Product Study: air-Q

The air-Q intubating laryngeal airway is a supraglottic airway device which may overcome some limitations inherent to the classic laryngeal mask airway for tracheal intubation. The authors of a study published in Pediatric Anesthesia reported on a series of cases with patients with anticipated difficult airway in whom the air-Q device was used successfully as a conduit for fiberoptic intubation.*

Background
The laryngeal mask airway has been demonstrated to be effective as a conduit for tracheal intubation in pediatric patients with a difficult airway. Though the LMA has undergone advancements to facilitate tracheal intubation in adults, the authors note that such advancements were not previously available for application to children. The advantages of LMA-assisted tracheal intubation are ease of placement, reliable alignment of the glottic opening, the ability to continuously oxygenate and ventilate the patient, and minimizing disconnection time from the breathing circuit. The air-Q intubating laryngeal airway supraglottic airway device has been designed to overcome the limitations of classic LMA for tracheal intubation. Its advantages include: a shorter, more curved shaft, an easily removable airway adapter, lack of a grill in the ventilating orifice, and the ability to remove the laryngeal airway after tracheal intubation with or without a stabilizing rod. The authors present several cases of patients with anticipated difficult airway in whom the air-Q was successfully used as a conduit for fiberoptic intubation.

I. 2-Year Old With Hurler's Syndrome
A 2-year-old boy with Hurler's syndrome was to undergo ventriculo-peritoneal shunt revision. Two months before the revision, the boy had been difficult to ventilate after inhalation induction. A Cormack and Lehane Grade IV was noted upon direct laryngoscopy. A number 2 classic LMA was placed revealing a C&L II view of the glottis through a fiberoptic bronchoscope, and the patient was successfully intubated with a 4.0 uncuffed TT via the LMA. A new supraglottic revealed a limited oropharyngeal space secondary to mucopolysaccharide deposits resulting in a mouth opening of 12 mm. Intramuscular ketamine was administered, and IV access established. When positive pressure ventilation was adequate, paralysis was instituted with rocuronium. A size 1.5 air-Q ILA was inserted with a leak pressure of 24 cm H2O followed by fiberoptic-assisted tracheal intubation with a 4.0 mm ID cuffed TT.

II. 2-Year Old With Large Bilateral Maxillomandibular Dysplastic Mass
A 2-year-old girl with a large bilateral maxillomandibular dysplastic mass presented for excision. CT scans revealed an expanding fibrous mass involving both the maxilla and the mandible. Previous records documented easy mask induction and placement of a 1.5 LMA for the CT scans. The girl’s mouth opening was now less than 2 cm. Inhalation induction was performed with sevoflurane in oxygen, and PPV was instituted. IV access was obtained and paralysis was established with rocuronium. An air-Q ILA size 1.5 was placed with a leak pressure of 26 cm H2O and the patient was intubated with a 4.5 ID cuffed TT over a fiberoptic scope.

III. 6-Year-Old With Treacher-Collins Syndrome
A 6-year-old boy with Treacher-Collins syndrome was to undergo dental extractions. For a previous mandibular distraction surgery, mask ventilation was noted to be easy and an oral fiberoptic intubation was successfully accomplished, although difficult secondary to a large epiglottis. Airway examination revealed a mouth opening of 13 mm with significant micrognathia. Anesthesia was the same as described above for patient II. An air-Q ILA size 1.5 was placed without difficulty, with a leak pressure of 30 cm H2O and the patient was intubated with a 5.0 ID cuffed TT using a fiberoptic scope.

IV. 7-Year-Old With Goldenhar Syndrome
A 7-year-old boy with Goldenhar syndrome was scheduled for mandibular extraction. Prior history was significant for easy mask ventilation, but limited visualization by direct laryngoscopy and difficult tracheal intubation. Airway examination revealed a limited mouth opening of 15 mm and micrognathia. The patient was sedated with 70% nitrous oxide in oxygen and an IV was placed. Anesthetic induction was achieved with propofol. An air-Q ILA size 2 was placed with a leak pressure of 26 cm H2O and the patient was intubated with a 5.5 ID cuffed TT and a fiberoptic scope.

V. A 16-Month-Old Girl With Hunter's Syndrome
A 16-month-old girl with Hunter's syndrome presented for magnetic resonance imaging of the brain and spine. At age 10 months she was found to have limited visualization upon direct laryngoscopy. She was a difficult intubation and was intubated with a fiberoptic scope with a 2.5 uncuffed TT through a no. 1.5 LMA for a ventriculo-peritoneal shunt placement. Airway examination revealed a limited oropharyngeal space due to mucopolysaccharide deposits. A size 1 air-Q ILA was placed with

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a leak pressure of 28 cm H₂O and the patient was intubated with a 4.0 mm ID cuffed TT using a fiberoptic scope.

Securing the Airway
All patients received 10 mcg/kg of IV glycopyrrolate to minimize secretions. The air-Q ILA was deflated and inserted using a rotational technique. The cuff of the air-Q ILA was inflated according to the manufacturer's instructions: Size 1 required <3 ml, size 1.5 required <5 ml, and size 2 required 5–10 ml. The authors’ goal was to achieve a minimum leak of 20 cm H₂O while staying within the manufacturer's guidelines for cuff inflation. Leak pressures were obtained by auscultation over the anterior neck while observing the ventilator manometer during a positive pressure breath. Subsequently, mechanical ventilation of about 10 ml/kg using pressure-limited ventilation was instituted. The airway adapter of the air-Q ILA was removed prior to proceeding with a fiberoptic-assisted intubation. A TT was loaded on to the fiberoptic scope prior to insertion into the trachea. The patients were ventilated through the TT while staying within the air-Q to verify bilateral breath sounds and end-tidal carbon dioxide. The air-Q ILA was easily removed without the aid of a “pusher” or stabilizing rod after intubation. Removal of the air-Q ILA required removal of the TT adapter, deflation of the air-Q ILA, downward traction on the TT, and distal control of the TT with the forefinger and thumb, while withdrawing the laryngeal airway. All patients were successfully extubated over an airway exchange catheter.

Summary
Classic LMA has some limitations when it is used as a conduit for intubation. The shaft of the LMA can be as long as the TT, making it difficult to maintain control of the TT while removing the LMA. Either a long tracheal tube, a double tracheal tube assembly, or a stabilizing rod is required to overcome the length of the LMA. Shortening the shaft of the LMA or leaving the LMA in place for the duration of surgery have also been suggested to minimize these potential risks. The airway connector of the LMA is not wide enough to allow passage of the cuffed TT pilot balloon. This would result in the pilot balloon “hanging up” within the shaft of the LMA and potentially breaking upon attempted withdrawal of the LMA. When using disposable LMAs, the grill may have to be cut to permit a larger or cuffed TT when compared with its nondisposable counterpart.

The air-Q ILA has several key structural differences from the classic LMA and thus has the potential to overcome the above limitations. Since the shaft of this airway is much shorter and curved, enough of the proximal TT is still above it, allowing for removal of the air-Q without the aid of a stabilizing rod. The air-Q ILA can be easily removed with a specially designed removal styllet to prevent dislodging the TT. In the cases outlined above, the authors were able to remove the air-Q ILA without use of this styllet to stabilize the TT in the larynx. The airway connector of the air-Q ILA is easily removable, eliminating the potential area where the pilot balloon of the TT can get stuck. The air-Q ILA doesn't have a grill, and pediatric sizes 1, 1.5, 2, and 2.5 can accommodate up to cuffed TT sizes of 4.0, 5.0, 5.5, and 6.0 mm ID. This issue is clinically applicable in patients with a limitation in mouth opening in whom only smaller laryngeal airways may fit, while the placement of a size-appropriate cuffed TT is needed. The authors found the rotational insertion technique of the deflated air-Q ILA to be the most successful. Prior to conducting this case series, they placed several air-Q ILAs in children with normal airways and found this to be easiest. In all patients the TT was inserted into the trachea on the first attempt with no decrease in oxygen saturation. An AEC was placed through the TT prior to extubation as a means to re-intubate if needed. The AEC was removed when the patient exhibited adequate respiratory effort, facial grimacing, and hip flexion. There were no postoperative airway complications in any of the patients.

The air-Q ILA is available in sizes 1, 1.5, 2, 2.5, 3.5, and 4.5 for single use and sizes 2.0, 2.5, 3.5, and 4.5 for reusable use. Sizing of the pediatric air-Q ILA, as for the LMA, is weight-based. A size 1 is designed for patients ≤5 kg, size 1.5 for 5–10 kg, size 2 for 10–20 kg. In the case series presented here, various cuffed TT sizes can be placed through the same size air-Q ILA as seen with patients I through III, above. The patients demonstrated that a smaller than weight-based size air-Q ILA can be used without compromising ventilation parameters and to allow for tracheal intubation with an appropriately sized cuffed TT. This would not have been possible with an equivalently sized classic LMA. The shaft of the air-Q ILA does not permit passage of a larger diameter TT or the pilot balloon of a cuffed TT. While the use of the air-Q ILA may not improve the view when used in conjunction with a fiberoptic scope in the presence of blood and secretions, the alignment with the glottic anatomy may allow for increased success in the use of a “light guided” or blind technique for intubation. When intubating neonates, if a continuous ventilation technique is employed, a standard bronchoscope adapter will add length to the shaft of the air-Q ILA, necessitating the use of a stabilizing rod. Once the air-Q ILA airway connector is removed, the bronchoscope adapter will no longer be able to be connected to the shaft.

The authors concluded: “We believe the use of the air-Q ILA may be a well-suited alternative to the classic LMA in children with difficult airways, especially when a cuffed TT is desired. In these patients with restricted mouth opening, this airway offers many advantages over the traditional LMA-assisted intubation... This device may prove to be a valuable tool in the management of a difficult pediatric airway.”

Endnote
In a correspondence in a subsequent issue of the journal in which the aforementioned air-Q study appeared, the respondents wrote: “By way of contribution to this debate, we report the successful use of the ILA in two pediatric patients with a predicted difficult airway and discuss solutions to some practical problems we have encountered in our early experiences with this device.” Their first patient was ideally suited for a supraglottic device-assisted technique. The size 2.5 device gave a good airway seal at pressures that allowed easy positive pressure ventilation. A styllet helped to overcome a problem particular to pediatrics, where the ETT can be contained entirely within the shaft of an LMA. The styllet effectively lengthens the ETT to sufficiently allow continuous retention of control of the ETT throughout withdrawal of the ILA over the ETT, which is helpful in reducing the risk of accidental extubation. While the note’s authors agreed that the ILA could be withdrawn over the ETT without extending the ETT because of the short, hyper-curved style, they noted that this was awkward. Tube hold-up at the ILA exit caused some difficulty. The authors noted that they did not adequately lubricate the lumen of the ILA airway. With better lubrication, they did not have this problem during subsequent intubations through the device. By contrast, in another case, Continued on page 62...
the authors of the correspondence encountered no difficulty passing the 3.5 cuffed endotracheal tube past the distal aperture of the size 1 ILA. The only problem encountered was an inability to pass the pilot balloon through the ILA lumen. This was handled by cutting off the pilot balloon. Using a 4.0 uncuffed endotracheal tube would have obviated this problem. They noted that the technique of inverting a stylet designed for a larger ETT worked very well but didn’t routinely recommend it because of the theoretical risk of having the end of the stylet advance too far into the endotracheal tube such that it becomes difficult to remove. The correspondents noted: “In summary, we have used a novel supraglottic airway device, the air-Q ILA, as a conduit for fiberoptic intubation in two difficult intubation scenarios.” The correspondents are: Kawshala Peiris, Mike Traynor and Simon Whyte, with BC Children’s Hospital, Vancouver.