Comparison of supraglottic airway devices I-Gel and LMA-Supreme in adults

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Abstract

Whenever the conventional laryngoscopy fails, insertion of supraglottic airway device may be indicated. The I-Gel and LMA-Supreme are both novel supraglottic airway devices which are disposable, cheap and aids the passage of gastric tube which helps in gastric drainage. Both the devices can be used as an adjunct to endotracheal intubation in patient with difficult airway.

This prospective randomized, single blind study was designed to compare the supraglottic airway devices I-Gel and LMA-Supreme in patients undergoing general anaesthesia for elective surgeries.

After obtaining the institutional ethical committee approval, 60 adult patients of ASA I and II physical status of either sex undergoing elective surgical procedures under general anaesthesia were randomly allocated into 2 groups. Group A I-Gel group (n=30) and Group B LMA-Supreme (n=30).

The study showed no significant difference between the two groups based on demographic variables. The mean insertion time for LMA-Supreme is significantly lower than I-Gel ($P<0.05$). The airway leak pressure was comparable between the two devices. The first attempt success rate and the ease of insertion was significantly better in LMA-Supreme than I-Gel ($P<0.05$). There was no significant variation in the hemodynamic response in both the groups. Post-operative sore throat was noted in LMA-Supreme and blood staining was noted in I-Gel group.

When compared with I-Gel LMA-Supreme has a higher first attempt success rate and also a lower insertion time.

Keywords: Gastric insufflation, LMA-Proseal, LMA-Supreme, I-Gel, Thermoplastic elastomer, Supraglottic.

Introduction

Airway is life not only for the patient but also for the anaesthesiologist. Adverse respiratory events are responsible for 75% of ASA closed claims. The first oro-tracheal intubation was performed by William Mac even in the year 1878.[1] Although the tracheal intubation is the gold standard method for a patent airway maintenance in anaesthesia, this technique not only requires skill but continuous training, practice and a direct laryngoscopy which is difficult without adequate neuro muscular blockade and may damage cords and tracheal mucosa. Both laryngoscopy and endotracheal intubation produce reflex sympathetic stimulation and may provoke laryngospasm and bronchospasm in a person having a reactive airway.[2-4]

The difficulties encountered during intubation and the complications arising following endotracheal tube placement have necessitated the need for alternative techniques.[5-7]

Archie Brain revolutionized the airway management by inventing a supraglottic device called Laryngeal Mask Airway (LMA).[8-10]

But even this device didn't offer full protection against complications like aspiration. So the inventor himself improvised the device with a drainage tube and an extra cuff dorsally which was widely believed to replace all other models of LMA called the LMA Proseal. But this LMA Proseal needs digital or an introducer guided techniques which is difficult for assuring proper sealing in laryngeal inlet. So a new LMA which has protective features as that of LMA Proseal and easier for insertion came into use in the last decade called as the LMA-Supreme.

I-Gel is a new supraglottic airway device and is an uncuffed peri-laryngeal sealer group of airway devices as classified by Miller[11]. This device also has a gastric channel for drainage of gastric contents. The gel like cuff avoids compression trauma of the other inflatable supraglottic devices.[12-14]

Aim

To compare the functional differences between LMA-Supreme and I-Gel in such as the ease of insertion, time taken for insertion, attempts for proper placement, airway leak pressure and complications.

I-Gel: The I-Gel is a novel and innovative supraglottic airway device made of thermoplastic elastomer which is soft gel like and transparent. It achieves a non-inflatable anatomical seal to the pharyngeal, laryngeal and perilaryngeal structures avoiding the compression trauma that occurs with an inflatable supraglottic device. It has several advantages like easier insertion, minimal compression on tissues, has no latex and is stable. It has a standard airway channel and a separate gastric channel. The gastric channel indicates regurgitation early, helps in venting out the gas from stomach and also helps in nasogastric tube insertion to empty the contents of the stomach.[15]

LMA Supreme: The LMA-Supreme is an advanced form of airway device that can be used as the same indications of LMA-Proseal. The LMA-Supreme has four main components: an anatomically shaped airway tube to which a drain tube has been attached, an inflatable cuff which is modified from other LMAs and a cuff inflation line with pilot balloon. The inflatable cuff is modified from other forms of LMA such that it fits to the contours of hypopharynx and the airway lumen is facing the laryngeal opening. The cuff is so designed that it offers high seal pressures around the laryngeal opening. The LMA-Supreme has an inbuilt bite block which prevents the airway obstruction and tube damage. The device when correctly positioned has the drain tube tip at the upper oesophageal sphincter, the sides of the cuff facing the pyriform fossa and the upper border rests against the base of the tongue.[16-18]

Materials and Methods

This study was a randomized, single blinded, prospective study comparing the two supraglottic devices. This study was conducted in Govt. Kilpauk Medical College and Hospital, Chennai from April 2013 to August 2013. After obtaining the institutional ethical committee approval and written informed consent, forty patients under ASA physical status I & II of either sex undergoing elective surgical procedures under general anaesthesia were enrolled in the study. The supra-glottic airway device insertions and the data collection were done by the author.

Patient Selection

Inclusion Criteria

1. ASA I, II
2. 18 to 60 years
3. Both sexes
4. Elective surgical procedures under general anaesthesia.
5. MPC class I & II airway

Exclusion Criteria

1. ASA III and above
2. BMI > 30 kg/m2
3. Difficult airway
4. History of acute or chronic airway disease
5. Comorbid illness eg diabetes mellitus, hypertension and cardiopulmonary disease
6. History of gastro oesophageal reflux disease, hiatus hernia
7. Musculo-skeletal abnormalities involving cervical vertebra
8. Obstructive sleep apnoea

A. Patient refusal

The patients were randomized into one of the two groups viz Group I (I-Gel) and Group L (LMA-Supreme) using a closed envelope with predetermined group numbers and then single blinded. The day before surgery the patients were evaluated with their complete medical history, physical examination and investigations. The patients were advised overnight fasting and aspiration prophylaxis with Tab. Ranitidine 150 mg and Tab. Metoclopramide 10 mg were given the night before surgery.

In the operation theatre ECG, Pluseoximetry, Noninvasive blood pressure monitors were connected. Intravenous access was obtained with 18 G intravenous Cannula. The patients were pre-medicated with Inj Glycopyrrolate 0.2 mg IM about half an hour prior to induction. Inj. Ranitidine 50 mg IV, Inj. Metoclopramide 10 mg IV about 10 minutes before induction. The patients were pre-oxygenated for three minutes with 100% oxygen and all patients were given Inj. Midazolam 0.02 mg/kg IV and Inj. Fentanyl 2 micrograms/kg IV about 5 minutes before induction. Preinduction baseline cardiorespiratory parameters like heart rate (H.R), blood pressure (B.P) and oxygen saturation (SpO2) were recorded. Anaesthesia was induced with Inj. Propofol 2 mg/kg IV and neuromuscular blockade with Inj Atracurium 0.5 mg/kg IV. Patients were ventilated with bag and mask with 2% sevoflurane and oxygen for three minutes and an appropriate supra glottic airway device based on the weight of the patient was inserted.

The patients were placed in sniffing the morning air position with head extended and neck flexed. Depending on the group, the patients are inserted either I-Gel or LMA-Supreme. Both the devices were inserted as per the standard techniques by the manufacturers. The proper insertion and the correct placement was assessed by adequate chest expansion bilaterally, presence of CO2 wave form with a plateau, absence of audible leak and lack of gastric insufflation determined by epigastric auscultation and ability to achieve an adequate expiratory tidal volume of 7ml/kg. If adequate ventilation was not possible, chin lift, jaw thrust, head extension or flexion were the maneuvers used. In case of I-gel position was also adjusted by gently pushing or pulling the device. After any maneuver, adequacy of ventilation was re-assessed. In case of LMA after fixing the device the cuff pressure was checked with the help of portex cuff pressure monitor to maintain cuff pressure of 60 cm H2O.

The ease of insertion of the device was graded as Easy-1, Difficult-2, and Failure-3. An attempt of insertion was considered difficult if an audible leak or inadequate chest expansion or the absence of square wave on capnography is noted and the device was removed and re-inserted with the same device or a different size is chosen. Two more attempts to reinsert were allowed. If failed after three attempts, the insertion was considered a failure and the patient will be intubated with an endo-tracheal tube.

Time taken for insertion was considered as the time between picking of the supraglottic device in hand and achieving adequate and effective ventilation.

A gastric tube was then passed through the gastric channel of both the devices. Termed easy if passed in

the first attempt, difficult if passed in the second attempt and was termed failure if it was not able to be pass in two attempts.

Anaesthesia was maintained with nitrous oxide – oxygen mixture (3:1) with sevoflurane 1-2% and Inj. Atracurium intermittent doses. The ease of insertion, number of attempts taken for insertion and the time taken for insertion were recorded.

Heart rate, Non-invasive blood pressure, oxygen saturation were monitored and recorded at insertion, 1, 3 and 5 minutes post insertion of the device. Ventilation of the patient was given by Datex Ohmeda with in-built pressure gauge.

The Oropharyngeal leak pressure: The APL valve of the circle system was completely closed and the gas flows were set at a minimum fixed flow rate of 3 liters/ min. The airway pressure is measured by manometer stability test i.e., the airway pressure is recorded at which the equilibrium is reached (maximum allowable pressure limit was 40 cm H2O). The point at which an audible leak is heard from the mouth is taken as the equilibrium point.

The parameters observed,
Ease of insertion of the device,
Number of insertion attempts,
Time taken for the insertion,
The Oropharyngeal leak pressure,
Ease of insertion of gastric tube,
Heart rate, NIBP at insertion, 1 min, 3 min and 5 min post insertion.

Incidence of complications such as blood staining of the device, laryngo-spasm, dental trauma, desaturation (S_PO_2 less the 95%), gastric insufflation and post-operative airway complications like sore-throat.

At the end of the surgery, inhalational agent sevoflurane was cut off. Once the patient become conscious and obeys oral commands, the neuromuscular blockade was reversed with Inj. Neostigmine and Inj. Glycopyrrolate and the device was removed. Patient was shifted to the recovery room and then to PACU for observation for 24 hours.

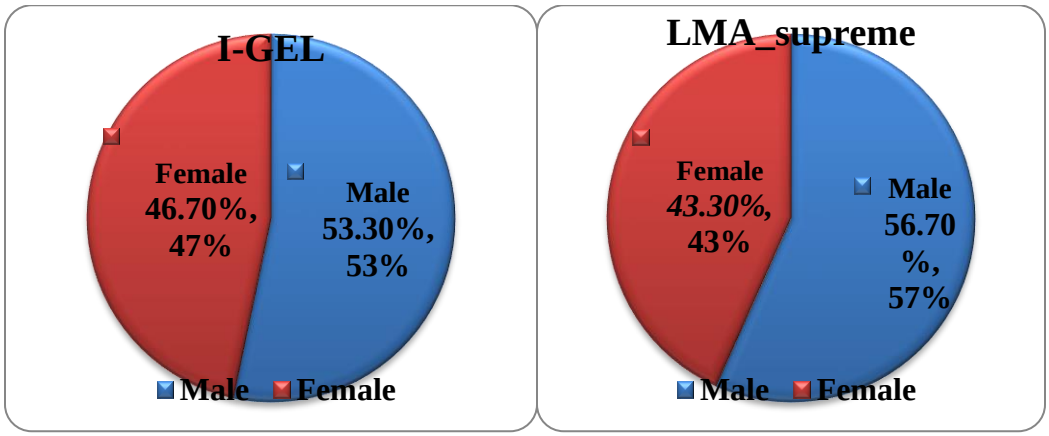
Observation and Results

This study was conducted in Government Kilpauk Medical College between April 2013 to July 2013 and the study involved 60 patients belonging to ASA physical status I and II. They were randomized into two groups, I-Gel group and LMA-Supreme group. Sixty patients of either sexes in ASA I & II status undergoing elective procedures under general anaesthesia were studied.

Data entry was done in Microsoft office Excel 2010. The data was analysed with IBM SPSS version 15. P values less than 0.05 were considered statistically significant. Demographic data, the time taken for placement of the device, oropharyngeal leak pressure and hemodynamic variables among the groups were analysed with unpaired one tailed student t test. Chi-square analysis was used to compare the gender and number of attempts for insertion.

The gender distribution was comparable in both the groups without any statistically difference in distribution (Fig.1).

Fig.1: Gender Distribution



The mean age of distribution in both the groups was around 35 years. Both the groups were comparable with respect to age. There was statistically no significant difference between the two groups (Table 1).

The mean weight in both the groups was around 62Kgs. Both the groups were comparable with regard to weight. There was statistically no significant difference between the two groups in terms of weight (Table 1).

The mean height in both the groups was around 161cms. There was statistically no significant difference between the two groups in terms of height and both groups are comparable with regard to height (Table 1).

The mean Body Mass Index was around 24. Both the groups were comparable in terms of BMI and were not statistically significant (Table 1).

The MPC distribution was comparable between the two groups without any statistical significant difference (Table 1)

Table 1

Group	Number	Mean	STD deviation	P value
Age				
I-Gel	30	37.47	7.104	0.667
LMA- Supreme	30	35.23	6.611	
Weight (KGs)				
I-Gel	30	62.47	6.872	0.624
LMA- Supreme	30	62.60	6.750	
Height (CMs)				
I-Gel	30	160.10	6.855	0.449
LMA- Supreme	30	161.57	8.016	
Body Mass Index				
I-Gel	30	24.298	2.7816	0.259
LMA- Supreme	30	23.582	2.0253	
Distribution by Mallampatti Classification				
		MPC-I	MPC-II	
I-Gel	Count	24	6	30
	% Within Group	80.0%	20.0%	100%
LMA-Supreme	Count	26	4	30
	% Within Group	86.7%	13.3%	100%
Total	Count	50	10	60
	% Within Group	83.3%	16.7%	100%
P=0.729				

Ease of insertion

Though the device insertion was successfully done in all patients(100%), the ease of insertion was higher in LMA-Supreme 28 patients out of 30 (93.3%) compared with I-Gel 17 patients out of 30 (56.7%) and the total collective ease of insertion was 45 out of 60 (75%). Though there were no failures, difficulty of insertion was seen more in I-Gel (43%) and in LMA-Supreme it was (6.7%). The P Value calculated (0.002) was significant (Table 2).

Number of attempts for insertion

Most of the patients in LMA-Supreme group the first attempt successful insertion were 29 patients out of 30 (96.7%) when compared with I-Gel group in which 22 patients out of 30 (73.3%). 8 patients in I-Gel Group (26.7%) and one (3.3%) in LMA-Supreme required a second attempt. The P Value Calculated (0.026) was significant (Table 2).

Time taken for insertion

The maximum time for I-Gel insertion was 32 seconds and for LMA-Supreme was 26 seconds. The minimum time for I-Gel insertion was 19 seconds and for LMA-Supreme was 12 seconds. The mean time taken for the I-Gel insertion was 24.30 ± 2.961 seconds compared with LMA-Supreme where the time taken was lesser at 16.57 ± 3.329 seconds with a calculated significant P Value of 0.0001 (Table 2).

Ease of insertion of gastric tube

In 45 out of the 60 (75%) patients the gastric tube was inserted in the first attempt the majority 28 out of 30 (93.3%) belonging to the LMA Supreme and 17 out of 30 (56.7%) in I-Gel and a second attempt was required in 2 out of 30 (6.7%) and 13 out of 30 (43.3%) respectively (P Value of 1.000). There was no failure to insert the gastric tube.

Oropharyngeal seal pressure

The maximum oropharyngeal seal pressure in both the groups was 32 cm H2O. The minimum oropharyngeal pressure was 19 cm H2O in both the groups. The mean OSP was 24.20 ± 3.3925 Cm H_20 in I-Gel and 25.00 ± 3.322 Cm H_20 in LMA-S and the P value calculated at 0.398 which was insignificant.

Table 2: Ease of Insertion

		Ease		
		1	2	
I-Gel	Count	17	13	30
	% Within Group	56.7%	43.3%	100%
LMA-Supreme	Count	28	2	30
	% Within Group	93.3%	6.7%	100%
Total	Count	45	15	60
	% Within Group	75%	25%	100%
P=0.002				
Number of Attempts				
		1	2	Total
I-Gel	Count	22	8	30
	% Within Group	73.3%	26.7%	100%
LMA-Supreme	Count	29	1	30
	% Within Group	96.7%	3.3%	100%
Total	Count	51	9	60
	% Within Group	85.0%	15.0%	100%
P=0.026				
Supraglottic Device insertion time (Seconds)				
Group	Number	Meantime sec	STD Deviation	P value
I Gel	30	24.30	2.961	0.0001
LMA-Supreme	30	16.57	3.329	
Ease of insertion of Gastric Tube				
		Ease		
		1	2	
I-Gel	Count	17	13	30
	% Within Group	56.7%	43.3%	100%
LMA-Supreme	Count	28	2	30
	% Within Group	93.3%	6.7%	100%
Total	Count	45	15	60
	% Within Group	75%	25%	100%
P=1.000				
Oropharyngeal Seal Pressure				
Group	Number	Mean OSP $cm.H_2O$	STD Deviation	P value
I Gel	30	24.20	3.925	0.398
LMA-Supreme	30	25.00	3.322	

Complications

There was no incidence of desaturation, gastric insufflation, dental trauma or laryngospasm. However Blood staining of I-Gel was noted in 3 patients (10%) and postoperative sore throat was seen in 2 (6.66%) patients of LMA-supreme (Table. 3).

Table 3

Complications	I-Gel	LMA-Supreme
Blood staining of the device	3	0
Dental trauma	0	0
Gastric insufflations	0	0
Desaturation < 95%	0	0
Post op sore throat	0	2
Laryngospasm	0	0

Table 4

	I-Gel (mean)	LMA-Supreme(mean)	P value
Heart rate			
Pre-induction	74.7±10.991	77.03±14.339	0.495
Induction	72.07±10.913	81.3±15.177	0.009
1st minute	84.27±13.383	87.43±14.766	0.388
3rd minute	87.93±13.988	88.50±16.328	0.886
5th minute	75.07±10.875	80.47±13.475	0.093
Mean BP			
Pre-induction	90.780±9.9625	88.377±10.056	0.356
Induction	75.647±7.6198	74.140±8.2817	0.466
1st minute	81.493±7.4581	79.447±8.4401	0.324
3rd minute	85.140±7.3085	85.333±8.0969	0.923
5th minute	85.133±7.4916	85.140±8.0610	0.997

The mean heart rate of the two groups was compared and was found to be statistically insignificant.

There was no significant statistical difference between the I-Gel and LMA-Supreme groups when the mean systolic pressure values were compared in terms of pre-induction, induction, 1st, 3rd and 5th minute. When the mean diastolic blood pressures of the groups were compared there was no statistical significant difference between the pre-induction, induction, 1st, 3rd, 5th minute values. Among the groups, there was no significant statistical difference between pre-induction, induction, 1st minute, 3rd minute and 5th minute values in terms of mean blood pressure (Table 4).

Discussion

Since the introduction of LMA into clinical practice has been used in over a million patients and the efficacy is proven beyond doubt. Limitations of previous LMA models lead to improvisation of the device. LMA has come a long way from the basic model to a various modifications specified for different situations and case scenarios. The improvisation of the existing devices also paved a way to many researches creating in new ideas and thereby newer supraglottic devices. We chose to study and compare relatively newer supraglottic devices LMA-Supreme and I-Gel.

Review of Literature

Ishwar Singh et al[20] studied parameters like airway sealing pressure, ease of insertion and that of gastric tube placement. The airway trauma inflicted by I-Gel and LMA-Proseal was also assessed. They observed that the ease of insertion and gastric tube placement was better in I-Gel. They also found that airway sealing pressure was higher in Proseal than that of I-Gel and the pressure was within normal limits to prevent aspiration. Airway trauma like blood staining, lip injury was higher in Proseal group. They concluded that I-Gel is a new supraglottic device with acceptable sealing pressure (25.27 cm H2O) which can be easily inserted, and it required less attempts and was less traumatic than Proseal.

WJ Shin et al[22] did a comparative study with I-Gel, LMA-Proseal and Classic LMA in patients requiring general anaesthesia for orthopedic surgeries. They assessed the hemodynamic stability, airway leak pressure, leak volume, success rate and post-operative complications. They observed that the hemodynamics remained stable, but the airway leak pressure was higher in I-Gel and Proseal groups when compared to cLMA group. Success rate was equal in all groups but the incidence of sore throat was higher in the cLMA group. They concluded that I-Gel has a similar sealing of airway as that of Proseal without any postoperative complications and hence I-Gel might well be an alternative supraglottic device.

Amr M. Helmy et al[23] carried out a prospective, randomized, clinical trial on 80 patients for different surgical non-emergency procedures, comparing two supraglottic airway devices, LMA and I-Gel with spontaneous ventilation in supine position. They observed that both were showing similar hemodynamic stability. Leak pressure was higher in I-Gel and in LMA the incidence of gastric insufflation was higher. Postoperative nausea and vomiting were higher in LMA group.

Lee AK et al[24] compared Proseal LMA and LMA-Supreme and found no significant difference in ease of insertion and postoperative complications.

Hosten Tulay et al[25] studied LMA-Supreme and LMA-Proseal for lap cholecystectomy and found the oropharyngeal seal pressure was comparable. The success rate was also equal in both but the mean airway insertion time was significantly shorter in LMA-Supreme.

Bimla Sharma et al[26] evaluated the respiratory mechanics of I-Gel and Proseal LMA in patients undergoing lap cholecystectomy such as the oropharyngeal seal pressure, dynamic compliance and fiber optic view. Oropharyngeal seal pressure was

significantly high in PLMA and dynamic compliance was statistically significant among I-Gel group. The fibreoptic view was comparable between the two devices.

R. Ragazzi et al[27] did a comparative study on 80 patients undergoing breast surgery with LMA-Supreme and I-Gel comparing Insertion time, success rate, leak pressure and adverse events. The first time success rate was higher in LMA-Supreme (33/38) than I-Gel (22/41). The failure of placement was higher in I-Gel (6) compared to LMA-Supreme (0). The leak pressure was also higher in LMA-Supreme (29 cm H2O) compared to I-Gel (23). But the Postoperative adverse events like pharyngolaryngeal pain were more common in LMA-Supreme (17/39) than in I-Gel group (8/41). Hence they concluded that better first time success rate, fewer failure rate and better seal were seen with LMA-Supreme.

Teoh WH et al[28] compared LMA-Supreme and I-Gel in 100 patients undergoing laparoscopic gynecological surgeries under Trendlenburgh position the oropharyngeal leak pressure was significantly higher among LMA-Supreme (26.4 cm H2O) than in I-Gel (25 cmH2O). The time taken to insert gastric tube was less in LMA-Supreme (9 s) than in I-Gel (15.1 s). Blood staining was found twice in LMA patients and once in I-Gel during removal. 4 patients among LMA and 1 Patient in I-Gel group complained of sore throat in the postoperative period.

Beringer RM et al[29] studied about I-Gel in 120 children anaesthetized to assess efficacy and usability. The insertion success rate in $1^{st}/2^{nd}/3^{rd}$ attempts were 110/81/1 and failure in 1 patient. The insertion time was 14s (9-16 s) and the fiberoptic view revealed vocal cords clearly in 40 patients out of 46 patients who are visualized. The median OLP was 20 (16-26 cm H2O). 16 manipulations were required during maintenance of anaesthesia in 11 children. They concluded that I-Gel was inserted without complications and clear airway maintenance was achieved under spontaneous/controlled ventilation in 113/120 patients (94%).

Tietenthaler W et al[30] compared OLP between Guardian CPV and LMA-Supreme measured with cuff inflation between 0-40 cm H2O. The OLP was 31cm H2O in GuardianCPV vs 27 cm H2O in LMA-Supreme with acceptable cuff volumes of 20-40 cm H2O. The intracuff pressure was 68 in GuardianCPV and 88 cm H2O in LMA-Supreme. There was no difference in success rate, fibreoptic position, drain tube insertion, blood staining and airway morbidity between the two devices.

Lopez A M et al[31] did a comparison between LMA-Supreme and Proseal LMA in 12o patients anaesthetized for short surgical procedures in prone position. The respective devices were inserted by experienced anaesthesiologists in prone position. They noted no difference in the insertion time and the first attempt success rate except a few manipulations was required in Proseal LMA. The mean OLP was 31 cm H2O in Proseal group compared to 27 cm H2O in Supreme LMA group. The incidence of postoperative sore throat and blood staining were comparable between the two devices.

Theiler LG et al[32] conducted a prospective, cross over randomized controlled trial in simulated difficult airway scenario using an extrication collar limiting mouth opening and neck movements in 60 patients using LMA-Supreme and I-Gel. The success rates between the two groups were 95% vs 93% respectively. The mean insertion time was 34±12 s and 42±23 s in LMA-Supreme and I-Gel respectively. The oropharyngeal leak pressure was 26±8 cm H2O in LMA-Supreme and 27±9 cm H2O in I-Gel. Fiberoptic view showed less epiglottic down folding with I-Gel compared to LMA-Supreme.

Eschertzhuber S et al[33] measured mucosal pressures directly at 4 different sites like base of the tongue, distal oropharynx, hypopharynx and pyriform fossae on patients with LMA-Supreme and I-Gel. They concluded that mucosal pressures were low and similar in both the devices.

Howes BW et al,[34] evaluated the use of LMA-Supreme by non-anesthetists. Training was conducted for 100 non anesthetist medicos in manikin and selected successful 50 medicos for LMA-Supreme insertion in patients. The first time success rate was 86% and the overall success rate was 100%. The mean time taken for insertion was 34s (26-40 s). The mean OLP was 23(19-28 cm H2O). They concluded that the results were comparable between the students and the airway experts.

Abdi et al[35] compared the ventilation characteristics in morbidly obese patients by between facemask and LMA-Supreme. They concluded that the time taken for establishment of successful ventilation with LMA-Supreme was 21s compared to 34s with facemask. No failure was seen in LMA-Supreme, but 4 failures seen in facemask. They concluded that the quality of ventilation was good and difficulty of ventilation score was less with LMA-Supreme.

Verghese C et al[36] compared LMA-Supreme and Proseal LMA in 36/36 female patients who underwent elective lower abdominal surgeries under PPV. The success rate during the first attempt (35/36), insertion time (15s), OLP (28 cm H2O) and gastric tube access were comparable in both. The volume of air needed to attain optimum cuff pressure of 60 cm H2O was 22.4 ml with LMA-Proseal and 21.9 ml with LMA-Supreme.

Zhang L et al [37] compared OLP of LMA-Supreme at various cuff pressures. The OLP at cuff pressures of 80/60/40 cm H2O were 26/20/18 cm H2O. But the incidence of postoperative pharyngeal and laryngeal adverse events were comparable. Hence they recommended that cuff pressure up to 80 cm H2O to achieve tight seal without airway morbidity.

Zehra Ipek Arslam et al[38] compared size 2 LMA-Proseal with size 2 LMA-Supreme in spontaneously breathing children undergoing lower abdominal elective surgeries lasting less than 1 hour. There were no differences in the demographic variable, ease of gastric tube placement, ease of insertion and ventilation, no. of insertion attempts, hemodynamic changes on insertion, postoperative complications like blood staining of the device. The only significant difference was the OLP which is 21.3±4.2 for LMA-Supreme and 24.6±5.5 for Proseal LMA.

Chew EE et al[39] compared LMA-Supreme and I-Gel in spontaneously breathing patients. The mean OLP was 25.6 and 20.7 cm H2O for LMA and I-Gel. LMA-Supreme was easier to insert than I-Gel but the Fibreoptic Viewing was better with I-Gel. The first attempt insertion, overall success rate and the complications postoperatively were comparable between the two devices.

In our study the insertion of I-gel and LMA-Supreme were mostly successful on the first attempt without any statistical significance except in one case in each group due to the patient's small mouth and large tongue, and all devices were successfully inserted within two attempts. Our result were consistent with the observations of Richez et al, Jay Duckett and P.Fell et al where the overall success rate for I-Gel was 97% and more than 93% respectively. Likewise our results for LMA-Supreme were comparable with that of Lopez et al, where the success rate was 97%.

Our study result was inconsistent for the ease of insertion and also to the number of attempts required for insertion of appropriate size I-Gel with that of reports obtained from Cook et al and Gatward et al who reported that a single insertion attempt was almost required in most of the patients. Choosing the correct size airway device was important as incorrect sizing would lead to reduction in the success rate of insertion of the device. In our study, the choice of appropriate size was based on the weight of the patient and the manufacturer recommendations. The guidelines for size-3 and size-4 I-Gel were overlapping which were very confusing for the users. The mean insertion time for I-Gel insertion in our study was 24 seconds that was contrasting to the studies done by Cook et al and Gatward et al.

We observed from our study that our first attempt success rate of LMA-Supreme was 96.7% which was comparable to that of Lopez-Gil et al who reported a first attempt success rate of 95%. The study done by Russo SG et al in 100 adult females showed that the first attempt success rate of 94% which is similar with our observations.

Our mean insertion time for LMA-Supreme insertion was 16 seconds that was comparable to the study results of Russo SG et al who had a mean insertion time of 12 seconds and in another study by Verghese, Ramasamy et al it was reported to be 15 seconds. This could be because of the advantage of the inbuilt tongue depressor of LMA-Supreme which makes it easier to insert which was suggested in the study by Theiler LG et al and Srivatsava Arati et al.

Seet et al studied the oropharyngeal seal pressure and observed a seal pressure of 25 cm H_2O which is similar to the findings in our study which showed it as 25 cm H_2O, furthermore our results of the OSP in I-Gel was 24.2 cm H_2O. This shows that there was no major difference in the quality of seal pressures between both the groups. The results obtained by studies done elsewhere such as Suhitharan et al who studied 100 patients obtaining a result of 26.4 cm H_2O and 25 cm H_2O and of Theiler LG et al who found that OSP was 26 cm H_2O and 27 cm H_2O respectively for I-Gel and LMA-Supreme groups which were quite analogous to our study.

An oropharyngeal seal pressure of 24.2 cm H_2O for I-Gel is adequate for effective controlled ventilation. Levitan et al concluded that I-Gel can provide a worthy peri-laryngeal seal without the necessity for an inflatable cuff, which could be because of the fact that the non-inflatable cuff is made of a thermoplastic elastomer and it also fits securely in the oval groove of the glottic surroundings. The seal is also known to improve in situ with time as the thermoplastic cuff warms up and molds in the body temperature. The airway seal pressure achieved in our study for LMA-Supreme was 25 H_2O which is also sufficient to provide controlled ventilation. This potential seal possible in LMA-Supreme is because of the inflatable cuff that is quite similar to that of Pro-Seal LMA which snuggly fits anatomically and also demarcates the respiratory system from esophagus Sharma et al, Dorsch 4e, Duckett et al, Shin WJ et al.

The gastric tube insertion was done in all patients there was no failure in the passage of gastric tube The insertion criteria observed was easy was three fourths in both groups but with LMA-Supreme the first attempt was more. The results achieved in this study was comparable to that of Teoh WH et al and Lee KM et al. they were able to successfully insert the gastric tube in all the patients.

The compared hemodynamic responses were quite similar in both the groups without any statistical significance at the first, third and fifth minute after the insertion of the supraglottic device. It can also be said that both the devices have identical responses on insertion the results observed by Teoh WH et al.

Though Laryngospasm and desaturation can occur with both the devices we did not come across any such incidence. But we did notice blood staining of I-Gel in 3 patients which can occur as the airway is manipulated. Similar results were observed with Amr M Helmy et al who reported 2 cases of blood staining and it was consistent with our study. Whenever a supraglottic device is used the incidence of blood staining may vary between 12% and 18% and also it

may be dependent on the technique of the individual as noted by Lee et al, but in our LMA-Supreme group it was not present.

Postoperative sore throat is also quite common after the insertion of the supraglottic device and two of LMA-Supreme patients had complains of sore throat and it could be due to the presence of the inflatable cuff Ragazzi et al, Finessi et al.

Conclusion

LMA-Supreme is better than I-Gel in terms of lesser insertion time and higher first attempt success rate. Both these devices enable effective gastric drainage.

References

1. James CD. Sir William Macewen and anaesthesia. Anaesthesia 1974; 29:743–53.
2. International Guidelines 2000 for Cardiopulmonary Resuscitation and Emergency Cardiac Care. An International Consensus on Science.Resuscitation2000;6:29–71.
3. Peppard SB, Dickens JH. Laryngeal injury following short-term intubation. Ann Otol Rhinol Laryngol. 1983;92:327–30.
4. Gal TJ. Airway management. In: Miller RD, editor. Textbook of anesthesia. 6th ed. Philadelphia: Elsevier; 2005. pp. 1617–52.
5. Domino KB, Posner KL, Caplan RA, Cheney FW. Airway injury during anesthesia: a closed claims analysis. Anesthesiology 1999;91:1703-11
6. Utting JE. Pitfalls in anaesthetic practice. Anaesthesia 1987;59:877–90
7. Gannon K. Mortality associated with anaesthesia. A case review study. Anaesthesia 1991;46,962-6
8. Brimacombe JR., Berry AM. The Laryngeal Mask Airway. In: The Difficult Airway I. Anesthesiol Clin N Am June 1995;13(2):411-37.
9. Pollard BJ, Norton ML. Principles of Airway Management, In: Wylie and Churchill – Davidson's (ed), A Practice of Anesthesia (7th Edn), 2003;28:445-46.
10. Verghese C, Brimacombe JR. Survey of laryngeal mask airway Usage 11, 910 patients: Safety and efficacy for conventional and nonconventional usage. Anesth Analg 1996;82:129-3310.
11. Miller DM. A proposed classification and scoring system for supraglottic sealing airways: a brief review. Anaesthesia-Analgesia journal 2004;99:1553–9.
12. Levitan RM, Kinkle WC. Initial anatomic investigation of the I-gel airway: a novel supraglottic airway without inflatable cuff. Anaesthesia 2005;60:1022–6.
13. Sharma S, Scott S, Rogers R, Popat M. The I-gel airway for ventilation and rescue intubation. Anaesthesia 2007;62:419–20.
14. Michalek P, Hodgkinson P, Donaldson W. Fibreoptic intubation through an I-gel supraglottic airway in two patients with predicted difficult airway and intellectual disability. Anaesthesia-Analgesia journal 2008;106:1501.
15. IGEL - http://www.igel.com. I-Gel supraglottic airway.
16. LMA Supreme-Instruction Manual.
17. Brimacombe JR. In: Laryngeal Mask Anesthesia - Principles and Practice (2nd Edn), Saunders, Philadelphia 2005.
18. Dorsch and Dorsch- Understanding anaesthesia equipment -4th edition pg 464-48
19. Richez L. Saltel, A New Single Use Supraglottic Airway Device with a Noninflatable Cuff and an Esophageal Vent: An Observational Study of the i-Gel anaesthesia and analgesia April 2008 vol. 106 no. 4 1137-1139
20. Duckett J, Fell P, Han K, et al Introduction of the i-gel supraglottic airway device for prehospital airway management in a UK ambulance service Emerg Med J 2014;31**:**505-7.
21. Ishwar Singh et al Comparison of Clinical Performance of I-Gel™ with LMA—Proseal™ in Elective Surgeries Indian J Anaesth. 2009 June;53(3):302–5.
22. Shin WJ, Cheong YS The supraglottic airway I-gel in comparison with ProSeal laryngeal mask airway and classic laryngeal mask airway in anaesthetized patients Eur J Anaesthesiol. 2010 Jul;27(7):598-601.
23. Amr M. Helmy, Hossam M. Atef Comparative study between I-gel, a new supraglottic airway device, and classical laryngeal mask airway in anesthetized spontaneously ventilated patients Saudi J Anaesth. 2010 Sep-Dec;4(3):131–6.
24. Lee AK, Tey JB, Lim Y, Sia AT. Comparison of the single-use LMA supreme with the reusable ProSeal LMA for anaesthesia in gynaecological laparoscopic surgery. Anaesth Intensive Care. 2009 Sep;37(5):815-9.
25. Hosten T, Gurkan Y, Ozdamar D, Tekin M, Toker K, Solak M.A new supraglottic airway device: LMA-supreme, comparison with LMA-Proseal. Acta Anaesthesiol Scand. 2009 Aug;53(7):852-7.
26. Bimla Sharma, Raminder Sehgal, and Jayashree Sood LMA vs. I-gel: A Comparative Evaluation of Respiratory Mechanics in Laparoscopic Cholecystectomy Anaesthesiol Clin Pharmacol. 2010 Oct-Dec;26(4):451–7.
27. Ragazzi R, Finessi L, Farinelli I, Alvisi R, Volta CA. LMA Supreme™ vs i-gel™--a comparison of insertion success in novices. Anaesthesia. 2012 Apr;67(4):384-8.
28. Teoh WHL, Lee KM, Suhitharan T, Yahaya Z, Teo MM, Sia ATH. Comparison of the LMA SupremeTM vs the i-gelTM in paralysed patients undergoing gynaecological laparoscopic surgery with controlled ventilation. Anaesthesia 2010;65:1173–9.
29. Beringer RM, Kelly F, Cook TM, Nolan J, Hardy R, Simpson T, *et al.* A cohort evaluation of the paediatric i-gel(™) airway during anaesthesia in 120 children. Anaesthesia 2011;66:1121-6
30. Tiefenthaler W, Eschertzhuber S, Brimacombe J, Fricke E, Keller C, Kaufmann M. A randomised, non-crossover study of the GuardianCPV Laryngeal Mask versus the LMA Supreme in paralysed, anaesthetised female patients. Anaesthesia. 2013 Jun;68(6):600-4.
31. Lopez A M, Valero R, Hurtado P, Gambu´s P, Pons M and T. Anglad Comparison of the LMA SupremeTM with the LMA ProsealTM for airway management in patients anaesthetized in prone position Br J Anaesth (2011)107(2):265-71.
32. Theiler LG, Kleine-Brueggeney M, Kaiser D, et al. Crossover comparison of the laryngeal mask supreme and the i-gel in simulated difficult airway scenario in anesthetized patients. Anesthesiology 2009;111:55–62.
33. Eschertzhuber S, Brimacombe J, Hohlrieder M, Keller C. The laryngeal mask airway Supreme – a single use laryngeal mask airway with an oesophageal vent. A randomised, cross-over study with the laryngeal mask airway ProSeal in paralysed, anaesthetised patients.Anaesthesia 2009;64:79–83.
34. Howes BW, Wharton NM, Gibbison B, Cook TM. LMA Supreme insertion by novices in manikins and patients. Anaesthesia. 2010 Apr;65(4):343-7

35. Abdi W, Dhonneur G, Amathieu R, Adhoum A, Kamoun W, Slavov V, Barrat C, Combes X.LMA supreme versus facemask ventilation performed by novices: a comparative study in morbidly obese patients showing difficult ventilation predictors. Obes Surg. 2009 Dec;19(12):1624-30.
36. Verghese C., Ramaswamy B. LMA-SupremeTM—a new single-use LMATM with gastric access: a report on its clinical efficacy. BJA 2008;101(3):405-10
37. Zhang L, Seet E, Mehta V, Subramanyam R, Ankichetty SP, Wong DT, Chung F. Oropharyngeal leak pressure with the laryngeal mask airway Supreme™ at different intracuff pressures: a randomized controlled trial. Can J Anaesth. 2011 Jul;58(7):624-9.
38. İpek Arslan, Zehra; Balc, Canan; Akalın Oysu, Duygu; Yılmaz, Mehmet; Gürbüz, Necla; ıice, Zekeriya. Comparison of Size 2 LMA-ProSealTM and LMA-SupremeTM in Spontaneously Breathing Children: a Randomised Clinical Trial. Balkan Medical Journal;Mar2013, Vol. 30 Issue 1, p90
39. Chew EE, Hashim NH, Wang CY. Randomised comparison of the LMA Supreme with the I-Gel in spontaneously breathing anaesthetised adult patients. Anaesth Intensive Care. 2010 Nov;38(6):1018-22.
40. Russo SG, Cremer S, Galli T, Eich C, Bräuer A, Crozier TA, Bauer M and Strack M Randomized comparison of the i-gel™, the LMA Supreme™, and the Laryngeal Tube Suction-D using clinical and fibreoptic assessments in elective patients BMC Anesthesiology 2012 12:18 1471-2253-12-8.
41. Seet E, Rajeev S, Firoz T, Yousaf F, Wong J, Wong DT, Chung F. Safety and efficacy of laryngeal mask airway Supreme versus laryngeal mask airway ProSeal: a randomized controlled trial. Eur J Anaesthesiol. 2010 Jul;27(7):602-7.