Awake Intubation for Children

Paul A. Baker, M.B.Ch.B. M.D.
University of Auckland and Starship Children's Hospital
Auckland, New Zealand

Narasimhan Jagannathan, M.D.
Ann & Robert H. Lurie Children's Hospital of Chicago, Northwestern University Feinberg School of Medicine
Chicago, IL, USA

Awake intubation is a low-risk, under-utilized, highly successful technique for the management of patients with a difficult airway.[1] The same principles used for adults generally apply to children. Children and adolescents make up approximately 25% of the world's population, and many of these individuals would cooperate for awake intubations. Younger children can also tolerate awake intubation while using local anesthesia, a conduit such as a supraglottic airway (SGA), and occasionally, sedation.

The article aims to provide a brief overview of the practical aspects of awake intubation, emphasising pediatric patients presenting for general anesthesia.

Awake oral intubation

Awake intubation has historically been performed unmodified in neonates without sedation or muscle relaxant, typically with direct laryngoscopy. This practice is no longer recommended, particularly in preterm neonates or term infants because of poor first-pass success and traumatic consequences, which have been attributed to inexperienced trainees intubating these babies without accompanying medication. For these

reasons, it is recommended that direct laryngoscopy intubation should include sedation and muscle relaxants.[2]

The Goals for Awake Intubation

The objective of awake intubation is to provide safe, smooth intubation in conscious, well-oxygenated, cooperative patients who are adequately anesthetized with minimal secretions, reduced autonomic reflexes, and absent pharyngeal and laryngeal reflexes. Under these conditions, patients can breathe spontaneously and protect their reflexes with intact neurological symptoms and signs that can be monitored throughout the intubation. There are very few contraindications to awake intubation. These include declined consent, local anesthetic allergy, uncooperative patients, soiled airways, limited mouth opening, obstructive airway lesions, and inexperienced clinicians.

Declined consent is sometimes due to apprehension. Consent can often be obtained after gentle, thorough explanations of the advantages of awake intubation regarding patients' circumstances, and complications that might occur from non-awake intubation attempts. Histories of local anesthetic allergy require investigation to determine causes such as needle phobia, previous local anesthetic overdoses, or inadvertent intravascular injections. Some uncooperative patients or guardians may change their minds when offered reassurances, explanations, and local anesthetic/sedation options.

The primary indication for awake intubation is for patients with predicted difficult airways, particularly where oxygenation following the loss of consciousness cannot be guaranteed. Other secondary indications include histories of difficult airways, risks of aspiration, at-risk hemodynamic states, necessities for neurological examination after intubation, and inadequate airway management training.

Airway management after induction of anesthesia is not recommended for children with predicted difficult intubation and difficult ventilation. Under these circumstances, the safest course for airway management is the awake technique with or without sedation.

Awake Intubation with Local Anesthesia and Inhalation Induction

Awake insertion of a supraglottic airway (SGA) after topical lidocaine anesthetic is applied to the airway can provide a safe and reliable conduit for oxygenation, flexible bronchoscopic insertion, and tracheal intubation in neonates. This technique was first described in 1994 for a 3.6 kg neonate with Goldenhar syndrome, requiring an elective tracheostomy.[3] Once the laryngeal mask airway (LMA®) was successfully placed after local anesthesia;

it became a conduit for a 1.8 mm external diameter flexible bronchoscope (FB). Two size 3.0 mm external diameter endotracheal tubes (ETTs) with detached connectors were forced end-to-end and fitted onto the flexible bronchoscope. After the distal ETT was successfully advanced down the trachea by the FB, the proximal ETT was used to hold both ETTs in place while the LMA and FB were withdrawn. Capnography was used to confirm the position of the distal ETT, after which the proximal ETT was disconnected, the distal ETT connector was reattached, and the patient was administered an inhalation induction of anesthesia.

Various modifications of this technique have been used for children with predicted difficult airways. The following is a step-by-step approach for oral awake intubation through an SGA as described by Jagannathan et al.[4]

Step 1. Antisialogogue (glycopyrrolate 0.01 mg/kg) and lidocaine 3 mg/kg are the basis for topicalization. Remember that lidocaine administrations are additive, and the total cumulative dose should be carefully calculated for each child to avoid local anesthetic toxicity. Lidocaine can be applied as jelly using a gloved finger to the pharynx, **(Figure 1)** or via a pacifier (the pacifier is injected with 2% lidocaine jelly, and needle holes allow the child to suck and release the lidocaine). **(Figure 2)** Lidocaine can also be given via an atomizer (DeVilbiss or Mucosal atomizer device) **(Figure 3)**, and if necessary, lidocaine can be sprayed onto the larynx through an epidural catheter placed in the working channel of the FB. **(Figure 4)**

Figure 1: Lidocaine 2% jelly applied digitally to an infant's pharynx

Figure 2: Lidocaine jelly injected into a pacifier

Figure 3: Atomizers (DeVilbiss EZ-100® and mucosal atomizer device (MAD®)

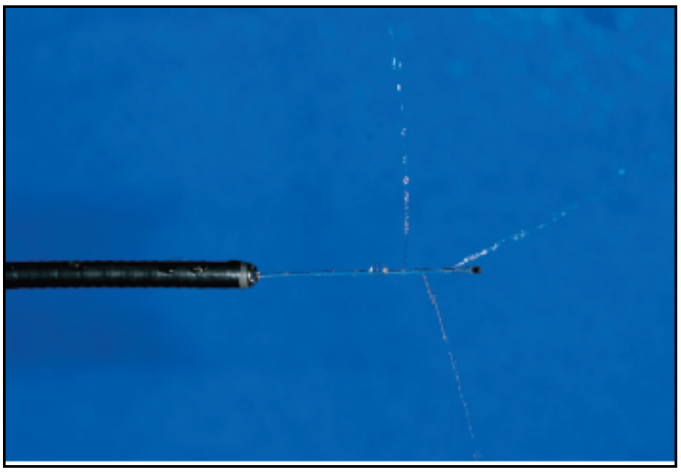

Figure 4: Lidocaine spray via a flexible bronchoscope

Step 2. Insert the SGA. This can be a classic LMA® or an air-Q® SGA. The air-Q® SGA has a detachable 15mm connector and a short, relatively wide tube which helps tracheal tube advancement off an ETT-preloaded FB. **(Figure 5)**

Figure 5: Laryngeal mask airway, air-Q® SGA conduits for awake intubation

Step 3. Adjust the position of the SGA to optimize ventilation.

Step 4. Remove the 15mm connector of the air-Q® SGA. Intubate with the FB and an appropriate size preloaded ETT. For an LMA®, which has a proportionally longer and narrower tube, use the technique described by Johnson et al with two ETTs.[3] Correct tracheal intubation is then confirmed by capnography and auscultation that indicates bilateral air entry. After

confirmed intubation, administer general anesthesia by using intravenous (IV) or inhalation techniques.

Awake Intubation Equipment

The following equipment can be useful for awake intubation in children and adolescents:

1. Intubating oral airways for older children (Berman, Ovassapian, Williams). **(Figure 6)**
2. Endoscopy masks to support oxygenation during oral or nasal intubation. **(Figure 7)**
3. Newton cerebral wires (long atraumatic wires) suitable to insert down a 2mm working channel of a FB to aid tracheal intubation, particularly if a small diameter FB is not available. **(Figure 8)**
4. Specialized ETTs (Parker curve-tip) and SGAs. There are a variety of SGAs suitable for this purpose.[5]
5. Pediatric FB ideally suitable for nasal or conduit intubation. For older children, awake oral videolaryngoscopy or a combined FB and VL approach are options.

Figure 6: Intubating oral airways

Figure 7: Endoscopy mask

Figure 8: Newton cerebral wire

Nasal Intubation

Nasal intubation may be indicated if the oral cavity is occupied by a lesion or the mouth opening is severely restricted. Preparation starts with a topical mucosal vasoconstricting spray (Xylometazoline, phenylephrine) and lidocaine spray with an atomizer to the nostrils and the posterior nasopharynx. Introduce a nasopharyngeal airway down one nostril for oxygen and, if required, an inhalation agent to provide sedation. **(Figure 9)** Alternatively, use intravenous sedation, if required. A FB should be advanced through the contralateral nostril with a preloaded ETT for tracheal intubation.

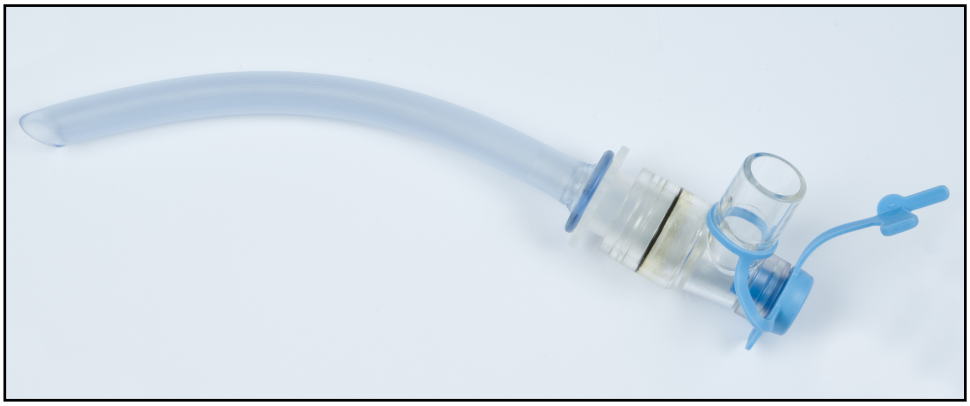

Figure 9: Nasopharyngeal airway for oxygen delivery

Sedation

Sedation may be indicated for older children but rarely for neonates and infants. The goal for sedation is to reduce anxiety and produce a sedated state without loss of patient consciousness or ability to communicate. Options for sedation include benzodiazepines (Midazolam), opiates (Remifentanil), Dexmedetomidine, Ketamine, and/or Propofol. These

medications require careful and slow administration to achieve the desired effect. Sedation should not be a replacement for poor topical anesthesia.

Muscle Relaxants

Muscle relaxants or neuromuscular blockers (NMBs) can be safely used after sedation once the SGA placement is confirmed and ventilation is ensured. This might improve intubation conditions and reduce airway trauma, laryngospasm, and hypoxia. Contraindications for NMBs include severe distal airway collapse conditions such as those caused by tracheomalacia, bronchomalacia, and mediastinal masses.

Oxygen

Hypoxia is the most common cause of morbidity during awake intubations. Continuous low flow oxygen (2L/min) can be given through a swivel connector on an SGA, nasopharyngeal airway, or nasal high flow cannula (HFC). Oxygen can also be given through an endoscopy mask but this should not be used in conjunction with HFC. Avoid giving subglottic oxygen through the working channel of an FB or any other catheter because of the risk of barotrauma.

Conclusion

Awake intubation for children can be a safe technique if conducted by experienced pediatric practitioners who are familiar with advanced pediatric airway management techniques.

References

1. Ahmad I, El-Boghdadly K, Bhagrath R, et al. Difficult Airway Society guidelines for awake tracheal intubation (ATI) in adults. Anaesthesia. 2020;75(4):509-528.
2. Lerman J, Heard C, Steward DJ. Neonatal tracheal intubation: an imbroglio unresolved. Paediatr Anaesth. 2010;1(7):585-590.
3. Johnson CM, Sims C. Awake fibreoptic intubation via a laryngeal mask in an infant with Goldenhar syndrome. Anaesth Inten Care. 1994;22(2):194-197.
4. Jagannathan N, Sohn LE, Eidem JM. Use of the air-Q® intubating laryngeal airway for rapid-sequence intubation in infants with severe airway obstruction: a case series. Anaesthesia. 2013;68(6):636-638.
5. Huang AS, Sarver A, Winding A, Hajduk J, Jagannathan N. The design of the perfect pediatric supraglottic airway device. Paediatr Anaesth. 2020;30(3):280-287.