



Comparison of I-gel with Classic Laryngeal Mask Airway Regarding the Ease of Use and Clinical Performance

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Objective: I-gel is a new supraglottic airway device without an inflatable cuff. We aimed to compare I-gel and the classic laryngeal mask airway (LMA) regarding the ease of use and clinical performance in Turkish population.

Methods: Fifty American Society of Anesthesiologists (ASA) I-II patients were randomly allocated into two groups: Group I-gel and Group LMA. Insertion time and success in first attempt were recorded. Peak, plato and mean airway pressures, EtCO₂, airway compliance and leak volume were periodically recorded during the operation. The presence of blood on device removal and postoperative sore throat were also assessed.

Results: The device insertion time in Group I-gel was shorter than that in Group LMA (21.00±4.15 vs. 30.40±12.17 s, p=0.001). The success rate in first attempt, peak, plato and mean airway pressures, EtCO₂ and airway compliance did not differ between the groups. The leak volume was lower in Group I-gel 5 and 45 min after insertion (p=0.041 and p=0.027). The presence of blood on device removal and postoperative sore throat were similar in both groups.

Conclusion: I-gel may be a more advantageous supraglottic airway device compared with LMA.

Keywords: Airway, I-gel, laryngeal mask airway

Introduction

Although endotracheal intubation is the gold standard in the provision of airway during anaesthesia, it is known that laryngoscopy and intubation have side effects such as an increase in the level of plasma catecholamine, hypertension, tachycardia, arrhythmia, myocardial ischemia and an increase in intracranial and intraocular pressures. Many supraglottic airway devices have been successfully used to provide and secure the airway in elective and emergency surgical interventions (1).

Laryngeal mask airway (LMA) having an inflatable cuff is the most commonly used supraglottic material over the last 10 years. On the other hand, I-gel is a new type of laryngeal mask and does not have an inflatable cuff. Owing to its thermo-plastic elastomer structure, it exactly adapts to the supraglottic tissue by bending with body temperature, thus minimising air leakage (2). Besides, the presence of a gastric drainage tube allowing the entrance of a nasogastric catheter decreases the risk of aspirating the stomach contents to the lung (2). Owing to the stiff part providing its standing firm and protecting from the bite, it adapts to the oropharyngeal curve without malrotation (3). In studies conducted, it was reported that when I-gel was compared with the classical LMA, I-gel surrounded the airway better; it could also be more easily placed, and it led to less trauma (2, 4, 5).

I-gel has recently become available in our country. We aimed to compare I-gel with classical LMA with regard to the ease of use and clinical performance in the patient population of our country.

Methods

After receiving approval from Fatih Sultan Mehmet Education and Research Hospital Ethics Committee and written informed consent from patients, 50 patients for whom surgery for less than 90 min in the supine position was planned, who

were in the ASA I-II group and between the ages of 18 and 80 were included in the study. The study was conducted in Fatih Sultan Mehmet Education and Research Hospital between September 2013 and July 2014. Patients having a high risk of aspiration pneumonia such as those with pulmonary disease, obesity (BMI>35 kg m⁻²), pregnancy, a history of gastric reflux or suspicion of difficult airway (Mallampati score>2 and mouth opening<2.5 cm) and pharynx pathology or those having airway obstruction due to larynx pathology were excluded from the study. The patients were randomly divided into two groups as Group I-gel and Group LMA by the sealed envelope technique. The patients were not premedicated. Following the monitoring of heart rate, non-invasive arterial blood pressure and SpO₂, anaesthesia induction was applied with 3 mg kg⁻¹ of propofol, 2 mcg kg⁻¹ of fentanyl and 0.5 mg kg⁻¹ of rocuronium. After the patients were ventilated by 100% O₂ with a mask for 2 min, I-gel of suitable size or classical LMA was placed by an anaesthesiologist. The LMA cuff was inflated with the recommended volume of air according to the size of LMA. The occurrence of the capnograph wave and bilateral chest movements with manual ventilation were accepted as the indicator of effective ventilation. The intervention was accepted to be unsuccessful in the presence of partial or complete airway obstruction or serious air leakage. When the intervention failed in the first attempt, the second attempt was conducted again by the jaw thrust manoeuvre or by changing the position of the head. If a third attempt was conducted, a different size of I-gel/LMA was used. The patient was intubated if the third attempt failed. Manual ventilation was initiated after the airway device was placed. When a typical wave CO₂ occurred, it was accepted that I-gel/LMA placement was completed. A 12-G aspiration catheter was placed to the gastric drainage tube in the patients in the I-gel group, and the stomach contents were aspirated. The maintenance of anaesthesia was provided with 1–2% of sevoflurane and remifentanyl infusion in 50/50% O₂/air mixture by controlled mechanical ventilation in such a way that the tidal volume would be 7 mL kg⁻¹, 12 respiration min⁻¹. I-gel/LMA placement durations, number of interventions and success in the first attempt were recorded. Peak inspiratory pressure, plateau pressure, mean airway pressure, airway compliance, EtCO₂, inspiration tidal volume and expiration tidal volume were recorded 1, 5, 10, 15, 30, 45, 60, 75 and 90 min after I-gel/LMA was placed. The amount of leakage was calculated by subtracting expiration tidal volume from the inspiration tidal volume. After reversing the neuromuscular block with neostigmine and atropine after the surgery, I-gel/LMA was removed. The presence or absence of blood on the airway material when it was removed was recorded. The patients were evaluated at the postoperative 2nd hour with regard to the presence sore throat by an assistant anaesthesiologist who did not know in which group the patient was included.

Statistical analysis

For analysing the data obtained, SPSS 16.0 for Windows (Statistical Package for the Social Sciences Inc., Chicago,

IL, USA) was used. The numerical values were presented as mean±SD. After the consistency of the numerical values to the normal distribution was assessed with Shapiro–Wilk test, t-test was used to compare numerical values consistent with normal distribution, and the results were evaluated according to the equality of the variances. On the other hand, Mann–Whitney U test was used to compare numerical values inconsistent with normal distribution. Categorical values were presented as number and percentage. Pearson chi-square and Fisher's exact tests were used in the comparison of categorical data. P≤0.05 was accepted to be statistically significant.

Results

There was no difference between the groups with regard to age, gender, height, weight and duration of intervention (Table 1).

The duration of the placement of airway material was shorter in the I-gel group than in the LMA group (21.00±4.15 s and 30.40±12.17 s; with t-test, p=0.001).

There was no difference between the groups with regard to the number of interventions. The first attempt was successful in 88% of the patients in both groups (Table 2). Three attempts were unsuccessful in 1 patient in the LMA group, and the patient was intubated and excluded from the study.

There was no difference detected between the groups with regard to peak, plateau and mean inspiratory pressures, EtCO₂ and compliance.

Leakage volume at the 5th and 45th minutes after the airway device was placed was lower in the I-gel group than in the LMA group (Table 3).

Table 1. Demographic characteristics and intervention duration

| | Group I-gel | Group LMA | p |
|---|-------------|-------------|-------|
| Age (years) | 48.00±15.80 | 45.56±15.88 | 0.596 |
| Gender (F/M) | 14/11 | 13/12 | 0.777 |
| Height (cm) | 168.00±7.57 | 168.65±7.30 | 0.770 |
| Weight (kg) | 71.54±14.25 | 74.44±11.28 | 0.433 |
| Duration of surgery (min) | 51.44±24.49 | 46.46±24.10 | 0.477 |
| Pearson Chi-square test (gender), t-test (age, height, weight and duration of intervention) F: female; M: male; LMA: laryngeal mask airway | | | |

Table 2. Number of interventions

| Group | Number of interventions | | | p |
|--|-------------------------|--------|-------|-------|
| | 1 | 2 | 3 | |
| Group I-gel | 22 (88) | 3 (12) | 0 (0) | 0.223 |
| Group LMA | 22 (88) | 1 (4) | 2 (8) | |
| Pearson Chi-square test Data are presented as number (% value). LMA: laryngeal mask airway | | | | |

There was no difference found between the groups with regard to the presence of blood after the airway device was removed (Table 4).

There was no difference between the groups with regard to postoperative sore throat (Table 5).

Discussion

In our study, I-gel placement duration was found to be shorter than the placement duration for LMA (21 s for I-gel and 30.4 s for LMA). In the study by Kini et al. (6) where they compared I-gel and LMA proseal (multi-use LMA with the opportunity of gastric drainage) in 48 patients, placement durations were similar to those in our study were found. These were 21.98 s for I-gel and 30.60 s for LMA. Although a relaxant was used for anaesthesia induction in our study, these researchers provided anaesthesia induction with fentanyl, propofol and isoflurane without using any relaxant. The authors suggested that the longer placement duration in the patients in whom LMA Proseal was applied may be associated with the duration of inflation of the cuff (6). Because the

inflation of the cuff did not last long enough to explain the duration difference between the two groups, we are of the opinion that the longer placement duration was related to the inflation of cuff and that the ease of I-gel use contributed to the shortening of the period. Although I-gel placement duration was detected between 11 and 20 s in many studies (5, 7-9), Hayashi et al. (10) reported placement duration to be 16 s for LMA proseal and 4.4 s for I-gel. In the study by Kuş et al. (11) where they simulated difficult airway conditions for the children, LMA Supreme (single-use LMA with the opportunity of gastric drainage) was found to be placed in a shorter time than I-gel (11.2 and 13.5 s), and the success rate in the first attempt using LMA Supreme was higher than the group of patients for whom I-gel (100% and 90%, respectively) was used. Theiler et al. (12) reported that the placement duration of LMA supreme was shorter than that of I-gel (34 and 42 s, respectively) in adult patients who were applied the difficult airway scenario again.

Success incidence in the first attempt in our study was detected to be 88% for both groups. Although there was no patient in the I-gel group to pass to the third attempt, it was necessary to pass to the third attempt for 2 patients in LMA group; however, there was no statistical significance between the groups with regard to the number of attempts. One patient in the LMA group was intubated and excluded from the study because it failed in all three attempts. In the study by Chauan et al. (5) where I-gel and LMA Proseal were compared with regard to the ease of use, I-gel was found to be more advantageous than LMA Proseal. On the other hand, in the meta-analysis by Chen et al. (13), where they compared the performances of I-gel and LMA supreme, it was concluded that placement durations and success rates in the first attempt were similar. I-gel is also used for children, and in case there is airway obstruction, it is reported that a smaller size solves the problem (14, 15). In a study in which 51 cases of cardiac arrest were evaluated, it was concluded that success incidence with I-gel in the provision of airway was higher than that with LMA (90% for I-gel, 58% for LMA). Emergency medical technicians placed I-gel in a shorter time and with a higher success rate when compared with LMA after a short theoretical training (17).

Chauan et al. (5) detected blood more often on the airway material in patients using LMA Proseal than in those using I-gel, and they reported that LMA Proseal more frequently led to sore throat after surgery. They emphasised that trauma during the placement, more than one intervention and the pressure of cuff on pharyngeal mucosa were regarded to be responsible for postoperative complications (5). The pressure on tissues, venous compression and the nerve injury caused by airway materials with inflated cuff explain the higher incidence of postoperative morbidity when compared with airway materials without cuff (5). Singh et al. (7) reported that tongue, lip and dental trauma were observed at a rate of 16.7% in patients in whom LMA Proseal was applied and 3.3% in those in whom I-gel was applied.

Table 3. Leakage volume

| Leakage volume (mL) | Group I-gel | Group LMA | p |
|----------------------|-------------|-------------|--------|
| 1 st min | 15.24±16.53 | 22.17±18.41 | 0.172 |
| 5 th min | 12.80±14.63 | 23.17±19.61 | 0.041* |
| 15 th min | 14.75±16.03 | 19.92±17.22 | 0.288 |
| 30 th min | 15.30±19.10 | 26.83±22.35 | 0.064 |
| 45 th min | 12.52±12.69 | 22.95±16.45 | 0.027* |
| 60 th min | 14.00±13.66 | 21.33±15.36 | 0.187 |
| 75 th min | 19.90±19.66 | 15.57±11.63 | 0.611 |

*comparison between the groups with t-test
The data are presented as mean±standard deviation.
LMA: laryngeal mask airway

Table 4. Blood presence on I-gel/LMA

| Group | Blood | | p |
|-------------|--------|---------|-----|
| | Yes | No | |
| Group I-gel | 2 (8) | 23 (92) | 1.0 |
| Group LMA | 3 (12) | 22 (88) | |

Fisher's exact test
Data are presented as number (%value).
LMA: laryngeal mask airway

Table 5. Frequency of postoperative sore throat

| Group | Sore throat | | p |
|-------------|-------------|---------|-----|
| | Yes | No | |
| Group I-gel | 4 (16) | 21 (84) | 1.0 |
| Group LMA | 4 (16) | 21 (84) | |

Fisher's exact test
Data are presented as number (% value).
LMA: laryngeal mask airway

Although there was no difference detected between the groups with regard to sore throat, the meta-analysis results of Chen et al. (13) drew attention to the fact that sore throat was more frequently observed than I-gel.

Cuff inflation may give rise to malrotation after the airway material is placed (18). Owing to the more stiff part providing it to stand firm and protecting from bite, I-gel adapts to the oropharyngeal curve without malrotation (3). It was indicated with fibre-optic imaging that I-gel was much more compatible with the anatomic structure than LMA Proseal (5). Because I-gel does not have a cuff, a higher volume of leakage is expected. The leakage volumes at the 5th and 45th min were found to be lower in the I-gel group. It is emphasised that the full compatibility of I-gel to the supraglottic tissue provided less air leakage (2). Kim et al. (19) reported that even if they applied 5 cm of H₂O PEEP, there was no change in leakage volume. However, they added that they could not detect an improvement in oxygenation.

The limitation of our study is that it was technically impossible for the person who records the peroperative data to be uninformed about the airway device used. The assistant anaesthesiologist who recorded the presence of sore throat did not know the groups of patients.

Conclusion

When shorter placement duration and lower leakage volume are taken into consideration, we think that I-gel is a more advantageous airway material.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Fatih Sultan Mehmet Training and Research Hospital.

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

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