Original Research Article

LMA-Supreme vsi-Gel™: Comparison in difficult airway scenario

Subah Bharaj[1], Pritish Ranjan[2*], Gaurav Chopra[3]

[1]Junior Resident, [2]Assistant Professor, [3]Professor & HOD, Department of Anesthesiology, Shri Guru Ram Rai Institute of Medical And Health Sciences, Dehradun, Uttrakhand, 248001, India.
Email: pritish2002@gmail.com

Abstract

Background: To evaluate and compare efficacy of LMA Supreme and i-Gel in anaesthetized patients with simulated difficult airway undergoing elective surgery. **Methods:** A prospective randomized study was conducted in 200 adult patients undergoing elective surgery under general anaesthesia. The study was conducted in the Department of Anaesthesia during the period of Feb 2018 to July 2018, Intensive Care, SGRRIM and HS, Dehradun, **Results:** Out of the 100 patient, 94 (94.0%) patient with i-gel and 95(95.0%) patient with LMA-S required I attempt for successful insertion and the difference was statistically insignificant (p value=1.00). Number of patient in whom second attempt was successful was 4(4.0%) in group i-gel and 4(4.0%) in group LMA-S. This difference was statistically insignificant (p value= 1.000). One device in i-gel group was inserted successfully in the third attempt. There was a failed third attempt in one patient in each group which resulted in device failure due to insertion failure. **Conclusion:** Both LMA-S and i-Gel are equally efficacious in patients with simulated difficult airway due to reduced mouth opening and restricted neck mobility under general anaesthesia with controlled ventilation. They both have high success rate of insertion, require fewer manipulation.

Key words-LMA Supreme, i-Gel™, simulated difficult airway

***Address for Correspondence:**
Dr Pritish Ranjan, Assistant Professor, Department of Anesthesiology, Shri Guru Ram Rai Institute of Medical and Health Sciences, Dehradun, Uttrakhand, 248001, India
Email: pritish2002@gmail.com

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INTRODUCTION

Airway management is a vital skill that is relevant to the practice of all medical specialties, especially anaesthesiology, critical care, emergency medicine and surgery. Inappropriate airway management may result in adverse outcomes. An unanticipated difficult airway tests both the technical and non-technical skills of the provider, during a potentially life-threatening clinical situation [1]. The difficult airway is a common clinical problem faced by all anaesthesiologists and is probably the most important cause of airway related morbidity and mortality.[3]

Society of Anaesthesiologists (ASA) recommend use of laryngeal mask airway (LMA) in following situations [2]:
(a) As a conduit for facilitating tracheal intubation in anaesthetized patients whose trachea cannot be intubated.
(b) As an airway rescue device in patients whose trachea cannot be intubated and lungs cannot be ventilated conventionally.

MATERIAL ANDMETHODS

The study was conducted in the Department of Anaesthesia and Intensive Care, SGRRIM and HS, Dehradun, after obtaining approval from hospital ethics committee and written informed consent from all patients. A prospective randomized study was conducted in 200 adult patients undergoing elective surgery under general anaesthesia.

Exclusion Criteria

1) Patient's refusal
2) Weight <30kg
3) Body Mass Index> 30kg/m^2
4) Anticipated difficult airway
5) Mouth opening <4cm
6) Cervical spine pathology
7) Intestinal and esophageal pathology

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8) Operation duration> 4hrs
9) High risk aspiration (non fasted, gastro-esophageal reflux)
10) Pre-operative sore-throat
11) Poor dentition with high risk of damage
12) Pregnancy
13) Impossible face mask ventilation with extrication collar in place

Total number of 200 patients were randomly allocated in to two groups of 100 each.

All patients were made to fast overnight and received Tab Alprazolam 0.25mg orally night before surgery and 2hrs prior to surgery. Tab Ranitidine 50mg and Tab Metoclopramide 10mg was given 2hrs prior to surgery.

Inter incisor gap, Mallampati grade and thyromental distance was noted. An extrication cervical collar was adjusted to the required size and made ready for later application. IV line was established with 18G cannula and pre-medication was done with InjMidazolam 0.02mg/kg body weight and InjGlycopyrolate 0.2mg.

Patient was taken in OT and laid in supine position with a pillow of 5cm height under the head. The standard monitors for NIBP, ECG and SpO_2 were attached and basal heart rate, blood pressure and SpO_2 was noted before induction. Pre-oxygenation was done for 3-4mins with 100% oxygen and InjFentanyl 2mcg/kg body weight IV was given.

Induction was done with InjPropofol 2-2.5mg/kg body weight. After checking for ventilation, neuromuscular blockade was given with InjVecuronium Bromide 0.1mg/kg body weight. Ventilation was done with 100% oxygen and Isofluranefor 3mins. All hemodynamic parameters were monitored.

After ventilating the patient for 1min, we applied the extrication cervical collar and continued face mask ventilation with collar in place. After 3mins of administering Vecuronium Bromide, reduced inter incisor distance was measured and airway device was inserted. Time of insertion of the supraglottic device was taken from end of 3 minutes after administering Vecuronium Bromide to the point of effective ventilation.

After placement of device, airway tube was connected to closed circuit and we checked for bilateral symmetrical chest rise and bilateral equal air entry on auscultation, capnograph tracing and gastric insufflations. Thereafter we secured the device in place by taping it. During LMA insertion, we recorded the number of attempts and the insertion conditions using a 6 variable and 3 point scoring system (62).

Variables	0	1	2
Mouth Opening	Complete	Partial	Impossible
Ease of insertion	Easy	Difficult	Impossible
Swallowing	Nil	Partial	Complete
Coughing	Nil	Partial	Complete
Laryngospasm	Nil	Partial	Complete
Movement	Nil	Partial	Gross

In event of failure of insertion of device, significant air leak, ineffective ventilation, second attempt was made with same size. Three failed attempts were considered failure of device. In case of failure of device, airway was secured with endotracheal tube after removing the extrication collar.

Statistical Analysis

Categorical variables were presented in number and percentage (%) and continuous variables were presented as mean± SD and median. Normality of data was tested by Kolmogorov-Smirnov test. If the normality was rejected then non parametric test was used.

1- Quantitative variables were compared using unpaired t-test/Mann-Whitney Test (when the data sets were not normally distributed) between the two groups.
2- Qualitative variable were compared using Chi-Square test/Fisher's exact test.

A p value of <0.05 was considered statistically significant. The data was entered in MS EXCEL spreadsheet and analysis was done using Statistical Package for Social Sciences (SPSS) version 26.0.

OBSERVATION AND RESULTS

About 208 patients were scrutinized and 8 patients were excluded as they did not fulfill the study criteria and finally 200 adult patients in the age group 18 to 65 years, belonging to ASA physical status 1 and 2 scheduled to undergo elective general surgery were included in the present study. They were randomly allocated to group I (I-gel) and group S (LMA-Supreme) with 100 patients in case group. All exclusion criteria were ruled out before including the patient in the present study. The demographic profile of patient in the both groups was similar. Both the groups were comparable with respect to the type of surgery, duration of the surgical procedure and size of device used. The Characteristics of patient in both groups were similar with regards to thyromental distance (cm), Mallampati class, interincisor gap (cm) and Interincisor gap after collar application (cm).

Table 1: Demographic Data (mean ±standard deviation)

Variables	Group i-Gel	Group Supreme	p-Value
Age (yrs)	44.20±10.6	45.43±13.33	0.472
Sex (M/F)	46/54	40/60	0.394
Weight (kg)	60.73±8.28	58.66±8.52	0.265
Height (cm)	166.52±10.83	164.52±7.04	0.431
BMI (kg/m^2)	22.01±2.77	22.18±2.73	0.684
ASA (I/!!)	71/29	76/24	0.426
Type of Surgery (lap/non-lap)	55/45	54/46	0.367
Duration of surgery (min)	78.81±17.12	80.51±15.67	0.075
Size of device (3/4)	33/67	35/65	0.498
Thyromental Distance (cm)	7.43±0.49	7.36±0.59	0.495
Mallampati Class (1/2)	33/67	35/65	0.472
Inter-incisor Gap(cm)	4.42±0.38	4.46±0.37	0.381
Reduced Inter-incisor Gap (cm)	2.21±0.15	2.17±0.15	0.159

A Statistically significant difference was found between group i-gel (21.83±5.75 secs) and group LMA SUPREME (26.97±7.92 secs) with regard to total time for successful insertion (p value = <0.0001).

Table 2: Device Insertion

		Group i-Gel	Group Supreme	p-Value
Time for successful insertion (sec)		21.83±5.75	26.97±7.92	<0.0001
Manipulation	Yes	6	6	1
	No	93	93	

Out of the 100 patient, 94 (94.0%) patient with i-gel and 95(95.0%) patient with LMA-S required I attempt for successful insertion and the difference was statistically insignificant (p value=1.00). Number of patient in whom second attempt was successful was 4(4.0%) in group i-gel and 4(4.0%) in group LMA-S. This difference was statistically insignificant (p value= 1.000). One device in i-gel group was inserted successfully in the third attempt. There was a failed third attempt in one patient in each group which resulted in device failure due to insertion failure.

Table 3: Number of attempts

Number of attempts	Group i-Gel	Group Supreme	p-Value
1	94	95	1
2	4	4	
3	1	0	
Total	**99**	**99**	

There was a statistically insignificant (p value=1.00) difference in the number of manipulation required while insertion both the device. Manipulations were required in 6 cases in group i-gel and 6 cases in group LMA-S to insert the device. Changing the depth of the device was the only manipulation done in our study.

DISCUSSION

The difficult airway society guidelines 2015 for unanticipated difficult airway recommends placement of a supra-glottic device in a cannot intubate patient where facemask ventilation is possible. This gives time to consider other available options while the patient is being ventilated and oxygenated. The guidelines suggest the use of second generation SGA in such situation. [4] i-gel and LMA-Supreme are newer second generation SGA. Inter-incisor gap Theiler *et al.* did a crossover comparison between LMA-S and I-gel in simulated difficult airway scenarios in 60 patients posted under general anaesthesia without muscle relaxant using an extrication collar to restrict head and neck movement and reduce mouth opening. Our results are consistent with their study [5].

Time for successful insertion

In our study, the longer time taken for LMA-S can be attributed to time taken to inflate the cuff whereas i-Gel does not require any inflation. The variation in mean time of insertion of the two devices was also not clinically appreciable, approximately 5.1s. Theiler *et al.* in contrast to our result showed that LMA-S needed LMA-S needed significantly lesser insertion time (34±12s) as compared to i-Gel (42±23s) (p<0.024). (5) They attributed the difference to the bulky design of i-Gel which made the insertion time longer and thought that the size of tongue in their patient was larger and responsible for the same. However, their result showed that when i-Gel was inserted as a second device after LMA-S in the same patient, it required similar insertion time as LMA-S. The depth of anaesthesia was maintained in their patients using bispectral index (BIS) and were not paralysed whereas in our study the patients were paralysed which might have contributed to lesser difficulty in insertion of i-Gel. The different result in the study could also be because of difference in sex and weight of the patients in their study from our study. There were more male patients in their study (53%) as compared to ours (46%). They used a size 5 i-Gel in patients with 70-100kg weight whereas in our study patient

with weight >70kg were excluded and we used size 3 and 4. Size 5 i-Gel is bulkier which might have added to longer insertion time in a difficult airway scenario in their study. Neither of the study quantified the tongue size. Joly *et al.* in their study compared i-gel and LMA-S in 100 adult anaesthetized and paralysed patients undergoing elective surgery. The patients head was placed in partial sniffing position. Insertion time for i-Gel was shorter than that of LMA-S (19±7s vs 27±17s; p value=0.003) similar to our study [6].

Number of attempts taken for successful insertion

Reason for failed first attempt in both the groups was either difficulty to advance the device due to certain resistance encountered through pharynx or ineffective ventilation due to air leak. No patient required abortion of insertion attempt to mask ventilate the patient due to fall in saturation. Theiler *et al.* found similar first attempt success rate of insertion, 93% for LMA-S and 85% for i-gel which was statistically similar (p value=0.18) [5]. The low first attempt rate for i-Gel in their study as compared to our study might be due to greater number of male patients, higher mean weight of the patient and absence of neuromuscular blockade. The antero-posterior diameter of head is less in neutral position as compared to sniffing position. There is also less elevation of tongue from the posterior pharyngeal wall and less space for unobstructed passage of the device through pharynx. This along with large tongue in their patients and decreased mouth opening might have caused difficulty in insertion of the bulky cuff of i-Gel. Several other studies in patients with normal airway showed results consistent with our results. Kumar *et al.* compared the clinical performance of LMA-S with i-Gel in 134 patients undergoing elective surgery. The difference observed in first attempt success rate was statistically insignificant (p value=0.46), i-gel being the one with more first attempt success rate [7]. Gupta *et al.* did a comparative evaluation of LMA-S vsi-Gel in 60 ASA I and II adult patients and found 96.7% first attempt success rate for i-gel and 93.3% for LMA-S and their difference was statistically insignificant (p value>0.05) [8]. The high success rate in our study shows a good role of these second generation SGA devices in patients with restricted neck mobility and limited mouth opening.

Manipulation

Change in depth of the device was the only manipulation done in our study. No other manipulation such as jaw thrust, chin lift and head and neck movement could be done due to extrication collar. Theiler *et al.* required manipulation in 5 (8%) patients in i-Gel group and 2(3%) patients in LMA-S group for achieving effective ventilation. This difference was statistically insignificant (p value=0.45)[5]

CONCLUSION

Both LMA-S and i-Gel are equally efficacious in patients with simulated difficult airway due to reduced mouth opening and restricted neck mobility under general anaesthesia with controlled ventilation. They both have high success rate of insertion, require fewer manipulation. Therefore we suggest that any of these devices may be used as rescue airway device in anaesthetized and paralyzed patients when facemask ventilation and/or laryngoscope guided tracheal intubation is difficult due to reduced mouth opening and restricted neck mobility (difficult airway similar to our simulated difficult airway)

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