

## Evaluation of I-Gel and LMA-C Clinical Presentation in Anaesthetized Patients

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### Abstract

**Introduction:** I-gel and LMA-C are most commonly used supraglottic air way devices to secure the airway during general anaesthesia our main objectives were to compare the ease of insertion, duration of insertion and number of attempts of insertion between I-gel group and LMA-C group. **Methodology:** Prospective randomized study conducted in SVMCH & RC Puducherry, during the period Oct 2015 to Mar 2017. Total patients 120 were divided into two groups LMA-C,  $n = 60$  and I-gel,  $n = 60$  by randomized method. SPSS 23 Version software was applied for  $t$  test as  $\text{mean} \pm \text{SD}$  for continuous variables and chi-square test used for categorical variables. **Results:** I-gel was more easily inserted than LMA-C group (90%, 85%) respectively and was statistically non-significant ( $p > 0.05$ ). Duration of insertion was shorter in I-gel group compared to LMA-C group ( $9.7 \pm 1.02$  Vs  $17.2 \pm 1.99$ ) respectively and statistically highly significant ( $p < 0.001$ ). First attempt success rate was (95% Vs 91.6%) between I-gel and LMA-C group. Number of insertion attempts between these groups were statistically non significant ( $p > 0.05$ ). **Conclusions:** Duration of insertion of highly shorter in I-gel group. Ease of insertion and first attempt success rate makes and I-gel a suitable alternative for elective surgeries under general anaesthesia.

**Keywords:** LMA-C (Laryngeal Mask airway-Classic); I-gel; SAD (Supraglottic Airway Device); Ease of Insertion; Duration of Insertion.

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### Introduction

Airway management is the major responsibility of the anaesthesiologists to provide adequate ventilation to the patients and reduce the airway related problems which are the most common cause of anaesthesia related morbidity and mortality [1]. Tracheal intubation is the gold standard method for maintaining a patent airway during general anaesthesia [2]. Laryngoscope and intubation produce hemodynamically detrimental reflex

sympathetic stimulation and are associated with increase in level of plasma catecholamine's, hypertension, tachycardia, myocardial ischemia, ventricular arrhythmias and intracranial hypertension [3]. Many types of supra-glottic devices are available for maintaining patent airway during emergency and elective surgical procedures. LMA with an inflatable cuff has been most commonly used since many years. The I-gel is a unique supraglottic device made up of medical grade thermoplastic elastomer that has a non-inflatable cuff that fits snugly in to the peri-laryngeal structures. It has provision to

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introduce a gastric catheter. Its safer use has been confirmed by various studies [4,5]. Many comparative studies between I-gel and LMA- classic demonstrate that I-gel establish a good seal, more easily placed and it lead to less trauma. In the present study we compare I-gel with LMA-C during general anaesthesia with regard to attempts of insertion, ease of insertion, and time required for insertion.

## Materials and Methods

This study was conducted between October 2015 to March 2017 at Sri Venkateshwaraa Medical College and Hospital & Research Centre, Puducherry. The study protocol was approved by the Institutional Ethics Committee (IEC) clearance and informed consent from all patients were obtained. All statistical analysis were performed by using SPSS version 23.0 software package as it is licensed with the SVMCH & RC. *t*- Test was used to compare and computed as mean $\pm$ SD for continuous variables and chi-square test used for categorical variables. We used 95% CI and the results were accepted as statistically significant if  $p < 0.05$  are shown in Table 1. A total of 120 patients aged between 18-60 years-both sex, scheduled for various elective surgical procedures lasting for 60 to 90 minutes under general anaesthesia belonging to ASA class I and II were included in the study. Patients with history of hypersensitivity for one or more medications, latex allergy, patients having abnormality of the neck, upper respiratory tract, history of obstructive sleep apnea and patients who underwent thoracic, abdominal and neurosurgical procedures were excluded from the study.

These patients were randomized into two groups (group LMA-C,  $n = 60$  & group I-gel,  $n = 60$ ) by a computer-generated random number table. Pre-operative assessment was done to all the patients included in the study one day before the surgery, informed written consent taken and fasting advice was given on the night before surgery. On the day of surgery patients shifted to operation theatre and intravenous line secured and administration of lactated Ringer's solution started. Pre- medication done with inj Ondansetron 4mg IV, inj glycopyrrolate (0.01mg/kg IV), inj midazolam (0.05 mg/kg IV), inj fentanyl (2

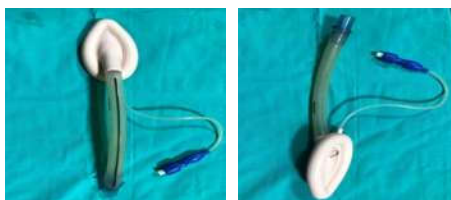
microgram/kg IV). Patients were connected to monitor and baseline heart rate, blood pressure, SpO<sub>2</sub> and ECG recorded. All patients were pre-oxygenated with 100% oxygen 5 minutes, induced with inj propofol (2.5 mg/kg IV) and inj atracurium (0.5 mg/kg IV) as muscle relaxant. Jaw relaxation and loss of eyelash reflexes confirmed.

Patients head placed in sniffing position, lubricated I-gel was held along the integral bite block and introduced into the mouth and slid downwards and backwards along the hard palate gently until definitive resistance is felt. I-gel connected with breathing circuit and ventilated manually. LMA-C was inserted by classic method and the cuff was inflated with recommended volume of air according to the size of LMA (size 3 classic-LMA for patients weighing 30-50 kgs, size 4 for 50-70 kgs and size 5 for patients of 70-100 kgs). Number of attempts noted and it was considered failure if airway is not secured with maximum of three attempts, alternatively patient was intubated with adequate sized endotracheal tube and excluded from the study. Each attempt of insertion could last not more than 60 seconds in between the attempts patient maintained on IPPV with a face mask to maintain SpO<sub>2</sub>. Insertion is considered easy if there is no resistance to insertion in pharynx in a single maneuver, insertion is considered difficult if there is resistance to insertion and more than one maneuver is required for correct placement of LMA.

Duration of insertion is considered from removal of face mask to connection of LMA to patient end of the anaesthesia circuit. Effective placement confirmed by occurrence of square wave pattern capnography, bilateral chest moment and equal air entry on auscultation during manual ventilation and maintenance of anaesthesia is with mixture of 66% N<sub>2</sub>O in 33% O<sub>2</sub> and 1% isoflurane. N<sub>2</sub>O and isoflurane were discontinued at the end of surgery. Neuromuscular blockade was reversed with inj Neostigmine (0.05mg/kg IV) and Inj glycopyrrolate (0.01mg/kg IV). After reversal of blockade, on spontaneous eye opening I-gel or LMA-C was removed.

In Table 1 there is no significant difference in ease of insertion between LMA-C and I-gel ( $p=0.585$ ) and there was highly significant difference in duration of insertion with mean value ranges 17.2 $\pm$ 1.99 and 9.7 $\pm$

LMA-C



I-gel



**Method of insertion of LMA-C**



**Method of insertion of I-gel**



0.02 for LMA-C and I-gel groups respectively ( $p < 0.0001$ ). In Table 2 the current study, the duration of insertion of I-gel ( $9.7 \pm 1.02$ ) was shorter compared to LMA-C ( $17.2 \pm 1.99$ ) which was statistically highly significant between the two groups ( $p < 0.0001$ ). In table 3 there is no significant difference in no of attempts of insertion of devices between LMA-C and I-gel groups ( $p = 0.464$ ). In table 4 in this study, insertion of I-gel was

successful in first attempt in 57 (95%) patients as compared to 55 (92%) first time insertion with LMA-C. Airway manipulation like jaw thrust was required during second attempt insertion in 3 patient of I-gel insertion and 5 patients with LMA-C insertions. The attempt of insertion was not statistically significant between the two groups ( $p > 0.05$ ).

**Table 1:** Comparison of ease and duration of insertion between groups

EI	LMA-C	IGEL	P value
Easy	51	54	0.585
Satisfactory	6	3	
Difficult	3	3	
Duration of insertion	$17.2 \pm 1.99$	$9.7 \pm 1.02$	$< 0.0001$

**Table 2:** Showing the duration of insertion of SAD in various studies

S. No	Year of study & author	SAD	Duration of insertion (Seconds)	p-value
1	2009 Francksen H et al	I-gel LMA-C	$5 \pm (10-60)$ $17(11-180)$	0.45.(NS)
2	2010 Helmy M et al	I-gel LMA-C	$15.62 \pm 4.9$ $26.2 \pm 17.7$	0.0023(S)
3	2010 Ansar Ali et al	I-gel LMA-C	$10.76 \pm 5.53$ $10.90 \pm 5.17$	0.92(NS)
4	2012 Jeevan Singh et al	I-gel LMA-C	19.3 23.5	$< 0.05$ (S)
5	2013 Haq Dad Durrani et al	I-gel	$9.12 \pm 2.413$	0.893(NS)

S. No	Year of study & author	SAD	Duration of insertion (Seconds)	p-value
5	2013 Haq Dad Durrani et al	I-gel LMA-C	9.12±24.13 9.86±3.147	0.893(NS)
6	2014 Priyamvada Gupta et al	I-gel LMA-C	29.32±6.88 36.72±7.33	<0.05 (S)
7	2014 Seyed Mohammed et al	I-gel LMA-C	14.93±4.6 27.1±16.7	<0.05 (S)
8	2015 Shwetha K.M. et al	I-gel LMA-C	17.12±3.42 25.62±5.28	<0.001 (S)
9	2015 G.Venkateshwarlu et al	I-gel LMA-C	40.15±9.65 46.09±8.67	0.0266
10	2016 G . Srinivas Rao et al	I-gel LMA-C	17.26±2.93 24.9±4.82	0.0001 (S)
11	2016 Smitha R Engineer et al	I-gel LMA-C	53.1±5.966 57.76±9.817	0.005
12	Present Study	I-gel LMA-C	9.7±1.02 17.2±1.99	< 0.0001 (S)

**Table 3:** Comparison of number of insertion attempt between Groups

IA	LMA-C	I-gel	Total	P value
First Attempt	55	57	112	0.464
Second Attempt	5	3	8	
Total	60	60	120	

**Table 4:** Showing number of attempts of insertion in various studies

S. No	Year of study & author	SAD	1 <sup>st</sup> Attempt Insertion %	2 <sup>nd</sup> Attempt Insertion %	3 <sup>rd</sup> Attempt Insertion %	p-value
1	2009 Franksen H et al	I-gel LMA-C	90 85	10 12	10 2	0.001(s)
2	2009 Janakiraman C et al	I-gel LMA-C	54 86	30 6	16 8	0.001(s)
3	2010 Helmy M et al	I-gel LMA-C	96 95	7.5 15	2.5 5	<.005(S)
4	2010 Ansar Ali et al	I-gel LMA-C	94 60	6 10		NS
5	2012 Jeevan Singh et al	I-gel LMA-C	91.7 79.2	8.3 20.8		S
6	2013 Haq Dad Durrani et al	I-gel LMA-C	92 92	4 4	4 4	1(NS)
7	2014 Priyam Vada et al	I-gel LMA-C	82.5 77.5	15 20	2.5 2.5	0.986 (NS)
8	2016 Smita R Engineer	I-gel LMA-C	88 90	12 10	0 0	0.004
9	PRESENT STUDY	I-gel LMA-C	95 92	5 8	0 0	0.464 (NS)

## Discussion

Supraglottic airway devices have filled the gap between face mask, jaw holding, laryngoscopy and

endotracheal intubation. LMA-C and I-gel are simple alternative to face mask and endotracheal intubation in uncomplicated surgical procedures. The results of this study with regard to ease of insertion, mean insertion time and attempts of

insertion with first attempt success rate are in compliance with previous studies. Ease of insertion was comparable in I-gel group and LMA-C group and it was statistically non significant in our study ( $p=0.585$ ). This was similar to study conducted by Haq Dad Durrani et al. [16] ( $p=0.844$ ) and can also be correlated with previous studies. On other hand in a study conducted by Jeevan Singh et al [7]. they encountered more ease of insertion with I-gel 22/24 than that with LMA-C group ( $p=0.023$ ) which is statistically significant. The time for insertion was considered according to the study conducted by Seyed Mohammed et al. [9] from picking up the device to confirmation of effective ventilation by bilateral chest movement, square wave pattern capnography, normal range end tidal  $CO_2$  and stable  $SpO_2$  ( $>95\%$ ).

In our study, the duration of insertion was lower with mean insertion time of  $(9.7\pm 1.02)$  seconds in I-gel group and  $17.2\pm 1.99$  seconds in LMA-C group respectively and was highly significant ( $p<0.0001$ ). This was contradicting with the study conducted by Haq Dad Durrani et al. [16] ( $p=0.089$ ). Helmy mentioned that mean insertion time was  $15.6\pm 24.9$  seconds in I-gel group and  $26.2\pm 17.7$  seconds in LMA-C group ( $p=0.0023$ ). The I-gel SAD is made of thermoplastic elastomer and has no cuff to be inflated after its insertion, hence requires less time for successful insertion as compared to LMA-C, which has a cuff to be inflated after its insertion.

Consistent with our results, Helmy AM et al. [6] Jeevan Singh et al. [7] Priyamvada Gupta et al. [8] Seyed Mohammed et al. [9] Shwetha K.M et al. [10] Venkateshwarlu G et al. [11] Dilek Erdogan Ari et al. [12] Srinivas Rao G et al. [13] Smita R Engineer et al. [14] also had significant difference in the insertion times as shown in Table 2.

In our study number of attempts of insertion with first attempt success rate was 95% Vs 91.6% between I-gel group and LMA-C group but statistically non-significant ( $p>0.05$ ). Very similar results were found in studies conducted by Ansar Ali et al. [15] Haq Dad Durrani et al. [16] as shown in table 4. However, Janakiraman et al. [5] had first attempt success rate significantly higher in LMA group 86% than I-gel group 54%. They replaced I-gel in second attempt with appropriate size and rate went up to LMA-C 92% and I-gel 84%.

## Conclusion

We conclude that LMA-C and I-gel were comparable in terms of ease of insertion, duration of

insertion and number of attempts of insertion. Shorter duration of insertion was highly significant in I-gel group and makes it a suitable alternative to secure a quicker airway than LMA-C in elective surgical procedures under general anaesthesia. I-gel was easier to insert and higher first attempt success rate reduces airway trauma and potential complications during general anaesthesia.

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