The Cook airway exchange catheter (CAEC) is a long, flexible, hollow tube designed to facilitate the exchange of an in situ endotracheal tube. The primary use of the CAEC had been as a tube exchanger in the critical care setting. The unique characteristics of this device led us to use and report the use of the CAEC in the anesthetic management of a morbidly obese patient with significant tracheal deviation secondary to an enlarged thyroid gland.

The potential strategies that we considered in this case were (1) extubating the patient in a deep plane of anesthesia; (2) extubating conventionally, with the patient awake; and (3) extubating the patient awake, with a “bridge” to full extubation. After carefully weighing the options, we decided to use the CAEC as a tool that would allow us, if the patient did well, to go forth to full extubation, or, if the patient’s condition deteriorated, to return to reintubation, or even oxygen insufflation, which would create a “bridge” to extubation.

Key words: Cook airway exchange catheter, difficult extubation.

Case report
A 53-year-old, 165.1-cm, 97-kg, morbidly obese female (body mass index = 36.5) with a greater than 20-year history of hypertension, bronchitis in the past 6 months, gastroesophageal reflux, diabetes mellitus, and rheumatoid arthritis sought care for thyroidectomy. She was taking procadia and prilinvi for hypertension and zantac for gastroesophageal reflux. Her diabetes regimen consisted of 10 units of NPH (neutral protamine hagedorn) insulin and 10 units of regular insulin, both morning and evening. Her dietary compliance was marginal.
The patient had a visibly large thyroid goiter; a neck radiograph demonstrated substantial right tracheal deviation due to an enlarged left lobe. She experienced occasional dysphagia, shortness of breath, and significant dyspnea when lying on her right side. Her previous cardiac catheterization had been normal, and the electrocardiogram showed left ventricular hypertrophy.

The patient was noted to have a Mallampatti class II airway, prominent front teeth, good mouth opening, good range of motion of the neck, and an appropriate thyromental distance. We undertook especially careful clinical evaluation of her airway, also considering her attendant obesity, rheumatoid arthritis, and diabetes. Her lungs were clear to auscultation. Her vital signs at the time of anesthetic evaluation while in the sitting position included blood pressure of 152/88 mm Hg, pulse of 82 beats per minute, respiratory rate of 18, and 98% oxygen saturation on room air. An intravenous (IV) catheter was placed, after which 2 mg of midazolam were administered intravenously for 10 minutes before she was transported to the operating room. Standard monitors were applied on arrival in the room. Once IV sedation was initiated, we remained with the patient.

After approximately 10 minutes of preoxygenation, we elected to perform a rapid-sequence IV induction under direct visual laryngoscopy and cricoid pressure. Emergency airway equipment, including Bullard and fiberoptic laryngoscopes and an assortment of standard laryngoscopes and endotracheal tube sizes, was available. The vocal cords were readily visualized with a Miller #3 laryngoscope blade, and intubation was rapidly accomplished with a 7.5-mm, styletted endotracheal tube, secured at 22 cm at the lips. Positive bilateral breath sounds were noted; the capnometer indicated appropriate end tidal CO₂.

The surgical thyroidectomy proceeded uneventfully under anesthesia with sevoflurane, nitrous oxide, oxygen, fentanyl, and vecuronium. The potential for airway complications on emergence from anesthesia was considered before anesthetic induction. Especially relevant complications from thyroidectomy include hematoma formation, tissue trauma, compression from externally applied bandages, and recurrent laryngeal nerve damage, all of which can produce significant or even life-threatening airway compromise.

After consultation with the surgeon, a concern was raised that the recurrent laryngeal nerve might have been traumatized due to the technical difficulty encountered in removing the enlarged gland. This heightened our concerns regarding the potential of postextubation airway distress in our patient. The potential airway management strategies that we considered were (1) extubating the patient in a deep plane of anesthesia; (2) extubating conventionally with the patient awake; and (3) extubating the patient awake, with a “bridge” to full extubation. After carefully weighing the options, we elected to use the CAEC as a tool that would allow us to go forth to full extubation if the patient did well or to return to reintubation if the patient’s condition deteriorated, thus creating a bridge to extubation.

A fresh 7.5-mm endotracheal tube was used to measure a priori the correct distance that the catheter would be inserted. Once the surgical procedure was completed, before extubation, and after confirmation of significant spontaneous recovery from the nondepolarizing muscle relaxant using a peripheral nerve stimulator, the patient was given, intravenously, 3.0 mg of neostigmine and 0.4 mg of glycopyrrolate. The patient had spontaneous respirations of 16 with average tidal volumes of about 320 mL. She received 40 mg of lidocaine laryngotracheally via the endotracheal tube, which minimized stimulation on extubation. Her vital signs at this time included blood pressure of 145/83 mm Hg, heart rate of 76 beats per minute, oxygen saturation of 100% (on 100% oxygen), and an end tidal CO₂ of 40 mm Hg. The patient was able to open her eyes and to follow commands and demonstrated full recovery from neuromuscular blockade.

We checked for airway edema and vocal cord function by performing a positive leak test. The cuff was deflated, the tube was obstructed, and air passing around the tube while the patient spontaneously breathed was heard. This latter finding would not be present if the cords were adducted due to recurrent laryngeal nerve damage. The CAEC was then inserted 26 cm into the patient’s endotracheal tube (Figure 2). This was approximately 4 cm beyond the endotracheal tube’s tip, to help prevent inadvertent removal during extubation. The endotracheal tube was then removed, leaving the CAEC in situ at the predetermined markings of 22 cm (Figure 3). Nasal cannulated oxygen was applied to the patient at a rate of 4.0 L/min. The catheter was secured to the patient’s cheek and left in place during transport to the recovery room. This provided us with an indwelling tracheal guide in the event she needed to be reintubated. It also afforded us a way to directly insufflate intratracheal oxygen or provide jet ventilation should circumstances merit it (Figure 4).

On arrival in the recovery room the patient was stable; vital signs included blood pressure of 131/63 mm Hg, heart rate of 79 beats per minute, oxygen saturation of 98%, and respiratory rate of 12. The CAEC was left in place for 35 minutes after arrival in the recov-
ery room to allow for the patient to become more alert. She tolerated the presence of the catheter without episodes of coughing and without complaint of discomfort. After the patient was alert and could vocalize the letter “e,” the catheter was removed.

**Discussion**

Literature addressing safe and effective endotracheal intubation is plentiful. Equally important, yet less emphasized, is the matter of safe and effective extubation of the trachea. This case report demonstrates the use of the CAEC as a bridge to extubation in the patient with a potentially difficult airway. According to the American Society of Anesthesiologists Closed Claims Project, adverse outcomes related to extubation accounted for 7% of respiratory-related claims.²

We considered awake extubation, with a “bridge” to full extubation,¹³ to be the safest means to manage a potentially tenuous airway, after extubation, in this obese patient who had undergone surgery associated with airway complications. Our plan was based, in part, on the guidelines described by Miller et al in their algorithm for extubation of the difficult airway (Figure 5).³

The CAEC provided us with (1) the reassurance of having a guide to facilitated awake or drug-assisted reintubation, (2) a way to achieve jet ventilation should circumstances merit it, and (3) a means to insufflate oxygen intratracheally in the event of developing hypoxemia.

Problems have occurred when using airway exchange catheters. The potential for trauma or tissue damage exists, but reports reveal that such complications result when stiffer, harder catheters are used.⁴ Although barotrauma with the jet ventilator has been reported when the airway exchange catheter is used, it has also been demonstrated that the CAEC could be used safely as a means of trial extubation and to prevent hypoxemia in patients who might otherwise be at risk for its occurrence.⁵

The use of indwelling catheters or bougies to facilitated endotracheal intubation in the anticipated or encountered difficult airway is well appreciated.⁶⁷ Less well appreciated is the potential value of using similar devices in achieving safe extubation of the dif-

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* Gloves, masks, and eyewear protection were not used in this simulated demonstration.*
We believe that the CAEC may have significant merit in this setting and that it can be performed easily and safely in selected cases when it is used as a bridge to extubation.

REFERENCES

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DISCLAIMER
The authors have no financial or vested interest of any kind in any product noted in this case report.