Emergent airway management in a patient with \textit{in situ} tracheal stent: A lesson learned

**ABSTRACT**

The prevalence of \textit{in situ} tracheal stents has increased in the past two decades for the management of malignant and benign central airway diseases for either palliation or definitive therapy. Recent placement of a tracheal stent has been associated with edema of the upper airway; therefore, these patients are at a great risk for airway collapse, especially within the days most recent to the procedure. The authors present the case of a morbidly obese patient with a tracheal stent admitted to the Intensive Care Unit who developed acute respiratory failure and was found to be “unable to ventilate, unable to intubate.” Surgical airway approach through a cricothyroidotomy failed to provide a patent airway and the patient subsequently developed cardiac arrest and expired. The presence of tracheal stent poses a high challenge during emergent airway interventions; thus, carefully planned airway manipulation in such patients is paramount in order to avoid catastrophic outcomes.

**Key words:** Central airway disease; difficult airway algorithm; morbid obesity; tracheal stents

**Introduction**

Tracheal stenting has gained popularity in the management of patients with complex central airway disease due to malignant, benign, or postlung transplant tracheobronchial narrowing.\[^1\] Although intraluminal stent provides patency to the airway, it warrants awareness of associated complications–including stent displacement or collapse, respiratory failure, and airway obstruction–immediately and in the long term after the device is deployed.\[^2-8\] The presence of these devices qualifies a patient as a “difficult airway,” and a competent decision-making process to select an appropriate airway management technique is paramount in the final outcome for these patients during elective or emergent situations.\[^2,3,8\]

**Case Report**

A 37-year-old female with past medical history of morbid obesity (body mass index 56.65 kg/m\(^2\)), severe obstructive sleep apnea, and tracheal stenosis from prior prolonged intubation due to penetrating neck injury of 3 weeks’ duration was admitted to our Intensive Care Unit for stridor. The patient’s postintubation tracheal stenosis was not found to be appropriate for surgical correction and therefore she was initially managed with laser ablation and mechanical dilation; although due to persistent stridor and dyspnea, a straight silicon tracheal stent was placed. Following resolution of symptoms, the stent was removed 6 months later.

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**Jose R. Navas-Blanco, Junior Uduman\(^1,2\), Javier Diaz-Mendoza\(^2\)**

Department of Anesthesia, Pain Management and Perioperative Medicine, Henry Ford Hospital, \(^1\)Division of Nephrology and Hypertension, Henry Ford Hospital, \(^2\)Division of Pulmonary and Critical Care Medicine, Henry Ford Hospital, Detroit, Michigan, USA

**Address for correspondence:** Dr. Jose R. Navas-Blanco, Department of Anesthesia and Perioperative Medicine, Henry Ford Hospital, 2799, West Grand Boulevard, CFP-341, Detroit, Michigan 48202, USA. E-mail: jnavas1@hfhs.org
Shortly thereafter, she returned with increased dyspnea and nonproductive cough. Bronchoscopy revealed severe tracheal stenosis with malacia extending 42 mm from the cricoid cartilage [Figure 1]. The decision was made initially to place a Dumon® tracheal straight silicon stent (Novatech SA, France) which unfortunately collapsed during postoperative recovery and had to be exchanged 5 days later for a Dumon® Y-shaped silicon stent (dimensions: 16 mm × 13 mm × 13 mm). The procedure was described to be a difficult procedure by the implanting interventionalist, requiring multiple balloon dilations, rigid bronchoscope manipulations, use of forceps, and complicated by postoperative laryngeal edema and spasm, which improved with oral prednisone and the patient was eventually discharged from the hospital.

On postoperative day 7, she developed dyspnea and stridor resulting in readmission to the Intensive Care Unit for close monitoring while awaiting bronchoscopy evaluation by interventional pulmonology. She had mild respiratory distress with associated mixed stridor, oxygen saturation levels of 96% on room air without pronounced respiratory rate or effort. Overnight, the patient developed increasing dyspnea and chest pain with oxygen saturation of 90%, initially responsive to conservative management. She progressed to worsen within the next few hours despite escalating doses of helium-oxygen therapy. A difficult airway team composed of anesthesiologists, otolaryngologists, and trauma surgeons was promptly called for advanced airway management. Upon evaluation at bedside, the patient was having increasing respiratory effort, with oxygen saturation on 80% through face mask with 100% supplemental oxygen.

Given impending respiratory decline, sedation and muscle relaxation were provided. Two-handed mask ventilation with oral airway was accomplished with difficulty. Following the American Society of Anesthesiologists’ difficult airway algorithm,[3,4,8] the decision was made to proceed with endotracheal tube placement. Portable videolaryngoscope (size #4 blade) was used, providing a full visualization of the glottis (Cormack–Lehane view Grade 1). Difficulty in advancing a size 7.0 Fr endotracheal tube was encountered due to resistance distal to the vocal folds. A second attempt with a tracheal tube introducer under direct videolaryngoscopy guidance also failed to advance due to similar airway resistance. Following this attempt, mask ventilation became more difficult.

A laryngeal mask airway (size #4) was placed; however, this also failed to provide adequate ventilation and oxygenation, necessitating a surgical airway. A cricothyroidotomy was performed with a palpable lumen across the incision through which a tracheal tube introducer was placed and a size 6.0 Fr endotracheal tube was threaded. Despite adequate colorimetric change, high ambu-bag resistance was encountered and the patient continued to have inadequate ventilation. At this point, attempted flexible fiberoptic evaluation of the patient’s airway was difficult due to secretions and blood in the supraglottic space. The patient subsequently developed cardiac arrest and expired after multiple rounds of cardiopulmonary resuscitation.

Discussion

The “cannot ventilate, cannot intubate” scenario is unarguably the worst possible scenario during emergency airway management, especially in patients with in situ tracheal stents.[3,4] Direct endoscopic visualization is crucial in these patients to increase the chances of successful definitive airway placement and to avoid tracheobronchial occlusion, perforation, or creation of a “false passage” during endotracheal tube positioning.[2,3]

Currently, there are no formal consensuses regarding the best method to approach a difficult airway with a tracheal stent in situ. During an elective procedure when the risk of aspiration of gastric content is not anticipated, Davis et al. recommend the use of supraglottic devices (laryngeal mask airway), and if tracheal intubation was necessary and hand ventilation is possible, a fiberoptic technique under anesthesia should be used to adequately position the endotracheal tube within or above the stent. If the patient is known to have difficult endotracheal tube placement, awake-fiberoptic intubation would become necessary.[2,3]

For emergency procedures, a fiberoptic guidance with tracheal visualization of the endotracheal tube provides the safest approach in securing the airway, while preserving the integrity of the stent, if oxygenation is critically compromised, the most familiar method by the provider should be used. Alternatively, tracheal tube introducers followed by endotracheal tube railroading may also be used during such scenarios, but confirmation with fiberoptic visualization after endotracheal tube placement is advised.[8] Similarly, no
formal consensus exists regarding the size of endotracheal tube to be used according to the size of the tracheal stent. The authors recommend the following size of endotracheal tube to be placed in case of emergency [Table 1].

This case highlights the challenges that the presence of tracheal stents poses to the approach of the airway to anesthesiologists, especially during emergency situations, and underlines the relevance of the use of fiberoptic to guide, position, and confirm the presence of an endotracheal tube in patients with these devices and avoid complications from stent malposition, false passage, or failed airway.

Declaration of patient consent
The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Table 1: Appropriate endotracheal tube size (values expressed in French) according to corresponding tracheal stent (values expressed in mm)

| Endotracheal tube (Fr) | Tracheal stent (mm) |
|-----------------------|---------------------|
| 5                     | <12                 |
| 6                     | 12-14               |
| 7                     | 16                  |
| 8                     | >18                 |

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Conflicts of interest
There are no conflicts of interest.

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