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Case Report

# Cook® Airway Exchange Catheter Used During Microlaryngeal Surgery

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**Abstract**

Anesthesia during laryngeal surgery presents the anesthesiologist with a number of potential challenges. It requires cooperation between the surgeon and anesthesiologist in order to maximize exposure for the surgeon and allow for adequate ventilation of the patient. Many anesthetic techniques have been used such as jet ventilation (subglottic or supraglottic) and endotracheal intubation (intermittently or continuously), with a variety of tubes. We present our experience of successful airway management with the assistance of the Cook® airway exchange catheter during microlaryngeal surgery. [*Tzu Chi Med J* 2008;20(1):73–75]

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## 1. Introduction

Laryngeal surgery lends itself to minimally invasive techniques, though the structure is just far enough from the mouth to create operational problems for early physicians trying to view and manipulate it. Improvements in microlaryngeal surgery during laryngoscopy and the use of microscopes and endoscopic instruments have made it easier to access the vocal cords. During the past 30 years or more, endoscopic surgery has replaced open surgery in a large number of laryngeal lesion cases [1]. Anesthesia for laryngeal surgery presents the anesthesiologist with a number of potential challenges, which must receive special consideration to ensure the safety of both the patient and operating room personnel. The type of airway device which the anesthesiologist may use is dictated by whether access is needed to the hypopharynx, supraglottis, larynx, or subglottis [1–3]. The potential challenges and possible airway management methods for microlaryngeal surgery are reviewed and discussed.

## 2. Case report

A 49-year-old woman (55 kg, 155 cm) with a small laryngeal tumor involving the right true and false vocal cords was scheduled for microlaryngeal surgical biopsy for tissue proving. Weighing the potential of airway obstruction following induction, an awake nasal intubation was planned. After topical anesthesia of

the right nasal canal and vocal cords, we inserted a 5.5-mm endotracheal tube (ETT) into the trachea with a fiberoptic bronchoscope via the right nostril smoothly. The ETT was fixed at the right nostril at the 26-cm mark. General anesthesia was induced with propofol 120 mg after the ETT *in situ*. A total of 30 mg of atracurium was given and controlled ventilation began with 4% sevoflurane and 60% oxygen. A rigid microlaryngoscope with a self-retaining holder, resting on an over-table firmly fixed to the operating table, was inserted. During the operation, her vital signs were stable.

However, the surgeon could not perform a biopsy of the laryngeal tumor owing to poor operative field hindered by the relatively large caliber ETT in the swollen vocal cords (Fig. 1). We chose a Cook® airway exchange catheter (CAEC) with an inner diameter of 2.3 mm, outer diameter of 3.7 mm, and length of 83 cm (Cook, Bloomington, IN, USA) as the airway equipment to obtain maximum airway access. After the patient regained spontaneous breathing, the CAEC was inserted smoothly through the 5.5-mm ETT into the trachea. Under direct vision via rigid microlaryngoscope, the 5.5-mm ETT was pulled out and the CAEC was left in the trachea at the same depth as the 5.5-mm ETT (Fig. 2).

After the CAEC was secured, oxygen 3L/min for spontaneous breathing was administered through the 15-mm connector. Anesthesia maintenance was kept with infusion of 200 mg of propofol per hour and intravenous bolus of 50 mg of ketamine. The laryngeal tumor biopsy took only 15 minutes. Her vital signs and other monitored parameters during this period were also stable, including blood pressure of 120/76 mmHg, heart rate of 90 bpm, $ETCO_2$ of 45 mmHg, respiratory rate of 18 breaths/min, and $O_2$ saturation of 100%.

After the surgical procedure was finished, a 5.0-mm ETT was re-intubated through the CAEC, and then the CAEC was removed. The 5.0-mm ETT was left in place and removed later in the recovery room. The postoperative course was uneventful.

## 3. Discussion

Microlaryngeal surgery (MLS) is a short operation under much stress such as intubation and rigid laryngoscopy. Therefore, both adequate anesthesia and quick recovery are needed. From the surgeon's perspective, airway equipment should not obstruct surgical visualization, move vocal cords, impede surgical manipulation, or allow blood, tissue or laser flumes to enter the bronchi. For the anesthesiologist, ideal anesthetic techniques provide adequate ventilation and the ability to monitor the airway pressure and end-tidal carbon dioxide [1]. For patients undergoing MLS, many airway management techniques have been proposed such as small caliber ETT, intermittent ventilation via ETT, jet ventilation, and even tracheostomy [4]. Brooker et al reported that jet ventilation techniques provide ventilation during the procedure to prevent hypoxia, and give a clear surgical view of the larynx for the surgeon [1]. In previous studies, MLS was possible with patients breathing spontaneously, using ventilation through a microlaryngeal tube, using jet ventilation devices, and using intermittent apnea techniques [5,6]. Despite the different kinds of airway equipment, there may be several complications including ETT obstructing surgical visualization or impeding surgical manipulation, hypoxia, tracheal fire, barotrauma, and tracheal injury due to transcutaneous airway approach [1,4]. None of the devices or techniques are perfect and without complications. It is important to set a safe

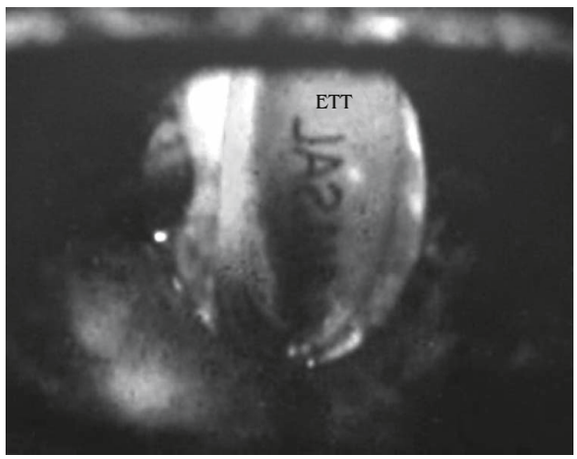


**Fig. 1 — Under rigid laryngoscope, laryngeal tumor and vocal cords are hindered by a 5.5# endotracheal tube (ETT).**

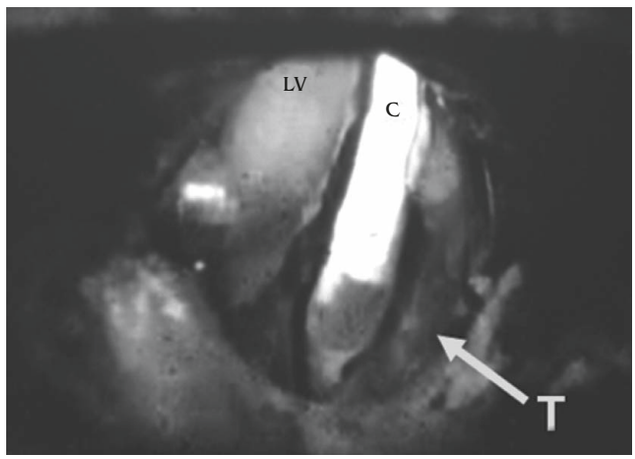


**Fig. 2 — A Cook® airway exchange catheter (CAEC) left in the trachea provides maximum airway access. C=CAEC; LV=left vocal cord; T=tumor.**

airway with minimal injury, and also have a backup plan ready for difficult airways.

In the case described here, we initially used a small caliber ETT to avoid potential complications. However, the surgical view was still inadequate. Intermittent ventilation was not suggested due to the risk of hypoxia and difficult intubation in this case. Thus, we used a CAEC as the airway equipment instead of invasive tracheostomy or percutaneous transtracheal jet ventilation. A CAEC is a long, small inner-diameter, hollow, and semi-rigid catheter that is designed for exchanging ETT and can be inserted through an *in situ* ETT before tracheal extubation. It can be used as a stylet for repeated intubation, to increase the safety of changing ETT, and as a conduit to administer oxygen manually, by insufflation or by jet ventilation [2,7]. A CAEC can be well tolerated even in clear patients, especially via nasoendotracheal intubation [2,8,9]. Tracheal re-intubation using the CAEC as a stylet may be technically difficult in some patients. Passing the airway equipment under the vision of the rigid laryngoscopy has the priority to ensure the position of the airway and minimal trauma to the vocal cords and trachea.

CAEC was developed to be a means of managing airways difficult for anesthesia or in the intensive care unit [2,7–11]. Extubation and subsequent re-intubation over a CAEC have been successfully demonstrated in adult and pediatric ICUs [10]. Inserting a CAEC during laryngeal surgery is rare. Dravid et al reported a case of microlaryngoscopic surgery for a large vocal cord polyp resection, which was managed successfully using a Frova airway intubation catheter (FAIC) [3]. Both FAIC and CAEC are long, small inner-diameter and hollow catheters and can allow surgery to proceed both with spontaneous respiration and jet ventilation. There are several advantages in using a CAEC during microlaryngoscopic surgery. First, the small caliber of the CAEC provides an excellent view for the surgeon. Second, it is a useful tool for exchanging tubes, especially during the situation of difficult airways. Third, rigid microlaryngoscopes help anesthesiologists to see the exact position of the CAEC and ETT to prevent the risk of difficult intubation or trauma [5,11]. Properly positioning the CAEC within the ETT by aligning the appropriate centimeter mark indicators of the CAEC to the ETT is a good way to prevent malposition. Fourth, spontaneous respiration with a CAEC could avoid the barotraumas that result from jet ventilation. Fifth, a CAEC is a conduit for subglottic oxygen supply that can reduce the risk of tracheal flame, and the blood and debris are carried out of the trachea by the expiratory phase airflow [12]. In conclusion, CACE is effective for simple procedures with a short duration, and trachea re-intubation may be relatively safe and easy through it (as a stylet) whenever necessary.

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