



AIRWAY MANAGEMENT WITH LMA-SUPREME AND I-GEL DURING GENERAL ANAESTHESIA IN LAPROSCOPIC SURGERIES – A COMPARATIVE STUDY

Anaesthesiology

Dr Pramod Chand Assistant Professor, Department Of Anaesthesiology, Lrm Medical College, Meerut.

Dr Tuhin Vashishth* Associate Professor, Department Of Anaesthesiology, Lrm Medical College, Meerut.
*Corresponding Author

Dr Garima Sharma Professor, Department Of Public Health Dentistry, Kalka Dental Meerut

Dr Vipin Dhama Professor, Department Of Anaesthesiology, Lrm Medical College, Meerut.

Dr Vijayant Kumar Assistant Professor, Department Of Anaesthesiology, Lrm Medical College, Meerut

ABSTRACT

Background: I-gel airway and LMA-Supreme are two recently introduced cuffed supraglottic airway devices used for maintaining airway during controlled ventilation under general anaesthesia.

Aim: Purpose of this study was to evaluate and compare the clinical performance of LMA SUPREME and I-GEL during general anaesthesia.

Material and methods: Our study was carried out on 100 patients (ASA I&II) 25-60 years of age of either sex weighing 50-90 kg undergoing laparoscopic surgeries in supine position under general anaesthesia. Patients were randomly divided into two groups, Group A (LMA-Supreme, n=50) and Group B (I-Gel, n=50). Ease of insertion, insertion time, airway sealing pressure and ease of insertion of gastric tube were recorded. Blood staining of device, lip and dental trauma, regurgitation and aspiration of gastric contents, post operative dysphagia and dysphonia were also recorded.

Statistical analysis used: Statistical analysis was done using SPSS (Statistical Package for Social Sciences) Version 15.0. Statistical formulas used included mean, standard deviation, chi square test and student 't' test. P value of <0.05 was considered statistically significant.

Results: Ease of insertion was more with LMA-Supreme (47/50, 94%) than I-Gel (40/50, 80%). Number of more than one insertion attempts was more in I-Gel (8/50, 16%) than LMA-Supreme (4/50, 8%). Mean insertion time (in seconds) with LMA-Supreme was (17.7±2.96) and (23.7±2.93) with I-Gel (P<0.001). Airway sealing pressure (in cm H₂O ± S.D.) was higher with LMA-Supreme (27.9±2.23) than I-gel (22.3±1.82), (P<0.001). Gastric tube placement was easier with LMA-Supreme (50/50, single attempt) than I-Gel (44/50, >1 attempts in 6 cases). Blood on device was lower with I-Gel (3/50, 6%) than LMA-Supreme (7/50, 14%). There was no incidence of lip and dental trauma, bronchospasm, laryngospasm, aspiration, regurgitation, dysphagia and dysphonia in both groups.

Conclusion: We conclude that LMA-Supreme is an effective device with higher airway sealing pressure, easier insertion, lesser mean insertion time, and easier gastric tube placement as compared to I-Gel.

KEYWORDS

LMA-Supreme, I-Gel, supraglottic airway device.

INTRODUCTION

Until 1983, there was no update on the cuffed supraglottic airway devices, which are introduced blindly into the hypo pharynx to form a seal around the larynx, so permitting spontaneous or positive pressure ventilation without penetration of the larynx or esophagus. It is used in place of face mask in routine anaesthesia and where difficulties with the airway are expected¹. The laryngeal mask airway (LMA) and similar supraglottic airway devices use an inflatable cuff to wedge into the upper esophagus and provide a perilaryngeal seal². The I-gel airway (Intersurgical Ltd, Wokingham, Berkshire, UK) and LMA-Supreme (Intavent Orthofix, Maidenhead, UK) are two recently introduced devices for maintaining the airway during controlled ventilation under general anaesthesia.

LMA-Supreme is made up of polyvinyl chloride. It is a single use device with precurved cuff, a drainage tube and an integrated bite block. The airway tube is elliptical, flattened and stiff; distal cuff edge of mask is reinforced (resisting folding), a design feature for easier insertion and reliable placement of device into the correct position.³

I-Gel is made up of medical grade thermoplastic elastomer and is a single use supraglottic airway device. Its shape, softness and contours accurately mirror the perilaryngeal anatomy to create the perfect fit. It also has a port for gastric tube placement.

The present study was undertaken to evaluate and compare the clinical performance of LMA-Supreme and I-Gel during general anaesthesia in supine position in terms of airway sealing pressure, ease of insertion, insertion attempts, insertion time, ease of gastric tube placement, lip and dental trauma, blood on device, incidence of regurgitation, aspiration, bronchospasm and laryngospasm.

Hemodynamic response of supraglottic device placement in terms of pulse rate (PR), systolic blood pressure (SBP), diastolic blood pressure

(DBP), mean arterial pressure (MAP) were also compared. An attempt was also made to compare patient compliance in terms of post-operative dysphagia and dysphonia.

MATERIAL AND METHODS

A randomized parallel group study was designed. Ethical approval for the study was taken from the institutional ethical committee. Hundred ASA I and II patients of either sex, 25-60 years old and weighing 50-90 kilograms (Kg), who were scheduled for elective laparoscopic surgeries in supine position under general anaesthesia were included in the study after obtaining written informed consent.

Patients with any pathology of the neck, upper respiratory tract and upper alimentary tract that produces difficult airway; predicted difficult airway (mouth opening < 2.5 cm, modified Mallampati class III & IV); potentially full stomach patients (trauma, morbid obesity, pregnancy, history of gastric regurgitation and heart burn); oesophageal reflux (hiatus hernia); emergency surgeries and patients with history of lung disease were excluded from the study.

All the 100 patients were randomly divided into two groups of 50 patients each using a lottery system wherein each patient was assigned a number and first 50 numbers picked were assigned to group A and next 50 to group B.

Group A – LMA SUPREME (No-4, 5) was used (n=50)

Group B – The I-GEL (No-3, 4) was used (n=50)

None of the patients were aware of the group to which they belonged.

The patients were premedicated with tablet alprazolam 0.25 mg and tablet ranitidine 150 mg the night before surgery and were kept fasting for 8 hours prior to surgery⁴.

On the day of surgery, after confirming the consent and fasting status,

an intravenous (IV) line was established with 18 G cannula and ringer lactate infusion was started.

Anesthesia technique:

All the patients received injection Midazolam 1mg, glycopyrrolate 0.2mg, IV 5minutes before surgery.

The multiparameter monitor was attached and base line readings of heart rate, non-invasive blood pressure, oxygen saturation (SpO₂) and end tidal carbon dioxide (CO₂) were recorded.

The patient lied in supine position and head was supported on a firm pillow in neutral position.

After preoxygenation with 100% oxygen for 3 minutes, the patient was induced with fentanyl 1.5mcg per kg and propofol 2.5mg per kg. Neuromuscular blockade was achieved by vecuronium 0.1mg per kg.

In both the groups the devices were lubricated with water soluble jelly. Once adequate depth of anaesthesia was achieved each device was inserted by a principal investigator. After confirming the correct placement of the device by proper chest expansion, absence of audible leak, absence of gastric insufflation and a square wave pattern in capnography, the device was fixed with an adhesive tape. A nasogastric tube of 12 French gauge was placed into the stomach through the gastric channel. Maintenance was achieved by 66% nitrous oxide in oxygen, halothane, and intermittent doses of muscle relaxant vecuronium in the doses of 0.015mg/kg.

Intraoperative monitoring of pulse rate, non invasive blood pressure, SpO₂ and end tidal CO₂ was done at baseline, after induction, 1, 5, 10, 15, 20, 25 and 30 minutes after insertion of device.

MEASURED PARAMETERS:

Ease of insertion (insertion within the pharynx without resistance and in single manoeuvre) was noted. If there was resistance during insertion of the device and more than one manoeuvre (eg. chin lift, jaw thrust) was used it was recorded as difficult insertion. If after three attempts the effective airway was not achieved then it was recorded as failure.

The insertion time (time taken in seconds from lifting the device in hand to obtaining an effective airway) for the device placement was recorded.

The airway sealing pressure was determined by closing the adjustable pressure limiting valve at a fixed fresh gas flow of 3L/minute and connecting the pressure gauge between the breathing system and the laryngeal mask airway. When an equilibrium state was reached the pressure was noted. After this equilibrium there was an audible leak which was heard near the mouth.

Ease of insertion of gastric tube was also recorded. The correct placement of the gastric tube was confirmed by aspiration of gastric contents, insufflation of air through the gastric tube and listening the audible noise by auscultating the epigastrium with stethoscope. Failure was recorded if the gastric tube was not placed correctly into the stomach within two attempts.

At the end of surgery, after the return of the spontaneous respiratory efforts residual neuromuscular blockade was reversed with 50 mcg/kg of neostigmine and 10 mcg/kg of glycopyrrolate. The device was removed when the reflexes were restored and patient was able to open the mouth on command. Any blood staining of device, lip and dental trauma were also recorded. Any regurgitation and aspiration of gastric contents were also assessed. Post operative dysphagia and dysphonia were also recorded after 24 hours of surgery.

Statistical analysis was done using SPSS Version 15.0. The statistical formulas used included mean, standard deviation, chi square test and student 't' test. *P* value of <0.05 was considered to be statistically significant.

RESULTS

A total of 100 patients satisfying the inclusion criteria were enrolled in the study and were randomly divided into two groups. In Group A (n=50) patients were managed with LMA Supreme whereas in Group B (n=50) patients were managed with I-Gel.

Statistically, there was no difference between the groups regarding age and weight (table 1). Majority of subjects in both the groups were females. There were 9 (18%) males in Group A and 12 (24%) males in Group B (*P*=0.461).

The mean pulse rate, SBP, DBP, MAP of the two groups and their intergroup comparison are shown in table 2, 3, 4 and 5 respectively. Statistically there was no significant difference in terms of hemodynamic changes.

Mean airway sealing pressure (in cm of H₂O) was observed to be significantly higher in Group A (27.9±2.23) as compared to Group B (22.3±1.82) (*P*<0.001).

Mean insertion time (in sec) was observed to be significantly lower in Group A (17.7±2.96) as compared to Group B (23.7±2.93) (*P*<0.001). Higher number of difficult insertions was seen in group B as compared to group A. Number of patients with more than one insertion attempts and difficulty in gastric tube insertion was also higher in group B than group A. However, blood on device was seen in more number of patients in group A as compared to group B (table 6).

None of the patients in either group suffered from trauma to teeth or lip, bronchospasm, laryngospasm, dysphagia & dysphonia, regurgitation and aspiration.

DISCUSSION

The present study was carried out with an objective to compare the efficacy of the LMA-Supreme with that of the I-Gel during general anaesthesia in terms of ease of insertion, airway sealing pressure, insertion attempts, ease of gastric tube insertion, bronchospasm and laryngospasm, incidence of regurgitation and aspiration, lip and dental trauma and to compare the hemodynamic response of supraglottic device placement in terms of PR, SBP, DBP, MAP. An attempt was also made to compare patient compliance in terms of post-operative dysphagia and dysphonia.

In our study, the airway sealing pressure was higher with LMA-Supreme than with I-gel which was statistically significant. The ease of insertion was more with LMA-Supreme than I-gel. Number of more than 1 insertion attempts was higher with I-Gel than LMA-Supreme. The mean insertion time was significantly lower in case of LMA-Supreme than I-Gel. Gastric tube placement was easier with LMA-Supreme than I-Gel. Blood on device was lower with I-gel than LMA-Supreme. There was no incidence of lip and dental trauma, bronchospasm, laryngospasm, aspiration, regurgitation, dysphagia and dysphonia in both groups. Statistically there was no significant difference in terms of hemodynamic changes.

Ragazzi R, Finessi L, Farinelli I, Alvisi R, Volta CA⁴ did the study in 80 patient undergoing breast surgery. They also found that first-time insertion success rate was significantly higher for LMA Supreme than with I-Gel and significantly more placement failures occurred with the I-gel.

Tan BH, Chen EG, Liu EH⁵ evaluated LMA Supreme in 100 patients with normal airways having elective surgery. Successful rates of insertion and ventilation were 96% at the first attempt and 100% after two attempts. The median time to successful placement was 15 seconds. Their findings suggest that in patients with normal airways, the LMA Supreme is easy to insert and provides a satisfactory airway with adequate seal pressures for ventilation. Our results are consistent with these studies.

Chew EE, Hashim NH, Wang CY⁶ compared the performance of the LMA Supreme (SLMA) with the I-Gel during anaesthesia in spontaneously breathing adult patients. Ninety patients with ASA physical status I or II were studied in a prospective randomised controlled study. Their primary outcome measure was oropharyngeal leak pressure. They also compared the overall insertion success rate, ease of insertion, adequacy of ventilation and incidence of complications. The mean oropharyngeal leak pressure for the LMA-Supreme was greater than that for the I-Gel in their study. The first attempt and overall insertion success rates were similar between the two groups. LMA-Supreme was easier to insert than I-Gel, but the time taken for insertion was similar. The incidence of complications was low in both groups. The grade of fiberoptic view was better with the I-Gel than the LMA -Supreme. They concluded that in adults with

normal airways, LMA-Supreme is easier to insert and provides a higher oropharyngeal leak pressure, but fibreoptic views are better with the I-gel.

Timmermann A, Cremer S, Heuer J, Braun U, Graf BM, Russo SG⁷ found that LMA-Supreme is a device suitable for use in routine anaesthesia which can be safely used by medical personnel with limited clinical experience. 30 patients were enrolled in the study. Insertion of the LMA-Supreme was possible in 27 (90%) patients at first attempt and in 3 (10%) at the second attempt. Insertion of gastric tube was possible in all patients at the first attempt. Mean Oropharyngeal Leak Pressure at the level of 60 cmH2O cuff pressure was 29.1 cmH2O (range 21-35 cmH2O, standard deviation +/-4.8 cmH2O). Laryngeal fit evaluated by fiber optic control was rated as optimal in all patients both immediately after insertion of the LMA-Supreme and after end of surgery. Three patients (10%) complained of mild sore throat. No patient reported dysphagia or dysphonia.

Teoh WH, Lee KM, Suhitharan T, Yahaya Z, Teo MM, Sia AT⁸ compared the efficacy of the inflatable cuff of the LMA Supreme against the non-inflatable cuff in I-Gel providing an adequate seal for laparoscopic surgery in the Trendelenburg position in 100 female patients. There was no difference in the oropharyngeal leak pressure, between the two groups. Forty-seven (94%) LMA Supremes and 48 (96%) I-gels were successfully inserted on the first attempt, with similar ease. Gastric tube insertion was easier and achieved more quickly with LMA Supreme than with I-gel. There was blood on removal of two LMA Supremes and one I-gel. Four patients in the LMA Supreme group and one patient in the I-gel group experienced mild postoperative sore throat.

CONCLUSION

After comparing the different parameters we conclude that LMA-Supreme is an effective supraglottic airway device than I-Gel in terms of airway sealing pressure, time of insertion, ease of insertion and gastric tube placement.

Table 1: Patient characteristics

Patient characteristics	Group A	Group B	Level of significance (P)
Age (in years)	33.34±7.37	35.32±7.79	0.583
Weight (in Kg)	56.48±4.05	57.00±4.50	0.520

Table 2: Comparison of two groups for pulse rate at different time intervals

S.No.	Time interval p.i.-post insertion	Group A (n=50)		Group B (n=50)		Significance of difference	
		Mean	SD	Mean	SD	t	P
1.	Baseline	82.80	11.84	79.86	11.12	1.280	0.204
2.	After induction	84.76	12.71	81.38	11.62	1.388	0.168
3.	1 min post insertion	87.70	10.13	87.56	11.39	0.065	0.948
4.	5 min p.i.	87.34	10.22	86.68	10.56	0.318	0.752
5.	10 min p.i.	84.60	10.51	86.02	10.75	-0.668	0.506
6.	15 min p.i.	81.86	9.22	82.72	9.38	-0.462	0.645
7.	20 min p.i.	81.24	9.39	81.24	9.50	0.000	1.000
8.	25 min p.i.	81.52	9.69	81.28	9.11	0.128	0.899
9.	30 min p.i.	81.64	9.18	80.12	8.34	0.867	0.388

Table 3: Comparison of two groups for SBP at different time intervals

S. No.	Time interval	Group A (n=50)		Group B (n=50)		Significance of difference	
		Mean	SD	Mean	SD	t	P
1.	Baseline	129.72	8.02	131.20	7.55	-0.950	0.345
2.	After induction	119.76	9.97	125.00	8.07	-2.888	0.005
3.	1 min post insertion	120.26	10.31	124.80	9.83	-2.254	0.026
4.	5 min p.i.	117.64	9.01	120.30	10.05	-1.393	0.167
5.	10 min p.i.	116.74	8.95	119.50	9.90	-1.462	0.147
6.	15 min p.i.	117.72	9.67	120.48	8.77	-1.495	0.138
7.	20 min p.i.	119.70	7.59	122.98	8.09	-2.091	0.039
8.	25 min p.i.	120.58	6.97	122.06	9.48	-0.889	0.376
9.	30 min p.i.	122.44	7.71	123.20	7.22	-0.509	0.612

Table 4: Comparison of two groups for DBP at different time intervals

S.No.	Time interval	Group A (n=50)		Group B (n=50)		Significance of difference	
		Mean	SD	Mean	SD	t	P
1.	Baseline	79.30	8.13	82.12	7.79	-1.770	0.080
2.	After induction	72.56	11.11	77.36	8.13	-2.465	0.015
3.	1 min post insertion	70.78	11.05	73.76	8.96	-1.481	0.142
4.	5 min p.i.	70.74	10.86	71.44	8.36	-0.361	0.719
5.	10 min p.i.	69.14	9.42	70.60	8.23	-0.825	0.411
6.	15 min p.i.	70.36	10.46	72.38	9.78	-0.997	0.321
7.	20 min p.i.	73.40	10.18	72.92	9.52	0.244	0.808
8.	25 min p.i.	74.36	10.50	72.86	10.12	0.728	0.469
9.	30 min p.i.	73.12	9.80	74.72	8.02	-0.893	0.374

Table 5: Comparison of two groups for MAP at different time intervals

S.No.	Time interval	Group A (n=50)		Group B (n=50)		Significance of difference	
		Mean	SD	Mean	SD	t	P
1.	Baseline	92.48	8.54	96.74	7.31	-2.680	0.009
2.	After induction	85.20	11.25	91.68	7.97	-3.323	0.001
3.	1 min post insertion	83.80	10.02	88.82	8.58	-2.691	0.008
4.	5 min p.i.	83.44	9.28	86.02	8.95	-1.415	0.160
5.	10 min p.i.	81.38	8.18	85.08	8.59	-2.207	0.030
6.	15 min p.i.	83.00	9.52	86.66	9.00	-1.976	0.051
7.	20 min p.i.	84.92	8.82	87.56	9.34	-1.453	0.150
8.	25 min p.i.	86.82	9.61	87.08	9.63	-0.135	0.893
9.	30 min p.i.	86.66	9.32	89.32	7.66	-1.559	0.122

Table 6: Comparison of two groups for different evaluation parameters

S.No.	Parameter	Group A (n=50)		Group B (n=50)		Significance of difference	
		No.	%	No.	%	χ ²	P
1.	Difficulty in insertion	3	6	10	20	4.332	0.037
2.	>1 attempts for insertion	4	8	8	16	1.515	0.218
3.	Difficulty in gastric tube insertion	0	0	6	12	6.383	0.012
4.	Blood on device	7	14	3	6	1.778	0.182

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