Case Report

Use of the air-Q® intubating laryngeal airway for rapid-sequence intubation in infants with severe airway obstruction: a case series*

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Summary
We describe a four-step method for fibreoptic-guided, rapid-sequence tracheal intubation through the air-Q® intubating laryngeal airway in infants with severe airway obstruction. Our step-wise process provides an organised and controlled approach to safely securing the airway.

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Recently published difficult airway guidelines recommend the use of a supraglottic airway device (SAD) in children with difficult airways [1]. The air-Q® intubating laryngeal airway (Cookgas LLC, Mercury Medical, Clearwater, FL, USA) is a SAD that has been shown to be an effective conduit for tracheal intubation either blindly [2] or with fibreoptic assistance [3, 4]. We describe a four-step method for tracheal intubation through the air-Q in three infants with a predicted difficult airway and severe airway obstruction in whom the awake placement of an air-Q was used to facilitate rapid-sequence tracheal intubation.

Case reports
All three cases involved infants at risk of aspiration, with Pierre Robin Syndrome (micrognathia, glossoptosis and cleft palate) and severe upper airway obstruction as evidenced by tachypnoea and sternal recession requiring supplementary oxygen. Infant one was a 4.1-kg, 6-week-old girl with CHARGE syndrome (coloboma, heart defects, choanal atresia, growth retardation, genitourinary problems and ear abnormalities), vocal cord paralysis and dysphagia who required gastrostomy tube insertion, tracheostomy, nasal endoscopy and bilateral myringotomy. Infant two was a 4.0-kg, 3-week-old boy with dysphagia and gastrointestinal reflux presenting for tracheostomy. Infant three was a 3.6-kg, 8-week-old boy with small bowel obstruction presenting for exploratory laparotomy followed by tracheostomy. Pre-operatively, baseline oxygen saturation on room air had been recorded as between 85% and 95% in all three infants.

The anaesthetic technique was the same in all three cases (Fig. 1). Intravenous access was established before the start of the case and the stomach decompressed with a nasogastric tube that was then removed. First, in the awake infant, the airway was topicalised with 2% lidocaine gel, either by swabbing the clinician’s gloved finger; or delivered via a pacifier with several perforations that was placed in the patients’ mouth [5]. Second, a size −0.5 or −1 air-Q was inserted according to the manufacturer’s
instructions using a standard midline technique with the red plastic tag remaining attached to the pilot balloon. The cuff of the air-Q was then inflated until minimal airway leak was detected. Acceptable airway positioning was verified by observing a tidal volume of at least 6 ml.kg$^{-1}$ whilst making minor adjustments to the position of the device to maintain adequate ventilation. Awake placement of the air-Q was well tolerated by all three infants with minimal coughing, breath-holding or gagging, and resulted in relief of upper airway obstruction with immediate improvement in oxygenation. Third, after removal of the 15-mm proximal air-Q connector, a fibreoptic bronchoscope preloaded with an appropriately sized, lubricated, cuffed tracheal tube, was placed through the air-Q to verify the laryngeal alignment and adjusted, if necessary, to optimise the glottic view. Fourth, after confirming adequate anatomical and functional position of the air-Q and pre-oxygenation, an induction agent (propofol or ketamine) and suxamethonium 1 mg.kg$^{-1}$ was administered intravenously to facilitate tracheal intubation whilst viewing the larynx with the fibreoptic bronchoscope. Once the trachea was intubated and correct placement confirmed by capnography, the air-Q was removed using a removal stylet to stabilise the tracheal tube. With improvement in airway patency, oxygen desaturation did not occur in any patient during fibreoptic bronchoscopy or whilst the breathing circuit was temporarily disconnected. Tracheal intubation, with an appropriately sized cuffed tracheal tube, and removal of the air-Q were both successful on the first attempt in all three patients.

**Discussion**

It is preferable to have an awake patient during difficult airway scenarios, but in a vigorous infant with severe airway obstruction and hypoxaemia, intubating conditions are often suboptimal. The insertion of SADs to facilitate fibreoptic-guided tracheal intubation in awake children has been described previously [6].
Advantages of an awake placement of an SAD include preserved protective airway reflexes, with improvement in ventilation and oxygenation by relieving upper airway obstruction, whilst still maintaining spontaneous respiration. In adults, it has been demonstrated that airway topicalisation and placement of an SAD does not affect the resting gastro-oesophageal barrier pressure or upper oesophageal sphincter pressure [7]. Given these findings, one can infer that the placement of an SAD itself should not increase the risk of aspiration in an awake patient. Caring for infants with a predicted difficult airway and at risk of gastric aspiration can be challenging; our method provides a practical approach in making rapid-sequence tracheal intubation a viable option in these situations by incorporating the awake SAD technique.

Once upper airway obstruction has been relieved and the feasibility of a fibreoptic-guided intubation through the SAD confirmed, the clinician may elect to proceed with awake tracheal intubation without the use of neuromuscular blockade. However, in practice, we believe that administration of an anaesthetic induction agent and neuromuscular blockade before the intubation process minimises the risk of trauma, laryngospasm, bronchospasm and potential dislodgement of the tracheal tube. If the child is not at risk of aspiration, anaesthesia may be induced with sevoflurane inhalation via the SAD, and the airway maintained using the SAD alone, or the trachea may be intubated under deep inhalational anaesthesia with or without the use of neuromuscular blockade. The limitations to this method for rapid-sequence tracheal intubation include dislodgement of the SAD in a vigorous infant, gagging and regurgitation, and the delay between administration and onset of action of suxamethonium, during which time the infant may be at risk of aspiration.

In conclusion, we describe a novel method to overcome upper airway obstruction in infants with a predicted difficult airway, providing a practical option for rapid-sequence tracheal intubation. Approaching the difficult infant airway in this controlled, step-wise manner reduces the likelihood of airway obstruction and its associated complications.

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References