Unusual Cause of Difficult Extubation

To the Editor—Most of the reported difficulties with the airway are related to difficult intubation. We report an unusual situation in which we were unable to extubate the patient's trachea.

An 8-yr-old boy weighing 29 kg and having a long-standing history of hoarseness was scheduled for direct laryngoscopy, tracheoscopy, and CO₂ laser excision of pedunculated subglottic anterior commissure mass. General anesthesia was induced with halothane/O₂/N₂O followed by neuromuscular blockade with vecuronium (3 mg). Direct laryngoscopy for tracheal intubation revealed widely abducted vocal cords with an approximately 3-mm-diameter mass protruding above the anterior commissure region. A metallic double-cuffed endotracheal tube, designed for laser surgical procedures (Laser Flex® [ID 4.5 mm, OD 7 mm], Mallinckrodt Anesthesia Products, St. Louis, Mo) was passed without difficulty through the relaxed vocal cords and cricoid ring and into the trachea. Positive-pressure ventilation revealed a leak at 24 cmH₂O around the tube, and the cuffs remained inflated. However, the endotracheal tube obstructed surgical exposure to the laryngeal mass, and the decision was made to proceed with an intravenous anesthetic technique (propofol, fentanyl, and vecuronium) to remove the endotracheal tube and to ventilate the lungs using a jet-venturi technique. All of the anesthesiologist’s attempts to “blindly” extubate the trachea were unsuccessful (the cuffs were deflated, and patient was completely paralyzed). Direct visualization with the laryngoscope revealed abundant space between vocal cords and endotracheal tube, but the cuffs were apparently “hanging up” on the anterior commissure mass, pulling the entire laryngeal structure with attempts to extubate. All efforts to extubate the trachea by rotating the tube did not bring any results, although this maneuver, as well as advancing the tube further into the trachea, was easy. Due to our inability to extubate the trachea, we requested the assistance of the ears–nose–throat surgeon. Under direct vision he manipulated the larynx and tube and with much difficulty finally forcefully extubated the trachea. During extubation the laryngeal mass was noted to have ruptured, revealing its partly cystic nature. For the rest of surgical procedure and uneventful anesthesia, the patient’s lungs were ventilated with a jet-Venturi device. The upper trachea was examined with a Hopkins rod telescope: minimal mucosal abrasions were noted in the subglottic area where the non-inflated cuffs were positioned. After completion of laser surgery, while still anesthetized, the patient’s trachea was reintubated with a cuffed endotracheal tube (ID 5 mm). He was then allowed to emerge from anesthesia. Extubation was accomplished in the operating room without any airway complications.

This unusual anesthetic complication may have two mechanistic explanations. First, the laryngeal mass narrowed the subglottic cross-sectional area, allowing advancement of the endotracheal tube but preventing its withdrawal across the vocal cords. Second, the cuffs of the Laser Flex® endotracheal tube, even when deflated, are cumbersome and not appropriate for intubation of patients with already narrowed glottic or subglottic space, as in this case. This tube might be improved by redesigning its cuffs to have longitudinal folds that favor a lower profile when collapsed as opposed to the current bulky and amorphous mass of plastic. In retrospect, we think that the choice of some other type of “laser-resistant” single-cuffed endotracheal tube or Laser Flex® uncuffed tube may have been a better choice for intubation of this patient’s trachea. In addition, the lubrication of the external surface of endotracheal cuffs, with a water-soluble agent, which is not a routinely recommended procedure, may have been a helpful advantage to remove the endotracheal tube in the current case.

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In Reply—Mallinckrodt agrees with the authors’ recommendation to use the Mallinckrodt Uncuffed Laser-Flex® tracheal tube for pediatric patients in whom a laryngeal mass must be removed and are provided in three sizes to fit small children: 3.0, 3.5, and 4.0 mm ID.

Difficult extubations have been noted in the past with standard single cuff tracheal tube designs.1–5 Tashayov and Oskouei reported a similar situation of a difficult tracheal extubation in a 9-yr-old girl and concluded that "the complication resulted from forceful intubation with a tube that was larger than necessary."

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Even where a cuffed tracheal tube is indicated, we do not agree with the authors’ recommendation for redesign of the cuff system of the cuffed Laser-Flex® Tracheal tube. The proposed changes could reduce its proven safety and efficacy:

1. Longitudinal folds in the cuff require higher inflation pressures to seal against the trachea, which may increase the potential for trauma and damage to the mucosa.

2. An inflated single cuff system may not maintain an airway seal after a puncture with a laser. No single cuff is resistant to puncture by a laser.