Original Article

A Comparative Study Evaluating I-gel and Air-Q LMA for Ventilation in Anaesthetised and Paralysed Patients

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ABSTRACT

Background: The aim of study is to compare I-gel and Air-Q supraglottic airways in terms of - success rate of device insertion, number of attempts taken, haemodynamic parameters before and after device insertion, incidence of trauma and postoperative sore throat, dysphagia. **Methods:** This randomised single blind study was conducted on 90 patients of age 18-60 years, undergoing elective surgery requiring general anaesthesia. Patients were randomly allocated in two groups- Group I: I-gel (n= 45), Group II: Air-Q (n=45). After preoxygenation, induction and muscle relaxation appropriate size I-gel or Air-Q was inserted and all parameters were noted by an independent observer. For statistical analysis, Student t-test was employed to compare the means and Chi-square test was used for categorical variables. Complications were compared using Fisher's exact test. **Results:** The demographic profile of patients in both groups was similar. In all patients supraglottic airway device was inserted within 3 attempts. Mean insertion time in first attempt for I-gel (25.85 ±1.7 sec) was found to be significantly lower than Air-Q (26.73±1.51 sec) [P=0.0128]. **Conclusion:** We conclude that I-gel is easier and safer than Air-Q when ventilation through LMA is intended during surgery.

Keywords: *Air-Q, I-gel, Supraglottic airway*.

INTRODUCTION

Airway management is one of the most important skills in the field of anaesthesiology and inability to secure the airway can lead to catastrophic results. Before the advent of supraglottic airways, only the face mask and endotracheal tube were available devices to secure patient's airway in routine surgery or emergency scenario.[1] Since then several supraglottic airway devices have been developed, of which the laryngeal mask airway (LMA) was the pioneer.[2]

Supraglottic airway devices (SADs) are helpful in difficult airways and in emergency lifesaving procedures. I-gel (Intersurgical,Wokingham,UK) is a supraglottic airway device made up of medical grade thermoplastic elastomer, which is soft gel like, transparent and designed to anatomically fit the perilaryngeal and hypopharyngeal structures, it does not have inflatable cuff. It also has a port for gastric tube placement, easier and stable insertion with minimal risk of tissue compression.

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Air-Q is a single use device, made up of polyvinyl chloride, designed primarily for blind tracheal intubation. It has an oval shaped hyper curved airway tube that accommodates large tracheal tubes and better approximates the anatomy for easy insertion. There is an auxiliary hole that improves airway flow in the event of partial airway obstruction by epiglottis. It has mask ridges to improve anterior mask seal. In this study we will evaluate and compare performance of I-gel and Air-Q in patients undergoing elective surgeries.

MATERIALS AND METHODS

After attaining approval from institutional ethics committee this single blind randomised control trial was started on 90 ASA I or II patients of either sex undergoing elective surgery requiring general anaesthesia and mechanical ventilation. Patients were randomly allocated by computer generated random number tables to one of two groups comprising, Group I: I-gel (n= 45), Group II: Air-Q (n=45). Patients having psychiatric disorder, severe pulmonary, cardiac, renal or endocrine disorder, coagulation disorders or on anticoagulation therapy, risk factors for pulmonary aspiration, patients with ASA class ≥ III, mouth opening less than 2 cm, patients with known or anticipated difficult face mask ventilation, gastroesophageal reflux disease, hiatus hernia and pregnancy were excluded.

In the operation theatre intravenous route was established and ringer lactate solution was started. Modified Mallampati grading was assessed and recorded in each case. All patients were monitored

for Systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial blood pressure (MAP) and heart rate (HR) non-invasively. Continuous ECG monitoring was done. Peripheral oxygen saturation (SpO_2) and End-tidal carbon-dioxide concentration ($EtCO_2$) was measured by pulse oximetry and capnometry. All patients were premedicated with injection ondansetron 0.1mg/kg (i.v), injection Glycopyrrolate 0.2mg (i.v) and injection Pentazocine 0.6mg/kg (i.v). Following premedication patients were preoxygenated with 100% oxygen for 3 minutes. Anaesthesia was induced with Propofol 2.5mg/kg intravenously, and muscle relaxation was facilitated with Vecuronium 0.1mg/kg and mask ventilation was continued for 3 minutes with 100% oxygen. The appropriate size I-gel or Air-Q was inserted.

Successful insertion of the device was confirmed by chest wall movement, auscultation of breath sounds and square wave capnographic tracing. If first attempt was failed then patients were ventilated with 100% O_2 for 1 minute before next attempt. If we were not able to successfully ventilate the patient even after three attempts, patient was intubated with direct laryngoscopy and this was included as failed case. Time of successful device insertion was noted as device inserted in mouth till confirmation by various methods. If more than one attempt was required, ventilation time (1 min. or 2 min) before successful attempt was excluded from total duration of insertion. After completion of surgery and reversal from muscle relaxation, device was removed from oral cavity and inspected for blood staining and oral cavity was looked for blood or trauma.

Haemodynamic parameters such as heart rate, systolic blood pressure, diastolic blood pressure and mean arterial blood pressure before induction, after induction and after successful insertion.

In postoperative period we observed for any sore throat, dysphagia, and any change in voice (hoarseness). All parameters were recorded by an independent observer and analysed by proper statiatical test. Study population was calculated by power analysis taking power of the study as 80%.

RESULTS

The two groups were statistically similar in relation to age, sex, weight, height and type of surgery [Table 1].

Table 1: Demographic data and type of surgeries performed.

Variables	I-gel (n =45)	Air-Q (n=45)	P-Value
Age (years)	32.13 ±11.69	32.43 ±7.27	0.887
Sex (m/f)	27/18	30/15	0.662
Weight (kg)	57.1 ± 8.48	58.15 ±11.24	0.642
Height (cm)	162.53 ± 9.23	161.73 ± 9.08	0.684
General surgery	18 (40%)	18 (40%)	-
Orthopaedic surgery	25 (55.5%)	24 (53.33%)	-
Gynaecological surgery	2 (4.44%)	3 (6.66%)	-

The success rate of use of supraglottic device for ventilation was 35 / 45 (77.78 %) vs 27 / 45 (60 %) in first attempt for I-gel and Air-Q respectively [Table 2]. In the second attempt it was 10/45 (22.22 %) for I-gel and 18/45 (40 %) for Air-Q. Overall success rate was 100 % for both devices.

Table 2: Device insertion parameters

Supraglottic airway device insertion	I-gel (n=45)	Air-Q (n=45)	p-value
1st attempt success rate (%)	35 (77.7%)	27 (60%)	-
2nd attempt success rate (%)	10 (22.3%)	18 (40%)	-
Overall success rate (%)	45 (100%)	45 (100%)	-
Inseration time (sec) in mean ± sd when 1st attempt successful	25.85 ± 1.76	26.73±1.51	0.0128
Insertion time (sec) in when 2nd attempt successful	33.12± 1.45	33.63± 2.40	0.23

Mean insertion time (25.85 ± 1.77 sec) when first attempt was successful for I-gel was found to be significantly lower than mean insertion time for Air-Q (26.73 ± 1.51 sec) (P = 0.0128). Mean insertion time (sec) when second attempt was successful was comparable in both groups. Adequate ventilation was achieved in both groups.

Significantly higher changes in haemodynamic parameters (HR, SBP, DBP and MAP) were noted at insertion of Air-Q supraglottic device [Table 3, 4, 5, 6].

Table 3: Comparison of heart rate

Heart rate at different time interval (min)	I-gel (n=45)	Air-Q (n=45)	p-value
At 0 min	77.03 ±8.09	77.97 ± 8.79	0.8478
After induction	90.18±17.03	88.31 ±15.29	0.5856
At insertion	91.69 ±17.03	84.84 ± 8.81	0.0187

Table 4: Comparison of SBP

SBP at different time interval (min)	I-gel (n=45)	Air-Q (n=45)	p-value
At 0 min	129.2 ± 10.37	117.15 ±7.60	0.0001
After induction	117.06 ± 7.79	117.17 ±10.78	0.9556
At insertion	125.82 ± 5.37	131.73 ± 5.28	<0.0001

Table 5: Comparison of DBP

DBP at different time interval (min)	I-gel (n=45)	Air-Q (n=45)	p-value
At 0 min	82.17 ± 6.64	83.31 ± 8.15	0.4
After induction	78.44 ± 6.46	77.84 ± 9.38	0.7246
At insertion	79.97 ± 7.05	86.71 ± 10.136	0.0004

Table 6: Comparison of MAP

MAP at different time interval (min)	I-gel (n=40)	Air-Q (n=45)	p-value
At 0 min	98.675 ± 8.71	101.644 ± 9.92	0.1351
After induction	92.53 ± 8.54	95.28 ± 8.95	0.1387
At insertion	96.11 ± 9.18	108.44 ± 10.43	<0.0001

Table 7: Recovery characteristics.

Variables	I-gel (n=45)	Air-Q (n = 45)	p-value
Blood staining of device			
Yes	2 (4.44%)	10 (22.2%)	0.0266
No	43 (95.6%)	35 (77.8%)	
Sore throat			
1hrs	2 (4.44%)	7 (15.5%)	0.0513
2hrs	2 (4.44%)	5 (11.1%)	
Dysphagia			
1hrs	0	7 (17.5%)	-
2hrs	0	4 (10%)	

Other parameters like SpO_2, end tidal carbon dioxide were comparable between the two groups and within normal limits during per operative period. No episode of hypercapnia or desaturation was observed. There were statistically significant differences regarding post-operative adverse events between two groups. Higher incidence of blood staining of supraglottic device, sore throat and dysphagia [Table 7] were observed in Air-Q group as compared to I-gel group.

DISCUSSION

In this study success rate of SAD insertion, time required for successful SAD insertion with number of attempts and haemodynamic parameters during SAD insertion were compared. First attempt success rate of SAD insertion in I-gel group was 80% and in Air-Q was 62.5%. Overall success rate was 100% in both the groups. Similar results have been observed in the study conducted by Halwagi et al[3]. They found that first attempt success rate was 80% in LMA-Fastrach group and 84% in I-gel group, and overall success rate was 100% in LMA-Fastrach group and 96% in I-gel group.

Karim et al[4] and Neoh Eu et al[5] conducted two different prospective randomized double blinded studies to compare Air-Q and LMA fastrach and both of them concluded that there was no statistical difference between ease of insertion, incidence of adverse effects and adequacy of ventilation.

Galgon et al[6] performed a prospective randomized controlled trial comparing Air-Q against LMA-Proseal and concluded that Air-Q performs well as a primary airway during the maintenance of general anaesthesia with an airway seal pressure similar to ProSeal , but with a higher incidence of post-operative oropharyngeal complaints.

In our study, time required in SAD insertion was less in I-gel group which was statistically significant. In I-gel group first attempt insertion time was 25.96 ±1.53 seconds and in Air-Q group it was 26.72 ± 1.54 seconds and in second attempt time required was 33.13 ± 1.45 seconds in the I-gel group and 34.13 ± 2.16 sec in Air-Q group, this was also similar to the study of Halwagi et al[3] who achieved first attempt insertion time of 29 ± 16 seconds in Intubating LMA group and 19 ± 8seconds in I-gel group.

The sympathetic response was observed during supraglottic airway device insertion. Heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP) and mean arterial blood pressure (MAP) after insertion of devicel were observed and noted. In this study HR, SBP, DBP and MAP were increased in Air-Q group during insertion and this was significantly higher. These results were similar to the study of Jindal et al[7] where they observed significant rise of heart rate upto 5 minutes after inserting Air-Q. Similarly SBP, DBP and MAP were increased at insertion and 1, 3, 5 minutes after insertion. But in our study observation of all these parameters was done only just after device insertion. Haemodynamic changes were least in I-gel group.

Based on these observations, we infer that I-gel effectively conforms to the perilaryngeal anatomy

despite the lack of an inflatable cuff and produce less sympathetic response. It consistently achieves proper positioning for supraglottic ventilation and causes less hemodynamic changes as compared to other supraglottic airway devices. Devices with an inflatable mask have the potential to cause tissue distortion, venous compression, and nerve injury, which explains the increased incidence of associated postoperative morbidity. [2] Greater post op oropharyngeal morbidity were also noted by Galgon et al with Air-Q.[6] Trauma on insertion, multiple insertions, pressure exerted by cuff against the pharyngeal mucosa, [8-13] cuff volumes [14] and cuff pressure [13] have all been incriminated for postoperative complications.

Conclusion

I-gel is comparable to Air-Q in securing patent airway during controlled ventilation. I-gel is better in terms of faster insertion, ease of insertion, less change in haemodynamic parameters, lower incidence of pharyngolaryngeal morbidity. I-gel requires less manipulation, no cuff inflation, so securing airway is rapid in most patients. Air-Q is a relatively new device which has a conduit for intubation. We did not compare intubation through these devices. For elective surgeries conducted by SAD insertion, we recommend I-gel as a preferred choice.

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