Fiberoptic Intubation Through an I-Gel Supraglottic Airway in Two Patients with Predicted Difficult Airway and Intellectual Disability

Pavel Michalek, MD, PhD

Philip Hodgkinson, MBBS, FCARCSI

William Donaldson, MBBS, FRCA

We describe successful fiberoptic-guided tracheal intubation through the novel supraglottic "I-gel" airway in two uncooperative adult patients with genetic syndromes, learning disability, and predicted difficult airway, scheduled for complex dental treatment under general anesthesia. The I-gel maintained the airway immediately after induction, allowing oxygenation and ventilation. Location of the laryngeal inlet was successful on the first attempt with a fiberscope, and the tracheal tube was inserted into the trachea over the endoscope without complication in both patients. This report suggests another option for management of predicted difficult airways.

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A significant number of patients with intellectual disabilities can have difficulties during airway management. The reasons are multifactorial: craniofacial abnormalities associated with some genetic syndromes, enlargement of the structures inside the oral cavity and pharynx, complete lack of cooperation, obesity, limited neck mobility or neck instability, and frequent respiratory tract disease.[1,2] In addition, airway assessment is frequently difficult. Awake, fiberoptic intubation, indicated in the adult population as a method of choice, is usually unfeasible because of patient lack of cooperation. Standard asleep fiberoptic intubation can be time consuming, carrying with it the risk of episodes of oxygen desaturation and aspiration.

In these patients, tracheal intubation through supraglottic airway devices may be an option. Varying techniques of either blind or fiberoptic-guided intubation through a supraglottic device have been described.[3–6]

The I-gel disposable airway (Intersurgical Ltd., Wokingham, UK) (Fig. 1) is a supraglottic, latex-free, airway device. It is made of a medical grade thermoplastic elastomer, anatomically preformed to mirror the perilaryngeal structures. The device contains an epiglottis blocker, which helps to prevent the epiglottis from down-folding or obstructing the laryngeal inlet. The soft noninflatable cuff seals anatomically against the perilaryngeal structures. The I-gel also has a gastric channel, which allows venting of air and gastric contents or passage of a gastric tube. In addition, the wide bore allows direct fiberoptic intubation without the need for exchange catheter techniques. It has been found in cadaveric studies to provide a good coverage of the glottic opening.[7]

The I-gel is designated for airway maintenance during general anesthesia in fasted patients. Ventilation may be both spontaneous and controlled. I-gel can also potentially be used as an airway device for cardiac arrest[8,9] or as a rescue device in unexpected difficult intubation.[10]

This report describes successful fiberoptic intubation through an I-gel in two uncooperative adult patients with predicted difficult airway.

CASE REPORTS

Case 1

A 25-yr-old man, weighing 67 kg, with a mild-to-moderate form of Hunter syndrome (mucopolysaccharidosis type II) was scheduled for a dental procedure under general anesthesia. His medical history included overnight snoring, episodes of sleep apnea, moderate asthma, epilepsy, dysphagia, hepatosplenomegaly, gastric reflux with repeated aspiration pneumonias, and chronic otitis media. His regular medication included salbutamol and budesonide inhalers and carbamazepine. General anesthesia was administered 3 yr previously for ear surgery. It was noted that mask ventilation was then possible but that laryngoscopy was difficult (grade 3, Cormack and Lehane) and that there was successful insertion of a laryngeal mask airway (LMA).

Airway assessment was difficult because of anxiety and lack of cooperation. Mallampati score could not be assessed. His thyromental distance was 5.5 cm, and neck mobility was limited to 20 degrees. Other features included short neck, big tongue, and small mandible. His vital signs preoperatively were as follows: heart rate 106 bpm, arterial blood pressure 115/70 mm Hg, respiratory rate 21, and room air oxygen saturation 93%. Laboratory investigation results were not available because the patient refused blood sampling.

From the Department of Anaesthetics, Antrim Area Hospital, Antrim, United Kingdom/Northern Ireland.

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Address correspondence and reprint requests to Pavel Michalek, MD, PhD, Consultant Anaesthetist, Antrim Area Hospital, 45 Bush Rd, BT412RL, Antrim, United Kingdom/Northern Ireland. Address e-mail to pafkamich@yahoo.co.uk.

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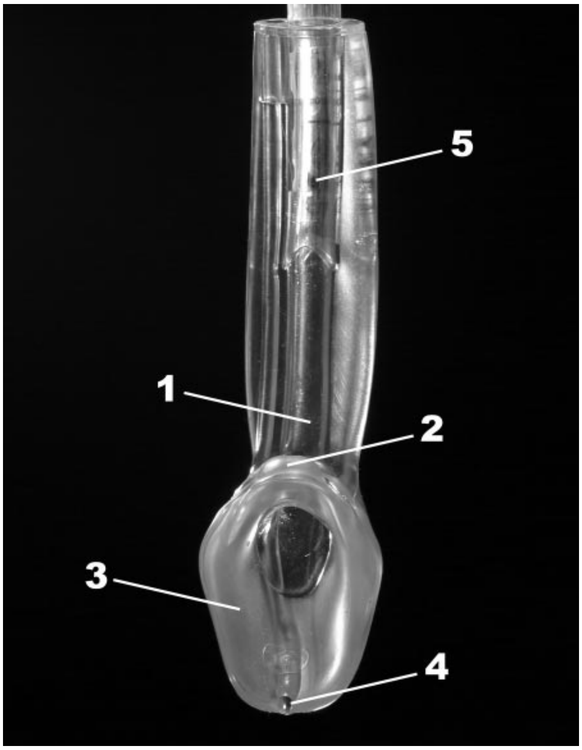

Figure 1. I-gel supraglottic airway. 1. Buccal cavity stabilizer, 2. epiglottis blocker, 3. noninflatable cuff, 4. distal opening of gastric vent, 5. integral bite blocker.

He received 8 mg of midazolam transbuccally (Consed, Special Products Ltd., Woking, UK)[11] and after 10 min was adequately sedated.

A difficult intubation was anticipated, and because of the lack of compliance, an awake, fiberoptic procedure was excluded. After discussion, we agreed on a fiberoptic intubation through an I-gel supraglottic airway.

A 20-gauge IV cannula was inserted. After 5 min of administration of oxygen, his oxygen saturation improved to 96%. Anesthesia was induced with propofol 2 mg/kg and fentanyl 1 μg/kg, cricoid pressure applied, and mask ventilation was started. Mask ventilation proved difficult and a size 4 I-gel was inserted at the first attempt. Mechanical ventilation with an I-gel was effective, with no audible leak and peak airway pressure 18 cm H_2O. His vocal cords were visualized with a 3-mm size fiberscope at the first attempt (Fig. 2) and a cuffed reinforced tracheal tube (size 7.0, Intavent Ltd., Reading, UK) was passed into the trachea (Fig. 3). It was noted that the perilaryngeal area was pathologically changed probably because of accumulation of glycosaminoglycans. Cricoid pressure was released and a gastric tube inserted. The I-gel device was removed with a similar technique to the intubating LMA (ILMA) and cotton throat pack placed. The dental procedure, which included radiographs, cleaning, polish, five fillings, and four extractions (including third molar), was uncomplicated. The duration of general anesthesia was 130 min. His postoperative course was smooth and our patient was dismissed the same afternoon.

Case 2

A 46-yr-old woman with Waardenburg syndrome was scheduled for extensive dental treatment under general anesthesia. She had spastic dysplegia with multiple muscle contractures and microcephaly. Her stature was short (130 cm) and her weight was only 30 kg. An anesthetic history included two sedations for dental treatment. The patient was only on antiepileptic medication. She did not cooperate during airway assessment and thus only left-sided spastic torticollis, short thyromental distance of 4 cm, and significantly limited neck movements were noted. Her preoperative vital signs were as follows: heart rate 98 bpm, arterial blood pressure 100/50 mm Hg, and room air Spo_2 97%.

Figure 2. A 3-mm intubating fiberscope and tracheal tube inserted through I-gel airway.

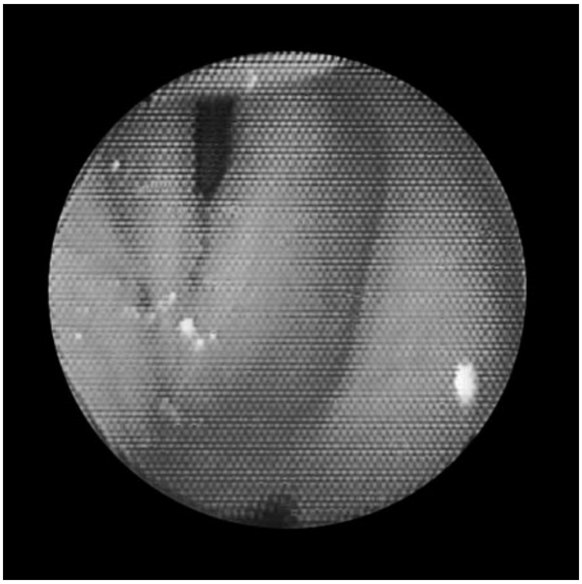

Figure 3. Fiberoptic view through I-gel to the vocal cords.

She was premedicated with 4 mg of buccal midazolam. After administration of oxygen, gas induction with 6% sevoflurane in O_2/N_2O mixture was started and 22-gauge IV cannula inserted. An insertion of a laryngoscopic blade was highly difficult because of the left lateral fixed position of her head and laryngoscopic grade 4 was noted. Mask ventilation was relatively easy. A size 3 I-gel was inserted on the first attempt and controlled ventilation was effective with minor audible leak. A 3-mm size bronchoscope was inserted through the I-gel and her vocal cords were visualized with ease. A cuffed endotracheal tube (size 6.0, Portex, Smith Medical Int., Watford, UK) was inserted into her trachea. The I-gel was then removed as described in the previous case and throat pack was placed. The procedure lasted 120 min and included radiographs, fillings, and six extractions. Both the extubation and postoperative course were uncomplicated, and the patient was discharged home that same evening.

DISCUSSION

The main reasons for insertion of a supraglottic device as a conduit for tracheal intubation are provision of a patent airway facilitating ventilation and oxygenation during attempts at tracheal intubation and shortening the distance to the vocal cords.[4–6] This approach is not a primary plan for predicted difficult intubation in patients who can cooperate for an awake oral/nasal fiberoptic intubation.[12] The situation changes dramatically when presented with a child or a patient with mental disability. Unfortunately, there is limited evidence available regarding airway management in mentally handicapped patients.

Both syndromes described in this article can be associated with difficult airway management. Hunter syndrome belongs to the genetically transmitted lysosomal storage disorders characterized by the accumulation of acid mucopolysaccarides in the central nervous system and peripheral tissues. Patients usually develop mental retardation and specific facial features: thick tongue, short neck, small mandible, and obstructive sleep apnea. Multisystem involvement may also be present but the most common problems characterized by this syndrome are related to airway management.[1,2] Anesthesia-related information about Waardenburg syndrome is minimal. However, specific facial features and muscle contractures may cause difficulties in both direct laryngoscopy and tracheal intubation.[13,14]

As illustrated by our case, insertion of a supraglottic device as a conduit for fiberoptic-guided tracheal intubation can be a very useful option in planned airway management for these patients. It aids maintenance of a relatively secured airway during attempts at intubation, improves oxygenation by intermittent ventilation and reduces the stress of the anesthetic team associated with difficult airway situations. It has been repeatedly described as a "low skill technique," even for relatively inexperienced anesthesiologists.[4–6]

A standard option has been the ILMA.[4,6] However, its use may be limited by several factors: difficult insertion due to limited mouth opening, problems guiding the fiberscope through a bar and its rigidity.[6,15] ILMA has also caused some mechanical complications including esophageal trauma.[16] Other options for intubation are through the classical LMA or Pro-Seal LMA. Both devices have been tested for fiberoptic intubation, but need insertion of exchange wires or catheters before definitive intubation.

I-gel has been reported to rescue the airway and facilitate fiberoptic tracheal intubation in a patient with unpredicted difficult intubation.[10]

In our cases, we decided on an I-gel instead of an ILMA because upper airway obstruction has been described after inflation of the LMA cuff in a patient with Hunter syndrome,[17] and in the second case, we were limited by restricted mouth opening. We also decided against the classical LMA or Pro-seal LMA because of the need for insertion of exchange catheters associated with episodes of desaturation and possibility of losing the airway.

The I-gel has been compared with other supraglottic airway devices for ease of insertion into airway training manikins and was found to be the best performing device tested.[10]

Levitan and Kinkle performed the initial anatomical evaluation of the I-gel on cadavers.[7] Sixty-five cadavers were used to study the technique of insertion and final position of a new device. The authors stated that the mean percentage glottic opening as evaluated by fiberoptic laryngoscopy was 82% and in 60% of models they achieved 100% percentage glottic opening. They also studied the positioning of the I-gel on neck dissections and lateral radiographs on some cadavers, and concluded that in each of them the device bowl effectively covered the laryngeal inlet.

We had practiced the technique described in this case report on manikins and three anesthesiologists of different grades were able locate the vocal cords with the fiberscope and insert a tracheal tube on the first attempt. This, together with Levitan and Kinkle's report, led us to consider the technique that we have described above.

This device can have some potential handicaps; however, they seem to be unremarkable. For insertion, it needs a bigger mouth opening than the flexible LMA, but smaller than the ILMA. Sharma et al. described difficulties removing the I-gel after intubation.[9] We have not noted any significant difficulties using the silicone pusher from the ILMA set. Serious airway trauma is unlikely and only in 1 of 100 patients was blood noted on the device after removal.[8]

We hope this technique will become another tool in the armamentarium of the anesthesiologist for the management of both expected and unexpected difficult airways.

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