Comparison of blind tracheal intubation through Air Q and I-gel in anaesthetized patients with difficult air way

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Abstract

This study assessed two disposable supraglottic devices, the newly developed Air Q and the i- gel, as a conduit for tracheal intubation in 30 healthy adults patients considered to have a difficult air way undergoing elective surgery. The primary outcome measure was successful tracheal intubation within two blind insertion attempts. Successful blind intubation after two attempts was achieved with no statistical difference between both groups. The total time taken to insert the tracheal tube was significantly shorter in the Air Q group than the i-gel group (mean 31 to 40 sec). There were no statistical difference between both groups as regards post operative complications .The single-use Air-Q appears to be superior compared with the i-gel , as a conduit to facilitate blind tracheal intubation of difficult air way.

Introduction

Many devices and techniques have been used to maintain the airway and to provide adequate ventilation. The endotracheal intubation provides an artificial conduit between the atmosphere and the patient's trachea. Supraglottic airways have become increasingly popular. The development of supraglottic airway devices has bloomed in the last decade (1). The air Q is a new supraglottic airway device proposed as an alternative to other ventilatory tools such as the laryngeal mask airway (LMA) and to allow for tracheal intubation with a cuffed tracheal tube and to facilitate easy removal with a custom removal stylet following tracheal intubation(2). It consists of an anatomically curved, wide bore, semirigid airway tube with an inflatable pharyngeal cuff that forms a seal in the pharynx (2).

The i-gel airway is a novel supraglottic device made up of a thermoplastic elastomer (stylene ethylene butadiene styrene) which is soft, gel-like and transparent. The mask of the gel is designed anatomically to fit the perilyrngaenial and hypopharyngeal structures without the use of an inflatable cuff. It allows endotracheal tube passage through its tube and has an integrated gastric channel provided for the suction of the gastric contents or to allow the passage of a nasogastric tube to empty the stomach as well as an integrated bite block. It is designed as a single patient use, disposable and will accept a 7 mm cuffed endotracheal tube(1-3).

The aim of this study is to compare the performance of air Q and the i-gel airway with respect to insertion success rates and times and the ease of inserting an endotracheal tube through these devices in a patient with difficult airway.

Patients and Methods

This study was carried out at Alexandria University Hospitals. After approval of the local ethics committee, an informed written consent was obtained from 30 patients under going elective minor surgical procedures under general anesthesia. Only patients ASA physical status I and II age range from (21-50 years) with suspected difficult air ways were enrolled in this study. Patient was considered to have difficult air way if the patient had Mallampati classification IV or thyromental distance less than 6 cm , has limited neck mobility (<80 degree) or history of difficult intubation. Patients were randomly assigned to have either i-gel airway (n=15) or air Q (n=15) for airway management. The Exclusion criteria were patients with ASA physical status III and IV, patients with symptomatic gastroesophageal reflux and patients complaining of upper respiratory tract symptoms in the previous two weeks. Anesthetic management was standardized and routine monitoring was applied to all patients. After preoxygenation with 100% oxygen for 3 minutes, anesthesia was induced with fentanyl 1 μg/kg and midazolam 0.05 mg/kg followed by propofol 2.5 mg/kg. Muscle relaxation was achieved in all patients using rocuronium 0.6 mg/kg. A face mask was used to provide ventilation with 100% oxygen until insertion of the selected airway device two minutes after rocuronium injection.

The i-gel was inserted according to the manufacturer's recommendations, size 4 i-gel was used in patients weighing 50-90 kg and size 5 for patients above 90 kg. Water soluble lubricant was applied to the rear of the cuff before insertion. The patient's head was placed in the sniffing position. The i-gel was grasped along the integral bite block and was introduced continuously into the mouth towards the hard palate until resistance was felt(5).

The air Q was inserted according to the manufacturer's instruction manual. The cuff was first deflated and smoothed proximally. Lubricating jelly was applied to the cuff and both sides. Before insertion the patient's head and neck were placed in the neutral position, the deflated, lubricated air Q is held in the dominant hand like a pen, such that the markings on the tube was in the direction of the patient's upper jaw. The mouth was opened by an assistant or by the non-dominant hand of the anesthetist him self, and the air Q was inserted in the mouth and pushed backward and downward along the midline, while maintaining contact with...
the patient’s hard palate, soft palate and posterior pharyngeal wall until resistance was felt. Once resistance is noted, the cuff was inflated with air; to obtain an effective seal[2,6].

Correct insertion of i-gel and air Q was assessed by proper chest expansion, absence of audible leak and lack of gastric insufflation as determined by epigastric auscultation, also the presence of CO₂ waveform with a plateau on the capnograph. Three attempts were allowed for placement of each device. Three unsuccessful attempts were considered to be an insertion failure, after which the patient was discarded from the research and an alternative mean was considered.

**Measurements**
A stopwatch capable of recording single or multiple events as well as the total time of these events was used to record the following times.

1. Insertion time of the study device: the time from the moment the device entered the mouth of the patient until the appearance of the capnograph waveform. If the seal was inadequate or no carbon dioxide was detected, the device was removed. Similarly the time of the second attempt was recorded. If a third attempt was required the time once again was started with insertion of the device and was stopped with the capnograph waveform. The insertion time was the sum of all attempts. This did not include the gap time between attempts.

After confirming establishment of an effective airway, attempt to insert an endotrachial tube was done through the i-gel and the air Q after adequate lubrication of the tube to facilitate its insertion three attempts were tried. If failed the devices was connected to a circle breathing system and controlled ventilation was adjusted to deliver 8 ml/kg body weight at a rate of 10 breath/minute with an I:E ratio of 1:2. If successful intubation was done the tube was used for ventilation. After completion of surgery and reversal of residual neuromuscular block, isoflurane was discontinued and airway devices were removed from the patient’s mouth upon awakening[6].

2. Insertion time of the tracheal tube: from the moment of insertion of the tracheal tube through the study device until the appearance of the capnograph waveform. If no carbon dioxide was detected, the tracheal tube was removed. The time of the second attempt was similarly recorded. If a third attempt was required the time once again started with insertion of the tracheal tube and ended with the capnograph waveform. The insertion time was the sum of all attempts. This did not include the gap time between attempts.

The following were noted:

1. Number of attempts to successful insertion of the device and the endotrachial tube.
2. The successfulness of insertion of the endotrachial tube through the device.
3. Immediately after removal, the device was inspected for traces of blood.
4. Postoperative in the recovery room patients were asked about sore throat (pain independent of phonation or deglutition), dysphagia (difficulty or pain during swallowing) and dysphonia (pain on phonation or altered voice). Each item was graded as absent, light, moderate or severe.

**Statistical analysis:**
Statistical analysis was performed with Microsoft Excel. Data was presented as mean ± SD or number (%). P values of < 0.05 will be considered significant.

**Results**
A total of 30 patients were studied and analyzed. Patients’ characteristics were similar between the two groups (Table 1) with no statistical difference. The success rate of blind intubation via the i-gel was 13 out of 15 patients vs 14out of 15 patients via the Air-Q with a p value of non-inferiority <0.0001.

**Table 1**

<table>
<thead>
<tr>
<th></th>
<th>Group I</th>
<th>Group II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>19-51 (31.2)</td>
<td>20-59 (32.06)</td>
</tr>
<tr>
<td>Sex (male: female)</td>
<td>7:8</td>
<td>9:6</td>
</tr>
<tr>
<td>Weight</td>
<td>59-104 (79.6)</td>
<td>56-102 (79.3)</td>
</tr>
<tr>
<td>Height</td>
<td>150-183 (170.9)</td>
<td>150-187 (172.1)</td>
</tr>
</tbody>
</table>
The total time to insert the i-gel was significantly longer than the total time to insert the air Q in the patients suspected to have difficult airway as shown in Table 2.

Table 2

<table>
<thead>
<tr>
<th>Total time of insertion of the device</th>
<th>Group I (I gel)</th>
<th>Group II (air Q)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min-max time</td>
<td>21-41</td>
<td>19-40</td>
</tr>
<tr>
<td>Mean</td>
<td>33.2</td>
<td>28.4</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>5.85783968</td>
<td>7.169379332</td>
</tr>
<tr>
<td>P value</td>
<td>0.048731357</td>
<td></td>
</tr>
</tbody>
</table>

The total time to insert the endotracheal tube through the i-gel was significantly longer than the total time to insert the endotracheal tube through the air Q in the patients suspected to have difficult airway as shown in Table 3.

Table 3

| Total time of insertion of the endotracheal tube |
|-------------------------------------------------|-------------------------------------------------|
| Group I (I gel)                                 | Group II (air Q)                                |
| Min-max time                                    | 23-62                                          |
| Mean                                            | 40.76923077                                    |
| Standard deviation                              | 11.64154805                                    |
| P value                                         | 0.016503335                                    |

This graph shows the no of patients with blood traces on the device after its removal.

![Graph showing blood traces on device](image)

Post operative complications:
In group I 2 patients complained of mild sore throat and another patient complained of severe dysphonia.

In group II one patient complained of mild sore throat another complained of severe dysphonia.

Discussion:
Managing a patient with difficult airway is a challenging task for any anesthetist. Many techniques and devices were invented to deal with this situation. From these devices are the supraglottic airways.
Since the invention of the laryngeal mask airway an effective alternative to the tracheal intubation no effort were spared to modify and to invent newer supraglottic airways.

Never the less the need of tracheal intubation never lost its importance.

So blind intubation through the supraglottic devices were invented the first of such trials was the Fastrach™ introduced in 1997 to facilitate blind rather than fibreoptic-assisted tracheal intubation, following a timeline of development that started in 1983, when the first prototype intubating LMA was used to intubate the trachea blindly. Other newer intubating supraglottic devices were introduced such as the i-gel and the air Q.

Very few work was found to compare those newly developed devices and even fewer studies to find out which of them is more efficient in blind intubation especially in difficult airway patients the main cause of developing such devices in the first place so in this study we focused on the ease of such maneuvers by determining the time taken to perform it in such conditions and if any side effects were there.

Conclusion

Both the air Q and the i-gel can be used with a high success rate in patients suspected to have difficult airways.

Reference


3. Y. M. Karim and D. E. Swanson. Comparison of blind tracheal intubation through the intubating laryngeal mask airway (LMA Fastrach™) and the Air-QTM. Anaesthesia, 2011, 66, 185–190


