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## ORIGINAL ARTICLE

# Comparison of Efficacy of Laryngeal Mask Airway and Intersurgical-Gel Supraglottic Airway Device During General Anesthesia in a Tertiary Care Hospital

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## ABSTRACT

**Background:** Upper airways collapse during anesthesia is a common issue faced by anesthetists. Air way maintenance is an essential component of general anesthesia. Laryngeal mask airway and Intersurgical-gel (i-gel) air way devices are new advances in general anesthesia. Present study aims to compare the ease of insertion and hemodynamic response of i-gel supraglottic and laryngeal mask airway (LMA).

**Material and Methods:** A Randomized Clinical trial was conducted at the Department of Anesthesia, Shaikh Zayed Hospital, Lahore. Study duration was 6 months (June 2014- December 2014). A total of 60 patients were selected through non-probability consecutive sampling. Ethical approval was taken from ethical review board of Sheikh Zayed Hospital and informed written consents were taken from all the participants. Patients were randomly divided into two groups using lottery method. Group A was given laryngeal mask airway device while group B patients were provided with i-gel supraglottic device during anesthesia. Patients were compared for ease of insertion and hemodynamic parameters. Data was analyzed using SPSS version 24. Chi-square and t-test were applied and p-value  $\leq 0.05$  was considered statistically significant.

**Results:** A total of 60 patients were included in study. Mean age of patients was  $35.2 \pm 11.7$  years in LMA group and  $36.7 \pm 13$  years in i-gel group. Group B had lower number of insertion attempts ( $p=0.01$ ) and high insertion satisfaction ( $p=0.4$ ) as compared to group A. However, process failure and bleeding rate was found to be slightly higher in group B (16% and 13% respectively) as compared to group A ( $p>0.05$ ).

**Conclusion:** i-gel supraglottic device is a successful alternative option in terms of ease of insertion and less hemodynamic response as compared to laryngeal mask airway during general anesthesia.

**Key words:** General anesthesia, Laryngeal mask airway, I-gel supraglottic device

### Authors' Contribution:

<sup>1,2</sup> Conception, synthesis, planning of research and manuscript writing  
Interpretation, discussion, <sup>3</sup> Active participations in data collection and Data analysis.

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## Introduction

Upper airways collapse during anesthesia is a common issue faced by anesthetists, worldwide.<sup>1</sup> Proportions of deaths associated with airways complication during anesthesia are increasing significantly from 1990.<sup>2</sup> Royal College of Anesthetists and Difficult Airway Society

reported that airway related deaths are 7/1,000,000 in United Kingdom (UK).<sup>3</sup> Mortality rate due to air ways collapse during anesthesia is 2.6% in Togo.<sup>4</sup> Prevalence of anesthesia related complications in Pakistan is 5.5% with more than 30% attributed to respiratory

complications.<sup>5</sup> Upper airway obstruction hallmark includes diminished or absent airflow (presence of continued respiratory effort).

Air way obstruction could be complete or partial. Literature reports that patients with supralaryngeal obstruction had snoring as most common sign while patients with perilaryngeal obstruction had inspiratory stridor as a common sign.<sup>6</sup> Prevention and management of upper airway obstruction include anatomical positioning and posture, Continuous positive airway pressure (CPAP), heliox, tracheal tubes and airways aids.<sup>7</sup>

I-gel supraglottic airway is anatomically designed as a mask (composed of gel like thermoelastic elastomers). This single used device is featured for separation of respiratory and gastrointestinal tract. The device allows gastric tubes to pass in stomach. Stability of device during insertion is associated with tensile properties of i-gel bowel. I-gel becomes narrow and longer upon sliding under pharyngo-epiglottis folds. Proximal bowl ridge catches tongue base and helps to prevent device from moving upward out of position.<sup>8</sup> A laryngeal mask airway (LMA) is another supraglottic airway device initially developed by Dr. Archi Brain (British Anesthesiologist).<sup>9</sup> LMA is shaped like an endotracheal tube at the proximal end and this tube connects to an elliptical mask at the distal end. LMA attributes to less gastric distention and reduce risk of aspiration.<sup>10</sup>

Revi et al reported that i-gel is a successful alternative to LMA in terms of shorter duration of insertion and less hemodynamic response during general anesthesia.<sup>11</sup> Radhika et al reported that LMA and i-gel did not cause any significant change in hemodynamic status of patients. However, i-gel insertion is easier and rapid as compared to LMA.<sup>12</sup> Limited data is available on efficacy of i-gel and LMA efficacy in Pakistan. The objective of the present study was to compare the ease of insertion and hemodynamic response of i-gel supraglottic device and laryngeal mask airway (LMA).

## Material and Methods

A randomized clinical trial was conducted at department of Anesthesia Shaikh Zayed Hospital, Lahore. Study

duration was 6 months from November 2015 to April 2016. Sample size was calculated with 80% power of study, confidence interval 95%,  $\mu_1=27.1 \pm 16.7$ ,  $\mu_2=14.93 \pm 4.6$ , standard deviation 16.7 using sample size calculation formula for clinical trials.<sup>13,14</sup> Calculated sample size was 30 patients in each group. Recruitment of patients was done through non probability consecutive sampling. Patients with age 18-70 years, both genders, weighing 30-100 kg, American Society of Anesthesiologists (ASA) I and II, Mallampati grades (I and II), patients undergoing elective surgery (under general anesthesia  $\leq 30$  minutes), fasting patients ( $>6$  hours' solids and  $> 2$  hours' liquids other than milk) and patients with non-symptomatic regurgitation were included in the study. Exclusion criteria included obesity, pregnancy, history of cardiovascular and renal diseases, gastro-esophageal reflux diseases, chain smokers ( $>40$  cigarettes/day), drug abusers, trauma (thoracic, abdominal, orofacial, head and neck) and anticipated difficult intubation. Ethical approval was taken from ethical review board. Consent forms were taken from all the participants. Patients were randomly divided into two groups using lottery method. In group A, laryngeal mask airway and in group B, i-gel was used for intraoperative maintenance of airway. The patients were pre-medicated with Midazolam 2.5mg intravenous (I/V) 15 minutes before shifting to operation theatre. Patients were pre-oxygenated for three minutes with 100% oxygen. Propofol 1% 2mg/kg I/V were given at induction. I-gel and LMA was lubricated with distilled water. After 1 minute of ventilation with Oxygen and sevoflurane using a face mask, LMA or an I-gel was placed in peri laryngeal area. Anesthesia was maintained with O<sub>2</sub>, sevoflurane and with intermittent positive pressure ventilation (IPPV). Injection Tramadol 1.5mg/kg was given for analgesia. Group A and B were assessed for ease of insertion and hemodynamic status of LMA and I-gel. Ease of insertion was measured in terms of mean insertion time, insertion attempts, bleeding and failure status. Hemodynamic response was measured through physical assessment with ASA grading, airways assessment through Mallampatti class (MPC) grading, mean heart rate, mean systolic and diastolic blood pressure and mean arterial pressure. Data was analyzed using SPSS version 24. Descriptive statistics, mean  $\pm$  standard deviation and frequency and

percentages were calculated. Independent t test and Chi-square test were applied for comparison. P-value  $\leq 0.05$  was considered statistically significant.

## Results

A total of 60 patients were included in the study (1:1 randomization, 30 patients in each group). Mean age of patients in group A was  $35.2 \pm 11.7$  years and mean age of patients in group B was  $36.7 \pm 13$  years. There were 15 (50%) males and 15 (50%) females in group A. There were 10 (33%) males and 20 (67%) females in group B. ASA grading and MPC grading were different in Group A and Group B. Number of 2 insertion attempts were significantly lower in group B as compared to LMA patients (10% versus 23%,  $p=0.01$ ) (Table I). Insertion satisfaction was higher in group B (93%,  $p=0.424$ ). Moreover, failure and bleeding rate were slightly high (16% and 13%) in group B, however no statistical significance was found ( $p>0.05$ ) (Figure 1).

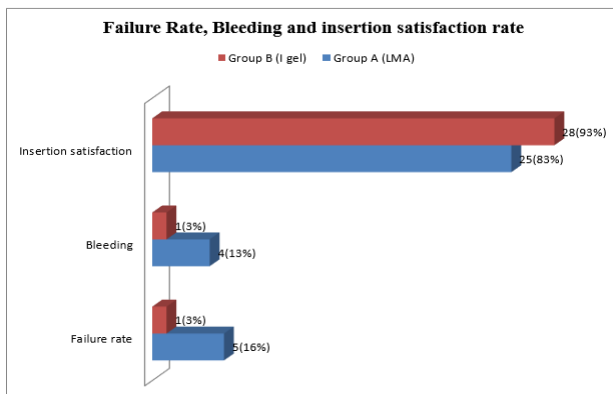


Figure 1: Comparison of failure rate, bleeding episodes and insertion satisfaction rate between two groups (n=60).

ASA grading	Group A n=30 n(%)	Group B n=30 n(%)	Total n(%)	P-value
ASA grade I	10(33)	20(67)	30(50)	0.01
ASA grade II	20(67)	10(33)	30(50)	
<b>MPC grading</b>				
Grade I	12(40)	18(60)	30(50)	1.00
Grade II	18(60)	12(40)	30(50)	
<b>Number of attempts</b>				
One attempt	23(77)	27(90)	50(83)	0.01
Two attempts	7(23)	3(10)	10(17)	
<b>Total</b>	30(50)	30(50)	60(100)	

Insertion time was significantly low in group B ( $p=0.02$ ). No statistical difference was found in hemodynamic parameters including heart rate, systolic blood pressure, diastolic blood pressure and Mean arterial pressure between groups A and B (Table II).

Variables	Group A (n=30) LMA	Group B (n=30) I-gel	T value	P value
	Mean $\pm$ SD	Mean $\pm$ SD		
<b>Ease of insertion</b> Insertion time; (seconds)	10.67 $\pm$ 1.6	9.5 $\pm$ 0.7	2.18	0.02
<b>Hemodynamic response</b>				
Heart rate; beats/min	80.9 $\pm$ 14.9	78.17 $\pm$ 11.2	1.23	0.72
Systolic blood pressure (mmHg)	114.4 $\pm$ 16.9	111.40 $\pm$ 18.4	2.15	0.83
Diastolic blood pressure (mmHg)	65.4 $\pm$ 12	63 $\pm$ 11.6	1.98	0.88
Mean arterial pressure (mmHg)	83.5 $\pm$ 11	81.10 $\pm$ 9	2.16	0.83

## Discussion

Adequate ventilation availability is a major responsibility of anesthesiologist. Several supraglottic devices are available but most common are laryngeal mask airway and i-gel supraglottic airway.<sup>15</sup> These devices are used in surgeries requiring general anesthesia and are used to avoid changes in hemodynamic responses due to endotracheal intubation in patients undergoing airway maintenance during anaesthesia.<sup>16</sup>

Majority of group B (i-gel) patients in our study had grade I ASA scores as compared to Group A (LMA) patients. Reza et al also reported that reduction in ASA grading was found in i-gel supraglottic patients as compared to patients treated with LMA ( $p=0.00$ ).<sup>17</sup>

In the present study, most of the patients in LMA group (60%) had MPC grade II for air way maintenance, however, in i-gel group majority of patients (60%) had MPC grade I for airway maintenance ( $p=0.60$ ). An et al.<sup>18</sup> and Kapoor et al.<sup>19</sup> reported findings contrasting to our study. They reported majority of patients with MPC I for airway maintenance in i-gel group as compared to LMA group.

In the present study, number of insertion attempts were significantly lower in i-gel group as compared to LMA patients (10% versus 7%,  $p=0.01$ ). Other researchers have reported much higher percentages of success in their studies. For example, Fujiwara et al reported that success rate in first attempt with i-gel was 100%, however, success rate in first attempt with LMA was 84%.<sup>20</sup> Similarly, Acharya et al reported that ease of insertion is higher in i-gel™ as compared LMA classic™ ( $p<0.05$ ).<sup>21</sup>

In the current study, among all patients in i-gel group, insertion time was found to be lower ( $9.5\text{sec}\pm 0.7\text{SD}$ ) as compared to patients in LMA group ( $10.67\text{sec}\pm 1.6\text{SD}$ ) ( $p=0.02$ ). Hayashi et al reported that LMA classic™ had significant higher duration of insertion as compared to i-gel.<sup>22</sup> Atef et al reported significant difference in median insertion time of i-gel and LMA with significantly lower time in i-gel group (16 seconds). Moreover, they reported that no cuff inflation was required by patients in i-gel group. They did not require any introducer and the device could be easily pushed into place.<sup>16</sup>

An insignificant difference between heart rate, systolic and diastolic B.P and mean arterial pressure in both groups was found in this study. Atef et al reported that LMA was associated with significant increase in heart rate and blood pressure ( $p=0.01$ ).<sup>23</sup> However, Ali et al conducted a similar study in Lahore and reported no significant difference in hemodynamic parameters after one minute of device insertion in both i-gel and LMA group ( $p>0.05$ ).<sup>24</sup>

This study was conducted at a single center that limits generalizability of the study. Furthermore, air way placement position was not assessed by flexible intubating fiberoptic.

## Conclusion

I-gel supraglottic device is a successful alternative option in terms of ease of insertion and less hemodynamic response as compared to laryngeal mask airway during general anesthesia. Surgeons and anesthesiologists should be very careful during application of these devices to avoid upper airway obstruction. Further research is required to evaluate minute details regarding efficacy of i-gel and LMA.

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