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I-GEL versus LMA classic: Comparison of two supraglottic airway devices in short surgical procedures

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ABSTRACT

Background: Supraglottic airway devices are more efficient than endotracheal intubation in management of difficult airway and hemodynamic response. **Aims and Objectives:** This study was undertaken for to compare laryngeal mask airway (LMA) Classic and I-Gel in terms of ease of insertion, insertion attempts, time taken for insertion, hemodynamic change, and adverse events after administering muscle relaxants for airway management in short surgical procedures. **Materials and Methods:** A total of 120 patients of American Society of Anaesthesiologist 1 and II, aged between 18 and 50 years with Malampatti score 1 and II posted for elective short surgical cases were randomly allotted into two groups (n = 60 in each), Group A for LMA Classic and Group B for I-gel. Patients were pre oxygenated with 100% O2 and pre-medicated. After induction and proper muscle relaxation, LMA Classic or I-GEL was inserted. The time and number of insertion attempts were assessed. Heart rate, Blood pressure, SpO_2 recorded at the time of insertion, 1, 3, 5, and 10 min following insertion. The recorded results were analyzed statistically. **Results:** The mean insertion time of Group A was 34.80 ± 3.193 and Group B was 21.72 ± 1.975. P < 0.001 and in Group B all patients were successfully intubated at first attempt whereas in Group B 23.33% patients required second attempts. Hemodynamic changes were also less with Group B. **Conclusion:** I-Gel has better hemodynamic stability. Ease of Insertion, insertion attempts and time taken for insertion are more convenient for I-Gel than LMA Classic after administering muscle relaxants.

Key words: Laryngeal mask airway classic; I-Gel; Short surgical procedures; Ease of insertion; Insertion attempts; Hemodynamic changes

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INTRODUCTION

Airway related problem is the second most common cause of anesthesia related mortality and morbidity. Airway emergency increases the odds of death or brain damage by 15-fold.[1] Maintenance of a patent airway for adequate ventilation is a major responsibility of an anesthesiologist. Although endotracheal intubation is gold standard for airway management, it requires direct laryngoscopy for endotracheal tube (ETT) placement. Manipulation of glottis and sub-glottic structures may lead to sympathetic stimulation which causes increase plasma level of catecholamine that leads to increased risk of hemodynamical instability such as hypertension, tachycardia, arrhythmia, myocardial ischemia, and also increase the risk of intracranial and intraocular pressure.[2] Supraglottic airway device (SAD) is an intermediate between facemask and ETT. These are very useful device for short duration surgeries with less hazards of intubation reflexes. Insertion of SAD causes less stimulation of sympathetic nervous system, so less chance of adverse cardiovascular events. It can be tolerated at lighter plane of anesthesia, less chance of sore throat post-operatively, less or no requirement of neuromuscular blockade, less chance of laryngospasm and

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bronchospasm, require minimal training for insertion than ET tube. Supraglottic device is a rescue device in a "cannot ventilate" or "cannot intubate" situation. It can be easily inserted in patient with cervical spine injury.

Nowadays, a variety of airway devices are available to protect the airway both in emergency and elective condition. These airways are classified as intraglottic and extraglottic. laryngeal mask airway (LMA) Classic is a first generation SAD developed by British anesthesiologist Dr. Archi Brain in 1983 and it has been used clinically since 1988.[1] The LMA Classic is being used widely now a days in emergency settings as an important accessory device for the management of difficult airway.[3] I-Gel is a new 2nd generation SAD has been designed in 2007 by UK anesthetist Dr. Muhammad Aslam Nasir.[1] It seals peri-laryngeal and hypo-pharyngeal structure with a wide range of anatomical variation.

The previous studies have evaluated LMA insertion without administering muscle relaxants. In the present study, the patients requiring short surgical procedures of 30–60 min duration and who had no contraindication for SAD insertion were recruited. LMA was inserted after administration of succinycholine and subsequently ventilation was controlled using injection atracurium. We compared two SADs, LMA Classic and I-Gel, in terms of time required for insertion, hemodynamic responses, post-operative adverse events such as sore throat, and cough.

Aims and objective

This study was undertaken for to compare laryngeal mask airway (LMA) Classic and I-Gel in terms of ease of insertion, insertion attempts, time taken for insertion, hemodynamic change, and adverse events after administering muscle relaxants for airway management in short surgical procedures.

MATERIALS AND METHODS

The study was a single blinded randomized controlled study performed in general and orthopedic operation theater of a tertiary care center of Eastern India over a period of 1 year. After taking ethical committee clearance and obtaining written and informed consent, 120 non obese patients aged 18–50 years of American Society of Anaesthesiologist (ASA) status I and II, Mallampati scores 1 and 2 with no history of hypertension, gastroesophageal reflux disease, cardiovascular disease, and renal disease from both sexes who underwent elective short surgical procedure with duration of operation 30–60 min were divided by computer generated random allocation into two groups, group A for LMA Classic (n=60) and Group B for I-Gel (n=60). Pre-anesthetic assessment was done for all patients. Fasting for 8 h before surgery and premedicated with alprazolam 0.25 mg, the night before surgery was followed. Intravenous access was established and slow infusion of crystalloids was started. Non-invasive monitors such as electrocardiography (ECG), non-invasive blood pressure (BP), and pulse oximetry were instituted and base line values of heart rate (HR), BP, SpO_2 recorded. While pre oxygenating with 100% O_2, intravenous injection of glycopyrrolate (10 mg/kg), midazolam (0.03 mg/kg), fentanyl (1 mg/kg), and ondansetron (0.15 mg/kg) were administered. The size of the airway device used was decided based on the patient's body weight, according to the manufacturer's recommendation. For the LMA Classic, size 3 was used when the patient's weight <50 kg, size 4 for patients weighing 50–70 kg and size 5 for patients weighting >70 kg. Whereas for I-Gel, size 3 was used for patients weighing between 30 and 60 kg, and size 4 for patients weighing between 50 and 90 kg. Both devices were lubricated on the tip and the posterior surface as recommended by the manufacturers and the LMA Classic was fully deflated before insertion, using the LMA Classic cuff deflator. Anesthesia was induced with intravenous propofol (2 mg/kg) once an adequate depth of anesthesia was achieved succinyl choline (1 mg/kg) was added intravenously. After proper muscle relaxation (after stopping of muscle fasciculation), LMA Classic or I-GEL was inserted. Ease of insertion, number, and duration of insertion attempts were assessed by the insertion attempts (<2 attempts-good, >2 attempts-poor) and duration (time from picking up the device until attaching it to the breathing system in seconds). A successful airway placement was confirmed by bilateral symmetrical chest movement, square waveform on capnography. Anesthesia was maintained with controlled intermittent positive pressure ventilation using oxygen and nitrous oxide (33–66%), sevoflurane/isoflurane, atracurium 0.5 mg/kg. Serial HR, BP, and SpO_2 monitoring was done at the time of insertion, 1, 3, 5, and 10 min following insertion and recorded by the investigators who were unaware about the grouping of the patients. Patients were reversed from muscle relaxant with injection neostigmine 60 μg/kg and injection glycopyrrolate 5 μg/kg. The device was removed when the reflexes were restored and the patient was able to respond to oral commands (eye opening, mouth opening). HR, BP, SpO_2 at the time of removal, and 1 min after removal were also noted by the investigators. The devices were inspected for presence of blood indicted any injury. Patients were kept under observation for any operative complication such as sore shroat, dyspnea, or dysphagia for next 24 h.

Statistical analysis

The statistical software SPSS version 22 has been used for the analysis. Continuous variables are expressed as Mean±standard deviation (SD) and compared across the groups using unpaired t-test. Categorical variables are expressed as number of patients and compared across the groups using Pearson's Chi-square test for Independence

of Attributes. Mean, SD, mean difference, unpaired t-value, P-value, degree of freedom as well as confidence interval were calculated. An alpha level of 5% has been taken, that is, if any P<0.05 it has been considered as significant.

RESULTS

Difference in demographic variability (Age, sex, body weight, height, and ASA status) was non-significant between both groups (P>0.05). Comparison for time taken of insertion shows that the mean duration is significantly less in Group B P<0.001) (Table 1) and the number of insertion attempts shows all patients in Group B intubation was successful at first attempt (Table 2). In our study, we observed that I-Gel insertion time was quicker than LMA Classic. Mean I-Gel insertion time was 21.72 and mean LMA Classic insertion time was 34.80 in our series. There was significant HR, systolic BP (SBP), and diastolic BP (DBP) variability seen in two groups and better hemodynamic stability was observed in Group B. There was significant difference in SBP and DBP at 1 min, 3 min, 5 min, and 10 min after insertion (P<0.001) and for HR at the time of insertion, 1 min, 3 min, 5 min, and 10 min after insertion significant p value was observed (Tables 3-5). No significant difference was noted between two groups for post-operative complications such as shore throat, cough, lip/dental injury (presence of blood on device), dyspnea or dysphagia, laryngospasm, and nausea vomiting(P>0.05). There was complaining of cough immediately after removal of device in both groups in our study. The differences were very insignificant (63.33% for Group A and 61.66% for Group B, P=0.850) between both groups. Patients were also complaining of sore throat immediately and 1 h after removal device and the differences were very much insignificant (51.66% for both groups, P=1.000).

DISCUSSION

LMA is used clinically as an alternative to both face mask and ETT. SADs have been found to be useful as effective airways during laparoscopic surgery as well.[4] The incidence of laryngospasm, cough at removal, dysphagia or dysphonia, sore throat, and hoarseness were found to be higher with the use of ETT in comparison with SADs.[5]

In the present study, it was found that I-Gel and LMA Classic were safe alternative to ETT for elective short surgical procedure. In the present study, successful placement of I-Gel was possible in all cases while for the LMA insertion a second attempt was required in about 23.3% of cases. In the present study, failure of insertion or failed attempt was defined if more than 3 attempts were required for the insertion of the device. There was not a single incidence of failure of insertion in either group in the current study.

Table 1: Mean, standard deviation and P value: Time taken for insertion of I Gel and LMA classic in minutes

Parameter to be assessed	Group A (Mean±SD)	Group B (Mean±SD)	P-value	Significance
Time Taken for Insertion (Seconds)	34.80±3.193	21.72±1.975	0.0001	Significant

LMA: Laryngeal mask airway

Table 2: Attempt taken for insertion of I Gel and LMA classic and P-value

Pararameter to be assessed	Group A	Group B	Total	P-value	Significance
Attempt 1	46	60	106	0.0001	Significant
Attempt 2	14	0	14		
Attempt 3	0	0	0		
Total	60	60	120		

LMA: Laryngeal mask airway

Table 3: Mean, standard deviation and P-value: HR

Time point	Group A (Mean±SD)	Group B (Mean±SD)	P-value	Significance
HR-1	77.46±4.102	76.95±3.766	0.474	Not significant
HR-2	92.38±3.494	73.13±2.943	0.0001	Significant
HR-3	89.52±3.638	71.37±4.154	0.0001	Significant
HR-4	86.20±4.445	70.22±3.484	0.0001	Significant
HR-5	88.88±3.996	70.07±3.695	0.0001	Significant
HR-6	88.38±4.654	69.00±3.075	0.0001	Significant

HR 1: 5 min before insertion, HR 2: At time of insertion, HR 3: 1 min after insertion, HR 4: 3 min after insertion, HR 5: 5 min after insertion, HR 6: 10 min after insertion, HR: Heart rate

Table 4: Mean, standard deviation and P-value: SBP

Time point	Group A (Mean±SD)	Group B (Mean±SD)	P-value	Significance
SBP-1	120.03±10.025	121.05±9.423	0.568	Not significant
SBP-2	107.83±8.300	107.70±8.722	0.932	Not significant
SBP-3	125.67±2.660	112.97±4.457	0.0001	Significant
SBP-4	125.60±2.663	114.40±3.406	0.0001	Significant
SBP-5	127.52±3.367	114.62±3.247	0.0001	Significant
SBP-6	127.10±3.383	114.95±3.016	0.0001	Significant

SBP 1: 5 min before insertion, SBP 2: At time of insertion, SBP 3: 1 min after insertion, SBP 4: 3 min after insertion, SBP 5: 5 min after insertion, SBP 6: 10 min after insertion. SBP: Systolic blood pressure

Table 5: Mean, standard deviation and P-value: DBP

Time point	Group A (Mean±SD)	Group B (Mean±SD)	P-value	Significance
DBP-1	77.45±6.743	75.27±6.628	0.076	Not significant
DBP-2	65.90±4.120	66.70±3.828	0.273	Not significant
DBP-3	79.98±2.943	68.12±3.632	0.0001	Significant
DBP-4	82.20±2.283	72.47±3.149	0.0001	Significant
DBP-5	85.60±2.853	70.93±3.804	0.0001	Significant
DBP-6	84.93±2.082	72.12±3.979	0.0001	Significant

DBP 1: 5 min before insertion, DBP 2: At time of insertion, DBP 3: 1 min after insertion, DBP 4: 3 min after insertion, DBP 5: 5 min after insertion, DBP 6: 10 min after insertion. DBP: Diastolic blood pressure

Dhimar et al.,[6] compared the I-Gel and LMA Classic as a conduit for tracheal intubation, and found that both could be useful alternatives to tracheal intubation using ventilating boogie while with stable hemodynamic parameters. Helmy et al.,[7] found that insertion of I-Gel took considerable shorter time in comparison with the LMA Classic (mean procedure time 15.6 s vs. 26 s, respectively). Placement of I-Gel takes less time probably due to no requirement of cuff inflation.[8] Alex et al.,[9] compared I-Gel and Classic LMA and found that the mean time taken for insertion was 13.6±3.9 s in the I-Gel group, while it was 23.2±7.9 s in the LMA classic group and it was statistically significant (P<0.05). The number of attempts for device insertion between the groups were statistically significant (P=0.027746). I-Gel is better than Classic LMA with respect to ease of insertion, other insertion characteristics and trauma, especially in first time users.

In the present study, no considerable changes were observed with regard to oxygen saturation and ECG. In the present study, the base line (5 min before the procedure) HR, SBP, and DBP were also comparable between the study groups. Interestingly, a slight decrease in blood pressure from the base line was noticed at the time of insertion of devices. This may be attributed to the effect of anesthetic agents used for induction of anesthesia. However, the difference was not statistically significant for both groups. In a study Jindal et al., found that placement of I-Gel was associated with the least hemodynamic change when compared with SLIPA and LMA.[10]

In the present study, on inspection of the devices for any blood stain after removal it was found to be insignificant in both the groups. Blood stain of the devices was found to be comparable in both the groups (in 10% of cases with the use of LMA and in 8.3% of cases during use of I-Gel). This finding is in line with that of Ari et al.,[11] who found comparable incidences of blood staining of devices and postoperative sore throat between the groups. In a study among infants, Lee et al.,[12] found similar performance of I-Gel and LMA Supreme as airway, although a shorter insertion time and higher oropharyngeal leak pressure was observed with I-Gel compared with the LMA Supreme. In a recent study in 2019, Bindal et al.,[13] concluded that considering insertion times and first attempt success rates, classic LMA and I-Gel were found to be superior to Baska mask. Bhola and Chandrasekar.[14] in 2020 conducted a study on clinical performance of classic LMA and I-Gel and concluded that both the devices are safe and good in performance with respect to ease of insertion in non-paralyzed anaesthetized adult. In a recent (2021) study, Bhattacharjee et al.,[15] observed that I-Gel is a better alternative to LMA Classic in the hands of novice residents for securing the airway in terms of shorter procedure time as well as higher success rate in the first attempt.

Limitations of the stud

The present study has a few limitations. Patients of ASA Grade III and IV and patients of pediatric age group was not included Large multicenter study is required to get more reliable and relevant information.

CONCLUSION

Both I-Gel and LMA Classic can be used safely for particularly short surgical procedure for anesthesia with

controlled ventilation. I-Gel has better hemodynamic stability. Ease of insertion and time taken for insertion are more convenient for I-Gel than LMA Classic.

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