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Original Research

Comparison of hemodynamic stress response to blind tracheal intubation through two supraglottic devices, Air-Q and I-gel in patients undergoing elective surgery under general anesthesia

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***ABSTRACT*:**
Background: The aim of this study is to compare hemodynamic stress response to blind tracheal intubation through two supraglottic devices, Air-Q and I-gel in patients undergoing elective surgery under general anesthesia. **Methods:** This randomised single blind study was conducted on 90 patients of age 18-60 years, undergoing elective surgery under general anaesthesia. Patients were randomly allocated in two groups-Group I: Air-Q (n= 45), Group II: I-gel (n=45). After preoxygenation, induction and muscle relaxation appropriate size Air-Q or I-gel was inserted and all parameters were noted by an independent observer. Blind tracheal intubation was done through the SAD and hemodynamic parameters were noted. **Results:** Baseline hemodynamic variables like heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP)] and mean arterial pressure (MAP) was comparable in both the groups. However statistical significant difference was found between two groups in HR, SBP, DBP and MAP after intubation and 1 minute after intubation. **Conclusion:** We conclude that I-gel causes less haemodynamic stress response to blind tracheal intubation as compared to Air-Q.
Keywords: *Air-Q, I-gel, Supraglottic airway*.

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INTRODUCTION:

Endotracheal intubation remains the keystone for definitive airway management. Nowadays, supraglottic airway devices (SAD) are increasingly being used to secure airway as an alternative to conventional direct laryngoscopy guided intubation. (1) SADs are easy to insert, take less time to secure the airway and cause less oropharyngeal trauma. They are often used as a rescue devices in unanticipated difficult intubation scenarios.(2) SAD insertion requires less expertise than conventional laryngoscopy guided intubation so it can be used by less skilled health care providers also.(3) SADs can be used as a conduit for tracheal intubation. It has many advantages including easy insertion, better alignment of glottic opening and continuous patient oxygenation and ventilation. Moreover, the hemodynamic stress response to intubation by SAD is less than direct laryngoscopy.(4) Blind intubation with SAD is a technique for endotracheal tube insertion through the airway channel of the SAD enabling airway management with better ventilation and a reduced risk of gastric content aspiration.(5,6,7)

I-gel™ is a SGD with non-inflatable cuff, designed to provide a more effective seal than conventional LMA, but it has also been used for intubation as its design allows for unobstructed passage of larger diameter tracheal tubes and a favourable alignment with the glottic inlet.(8) Air Q is a single use intubation SAD with a large airway tube with inner diameter which can accommodate large size endotracheal tubes. Air Q was mainly marketed and designed for blind tracheal intubation. It's shorter and more curved shaft enable easy insertion.

Size of SAD	Patients body weight(kg)	ETT size internal diameter (in mm)
i-gel Size 3	30-50	7.0
I-gel Size 4	50-90	7.5
Air-Q Size 2.5	30-50	6.5
Air-Q Size 3.5	50-90	7.0

Its specially designed mask ridges prevent the device tip from folding while insertion, provides better lateral stability and anterior mask seal. [9]

The objective of present study is to compare hemodynamic stress response to blind tracheal intubation through two supraglottic devices, Air-Q and I-gel in patients undergoing elective surgery general anesthesia.

METHOD & MATERIAL:

After obtaining approval from institutional ethics committee and written informed consent from all patients this single blind randomized control trial was conducted on 90 ASA I or II patients and age between 16-60 years of either sex undergoing elective surgery requiring general anaesthesia and endotracheal intubation. Sample size was calculated by power analysis, using a two- sample t test, with a two-sided type I error of 5% (α=0.05) and power at 80.37 (α=0.19). Patients were randomly allocated by computer generated random number tables to one of two groups comprising, Group I: Air-Q (n=45), Group II: I-gel (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 $\geq$ III, mouth opening less than 2 cm, patients with known or anticipated difficult face mask ventilation, gastro-oesophageal 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 premedicated with injection ondansetron 0.1mg/kg (i.v), injection glycopyrrolate 0.2mg (i.v) and Injection midazolam 0.03mg /kg. After recording the baseline parameters, patients were preoxygenated with 100% oxygen for 3 minutes. Anaesthesia was induced with and injection fentanyl citrate 1mg/kg (i.v), injection 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 successful ventilation was not established, accepted manoeuvres were used as recommended by manufacturer (Brain et al, 1997; Gatward et al, 2008) for both the devices. 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. After successful insertion of the SAD, blind tracheal intubation was attempted through the device with appropriate size well lubricated conventional PVC (Polyvinylchloride) endotracheal tube (Po**rtex ®).**

Successful intubation were confirmed by chest rise, auscultation of breath sounds and square wave capnographic curves. Time required for successful intubation was recorded. Maximum three intubation attempts were allowed, if failed then patients were ventilated through LMA or intubated after removal of the LMA according to the need of surgery and the cases were recorded as intubation failure. Patients were ventilated through LMA in between two intubation attempts and duration of ventilation was excluded from intubation time. After successful intubation the device i-gel or air Q was railroaded over the tube.

All patients were monitored for non-invasive Systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial blood pressure (MAP), heart rate (HR), Peripheral oxygen saturation (SpO2) and End-tidal carbon-dioxide concentration (EtCO2) and ECG continuously during and after successful intubation and at 1 minute, 3 minutes and 5 minutes after intubation. All parameters were recorded by an independent observer and analysed by proper statistical test.

Data presented as *Mean ± SD*. Age, height, weight, time taken to secure effective airway, time taken in subsequent attempts of intubation, hemodynamic parameters compared using the *Student t-test*, gender, ease of insertion of device compared by *chi square test*, Complications were compared using *Fisher exact test*, P values of ≤ 0.05 were considered *significant*.

RESULTS:

Demographic data such as age, weight, ASA physical status and Mallampati grade, mouth opening, thyromental distance and neck circumference were similar, and statistically no significant differences between the two groups. (Table-1)

Table-I: Patient characteristics

VARIABLES	Group I Air-Q (n = 45)	Group II I-gel (n = 45)	p-Value
Age(Years)	31.13 ±11.69	32.23 ±7.27	0.887 (NS)
Sex(M/F)	28/19	30/15	0.662 (NS)
Weight(Kg)	57.1 ±8.482	58.15 ±11.249	0.642 (NS)
Height(Cm)	161.53±9.234	162.73±9.08	0.684 (NS)
BMI (Kg/M^2)	21.00±1.50	21.60±1.27	0.639
ASA Physical Status (I& II)	21 : 24	18 : 27	1.000
MPS Class (I&II)	20 : 25	21 : 24	1.00
Mouth Opening (Cm)	4.43±0.18	4.37±0.20	0.669
Thyromental Distance (Cm)	7.68±0.27	7.61±0.22	0.844
Neck Circumferences (Cm)	34.64±2.58	33.85±2.28	0.679

Baseline heart rate was comparable in both the groups (table-2). However statistically significant difference was found in the heart rate between the two groups during intubation through the device (P<0.026) and 1 minute after intubation (P<0.000).

Table -2

HR at Different Time Interval	Air-Q	I-gel	p value
HR at 0 (Base line)	77.46±8.79	77.35±7.79	0.941
HR after induction	88.30±15.30	90.17±16.93	0.514
HR after intubation	91.68±17.00	84.84±8.81	0.026
HR after 1 min of intubation	103.82±6.57	92.84±16.65	0.00
HR after 3 mins of intubation	90.33±6.33	87.20±12.03	0.157
HR after 5 mins of intubation	82.22±5.44	80.80±8.14	0.308

Baseline systolic blood pressure was also comparable in both the groups however statistically significant difference was found in the SBP (table -3) in both the groups after intubation (P<0.000) and 1 minute after intubation (P<0.000)

Table -3

SBP at different time interval	Air-Q	I-GEL	p value
SBP at 0 (Base line)	117.16±7.61	120.89±13.89	0.133
SBP after induction	117.18±10.78	114.78±8.74	0.239
SBP after intubation	131.33±5.28	123.22±8.05	0.000
SBP after 1min of intubation	137.33±4.95	127.67±9.21	0.000
SBP after 3min of intubation	127.11±5.34	124.07±9.32	0.068
SBP after 5min of intubation	119.73±5.45	121.04±9.92	0.452

Similarly, baseline diastolic blood pressure was comparable in both the groups however statistically significant difference was found in the DBP (table -4) in both the groups after intubation (P<0.001) and 1 minute after intubation (P<0.000).

Table -4

DBP at different time intervals	Air-Q	I-GEL	p VALUE
DBP at 0 (baseline)	83.31±8.16	82.42±6.80	0.564
DBP after induction	77.84±9.38	78.44±6.62	0.737
DBP after intubation	86.71±10.14	79.98±7.23	0.001
DBP after 1 min of intubation	90.78±9.01	81.78±7.78	0.000
DBP after 3 min of intubation	86.73±9.41	83.42±6.77	0.050
DBP after 5 min of intubation	83.76±8.87	81.67±7.19	0.210

Baseline mean arterial blood pressure was also comparable in both the groups however statistically significant difference was found in the MAP (table -5) in both the groups after intubation (P<0.000) and 1 minute after intubation (P<0.000). Other parameters like Spo2, End tidal CO2 were comparable between the two groups and within normal limits during perioperative period. No episode of hypercapnia or desaturation was observed.

Table -5

MAP at different time intervals	Air-Q	I-GEL	p VALUE
MAP at 0 (Baseline)	101.64±9.93	98.69±8.72	0.627
MAP at induction	95.29±8.95	92.53±8.24	0.746
MAP at intubation	106.76±9.12	96.13±9.27	0.000
MAP after 1 minute of intubation	111.89±9.33	96.64±9.67	0.000
MAP after 3 minute of intubation	100.67±8.20	97.47±8.89	0.015
MAP after 5 minute of intubation	96.47±8.78	93.60±8.25	0.461

DISCUSSION:

The present study was done to compare hemodynamic stress response to blind tracheal intubation through two supraglottic devices, Air-Q and I-gel. The haemodynamic parameters (HR, SBP, DBP and MAP) was compared between two group after successful intubation and 1 minute, 3 minute and 5 minute after intubation.

In our study, haemodynamic variations was seen in both the groups. During intubation the mean heart rate was 91.68±17.00 with air-Q while for i-gel it was 84.84±8.81. These results were found to be statistically significant (p <0.026). Similarly, mean HR was also found statistically significant 1 minute after intubation (p <0.000). It was higher in Air Q group. Our results corroborates well with the finding of Abdel-Halim TM et al who compared hemodynamic variations during intubation through Air-Q and LMA fastrack when used as conduit for fiberoptic. [10] The heart rate showed statistically significantly higher values just after the ETT insertion through the air-Q as compared to LMA fastrack.

Similarly, Attarde VB et al also reported statistically significant difference (P < 0.0001) in heart rate post-intubation through Air-Q. [11]

Similarly, systolic blood pressure was also significantly higher in the air-Q group as compared to i-gel group after device insertion (p < 0.048), during intubation (p < 0.00) and 1 minute after intubation (p<0.00). Diastolic Blood pressure was significantly raised in air-Q group as compared to i-gel at the time of device insertion (p< 0.021) and intubation (p<0.00). Mean arterial pressure was also higher in air-Q group as compared to i-gel group at the time of device insertion (p <0.05), during intubation (p <0.00), 1 minute after intubation (p <0.00) and 3 minutes after intubation (p<0.015)., Attarde VB et al [11] and Shamaa MA et al [12] also found statistically significant increase in MAP post intubation through Air-Q In their respective studies.

Bashandy *et al* compared hemodynamic stress response to intubation through direct laryngoscopy versus intubation with air-Q-LMA. The authors concluded statistically significant increase in hemodynamic response to intubation in both the group but it was less in air Q group as compared to direct laryngoscopy. (4)

Chaudhary B et al compared endotracheal Intubation through I-gel and Intubating Laryngeal Mask Airway. They found that there was a similar hemodynamic response (increased HR and MAP) to SAD insertion and ET intubation through SAD in both groups. (13)

Jindal et al. also observed that changes in hemodynamic parameters following the use of i-gel were the lowest compared with those of LMA and SLIPA. (14)

Das et al compared hemodynamics like blood pressure, and heart rate alterations caused by stress response due to i-gel™ and LMA-ProSeal™ usage in day care surgeries. Hemodynamics (HR, BP) were less altered in i-gel as compared to PLMA group which was statistically significant ($p<0.05$). (15)

Based on these observations we infer that both the devices can be safely used for endotracheal intubation even in the absence of fiberoptic guidance. Haemodynamic perturbations during intubation and 1min after intubation were more with Air-Q as compared to I gel group which may be due to the fact that i-gel better conforms to the perilaryngeal anatomy.

CONCLUSION:

Both the supraglottic airway devices (SADs) Air-Q and I-gel can prove to be a useful alternative to conventional laryngoscope for blind tracheal intubation. Air Q cause more hemodynamic stress response as compared to I gel when used for blind tracheal intubation.

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