

# A Comparative Study Between Two Supraglottic Airway Devices: I Gel Vs Classic Laryngeal Mask Airway

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## ABSTRACT

**Objective:** During general anesthesia, in case of adults and children, supraglottic airway devices are good alternate to securing airway than tracheal intubation. This case study aimed at comparison between classical laryngeal mask airway (LMA) and modern i-gel with respect to adequate placement, ease of insertion of device, maintaining of parameters like ETCO<sub>2</sub> and SPO<sub>2</sub>, intra operative and postoperative complication point of view.

**Study Design:** Comparative Study

**Place and Duration of Study:** This study was conducted at the Department of Anaesthesia DHQ Teaching Hospital, Sargodha from September 2019 to February 2020.

**Materials and Methods:** There was selection of 120 patients in this randomized clinical trial from age ranged from 5 to 60 years of either sex and from ASA grading ranged from I-III. These all patients were operated in supine position under general anesthesia. Anesthesia was induced to all these patients after receiving premedication. Agents that were used in anesthesia were primarily, inj. Succinylcholine 1.5-2mg/kg and inj. Propofol 2-3 mg/kg. Patient's airway was secured with either classical LMA or i-gel in 'sniffing air' position. The device placement was monitored by normal chest expansion, by square wave capnography, absence of audible leak and SPO<sub>2</sub> >95%. The patients were checked keeping in view the parameters like number of attempts, ease of insertion, time utilized in insertion, hemodynamic changes preoperatively and complication involved intraoperatively as well as postoperatively

**Results:** Statistically, no significant difference was seen in patients of both the groups with respect to BP, SPO<sub>2</sub> ETCO<sub>2</sub> and heart rate, however it was observed that insertion time was greater in group classical LMA as compared to group i-gel.

**Conclusion:** I-gel is regarded as better and good alternative replacement device to LMA as its insertion is way easy, along with minimal complications intraoperatively as well as post operatively.

**Key Words:** I-gel, LMA, advantages, disadvantages.

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## INTRODUCTION

Endotracheal intubation was invented by Mc Evan in 1880, which was a great invention of past regarding airway management. It was a great revolutionary invention that led to the development of supraglottic airway approach. The highly professional skill and continuous training is required for proper tracheal intubation.

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In tracheal intubation, laryngoscopy is done directly that might lead to laryngopharyngeal lesions. Tracheal intubation can cause hypertension, raise in plasma catecholamine, generate reflex sympathetic stimulation, ventricular arrhythmias and finally can cause intracranial hypertension.<sup>1</sup>

Due to multiple disadvantages of tracheal intubation, we can use device such as supraglottic airway in order to maintain the airway during anesthesia to children and adults. During the year 1981, laryngeal mask airway (LMA) that was inflatable used.<sup>2</sup> Now a day, the modern supraglottic airway device i-gel is also available. The composition of i-gel consists of transparent soft gel like material with non-inflatable cuff.

The structure and design of making of i gel is such that it makes anatomical non inflatable seals of structures such as perilaryngeal, pharyngeal and laryngeal tissue. There are numerous advantages of i-gel such as easier insertion, lasting stability, low risk of compression of tissues and low price wise.<sup>3</sup>

The classic LMA has many disadvantages and it is inferior as compared to i-gel in a way that classic LMA

has difficult insertion method, its handling is way too tough, possibilities of tissue injuries, controlled ventilation and pulmonary aspiration risk always there while using c LMA.<sup>4</sup>

This case study was classically developed in order to make comparisons between both airway devices namely c LMA and i-gel. The complete evaluation, comparison and assessment was done to judge for hemodynamic parameters, intra operative and postoperative complications, insertion complications and ability of both devices to maintain ETCO<sub>2</sub> and SPO<sub>2</sub>,

## MATERIALS AND METHODS

A randomized study was conducted after taken approval from ethical committee in order to make comparison between two airway devices namely, classical LMA and i-gel. In this study, there was involvement of 120 patients that can be either male or female, with age ranged from 6 to 65 years and weight varied from 10-75 kgs and ASA grading ranged from i, ii and iii going under general anesthesia for their various surgical procedures.

The few patients were excluded from study such as patients with pregnancy, full stomach, hiatus hernia, neurosurgery, emergency patients and patients that were labeled with ASA grade iv.

The complete preoperative assessment of patients were done before the surgery. Both the devices, i-gel and c LMA were readily available depending on patients weight. Patients who participated in this case study were given injections of ondansetron 0.15 mg/kg and glycopyrrolate 0.004 mg/kg preoperatively. Oxygen was given to patients for about 3 minutes as preoxygenation. All essential monitoring such as blood pressure, pulse rate, electrocardiogram and oxygen saturation were applied on all patients. Anesthesia induction was done using inj. succinylcholine 1.5-2 mg/kg and inj. propofol 2-3 mg/kg.

After achieving required anesthetic state patients were positioned in “sniffing air” position then the airway was maintained using i-gel or c LMA. So on basis of which airway device was used, we grouped patients in two categories named group i-gel and group c LMA. In group i-gel patients airway was rescued using i gel while in group c LMA, patient airway was saved using c LMA. In group i gel, gastric tube that was well lubricated was channelized via gastric channel into stomach

In order to check proper placement of airway device, we used parameters like SPO<sub>2</sub> >95%, absence of audible leak, square wave capnography and normal expansion of chest.

There were few specific things that were noticed that include time taken for device insertion, number of failures and attempts to made device fix successfully, how comfortably device can be placed complications and difficulties during removal n insertion of device

and hemodynamic changes.

Breathing circuit of anesthesia machine was attached to these airway devices. The anesthesia of patients was achieved using 50% nitrous oxide, 50% oxygen, intravenous injection of atracurium 0.5 mg/kg and isoflurane. At the end of surgical procedures there was reversal of neuro muscular blocking agent by use of inj. glycopyrrolate 0.08 mg/kg intravenously along with the dose of inj. neostigmine 0.05 mg/kg. In the end airway device was removed after attaining adequate tidal volume.

All the patients that underwent surgery were observed for complications such as hypertension/hypotension, tachycardia/ bradycardia, hypercarbia. After the operation the patients were examined for symptoms like cough, tongue numbness, breath holding, spasm of larynx, dental injuries, lip injuries and presence of blood on devices.

Complete data analysis were done by using unpaired t test was done and also p value <0.05 was taken into account by using the graph pad software and after that analyzed either significant or not.

## RESULTS

After the observation of complete data, we came to the conclusion that there was not any statistically significant difference between the two groups regarding demographic data such as age, sex, weight, duration of surgery and ASA grading. This is shown in table 1.

**Table No.1: Demographic data**

Demographic Data		Group i-gel N=60 (%)	Group LMA N=60 (%)	P value
Age (years) Mean ± SD		21.09±15.0	21.19±17.90	0.579
Sex(%):	Male	42(70%):18	45(75%):15	0.501
	Female	(30%)	(25%)	
Weight (Kg) Mean ± SD		44.60±19.10	40.54±19.31	0.440
ASA: Grade(%)	ASA-I	09(15%)	09(15%)	0.667
	ASAI	40(66.6%)	45(75%)	
	ASA III	11(18.4%)	06(10%)	
Duration of Surgery (Minutes) Mean ± SD		40.1 ± 8.11	42.2 ± 6.16	0.161

There was no difference regarding types of surgeries either by use of c LAM or i-gel (table 2).

In patients of both groups, there was statistically significant difference with respect to efforts for insertion, attempts in making insertion, and time taken during insertion for both c LMA and i-gel. However, i-gel seemed to be superior with respect to parameters like easy insertion and less efforts involved as compared to c LM. This comparison is shown in table 3.

**Table No.2: Types of surgery**

Surgery	Group i-gel	Group LMA
	N=60(%)	N=60(%)
Contractor Release and STG	18(30%)	21(35%)
Diagnostic scopy	06(10%)	06(10%)
Circumcision and Hypospadiasis Repair	12(20%)	05(8.3%)
Excision biopsy for Fibroadenoma	06(10%)	09(15%)
I&D, Debridement, Resuturing	12(20%)	13(21.7%)
Fistulectomy, Haemorrhoidectomy	06(10%)	06(10%)

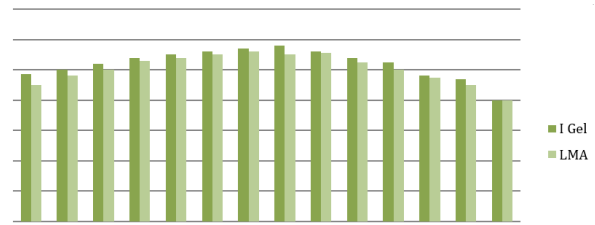
As far as parameters like hemodynamic were concerned, there was no statistically significant difference was seen in patients of both groups using i-gel or c LMA as shown in figure 1 and 2.

**Table No.3: Comparison between i-gel and LMA with respect to different parameters of insertion**

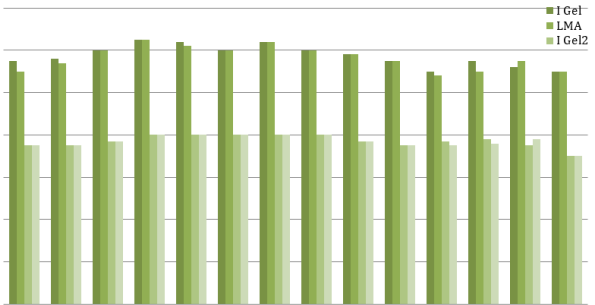
Parameters of Insertion of device		Group i-gel N=60 (%)	Group LMA N=60 (%)	P value
Quality of Insertion	Easy	51(85%)	42(70%)	0.008
	Difficult	09(15%)	18(30%)	
Attempt of Insertion	First	54(90%)	38(63.4%)	0.005
	Second	05(8.4%)	12(20%)	
	Third	01(1.6%)	10(16.6%)	
Insertion Time (Seconds) Mean ± SD		51.9 ± 6.001	56.98 ± 9.921	0.004
Manipulation	Gentle pushing	02(3.4%)	12(20%)	
	Chin lift	01(1.6%)	08(13.4%)	
During insertion		03(5%)	05(8.3%)	

**Table No.4: Perioperative complications**

Perioperative complications	Group i-gel	Group LMA
	No of Patients (%)	No of patients (%)
Difficulty in Removal	12 (20%)	30 (50%)
Post Extubation Cough	06 (10%)	18 (30%)
Numbness Of Tongue	03 (6%)	09 (15%)
Presence Of Blood On device	06 (10%)	10 (17%)



**Figure No.1: Preoperative systolic and diastolic BP changes**



**Figure No.2: Preoperative mean heart rate changes**

In patients who were in c LMA group during surgery, post-operative complications like cough, difficulty in removal of device, blood on removed device and tongue numbness was witnessed in greater percentage as compare to i-gel as clearly demonstrated in table 4.

## DISCUSSION

Now days, there are various supraglottic devices are available for maintaining patients airway during general anesthesia. These supraglottic devices are far much superior as compared to conventional endotracheal tubes.

There are numerous benefits of these supraglottic devices as compared to tracheal intubation such as easy insertion, avoidance of tachycardia, hypertension, better acceptance by patients, better hemodynamic parameters stability, less incidence of sore throat and cough. Moreover, supraglottic devices fit directly over peripharyngeal seal to have perfect fit. The supraglottic device c LMA, can be blindly put into pharynx that forms seal of low pressure around the larynx and in return permit positive pressure ventilation. c LMA permits anesthetic agents inhalation with decrease in airway stimulation.<sup>4</sup> i-gel is modern discovery and superior to c LMA in a sense that it is non-inflatable supraglottic airway device for maintaining respiratory airway. While using i-gel there is minimal risk of trauma of peripheral tissues as it fits with patients airway anatomy completely.<sup>3</sup> i-gel has tube that allows anesthetists to have access to gastrointestinal tract without any risk of regurgitation and gastric inflation.<sup>5</sup>

In about 65 non-embalmed cadavers, Kinkle and Levitan worked on i-gel positioning with the help of video laryngoscope, radiographs of necks especially

in lateral section view and neck block dissection.<sup>6</sup> They were surprised to find that i-gel sits perfectly over anatomy of perilaryngeal although it has no inflatable cuff. Moreover, it attains proper position with respect to supraglottic ventilation.

Lopez-Gil et al and Keller performed four different tests to access the oropharyngeal leak pressure using c LMA.<sup>7</sup> The assessment was done to test the audibility of noise over auscultation on the lateral side of thyroid cartilage, the audibility of noise over mouth, exhaled Co2 detection by placement of gas sampling line inside oral cavity and finally the assessment of airway during respiratory valve occlude. These all four test help in a great way in assessment of leak oropharyngeal pressure assessment in young children.

In some research, the placement of device was sure by Square wave capnography, chest movements, absence of audible leak, thoraco abdominal movements, lack of gastric insufflations on ventilation and leak pressure  $>20 \text{ cm H}_2\text{O}$ .<sup>8-13</sup>

In our current research, the position of airway device was confirmed by parameters like adequate chest movements,  $\text{SPO}_2 \geq 95\%$  and square wave capnography. The placement of device was done effortlessly in 88% patients using i-gel while 64% of the patients using c LMA. The manipulations required in placement of I gel was in 12% patients while in 36% patients using c LMA. These manipulations include jaw thrust and chin lift. Some studies done earlier in older times showed that placement of I gel is much more easy as compared to c LMA.<sup>13-15</sup>

In many studies while comparing insertion of i-gel and c LMA, we came to know that insertion of i-gel was far easy as compared to c LMA in patients with neck contracture and as well as in normal patients. Moreover, similar study was performed by Chauhan et al and Trivedi et al with respect to insertion of i-gel and c LMA and found similar results i.e i-gel was easy to inset as compared to c LMA.<sup>9,12,16,17</sup> Moreover, Das et al did similar study and came to conclusion that i-gel insertion involve less manipulations as compared to c LMA.<sup>18</sup>

In our current research i-gel was placed successfully in 85% patients while c LMA percentage was 75%. In group of patients that were given c LMA, about 12% of patient needed second attempt and 10% needed third. When mean insertion time was calculated for i-gel and c LMA, it came out to be  $51.9 \pm 6.001$  seconds and  $56.98 \pm 9.921$  seconds, respectively. Data collected from both groups was considered statistically significant regarding insertion times ( $p=0.0050$ ).

Various studies were reported by Chauhan et al that clearly reported that whether its i-gel or c LMA, almost both devices took 3 attempts for successful insertion. When mean insertion time was calculated, i-gel showed significantly lowered mean t insertion time as compared to c LMA.<sup>12</sup>

Another researcher, Wharton et al tested and evaluated the efficacy of i-gel in anesthetized patients and manikins and came to the conclusion that i-gel can be inserted easily and effortlessly into patients airway in both anesthetized and manikins even by inexperienced person as compared to other options of supraglottic airways available.<sup>5</sup>

A case study was performed by Jeon et al observed the attempts made for insertion of c LMA and i-gel. They found that no statistically significant difference was observed with respect to first time insertion of c LMA or i gel.<sup>11</sup> Similarly, Das et al and Chen et al did work on this and found similar findings regarding insertion of i-gel and c LMA.<sup>18,19</sup>

In our current Study, different parameters like diastolic blood pressure, pulse rate,  $\text{ETCO}_2$  and  $\text{SPO}_2$  were measured and we came to conclusion that there is no statistically significant difference in patients of both groups using i-gel or c LMA and we calculated p value  $>0.05$ . Chauhan et al, Helmy et al and Das et al did similar work regarding i-gel or c LMA. One study was also performed by Trivedi et al and showed that with the use of i-gel there are less changes and alteration in mean arterial pressure when compared to c LMA.<sup>12,15,17,18</sup>

Uppal et al did research with respect to make a comparison between i-gel and endotracheal tube. On basis of this research, he found that there was increased systolic and diastolic blood pressure and heart rate intraoperatively while using endotracheal tube as compared to i-gel.<sup>8</sup> In our current research, we found that i-gel was smoothly removed in about 80% of cases as compared to c LMA, where smoothly removal percentage was 50%. The complications such as numbness of tongue, coughing after device removal, and spotting a blood on device was higher in case of c LMA as compared to i-gel.

We observed that with the use of c LMA, we encounter complications like tongue numbness, dental trauma, lip injury, minor regurgitation, blood staining of device, GI symptoms like nausea, vomiting, major airway obstruction, sore throat and dysphagia s<sup>9,12,15,16,18,20</sup>.

## CONCLUSION

The both airway devices c LMA and i-gel were able to successfully maintain the airway of patients during anesthesia and can be tolerated well by all patients. i-gel is superior than c LMA in a way that its insertion is far easy as compare to c LMA. Secondly, there is less risk of airway damage by using i-gel as compared to c LMA. Thirdly, i-gel achieves ideal position for supraglottic ventilation, and fourthly it confirms to the perilaryngeal anatomy although there is no inflatable cuff as in c LMA. So in a nutshell, i-gel is superior and much better and excellent option in comparison to c LMA whenever supraglottic airway is used.

**Author's Contribution:**

Concept & Design of Study: Raza Farrukh  
 Drafting: Raza Farrukh, Asad Rizwan Rana  
 Data Analysis: Asad Rizwan Rana  
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 Final Approval of version: Raza Farrukh

**Conflict of Interest:** The study has no conflict of interest to declare by any author.

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