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Research Article

A comparative study between i-gel and classical laryngeal mask airway in elective surgery under general anaesthesia

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ABSTRACT

Background: Supraglottic airway devices have been widely used as an alternative to tracheal intubation during general anesthesia both in adults and children. This study was carried out to compare classical laryngeal mask airway (LMA) and i-gel, regarding ease of insertion, adequate placement of device, ability to maintain $ETCO_2$ and SPO_2, perioperative hemodynamic parameters and intra operative and postoperative complication.
Methods: This prospective, randomized clinical study was done on 100 patients of either sex, age between 5 to 60 years, ASA grade I-III who underwent different surgical procedures under general anesthesia in supine position. After giving premedication, induction of anesthesia was done with inj. Propofol 2-3 mg/kg and inj. Succnylcoline 1.5-2 mg/kg. In "sniffing air" position, airway was secured with either LMA or i-gel. An effective placement of device was checked by a square wave capnography, normal chest expansion, SPO_2 >95%, and absence of audible leak. Patients were observed for time and ease of insertion, number of attempts, perioperative hemodynamic changes and complications.
Results: No statistically significant difference was reported between both the groups, regarding heart rate, BP, SPO_2 and $ETCO_2$. Duration of insertion was more in group LMA. Insertion was easy and was possible in first attempt in 88% of patients without much manipulation in group i-gel.
Conclusions: I-gel is a better alternative supraglottic airway device than LMA in view of ease of insertion with minimal manipulations and minimal complications. Hemodynamic parameters, SPO_2 and $ETCO_2$ were maintained in both the groups.

Keywords: Classical LMA, I-gel, Supraglottic airway devices, Hemodynamic comparison

INTRODUCTION

The approach of airway has evolved greatly in recent times since development of endotracheal intubation by Mc Evan in 1880 to present day use of modern supraglottic airway. The tracheal intubation requires skill and continuous training and practice and usually requires direct laryngoscopy, which may cause laryngopharyngeal lesions. It also produces reflex sympathetic stimulation and is associated with raised levels of plasma catecholamine, hypertension, tachycardia and myocardial ischemia, depression of myocardial contractility, ventricular arrhythmias and intracranial hypertension.[1]

Supraglottic airway devices have been widely used as an alternative to tracheal intubation during general anaesthesia both in adults and children. The first successful supraglottic airway device – laryngeal mask airway (LMA) classic, an inflatable supraglottic airway device became available in 1981.[2] I-gel is the most recent development in supraglottic airway devices. It is made of

a medical grade thermoplastic elastomer which is soft gel like and transparent. I-gel is designed to create a non-inflatable anatomical seal of the pharyngeal, laryngeal and perilaryngeal structures. I-gel has several advantages including cheaper, easier insertion, minimal risk of tissue compression and stability after insertion.[3]

The limitations of cLMA are demand for careful handling to prevent cuff damage, relative difficulty of insertion, compression and trauma to the tissues in the vicinity, risk of pulmonary aspiration of regurgitated matter and controlled ventilation is not always possible due to the moderate pharyngeal seal.[4]

Present study was designed to compare supraglottic airway devices cLMA and i-gel for evaluation of easiness of insertion of the device, adequate placement of device, ability to maintain $ETCO_2$ and SPO_2, perioperative hemodynamic parameters, intra operative and post operative complications.

METHODS

After ethical committee approval, randomised prospective study was conducted to compare supraglottic airway devices classical LMA and i-gel. Study included 100 patients of either sex, age between 5 to 60 years, weight 11-70 kgs and ASA grade I, II and III undergoing various elective surgical procedures under general anaesthesia.

Patients with ASA grade IV and V, difficult intubation with surgery in prone or lateral position, full stomach patients and patients having hiatus hernia, pregnancy, neurosurgery and emergency surgeries have been excluded from the study.

After assessing all the patients standard monitored were applied including ECG, NIBP, SPO_2 and $ETCO_2$. According to the weight of patients both i-gel and cLMA were kept ready for all the patients. All the patients were premedicated with inj. Glycopyrrolate 0.004 mg/kg, inj. Ondansetron 0.15 mg/kg and inj. Fentanyl 2 µg/kg. Patients were preoxygenated for 3-5 minutes. Induction of anaesthesia was carried out using inj. Propofol 2-3 mg/kg and inj. Succnylcoline 1.5-2 mg/kg.

Once an adequate depth of anaesthesia was achieved, patients were given "sniffing air" position. Airway was secured with either LMA or i-gel. As per the device used patients were divided in two groups. Group LMA- airway secured by classical LMA. Group i-gel- airway secured by i-gel. In case of i-gel lubricated gastric tube was placed into the stomach through the gastric channel.

An effective placement of device in an airway was checked by a square wave capnography, normal chest expansion, SPO2 >95%, and absence of audible leak.

Various parameters observed were time to insert device, ease of insertion, number of attempts and failure of insertion and need to change of device, hemodynamic changes and complication during insertion and removal.

The device was connected to a Bain's circuit or JR circuit and anaesthesia was maintained using 50% oxygen, 50% nitrous oxide, Isoflurane/Sevoflurane and inj. Vecuronium bromide 0.06 mg/kg IV. After completion of surgery, neuro muscular blockage was reversed using IV inj. Glycopyrrolate 0.08 mg/kg and inj. Neostigmine 0.05 mg/kg. The device was taken out under deeper plane of anaesthesia, after deflating the cuff of cLMA and directly for i-gel.

Intraoperatively patients were watched for any complication like tachycardia or bradycardia, hypotension or hypertension, arrhythmias, hypercarbia, and fall in SPO_2. Postoperatively complications like cough, breath holding, and numbness of tongue, laryngospasm, presence of blood on devices, lip or dental injuries were noted.

For comparing data between two groups, unpaired T test was used and p value <0.05 calculated using graph pad software and interpreted as clinically significant.

RESULTS

Analysis of demographic data revealed that there was no statistically significant difference was observed between the groups in age, sex, weight, ASA grading and duration of surgery as given in Table 1.

Table 1: Demographic data.

Demographic Data		Group i-gel N=50 (%)	Group LMA N=50 (%)	P value
Age (years) Mean ± SD		22.01±14.92	20.21±16.85	0.580
Sex (%) Male : Female		30(60%):20(40%)	35(70%):15(30%)	0.401
Weight (Kg) Mean ± SD		43.57±18.15	40.54±19.31	0.440
ASA Grade (%)	ASA I	08(16%)	06(12%)	0.658
	ASA II	35(70%)	39(78%)	
	ASA III	07(14%)	05(10%)	
Duration of surgery (Minutes) Mean ± SD		37.2 ± 9.21	39.6 ± 7.27	0.151

No difference seen in types of surgeries in both groups as shown in Table 2.

Table 2: Types of surgery.

Surgery	Group i-gel	Group LMA
	N=50 (%)	N=50 (%)
Contractor Release and STG	12(24%)	17(34%)
Diagnostic scopy	05(10%)	03(6%)
Circumcision and Hypospadiasis Repair	10(20%)	04(8%)
Excision biopsy for Fibroadenoma	06(12%)	09(18%)
I&D, Debridement, Resuturing	14(28%)	13(26%)
Fistulectomy, Haemorrhoidectomy	03(6%)	04(8%)

Statistically significant difference observed in quality of insertion, attempt of insertion and insertion time between both the groups. It was easy to insert in first attempt with shorter duration and minimum manipulations were required in group i-gel as presented in Table 3.

No statistically significant difference was found in hemodynamic parameters in between both the groups as shown in Figure 1 and 2.

In group LMA complications like difficulty in removal of device, post extubation cough, numbness of tongue and blood on removed device were observed in higher percentage as in Table 4.

Table 3: Comparison between i-gel and LMA with respect to different parameters of insertion.

Parameters of Insertion of device		Group i-gel N=50 (%)	Group LMA N=50 (%)	P value
Quality of Insertion	Easy	44(88%)	32(64%)	0.009
	Difficult	06(12%)	18(36%)	
Attempt of Insertion	First	44(88%)	32(64%)	0.004
	Second	06(12%)	10(20%)	
	Third	00(00%)	18(16%)	
Insertion Time (Seconds)	Mean ± SD	53.1 ± 5.966	57.76 ± 9.817	0.005
Manipulation during insertion	Gentle pushing	01(2%)	10(20%)	
	Chin lift	01(2%)	05(10%)	
	Jaw thrust	04(8%)	03(6%)	

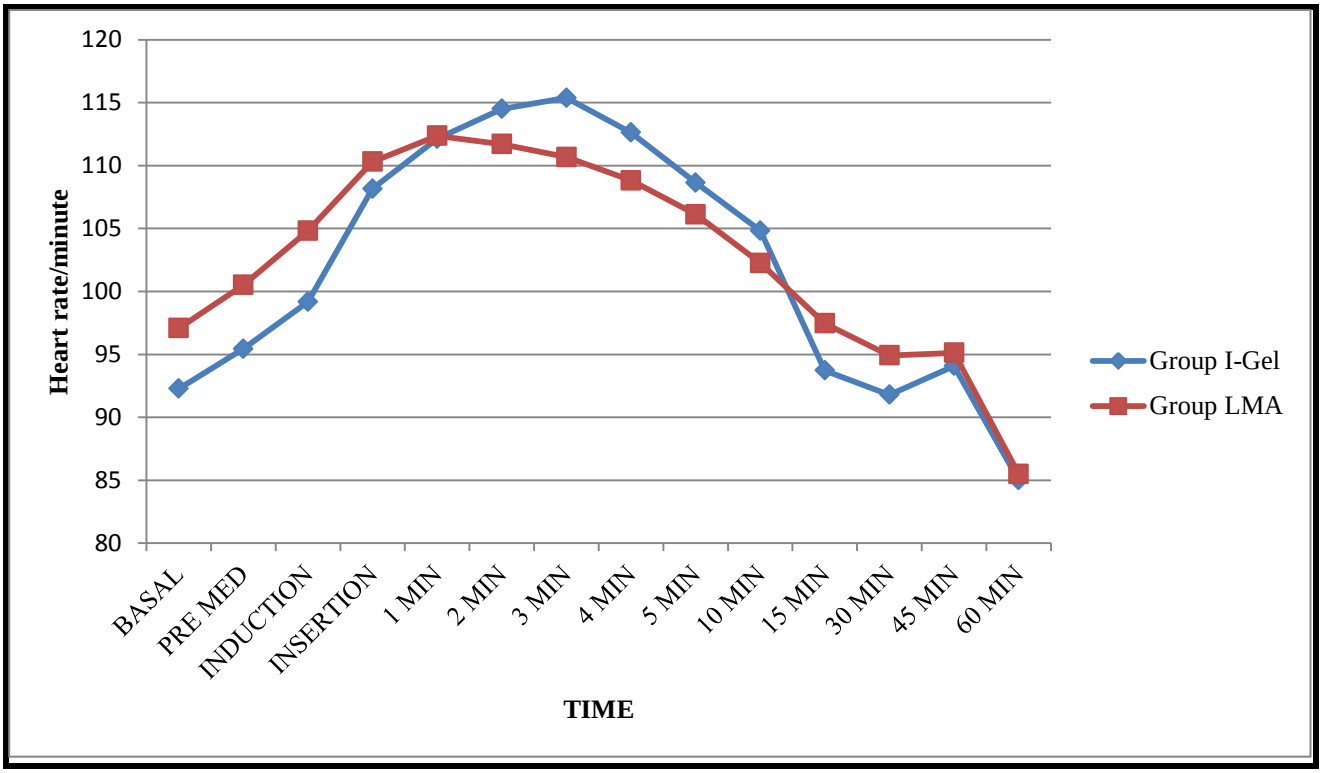

Figure 1: Perioperative mean heart rate changes.

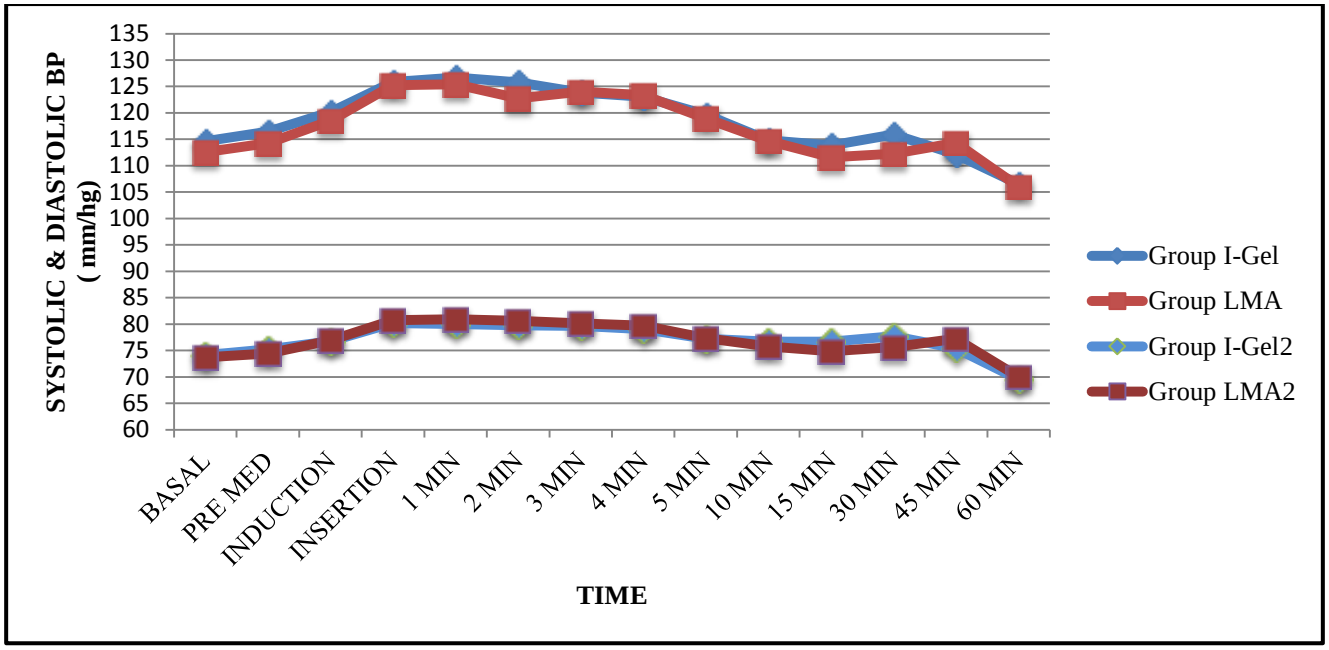

Figure 2: Perioperative systolic and diastolic BP changes.

Table 4: Perioperative complications.

Perioperative complications	Group i-gel	Group LMA
	No of Patients (%)	No of Patients (%)
Difficulty in Removal	10 (20%)	25 (50%)
Post Extubation Cough	05 (10%)	16 (32%)
Numbness Of Tongue	03 (6%)	09 (18%)
Presence Of Blood On device	05 (10%)	09 (18%)

DISCUSSION

Various types of supraglottic devices are widely used for securing and maintaining a patent airway for surgery requiring general anaesthesia and are alternative to tracheal intubation.

The advantages of the supraglottic airway devices include avoidance of tachycardia, hypertension response to laryngoscopy and intubation, less invasive for the respiratory tract, better tolerated by patients, increased ease of placement by inexperienced personnel, improved hemodynamic stability in emergence, less coughing and sore throat. The LMA a novel device is inserted blindly into the pharynx, forming a low-pressure seal around the laryngeal inlet and permitting gentle positive-pressure ventilation. It allows the administration of inhaled anaesthetic agents through a minimally stimulating airway.[4] I-gel is a new single use non inflatable supraglottic airway device. Its shape and contours accurately mirror the perilaryngeal anatomy to create the perfect fit. I-gel works in harmony with the patient's anatomy so that compression and displacement trauma are significantly reduced or eliminated.[3] Its drain tube allows access to the gastrointestinal tract and it is designed to reduce the risk of gastric inflation and regurgitation.[5] The bowl of i-gel has three dimensional structures that mirror to perilaryngeal anatomy. The small width and height of i-gel tip is intended to fit into the postcricoid cervical oesophagus just proximal to distal tip. The bowl enlarges slightly in width but more significantly in height.[6]

Levitan and Kinkle studied the positioning of i-gel in 65 non-embalmed cadavers using glidoscope video laryngoscope, block dissection of neck and neck radiographs in lateral view.[6] They found that the i-gel effectively conformed to the perilaryngeal anatomy despite the lack of an inflatable cuff and it consistently achieved proper positioning for supraglottic ventilation.

Keller et al and Lopez-Gil et al compared four tests for assessing oropharyngeal leak pressure with the LMA.[7] The tests were detection of audible noise over the mouth, audible noise on auscultation just lateral to the thyroid cartilage, detection of exhaled CO_2 by placing a gas sampling line inside the mouth and detection of a steady value airway pressure while occluding the expiratory valve of the circle system. They concluded that all four tests provide accurate and reliable information about oropharyngeal leak pressure in children.

In some study adequate placement of device was confirmed by gentle squeezing of reservoir bag, end tidal

CO_2 wave graph and chest movements, square wave capnography, thoraco abdominal movements, absence of audible leak, leak pressure >20 cm H_2O lack of gastric insufflations on ventilation and SPO_2.[8-13]

In present study adequate placement of device was confirmed by square wave capnography, adequate chest movements, end tidal CO_2 <40 mmHg and SPO_2 ≥95%. In our study device was inserted easily without any manipulation in 88% patients of group i-gel and 64% patients of group LMA. 12% patients of group i-gel and 36% patients of group LMA required manipulations in the form of gentle pushing chin lift and jaw thirst. Some of the earliest studies to evaluate the i-gel concluded that i-gel is easily and rapidly inserted.[13-15]

Studies comparing ease of insertion of i-gel and cLMA reported statistically significant easy insertion with I gel in normal patient and in contracture neck patients. Similarly Trivedi et al and Chauhan et al found i-gel airway was easier to insert with less attempt when compared to PLMA.[9,12,16,17] Das et al had observed higher number of manipulations to insert LMA than i-gel.[18]

In our study device was placed in first attempt in 88% patients of group i-gel compared to 64% of group LMA. In group LMA 12% patient required second attempt and 16% required third attempt. Mean insertion time for group i-gel was 53.1 ± 5.966 seconds while for group LMA it was 57.76 ± 9.817 seconds. Both the data were statistically significant (p=0.0050).

Study by Chauhan et al mentioned that in all patients i-gel or LMA was inserted within 3 attempts. Mean insertion time for the i-gel was significantly lower than LMA.[12]

Wharton et al evaluated the performance of i-gel supraglottic airway device in manikins and anesthetized patients. Their results suggest the i-gel is rapidly inserted in both manikins and patients by an inexperienced person and compares favourably to other supraglottic airways available.[5]

Successful insertion of PLMA and i-gel in the first attempt without statistically significant difference in insertion time was observed in study by Jeon et al.[11] Similar finding of successful insertion in first attempt were also observed in studies done by Das et al and Chen et al.[18,19]

In our study mean pulse rates, systolic and diastolic blood pressure, SpO_2 and $EtCO_2$ at all points of time interval were comparable and there was no statistically significant difference between the two groups with p value >0.05. Similar findings were observed by Helmy et al, Das et al, Chauhan et al in their study comparing LMA and i gel. Study done by Trivedi et al mentioned that i-gel produced fewer changes in Mean arterial pressure than PLMA.[12,15,17,18]

Uppal et al compare the i-gel with endotracheal tube. He found increase in heart rate, systolic and diastolic blood pressure with ETT than i-gel.[8] In our study i-gel was removed smoothly in 80% cases and LMA in 50% cases. Complications like coughing after removal of device, numbness of tongue, and presences of blood on device were found in higher percentage patients of group LMA.

With LMA blood staining of the devices, minor regurtation without aspiration, tongue, lip and dental trauma, numbness of tongue, nausea and vomiting major airway obstruction, sore throat and dysphagia were observed.[9,12,15,16,18,20]

CONCLUSION

Both the devices LMA and i-gel were tolerated well and a clear airway were maintained throughout the anaesthesia. I-gel is comparatively easier to insert than LMA. I-gel effectively confirms to the perilaryngeal anatomy despite of lack of inflatable cuff and it consistently achieves proper positioning for supraglottic ventilation. Further, there is minimal risk of tissue compression and trauma to the peripheral tissues with i-gel than LMA. I-gel is a better alternative supraglottic airway device than LMA in view of ease of insertion with minimal manipulations and minimal complications.

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REFERENCES

1. Gal TJ. Airway management. In: Miller RD, editor. Textbook of anaesthesia. 6th ed. Philadelphia: Elsevier; 2005: 1617–1652.
2. Brain AIJ. The laryngeal mask. A new concept in airway management. Br J Anaesthesia. 1983;55:801-5.
3. I -gel User Guide, 7th Edn. Wokingham, UK: Intersurgical Ltd, 2009. www.i-gel.com
4. LMA. Technical guideline and use in special situation. Iraqui Post Graduate Medical Journal. 2006;5(2).
5. Wharton NM, Gibbison B, Gabbott DA, Haslam GM, Muchatuta N, Cook TM. I-gel insertion by novices in manikins and patients. Anaesthesia. 2008;63:991–5.
6. Levitan RM, Kinkle WC. Initial anatomic investigations of the I-gel airway: a novel supraglottic airway without inflatable cuff. Anaesthesia. 2005;60:1022–6.
7. Keller C, Lopez Gil. Comparison of four methods for assessing oropharyngeal leak pressure with laryngeal mask airway in paediatric patients. Paediatric Anaesth. 2001;11(3):319-21.

8. Uppall V, Fletcher G, Kinsella J. Comparison of i-gel with cuffed tracheal tube in pressure controlled ventilation. Oxford Journal. 2008;102;264-8.
9. Singh I, Gupta M, Tandon M. Comparison of clinical performance of i‑gel with LMA Proseal in Elective surgeries. Indian J Anaesthesia. 2009;53:302−5.
10. Kini G, Devana GM, Mukkapati KR, Chaudhuri S, Thomas D. comparison of i-gel with procel LMA in adult patients undergoing surgical procedure under general anaesthesia. JOACP. 2014;30(2):182.
11. Jeon WJ, Cho SY, Beek SJ, Kim KH. Comparison of the Proseal LMA and intersurgical I-gel during gynaecological laparoscopy. Korean Journal. 2012;63(6):510-4.
12. Chauhan G, Nayar P, Seth A, Gupta K, Panwar M, Agrawal N. Comparison of clinical performance of the I-gel with LMA Proseal. Indian Journal of Anaesthesiology Clinical Pharmacology. 2013; 29(1):56-60.
13. Kannaujia A, Srivastava U, Saraswat N, Mishra A, Kumar A, Saxena S. A preliminary study of I-gel: A new supraglottic airway device. Indian J Anaesth. 2009;53:52-6.
14. Richez B, Saltel L, Banchereau F. A new single use supraglottic airway device with a non inflatable cuff and an esophageal vent: an observational study of the I-gel. Anaesthesia and Analgesia. 2008;106:1137–9.
15. Helmy AM, Atef HM, El-Taher EM, Henidak AM. Comparative study between i-gel and lma in anaesthetized spontaneously ventilating patients. SJA. 2010;4(3):131-6.
16. Singh J, Yadav MK, Marahatta SB, Shrestha B. IJA. 2012;6(4):348-52.
17. Trivedi V, Patil B. A Clinical Comparative Study Of Evaluation Of Proseal LMA V/S I-GEL For Ease Of Insertion And Hemodynamic Stability: A Study Of 60 Cases. The Internet Journal of Anaesthesiology. 2009;27(2):1-7.
18. Das B, Mitra S, Samanta A, Vijay BS. Comparison of i‑gel supraglottic device with classic laryngeal mask airway in anesthetized paralyzed children undergoing elective surgery Anaesthesia. Essays and Researches. 2012;6(2):180-3.
19. Chen X, Jiao J, Cong X, Liu L, Wu X. Comparasion of i-gel vs. LMA. Plos One. 2013;8(8):71910.
20. Cook TM, Gibbison B. Analysis of 1000 consecutive uses of the ProSeal laryngeal mask airway by one anaesthetist at a district general hospital. British Journal of Anaesthesia. 2007;99(3):436–9.

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