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Original research article

Supraglottic airway devices- I-gel and cLMA: Hemodynamic response

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Abstract

The 'I-gel' is a truly anatomical supraglottic device. It is made of medical grade thermoplastic elastomer, which is soft, gel-like and transparent. It is a non-inflatable cuff and fits snugly onto the perilaryngeal framework, mirroring the shape of the epiglottis, aryepiglottic folds, piriform fossae, perithyroid, pericricoid, posterior cartilages and spaces. After obtaining written informed consent, 60 adult patients of both sexes belonging to ASA Grade I and II planned various elective procedures lasting for 45min to 1hour duration, were randomly selected. The study group was divided in two groups of 30 each (n=30): Group I (30 cases where I- gel was used) Group II (30 cases where cLMA was used). Systolic blood pressure has been compared in both the groups at before induction, after induction and after insertion at 1 min, 2 min, 3 min, 4 min, 5 min, 20 min, 35 min and 50 min and is found to be statistically non-significant.

Keywords: I-gel, cLMA, hemodynamic response

Introduction

The primary function of the respiratory system is to deliver oxygen to cell and to remove carbon dioxide produced by cellular metabolism. All tissues require oxygen to maintain homeostasis. The vital organs i.e the brain and heart cannot sustain for prolonged periods of oxygen deficit without tissue ischemia or death. Therefore ensuring adequate respiration is clearly imperative in the provision of anaesthesia care [1].

Knowledge of airway anatomy is vital to successful airway management. The air passages starting from the nose and ending at the bronchioles are vital to the delivery of respiratory gas to and from the alveoli. During clinical anesthesia, the anesthesiologist uses these air passages to deliver the anesthetic gases to the alveoli while, at the same time, maintaining vital respiratory gas transport [2]. To accomplish proper airway management, anesthesiologists often gain access to the airways by means of an endotracheal tube (ET) or other devices that are directly introduced into the patient's upper or lower air passages. For the purpose of description, the airway is divided into the upper airway, which extends from the nose to the glottis, and the lower airway, which includes the trachea, the bronchi and the subdivisions of the bronchi. The airways also serve other important functions such as olfaction, deglutition, and phonation [3, 4].

The 'I-gel' is a truly anatomical supraglottic device. It is made of medical grade thermoplastic elastomer, which is soft, gel-like and transparent. It is a non-inflatable cuff and fits snugly onto the perilaryngeal framework, mirroring the shape of the epiglottis, aryepiglottic folds, piriform fossae, perithyroid, pericricoid, posterior cartilages and spaces. Each receives an impression fit, thus supporting the seal by enveloping the laryngeal inlet and avoiding any compression trauma. The seal created is sufficient for both spontaneously breathing patients and for intermittent positive pressure ventilation (IPPV) [5, 6].

Methodology

After obtaining written informed consent, 60 adult patients of both sexes belonging to ASA Grade I and II planned various elective procedures lasting for 45 min to 1hour duration, were randomly selected.

The study group was divided in two groups of 30 each (n=30):

Group I: (30 cases where I- gel was used).

Group II: (30 cases where cLMA was used).

Inclusion criteria were

- ASA Grade I & II patients
- Age between 18 to 55 years of both sexes

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- Planned for elective surgical interventions where spontaneous ventilation is ideal.

Exclusion criteria were

- Patients' refusal
- ASA Grade III & IV patients
- Mouth opening < 2.5 cm
- Obese patients with BMI > 28kg/m^2
- Emergency surgical interventions
- Patients with history of allergy or sensitivity to latex or egg
- History of Gastro esophageal reflux disorder
- Patients with risk factors like pregnancy more than14weeks
- K/C/O Hypertension or Blood Pressure ≥150/90
- Patients posted for head and neck surgery
- Impaired ability to communicate (eg. Confusion, poor hearing or language barrier)
- Patients with distorted or abnormal anatomy of pharynx.
- Patients with obstruction of the airway beyond the larynx.
- Patients with decreased compliance of the lung.

Study procedure: 60 patients who satisfied inclusion criteria were divided in two groups as mentioned previously.

All the patients were subjected to through pre-anesthetic checkup and evaluation was done pre-operatively which included:

- Detailed airway assessment.
- Nutritional status and body weight of the patient.
- Detailed medical history
- Surgical history
- Detailed examination of cardio-vascular and respiratory system.
- Drug therapy
- History of any allergy
- Any addiction (if any)

Results

Table 1: Comparison of Pulse rate in two groups studied

Pulse rate	Group I	Group II	P value
Before Induction	77.70±9.23	78.97±9.64	0.605
After Induction	76.83±8.92	79.00±10.74	0.399
After Insertion			
1 minute	75.87±9.03	77.67±13.09	0.538
2 minutes	76.47±9.16	78.93±10.71	0.342
3 minutes	74.10±10.22	78.83±13.26	0.127
4 minutes	72.87±11.85	79.37±15.15	0.069+
5 minutes	73.33±10.50	78.97±13.82	0.081+
20 minutes	73.21±9.29	79.50±9.39	0.019*
35 minutes	73.70±9.07	83.86±12.65	0.030*
50 minutes	71.00±9.86	78.00±2.83	0.381

Interpretation: In the above table pulse rate has been compared in both the groups at before induction, after induction and after insertion at 1min, 2 min, 3min, 4 min, 5min, 20 min, 35 min and 50mins and is found to be statistically non-significant.

Table 2: Comparison of SBP (mm Hg) in two groups studied

SBP (mm Hg)	Group I	Group II	P value
Before Induction	128.00±12.98	126.47±11.88	0.635
After Induction	122.60±14.10	121.57±13.36	0.772
After Insertion			
1 minute	121.93±18.54	119.70±17.74	0.635
2 minutes	119.10±22.64	118.00±22.02	0.849
3 minutes	117.73±17.16	118.87±16.48	0.795
4 minutes	120.70±13.69	121.83±14.32	0.755
5 minutes	119.50±12.51	120.50±11.14	0.745
20 minutes	120.89±11.54	122.71±10.70	0.561
35 minutes	120.20±10.52	121.71±9.25	0.739
50 minutes	122.67±8.24	121.00±12.73	0.831

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Interpretation: In the above table systolic blood pressure has been compared in both the groups at before induction, after induction and after insertion at 1 min, 2 min, 3min, 4 min, 5 min, 20 mins, 35 mins and 50mins and is found to be statistically non-significant

Table 3: Comparison of DBP (mm Hg) in two groups studied

DBP (mm Hg)	Group I	Group II	P value
Before Induction	74.93±11.26	76.63±10.30	0.544
After Induction	71.73±11.67	72.67±11.27	0.754
After Insertion			
1 minute	70.63±14.39	71.47±15.26	0.828
2 minutes	70.97±15.42	71.50±15.64	0.895
3 minutes	68.80±12.18	70.23±13.91	0.673
4 minutes	69.70±10.86	72.80±12.49	0.309
5 minutes	70.47±9.78	72.40±10.7	0.468
20 minutes	69.89±10.23	71.58±11.01	0.569
35 minutes	67.40±10.70	61.57±16.85	0.297
50 minutes	66.67±8.16	75.00±7.07	0.249

Interpretation: In the above table diastolic blood pressure has been compared in both the groups at before induction, after induction and after insertion at 1 min, 2 min, 3 min, 4 min, 5 min, 20 mins, 35 mins and 50 mins and is found to be statistically non-significant

Table 4: Comparison of SpO_2 % in two groups studied

SpO2 %	Group I	Group II	P value
Before Induction	99.40±1.00	99.57±0.77	0.474
After Induction	99.70±0.65	99.93±0.25	0.073+
After Insertion			
1 minute	99.70±0.65	99.93±0.37	0.092+
2 minutes	99.67±0.61	99.93±0.25	0.030*
3 minutes	99.63±0.76	100.00±0.00	0.011*
4 minutes	99.80±0.41	99.97±0.18	0.045*
5 minutes	99.77±0.57	100.00±0.00	0.028*
20 minutes	99.82±0.55	99.96±0.20	0.253
35 minutes	100.00±0.00	100.00±0.00	-
50 minutes	100.00±0.00	100.00±0.00	-

Interpretation: The mean SpO2 was comparable in both the groups. Statistical evaluation between the two groups showed no significant difference in the arterial SpO_2.

Discussion

During the insertion of LMA, the pressor response maybe induced by the passage of the LMA through the oral and pharyngeal spaces, pressure produced in the larynx and pharynx by the inflated cuff and the dome of the LMA. During removal of the LMA, the hemodynamic response is probably triggered by pharyngeal stimulation during reverse rotation of the cuff. The same thing can also occur during insertion and removal of I-gel.

Hemodynamic parameters heart rate, systolic blood pressure**,** diastolic blood pressure**,** SpO_2**,** $EtCO_2$ were taken at before induction, after induction and after insertion at 1 min, 2 min, 3 min, 4 min, 5 min, 20 mins, 35 mins and 50 mins time intervals. Statistical analysis was carried out and found that two devices elicit similar degree of pressor response but not above the baseline value. The results of our study were similar to the study done by Helmy AM *et al.* [7], Franksen *et al.* [8], who in their study found no significant difference between I-gel and cLMA with regard to HR, mean arterial BP, SpO_2 and $EtCO_2$. Proper premedication and use of Propofol in dose of 2mg/kg might be the reason for such hemodynamic response. Lee Y *et al.* [9] and Fuji Y *et al.* [10] also concluded that LMA associated with less degree of pressor response in both hypertensive and normotensive patients.

Jindal P *et al.* [11], in their study observed that I-gel produced less hemodynamic changes compared to other SADs. The author concluded that I-gel effectively conforms to the perilaryngeal anatomy despite the lack of an inflatable cuff, it consistently achieves a proper positioning for supraglottic ventilation and causes less hemodynamic changes as compared to other SADs like cLMA which due to its inflatable cuff can produce more hemodynamic changes [12].

Conclusion

So, it was concluded that I-gel is better alternative to cLMA during general anaesthesia on spontaneous ventilation with respect to ease of insertion (number of attempts and duration) and hemodynamic

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stability with comparable post-operative complications.

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