Foreign Body Obstruction Preventing Blind Nasal Intubation

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A healthy young male patient was scheduled for dental care under nasotracheal intubated general anesthesia. The presence of a plastic calculator key complicated the intubation. This case report describes the event and reviews some possible techniques for coping with an airway that becomes obstructed by a foreign object.

Key Words: Foreign body obstruction; Intubation.

CASE REPORT

A 4-year-old ASA 1 boy presented to our pediatric dental department with extensive dental decay. In total, 16 teeth required either restoration or extraction. His physical examination was unremarkable. He had no allergies, had a Mallampati Class II airway, and had no previous surgical or anesthetic exposure. Because of the extent of his dental needs and his limited capacity to endure the intended treatment, the decision was made to treat this patient under general anesthesia.

Routine questioning of the patient's caregiver confirmed that the child had abided with the NPO guidelines. The original examination findings were reviewed, heart and lung sounds were auscultated, and the patient's upper airway was inspected as far as his cooperation permitted. There were no detectable anomalies or changes in the previously recorded health status. The patient was moved to the pediatric operating room in our dental clinic; standard ASA monitors were placed; and an inhalation induction was performed with sevoflurane, oxygen, and nitrous oxide. After induction, intravenous access was established with a 22-gauge catheter-over-needle, and a continuous infusion of normal saline was delivered.

After discussion between the resident and attending dentist anesthesiologist, the decision was made to perform a blind nasal intubation.

The patient was placed supine and the head was stabilized on a pediatric head cushion. The chin was elevated and unlabored spontaneous ventilation with sev-

oflurane was continued until an appropriate depth of anesthesia was attained for the planned nasal intubation.

A 5.0-mm nasal RAE endotracheal tube that had been softened by warming to body temperature and lubricated with a small amount of 2% lidocaine ointment was introduced into the right naris. The endotracheal tube was advanced easily through to the pharynx following the technique described in the "Discussion" section under point b. However, some resistance was met at the level of the larynx. At this point, a laryngoscope with a McIntosh number 2 blade was used to visualize the laryngeal inlet directly. A dark shadow appeared beneath the aryepiglottic folds and was resting on the dorsal half of the vocal cords. The object could not be identified, and only its anterior margin was visible. A Magill forceps was taken and cautiously positioned to grasp the edge of the object closest to the ventral insertion of the vocal cords. The object was secured at the commencement of expiration and was easily removed. The endotracheal tube was then advanced with the aid of the Magill forceps into the trachea, after which the anesthetic and recovery proceeded uneventfully.

After withdrawing the object it was instantly recognized as the plastic memory key of a common calculator. Figure 1 is a digital recreation of the position the memory key occupied at the time it was "rescued" with the Magill forceps. Figure 2 shows the key measuring $1.8 \times 0.9 \times 0.5$ cm.

DISCUSSION

Several techniques of blind nasal intubation are taught in our dental anesthesiology training program that are

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Figure 1. View of vocal cords (situation recreated).

easy and gentle to perform. They offer the resident an additional perception of the airway and demand detailed attention to the preintubation positioning of the patient. The 2 techniques that are commonly taught are (a) advancing the endotracheal tube following the breath sounds with the aid of an esophageal stethoscope placed within the endotracheal tube or (b) observing the passage of an endotracheal tube advanced in a direction of 45° to the sagittal plane toward the midline of the trachea.

In the former blind nasal technique, advancing the tube while listening to breath sounds is a valuable skill to learn. If the breath sounds disappear during the advancement, the tube is pulled back and the tip is twisted slightly to the right or left until breath sounds are again heard. The tube is again advanced. Just before the tube's entrance into the glottis, the intensity of the breath sounds increases. At that point, and after the vocal cords are maximally abducted at the peak of inspiration, the tube is advanced farther into the trachea.

In the latter technique, the neck is observed for evidence of the tube having entered the larynx. A small bulge in the neck tissues related to the advancement of the endotracheal tube indicates that the endotracheal tube has passed beside the laryngeal inlet and contacted the venterolateral pharyngeal wall. At this point the tube is retracted a short distance and then redirected toward the midline in a direction opposite to the observed tissue bulge. Successful entry into the larynx is often signaled by movement of the overlying tissues in the midline of the neck, by a slight elevation of the tracheal outline, and by the tactile perception of the endotracheal tube passing over the cartilaginous rings of the trachea. Confirmation of correct placement is performed, as with standard intubation techniques, by auscultation, observing equal chest rise, and documenting the presence of adequate carbon dioxide in each exhalation.

Figure 2. Removed object (dimension rule = mm).

Difficult tracheal intubations account for 17% of anesthesia-associated respiratory-related injuries, and the inability to mask ventilate or intubate accounts for up to 28% of all anesthetic-related deaths.¹ This led us to consider the possible consequences had retrieval not been successful.

Intraoral examination is often difficult in the young patient, but this patient cooperated with inspection of the mouth and oropharynx. We did not, however, carefully inspect the nasal passages for foreign objects before induction of anesthesia.

Typically, we perform a detailed intranasal examination only after evidence of trauma, pathology, or abnormal function. As a result, we did not give ourselves the opportunity to detect the memory key within the nasal passages before intubation, if indeed that was where the object was initially lodged. To avoid a similar complication, we now attempt to inspect all nasal passages for foreign objects before induction, though a significant portion of the nasopharynx remains invisible to superficial inspection. Likewise, our oral examination is limited to the anterior portion of the oropharynx. The object, which the patient could have bitten off the calculator's keypad and partially swallowed into the laryngopharynx, would not have been visible before induction.

Mastery of the technique of blind nasal intubation has some major advantages, especially the ability to secure an airway without the use of auxiliary instrumentation in situations such as the presence of reduced oral opening or whenever awake intubation is indicated.

Disadvantages of a blind nasal intubation include the inability to visualize either foreign bodies or tumors that could be pushed into the trachea or result in significant hemorrhage and subsequent compromise of the airway.

In our case, had the intubation dislodged the object

Figure 3. ASA difficult airway algorithm.

to the level of the cricoid cartilage, reportedly the narrowest region of the pediatric airway, the object may have been impossible to grasp with Magill forceps. Had ventilation been impossible, the Heimlich maneuver would have been the next step. Other adjuncts such as the laryngeal mask airway, a Combitube, light wand, and ventilating-stylet may not have improved the situation, but transtracheal jet ventilation may have proven to be a useful alternative following the ASA difficult airway algorithm² (Figure 3). The more traditional needle placement through the crico-thyroid membrane, particularly in a child, could position the needle above a cricoid obstruction and bring little relief.

The present-day gold standard for retrieval of foreign objects from within the airway and below the level of the vocal cords remains either fiber-optic or rigid bronchoscopy, with transtracheal jet ventilation being arguably the most universal method of rescue oxygenation in extreme situations. Proficiency in bronchoscopy demands significant training and ongoing regular experi-

ence. It is also possible to imagine recovering the object by placing a catheter through the inferior aspect of the crico-thyroid membrane or between the first and second cartilaginous rings of the trachea, through which a wire could then be advanced in a retrograde manner in an attempt to push the obstacle up toward the region of the hypopharynx. In the case of a total or near-total obstruction, there may be insufficient time to accomplish this. Occlusion of the airway beneath this level would have been potentially disastrous and would have necessitated either subcricoid jet ventilation or tracheotomy.

It may also be possible to pass a small endotracheal tube (eg, 2.5, 3.0) past an obstacle or use this to drive the obstacle forward to the carina with the aim of ventilating at least 1 lung.

This case highlighted the importance of a thorough physical exam including the nasal passages and oropharynx before induction of general anesthesia. Review of the events and the recent literature leads to a better

appreciation of the value and flexibility of transtracheal jet ventilation and additional security to be gained by being able to perform an emergency tracheotomy with its low incidence of complications.³ It is perhaps a reasonable goal that all anesthesiology residents be trained to be able to perform transtracheal ventilation, cricothyroidotomy, and tracheotomy and be provided with the opportunity to do so during their residency. Should the need ever arise, a practitioner would not then be simply recalling a technique he or she had only read about or seen performed by others.

REFERENCES

1. Engel TP, Applegate RL II, Chung DM, Sanchez A. Management of the difficult airway. Available at: <http://www.gasnet.org/airway.htm>. Accessed August 1, 2005.
2. American Society of Anesthesiologists. Practice guidelines for management of the difficult airway. Available at: <http://www.asahq.org/publicationsAndServices/Difficult%20Airway.pdf>. Accessed August 1, 2005.
3. Gillespie MB, Eisle DW. Outcomes of emergency surgical airway procedures in a hospital-wide setting. *Laryngoscope*. 1999;109:1766–1769.