Digitally Assisted Tracheal Intubation in a Neonate with Pierre Robin Syndrome

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IN a recent review of approaches to the difficult adult airway1 and in a recent report and discussion of tracheal intubation in a patient with Pierre Robin syndrome,2,3 no mention was made of digitally assisted tracheal intubation. Our experience, reported here, suggests that digitally assisted tracheal intubation may be the technique of choice in this and similar conditions with mandibular hypoplasia.

Case Report

An 8-day-old, 3.3-kg female was scheduled for glossoxy and tongue-tip adhesion. The diagnosis of Pierre Robin syndrome was made shortly after birth when micrognathia and glossoptosis causing upper airway obstruction were observed.

The infant was brought to the operating room while prone and with an intravenous catheter in place. Precordial stethoscope, percutaneous oxygen saturation, electrocardiogram, blood pressure, and skin temperature were monitored. When the infant was turned supine, airway patency could be maintained using a nasal airway and gentle jaw-thrust maneuver. Atropine (0.1 mg intravenous) was given and midazolam was titrated in small incremental doses so that a total of 0.3 mg was given intravenously over about 2 h while preparations were made and intubation attempted. Experienced personnel and equipment for performance of an emergency trachecotomy were available immediately. Blind nasotracheal intubation with a 3.0-mm tube was attempted after insufflation of phenylephrine-lidocaine nose drops. Despite careful positioning of the head and neck throughout their full range of motion plus external manipulation of the larynx, tracheal intubation was not achieved. Direct laryngoscopy by three experienced laryngoscopists, using several different pediatric laryngoscope blades, failed to visualize the glottis. After about 2 h of unsuccessful intubation attempts, minor gingival and palatal bleeding occurred, and it was elected to cancel surgery and reschedule the case for the following week. Airway patency, viral signs, and percutaneous oxygen saturation remained stable throughout.

Eight days later, the infant, with a nasopharyngeal airway in place, was again brought to the operating room. The plan was to first attempt digitally assisted tracheal intubation under local anesthesia and mild sedation. Monitors and emergency preparations were as before. In addition, equipment was available for intubation using a 3.7-mm flexible fiberoptic endoscope (Olympus LF-1, New York, NY) in a modified Seldinger technique and for performance of a retrograde technique. Local anesthesia of the upper airway was achieved by having the infant breathe aerosolized lidocaine via a size 0 pediatric face mask for about 10 min. The lidocaine was aerosolized by flowing oxygen through 5 ml 5% lidocaine in a nebulizing chamber linked to several inches cut from a pediatric breathing circuit connected to the mask. Sedation was achieved with continuous intravenous propofol at 20–50 μg·kg⁻¹·min⁻¹. With this combination, the infant, eyes closed, appeared to be comfortably on the anesthesiologist's finger throughout the digitally assisted tracheal intubation procedure.
The index finger palpates and directs the endotracheal tube into the glottis.

The anesthesiologist, standing on the patient's right side, turned toward the head of the table and leaned sideways over the infant. The gloved left index finger, lightly coated with 5% lidocaine ointment, was advanced posteriorly over the surface of the tongue in the midline (fig. 1). The epiglottis and paired arytenoids were palpated easily. A 3.0-mm uncuffed endotracheal tube, curved into a C-shape with a stylet, was held like a pencil in the right hand and advanced along the right side of the left index finger until its tip was felt to lie between the glottis and finger tip. With slight additional advancement of the tube, its end was pushed into the glottis with a flexion motion of the left index finger. Direct palpation confirmed successful intubation. Auscultation of breath sounds and the consistent presence of end tidal carbon dioxide also were confirmatory. The intubation took about 10 s from the time the left index finger entered the patient's mouth until the endotracheal tube entered the trachea. Percutaneous oxygen saturation remained greater than 94%. The tube was secured at 10.5 cm so that its tip was about 1 cm above the carina, as determined by auscultation of the chest during slow advance and withdrawal of the tube. Surgery proceeded uneventfully. General anesthesia was maintained with propofol and nitrous oxide in oxygen. Atracurium was given for muscle relaxation. Postoperatively, the trachea remained intubated for 1 week to allow resolution of upper airway edema. Following tracheal extubation, the infant's airway obstruction was largely relieved, permitting simultaneous breathing and feeding.

Discussion

The tracheas of infants with Pierre Robin syndrome are notoriously difficult or impossible to intubate with the standard direct rigid laryngoscopic technique. The anesthesiologist therefore develops skill in one or more alternative approaches. Varying degrees of success have been enjoyed by several recently published techniques. Safety, efficacy, cost-effectiveness, and widespread availability would make a technique of tracheal intubation especially desirable. Our experience with the case reported suggests that, in the infant with hypoplastic mandible, digitally assisted tracheal intubation should be considered.

Conventional direct laryngoscopy may be ineffective because of inability to displace the tongue sufficiently to adequately visualize the glottis. Modifications in both laryngoscope blade and laryngoscopic technique have not completely alleviated the problem. In our patient, no more than the tip of the epiglottis could be visualized. Since repeated attempts at direct rigid laryngoscopy may lead to upper airway trauma, edema, and catastrophic loss of the airway, we elected to stop further instrumentation at the first hint of trauma to allow resolution of any injury.

Blind nasotracheal intubation has been described in an infant with Pierre Robin syndrome. This was our first choice because we believed it would be the least traumatic. However, despite careful positioning, the tube tip was apparently never directed anteriorly enough to enter the glottis of our patient.

In preparing for our patient's second visit to the operating room, we chose two alternatives to the planned digitally assisted tracheal intubation. First, based on experience with another neonate with mandibular hypoplasia, we prepared to use our 3.7-mm fiberoptic scope in a modified Seldinger technique as described by Howard-Hansen et al. and Scheller et al. In this approach, a wire is passed through the suction port of the endoscope and directed into the trachea. Next, the endoscope is carefully removed and replaced with an endotracheal tube, which is then advanced over the wire into the trachea. We prepared, in addition, to perform a retrograde tracheal intubation if necessary. This consists of retrograde passage of a wire through the cricothyroid membrane followed by anterograde passage of the endotracheal tube over the wire. The retrograde technique was not considered a first choice because of its invasive and inherently traumatic nature.

Other described techniques for tracheal intubation of infants with Pierre Robin syndrome were unavailable to us for lack of special equipment. For example, a double flexible fiberoptic endoscopic technique was reported by Kleeman et al. In this approach, topical local anesthetic was instilled through the first scope and a second, smaller scope was used for tube placement. Another innovative combination technique was described recently by Chadd et al. They used a laryngeal mask airway to guide a urethral catheter into the...
trachea of a 4.2-kg infant. As a refinement, Benumof suggested using a fiberoptic instrument in place of the catheter guide.5

Digitally assisted tracheal intubation may have been first performed as early as 154311 and has been described several times, especially in adults, over the past 100 yr.12-14 Our interest in digitally assisted tracheal intubation in pediatric anesthesiology arose from a recent report by Hancock and Peterson describing the role of ‘‘finger intubation’’ in their neonatal practice.15 They reported 39 successful digitally assisted intubations of neonatal tracheas with a mean time of 7 s per intubation. It occurred to us that the digital technique might make actual displacement of the tongue unimportant, and this proved to be the case. The palpat ing finger curved naturally around the tongue, to lie at once over the glottis.

The ability to perform digitally assisted tracheal intubation may help ensure the safety of the patient with mandibular hypoplasia and represents a valuable addition to the anesthesiologist’s armamentarium of tracheal intubation techniques.

References

2. Chad GD, Crane DL, Phillips RM, Tunell WP: Extubation and reintubation guided by the laryngeal mask airway in a child with the Pierre Robin syndrome. Anesthesiology 76:640-641, 1992

Tolerance to Isoflurane during Prolonged Administration

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TOLERANCE is defined as a reduction in physiologic response to a drug with repeated administration. 1 Tolerance has been described during prolonged use of vir-