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# A clinical evaluation of the I gel and Air Q as conduits for blind tracheal intubation in adult patients

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## Abstract

**Introduction**: Supraglottic airway devices have been recommended to be used as a conduit for tracheal intubation when required. We hypothesized that both I gel and Air Q would favor blind tracheal intubation with equal success rate when performed by senior anesthesia residents.

**Materials and Method**: After approval by Ethical Issues Committee, seventy-six adult patients were randomised to be intubated either through I gel or Air Q supraglottic airway device. Success rate and time to intubate via either device were assessed and analyzed. Also assessed was the success at placing either supraglottic device and if anterior thyroid pressure was required to achieve tracheal intubation via them.

**Results**: There were two device placement failures in Air Q groups versus none in I gel group. Mean time to intubate via Air Q and I gel were 16.5 and 23.4 s respectively that showed neither statistical (p= 0.17) nor clinically significant difference. There were no differences between the device with respect to intubation success rate and the need to apply anterior thyroid pressure for aiding tracheal intubation.

**Conclusion**: Both the supraglottic devices were equally effective in aiding blind tracheal intubation when performed by anesthesia residents.

**Keywords**: Air Q, I gel, tracheal intubation

## Introduction

It is well established that difficult tracheal intubation can never be predicted with accuracy despite using various assessment tools.[1-3] This mandates that all practicing anesthesiologists should have a well-drilled plan for such an eventuality. Supraglottic airway device (SAD) should be a part of such a bailout drill not only to achieve ventilation but also aid tracheal intubation. Flexible fiberscope guided tracheal intubation has been described via a number of SADs.[4-7] However, this may not only be technically challenging[8-12] but often the availability of a flexible fiberscope is not guaranteed when needed most for achieving tracheal intubation via SAD. Difficult Airway Society 2015 guidelines[13] have laid stress in identifying essential skills and techniques with the highest success rate for management of unanticipated difficult intubation in adults.

The Air-Q$^{Tm}$ (Air Q) laryngeal airway (Cookgas LLC, Mercury Medical, Clearwater, FL, USA) is a SAD designed to allow for tracheal intubation.[14] I-gel$^{Tm}$(I gel) too has been used as a conduit for tracheal intubation.[11,15-18] However these two SADs have not been previously compared as blind intubating aids.

We undertook this prospective randomized trial with a Null hypothesis that both devices (Air Q and I gel) will perform with equal success rate and time needed for their insertion and tracheal intubation without using flexible fiberscope as a guiding tool in adult patients.

## Materials and Method

Khoula hospital's Ethical Issues Committee approved this randomized trial in -29$^{th}$ January 2014 vide no. MOH/KH/EIC/3/2014. 76 consenting adult patients of either sex with American Society of Anesthesiologists physical status I-III, aged eighteen to sixty years undergoing elective non-head and neck surgical procedures under general anesthesia were enrolled for the trial. Patients with a known history of and/or predictor of a difficult airway were not enrolled in the study.

A computer-generated randomization was done for group allocation (I gel or Air Q group). The numbers were kept in closed sealed envelopes and revealed just prior to device placement. Only cuffed armored endotracheal tubes (ETT) were utilized in this study (RuschFlex; Teleflex Medical: Athlone, Ireland). Anesthesia trainees with more than three years experience performed all SAD placements and blind tracheal intubations via it after ascertaining adequate device placement as per good chest movement and capnographic curve. The same trainee, prior to attempting blind tracheal intubation, did flexible fiberscopy with assistance of a senior consultant to note the percentage of glottic opening (POGO) seen via the SAD (complete glottic opening visualized= POGO 100%, no portion of the glottic opening seen= POGO 0%).

Following a uniform technique of premedication and induction with propofol (1-2 mg/kg), fentanyl (1.5 μg/kg) and cisatracurium (0.15 mg/kg) intravenously, either of the two SAD was placed. Two attempts were

permitted for the correct placement of the SAD, using up and down maneuver if required. Failing a satisfactory SAD placement despite two attempts as indicated by poor chest movement and inadequate capnographic curve, conventional tracheal intubation was performed. If after successful placement of SAD, the intubation through the SAD was unsuccessful in the first attempt, a second attempt was taken after re-ventilation. During this attempt, anterior compression of the thyroid cartilage was performed while attempting tracheal intubation via the SAD. In case of failed tracheal intubation despite two attempts, conventional Macintosh laryngoscopy was performed to achieve tracheal intubation.

**Parameters recorded**

- Success rate of tracheal intubation via the two devices.
- Time to achieve successful blind tracheal intubation via I gel and Air Q (From introduction of the ETT into the SAD to first satisfactory capnographic curve after having progressed beyond 25 cm mark on the ETT).
- Incidence of adequate chest movement and capnographic curve via the SAD.
- POGO score via either SAD as per fiberoptic view.
- Need to apply thyroid compression to achieve tracheal intubation.
- Complications if any, such as fall in oxygen saturation, arrhythmias and trauma during the procedure.

**Statistics: Sample size calculation**: The sample size was calculated based on assuming that minimum clinically accepted difference in time is 10 s with standard deviation of 15 s and alpha of 0.05, power 80% and 95% confidence interval. However, based on this information and by using www.openepi.com site the sample size to be collected was 72 patients but we included 76 so as to compensate for any omissions in patient numbers such as failure to successfully place the SAD. Failed tracheal intubation time was to be discarded from analysis.

The median (IQR) was calculated for demographic data and for non-normally distributed continuous variables. Comparisons of intubation time and percentage of glottic opening size were performed using the Mann-Whitney U test. Frequencies and percentage were calculated for categorical variables and compared between groups by using Fisher's exact test. P value< 0.05 was considered as statistically significant. All statistical analysis was carried out using IBM SPSS version 22.0.

## Results

POGO score was better in the Air Q group as compared to I gel group though it did not reach the level of statistical significance (p= 0.52). Mean time to perform successful tracheal intubation via the Air Q was also faster (16s) than through I gel device but the difference was statistically insignificant (0.17).

Inadequate chest movement was noted in 2 (5.4%) patients in the Air Q group. They were deleted from the group for proceeding with tracheal intubation. In contrast, all patients showed adequate ventilation in I gel group.

In concurrence with inadequate chest movement, the same 2 (5.4%) patients in the Air Q group also showed inadequate capnographic curve (Table 3). However this did not result in any statistical significance between the two groups (p=14).

Nearly 20% of the patients in either group required a thyroid pressure for successful tracheal intubation (Table 4).

Tracheal intubation was more successful in the Air Q group (80.0%) as compared to 74.4% in the I gel group (Table 5). However, the difference between the two groups was statistically insignificant (p=0.54).

**Table 1: Percentage of glottic opening visualized via the SAD and time taken for successful tracheal intubation**

| Parameters | Air Q group (n=37) | I gel group (n=39) | P value |
|---|---|---|---|
| Percentage of glottis opening visualized with fiberscope via SGD [Range] | 90 [0-90] | 80 [0-90] | 0.52 |
| Mean time to intubate in seconds [Range] | 16.5 [10-60] | 23.4 [7-60] | 0.17 |

n= Number of patients

**Tables 2: Adequacy of chest movement following SAD placement in the two groups**

| Group | n | Adequate chest movement n % | Inadequate chest movement n % | P value |
|---|---|---|---|---|
| Air Q | 37 | 35 94.6 | 2 5.4 | 0.14 |
| I gel | 39 | 39 100.0 | - - | |

n= Number of patients, %=Percentage

**Table 3: Adequacy of capnography in the two groups**

| Group | n | n % | n % | P value |
|---|---|---|---|---|
| Air Q | 37 | 35 94.6 | 2 6.9 | 0.14 |
| I gel | 39 | 39 100.0 | - - | |

n= Number of patients, %= Percentage

**Table 4: Application of thyroid pressure in the two groups**

| Group | N | No thyroid pressure n % | Thyroid pressure n % | P value |
|---|---|---|---|---|
| Air Q | 35 | 28 80.0 | 7 20.0 | 0.94 |
| I gel | 39 | 31 79.5 | 8 20.5 | |

n= Number of patients, %= Percentage

* In Air Q group, two patients did not show adequate chest movement and capnography, and hence removed for further evaluation.

**Table 5: Incidence of successful tracheal intubation via SAD in the two groups**

| Group | N | Successful n % | Unsuccessful n % | P value |
|---|---|---|---|---|
| Air Q | 35 | 28 80.0 | 7 20.0 | 0.54 |
| I gel | 39 | 29 74.4 | 10 25.6 | |

n= Number of patients, %= Percentage

* In Air Q group, two patients did not show adequate chest movement and capnography, and hence removed for further evaluation.

## Discussion

The result of this study suggests that either of the two devises (Air Q and I gel) are equally supportive of a successful tracheal intubation in three out of four cases when attempted blindly. We purposely selected blind tracheal intubation via these two devices, as many of us do not have immediate access to a flexible fiberscope when we are using SADs as an intubation conduit, routinely or in emergent situations.

Our definition of a successful SAD placement was identical to that defined by Jaganathan et al in 2015[19] that included the ability to achieve tidal volumes of at least 7 mL/ kg and a square-wave capnogram. These authors reported a successful intubation time through the Air Q and I gel as 16.7 and 19.6 s respectively while using flexible fiberscope as an additional aid. This is in agreement to our findings of 16 and 23 s intubation time via Air Q and I gel groups respectively. This goes on to demonstrate that flexible fiberscope makes little difference in time to intubate via Air Q or the I gel, though it adds to a higher success rate. In this study we had 20 and 25.6% intubation failures in Air Q and I gel groups respectively. Others too have reported a similar failure rate of 18-25% when blind intubation was attempted via Air Q.[20,21]

Utility of flexible fiberscope guided tracheal intubation via SADs is undisputed. Jaganathan et al in 2015[19] reported a success rate of 95.8% tracheal intubations via Air Q while Girgis et al.[22] noted it in 96.7%. We too had access to flexible fiberscope but did not use it purposely to assist tracheal intubation keeping in mind its occasional non-availability at critical junctures of airway management. We still noted a success rate of tracheal intubation ranging from 74.4-80% via I gel or Air Q.

In this study we had purposely opted for tracheal intubation using armored tracheal tube. We did this with two purposes. First, armored tracheal tubes are relative softer as compared to conventional polyvinyl chloride tracheal tubes and hence less likely to cause soft tissue damage when blind tracheal intubation is attempted via I gel or Air Q. Second, our operators were anesthesia residents and we wanted them to have a feel of tissue resistance when faced with difficulty at tracheal intubation via the SADs without damaging soft tissue.

Some limitations may be noted with the present study. First, we did not include pediatric patients in our study and hence their utility in this population cannot be commented upon. Second, we did not include patients with predicted difficult airway. Lastly, we did not extend the study period of this trial to include the assessment of postoperative morbidity such as sore throat.

Unlike intubating laryngeal mask airway that is still available in three sizes, Air Q and I gel are available in sizes to suit all age groups and patient size making them more versatile when situation arises to use them as an intubation conduit.

In conclusion, this study demonstrated that both Air Q and I gel are acceptable alternatives as conduits for blind tracheal intubations in terms of timing and successful outcomes. This has proved our hypothesis to be true.

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