Present	1	7	
Dysphagia	Absent	6	37	0.001
	Present	32	7	
Blood staining	Absent	41	34	0.035
	Present	3	10	
Sore throat	Absent	42	34	0.013
	Present	2	10	
Hoarseness of voice	Absent	41	37	0.179
	Present	3	7	

Table 3: Comparison of complications: displacement, dysphagia, blood staining, sore throat, hoarseness of voice

These findings suggest that Baska masks may be preferable in terms of insertion ease, leak pressure, and sealing efficacy, though complication rates and specific conditions might influence device choice.

DISCUSSION

The study examined various aspects of supraglottic airway devices (SADs), comparing the Baska mask and I-Gel.

Baska masks were found easier to insert than I-Gel, aligning with research by N.A.R. El-Refai (2018),[16] Usha Kumari Chaudhary (2018),[17] and Thanesh Kumar Sinasamy (2020).[18] However, patient anatomy and clinician experience are critical factors to consider. The study showed a higher success rate for first-attempt insertions with Baska masks, consistent with findings by El-Refai (2018),[16] So Ron Choi (2019),[15] and Sinasamy (2020),[18] suggesting greater reliability with Baska mask. Baska masks generally required longer insertion times compared to I-Gel, as reported by Chaudhary (2018),[17] El-Refai (2018),[16] and Choi (2019),[15] highlighting the need to consider procedural efficiency and patient comfort.

Baska masks were more effective in maintaining airway seals, which contrasts with findings by Sachidananda et al., Ayisha Mohammed Imam Ghori (2023),[19] and Nidhi Agarwal (2021).[20] Differences may stem from device design and study protocols. Higher mean OLP was found with Baska masks, consistent with Chaudhary (2018) and Choi (2019).[15] However, Sinasamy (2020)[18] reported higher OLP values with I-Gel, possibly due to different study methodologies and patient characteristics. Lower mean peak airway pressure was noted with I-Gel, aligning with Xue et al. (2022)[21] and Keller et al. (2023),[22] which can be beneficial for patients with compromised pulmonary function.

Both devices showed similar mean inspiratory tidal volumes, consistent with Sinasamy (2020),[18] indicating both are effective in delivering adequate tidal volumes during ventilation. Similar mean expired tidal volumes were observed, though previous studies reported variations in EtCO2 levels. Discrepancies may arise from differences in study populations and methodologies.

Similar intraoperative blood pressure readings between Baska mask and I-Gel suggest comparable effects on intraoperative blood pressure control, supported by findings from Sachidananda (2019)[11] and Imam Ghori (2023).[19] These results indicate that both SADs maintain hemodynamic stability during anaesthesia. Intraoperative blood pressure control can be influenced by various factors beyond the type of airway management device, such as patient characteristics, surgical procedures, anaesthetic agents, and fluid management strategies.

Similar postoperative blood pressure readings between the two SADs indicate comparable effects on postoperative blood pressure control, consistent with Sachidananda (2019)[11] and Imam Ghori (2023).[19] Stable postoperative blood pressure is crucial for patient recovery and reducing complications. These findings suggest that the choice of SAD does not significantly impact postoperative blood pressure control. Postoperative blood pressure can be influenced by factors such as residual effects of anaesthesia, pain management, fluid status, patient comorbidities, and surgical factors.

Lower mean heart rate during I-Gel use compared to Baska Masks, as observed in the study and supported by Sachidananda (2019),[11] Imam Ghori (2023),[19] and Kachakayala (2019),[23] suggests a more favorable hemodynamic response with I-Gel. Differences in SAD design and airway sealing mechanisms may influence sympathetic nervous system stimulation, affecting heart rate responses. The I-Gel's soft, gel-like cuff design may provide a more comfortable fit compared to the Baska Mask's inflatable cuff design. Lower post-use heart rates with I-Gel suggest potential benefits in promoting postoperative hemodynamic stability and patient comfort. The softer, gel-like cuff design of I-Gel may provide a more anatomical and less stimulating fit, leading to lower sympathetic activation and heart rate responses.

Higher incidence of postoperative dysphagia with Baska masks compared to I-Gel was observed, consistent with El-Refai (2018),[16] Chaudhary (2018),[17] Choi (2019)[15] and Sinasamy (2020).[11] Differences in mask design, material composition, and cuff inflation pressure may contribute to these discrepancies. Higher incidence of blood staining complications with I-Gel compared to Baska masks suggests a difference in propensity for mucosal trauma or minor bleeding during insertion or removal. Differences in design and material composition may contribute to these findings. Higher incidence of sore throat with I-Gel compared to Baska masks aligns with El-Refai (2018).[16] Sore throat is often attributed to mucosal trauma or irritation during insertion, manipulation, or removal of the device. Differences in SAD design, cuff properties, and material composition may influence the likelihood of mucosal trauma. Similar incidence of hoarseness between I-Gel and Baska masks suggests comparable occurrences of this complication.

Despite potential differences in design and properties, both SADs are designed to minimize trauma to surrounding tissues. The comprehensive comparison of Baska mask and I-Gel highlights the importance of considering multiple factors, including ease of insertion, success rates, insertion durations, airway sealing pressures, oropharyngeal leak pressures, peak airway pressures, tidal volumes, and hemodynamic responses. These findings provide valuable insights for clinicians in selecting the most appropriate SAD based on individual patient needs and clinical scenarios.[15]

Study Limitations

The study's small sample size (44 patients per SAD) and single-center design limit generalizability. Selection biases and the non-standardized proficiency of clinicians may affect results. Findings are specific to adult daycare surgeries under general anaesthesia and might not apply to other settings. Additionally, technological advancements or variations in SAD versions used were not accounted for, potentially influencing outcomes.

CONCLUSION

The analysis comparing I-gel and Baska mask supraglottic airway devices (SADs) reveals that there is no significant difference in age, sex, or height distribution. Baska masks demonstrate higher ease of insertion, longer duration of insertion, higher airway sealing, and oropharyngeal leak pressures. I-gel devices show lower peak airway pressures and higher incidences of displacement, blood staining, and sore throat, but no significant difference in hoarseness. Physiological measurements and ASA status show no significant differences between the devices.

Ethics Committee Approval

Ethics committee approval was received for this study from the ethics committee of Dr Moopen's Medical College (Approval number (IEC/DMWIMS/JULY 2022-033)

Informed Consent

Written informed consent was obtained from patients who participated in this study.

Peer-review

Externally peer-reviewed.

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Conflict of Interest

The authors have no conflicts of interest to declare.

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