Case Report

T-Tube Aspiration: Revisiting a Rare Life-Threatening Event

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Received 9 April 2013; Accepted 13 May 2013

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Abstract

T-tubes are generally safe artificial airways used to stent and maintain the laryngotracheal airway in patients with stenosis or after laryngotracheal reconstruction. T-tube related airway complications are uncommon but potentially life-threatening. T-tube aspiration is rarely reported in the literature and may occur after coughing episodes and deep inspiration. Two cases of T-tube aspiration in patients with traumatic brain injury and laryngotracheal stenosis are presented, where altered mental status contributed to the aspiration events. Otolaryngologists need to be aware of T-tube related airway complications, specifically T-tube aspiration, especially in traumatic brain injury patients who may be at higher risk.

Keywords: T-tube; T-tube complications; laryngotracheal stenosis; laryngotracheal reconstruction

1. Introduction

The T-tube was introduced by Montgomery in 1965 and has remained the preferred artificial airway both for maintaining airway patency in laryngotracheal stenosis as well as for stenting the reconstructed airway [4]. The Montgomery T-tube is a flexible T-shaped silicone tube with advantages over a standard tracheostomy tube, including minimal mucosal reactivity and granulation tissue formation, decreased mucus plugging, improved phonation, and increased patient acceptance [5]. Also available for T-tubes now is an external limb luminal cap attached to a ring flange that fits around the ribbed external limb, allowing both phonation while capped and also protection from posterior dislodgement into the airway (Figure 1). While rarely reported, various emergent airway complications from T-tubes have been documented, including T-tube cap inhalation [6], fractured vertical and horizontal limbs of T-tubes [9,7], and T-tube aspiration [3,1,8]. Two rare clinical scenarios of T-tube aspiration in patients with traumatic brain injury will be presented here, as well as the interventions required to stabilize the airways.

2. Case reports

2.1. Case 1

A 24-year-old female with a traumatic brain injury after a motor vehicle accident required prolonged intubation and tracheostomy. She developed subglottic and tracheal stenosis, and therefore after tracheal dilation, a 13-mm Montgomery T-tube was placed. She subsequently presented to the emergency department with acute-onset tachypnea and biphasic stridor. The patient and her caretaker reported that the T-tube disappeared suddenly while the patient was deeply inspiring after a vigorous coughing episode. Of note, the patient had removed the T-tube’s external luminal cap prior to the coughing spell. A chest X-ray obtained showed no evidence of the T-tube within the airway. Flexible tracheoscopy at the bedside, however, revealed a foreign body consistent with an aspirated T-tube lying at the level of the carina extending into the mainstem bronchus (Figure 2).

The patient was taken to the operating room for removal of the T-tube. On rigid bronchoscopy, the patient was noted to have circumferential subglottic and tracheal stenosis. Using a combination of rigid and flexible bronchoscopic instrumentation, the T-tube was advanced to the level of the tracheostomy stoma. Hemostat clamps were then used to remove the entire T-tube through the tracheostomy stoma. The patient’s airway immediately stabilized following the T-tube’s removal and a standard tracheostomy tube was placed. No intraoperative complications occurred, and the patient was discharged home the same day.

Figure 1: 13-mm Montgomery® T-tube™ with labeled components.
Figure 2: Re-creation of the T-tube’s location and orientation after inadvertent aspiration in Case 1. Depicted are the (a) intraoperative view and (b) approximated appearance of the aspirated T-tube on coronal view. LMSB = left mainstem bronchus, * = proximal limb of T-tube, EL-TT = external limb of T-tube.

2.2. Case 2
A 23-year-old male with traumatic brain injury following a motor vehicle accident required prolonged intubation and tracheostomy. He developed subglottic stenosis, and therefore after subglottic dilation, a modified T-tube was placed to stent the area and improve his phonation. The patient later presented to the emergency department complaining of cough and dyspnea. A chest X-ray was read as normal, and the patient was placed on antibiotics for presumed bronchitis. The patient followed up in the ENT clinic 2 days later, and flexible tracheoscopy revealed that the T-tube had been aspirated to the level of the carina. The patient was taken urgently to the OR. In this case, a flexible bronchoscope was passed through the tracheostomy stoma, and the T-tube was removed directly through the stoma with flexible bronchoscopic graspers. The airway was stabilized, and a standard tracheotomy tube was then placed.

3. Discussion
While the Montgomery T-tube remains a valuable tool for airway maintenance in cases of laryngotracheal stenosis and stenting in airway reconstruction, otolaryngologists must be aware of the potentially devastating airway complications that may occur with its use. The mechanism by which the T-tube aspiration events occurred in the two cases presented were similar to previously described reports in the literature. T-tube aspiration tends to occur in the setting of significant coughing episodes followed by deep inspiratory efforts. Notably in the cases presented, coughing and deep inspiration alone were sufficient to cause T-tube aspiration, whereas other authors have described attempts at manipulating the T-tube after these coughing bouts as the cause of further dislodgement and aspiration [1,8]. Also notable in the cases presented was that both patients were mentally altered secondary to traumatic brain injury, a potential risk factor for T-tube complications not previously reported in the literature. This potential contribution of traumatic brain injury to T-tube aspiration was especially evident in the first case where, despite multiple warnings, the patient removed the T-tube’s protective external limb ring flange repeatedly, placing her at higher risk for aspiration.

In a recently published article by Athavale and colleagues, T-tube obstruction was cited as being one of the most feared complications of T-tube use, and the authors recommended extensive patient education on airway obstruction and on how to remove a T-tube in the setting of acute obstruction [2]. The two cases presented here further support the need for detailed patient education on airway-related T-tube complications. However, in contrast to an obstructed T-tube, patients with a dislodged T-tube should not be encouraged to manipulate or remove the tube, as this may dislodge it further and cause frank aspiration.

To prevent T-tube aspiration, patients should be taught to stabilize their T-tubes during forceful coughing or deep inspiration because once the T-tube is dislodged, the airway becomes unstable. A clear concern then becomes the patient’s understanding and reliability. A patient with traumatic brain injury who is mentally altered may not understand such detailed T-tube education, and consideration should be given as to whether or not the patient is a good candidate for T-tube placement. In the cases presented, while both the patients and their caretakers were instructed on the risks and management of T-tubes, their traumatic brain injuries may have placed them at higher risk for T-tube aspiration. This increased risk should therefore be considered by the surgeon as well as the patient, family, and caretaker when deciding whether or not to place a T-tube.

4. Conclusion
Otolaryngologists must be prepared to deal with airway crises secondary to T-tube complications, but first and foremost, must carefully select and thoroughly educate patients. Illustrated by the cases presented, otolaryngologists should consider patients with traumatic brain injuries who are left mentally altered as being higher risk patients for life-threatening T-tube related airway complications, and specifically T-tube aspiration.

References


