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Case Report

Fiberoptic Bronchoscopy-Assisted Endotracheal Intubation in a Patient With a Large Tracheal Tumor

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In the event of a high degree of airway obstruction, endotracheal intubation can be impossible and even dangerous, because it can cause complete airway obstruction, especially in patients with high tracheal lesions. However, a smaller endotracheal tube under the guidance of a bronchoscope can be insinuated past obstructive tumor in most noncircumferential cases. Here we report a case of successful fiberoptic bronchoscopy-assisted endotracheal intubation in a patient undergoing surgical resection of a large, high tracheal tumor causing severe tracheal stenosis. A 42-year-old Chinese man presented with dyspnea, intermittent irritable cough, and sleep deprivation for one and a half years. X-rays and computed tomography scan of the chest revealed an irregular pedunculated soft tissue mass within the tracheal lumen. The mass occupied over 90% of the lumen and caused severe tracheal stenosis. Endotracheal intubation was done to perform tracheal tumor resection under general anesthesia. After several failed conventional endotracheal intubation attempts, fiberoptic bronchoscopy-assisted intubation was successful. The patient received mechanical ventilation and then underwent tumor resection and a permanent tracheostomy. This case provides evidence of the usefulness of the fiberoptic bronchoscopy-assisted intubation technique in management of an anticipated difficult airway and suggests that tracheal intubation can be performed directly in patients with a tracheal tumor who can sleep in the supine position, even if they have occasional sleep deprivation and severe tracheal obstruction as revealed by imaging techniques.

Key words: Tracheal tumors – Fiberoptic bronchoscopy – Difficulty intubation – Difficult airway

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Primary tumors of the trachea, mostly malignant, are rare, accounting for fewer than 0.1% of all tumors.[1] Surgical resection is the major option that has the potential to cure all patients with benign and low-grade tumors and most patients with malignant tracheal tumors.[1] Since surgical procedure often requires the airway to be shared by the anesthetist and the surgeon, patients who undergo tracheal tumor resection often present with a considerable degree of airway obstruction, which makes anesthetic management during surgical resection challenging.[2] In the event of a high degree of airway obstruction, endotracheal intubation can be impossible and even dangerous because it can cause complete airway obstruction, especially in patients with high tracheal lesions.[3] However, tumors are not circumferential in most cases, and a small endotracheal tube can be insinuated past a highly obstructive tumor under the guidance of bronchoscopy.[3] Here we report a case of successful fiberoptic bronchoscopy-assisted endotracheal intubation in a patient undergoing surgical resection of a large, high tracheal tumor causing severe tracheal stenosis.

Case Report

A 42-year-old man presented with dyspnea, intermittent irritable cough, and sleep deprivation, for one and a half years, and weight loss of >5 kg over approximately 6 months. He had a long history of heavy smoking (1 pack/day over 20 years). He also had a history of allergy to local anesthetics (2% lidocaine). X-rays and computed tomography scan of the chest revealed that the lateral tracheal wall was thickened and there was an irregular pedunculated soft tissue mass within the tracheal lumen (Fig. 1). The mass occupied over 90% of the tracheal lumen and caused severe tracheal stenosis. The boundaries between the tumor and the esophagus or the left lobe of the thyroid gland were unclear. The patient was admitted for further evaluation and treatment.

Bronchoscopic examination was subsequently performed with a fiberoptic bronchoscope having an external diameter of 6.0 mm and a working channel of 2.8 mm (Olympus, Tokyo, Japan). A soft tissue mass measuring approximately 5 cm in diameter was found 4 cm below the vocal cord (Fig. 2). During the examination, the patient was unable to tolerate the procedure and further manipulation was suspended. It was decided that tracheal intubation would be done to perform tracheal tumor resection under general anesthesia. Due to the concerns of a possible ventilation and intubation failure after the induction of anesthesia and as well as the risk to patient's life, a surgeon was on standby for potential emergencies while anesthesia was induced.

The patient's blood pressure (BP: 130/92 mmHg), electrocardiogram (ECG: normal) and oxygen saturation (SPO_2: 96%) were evaluated in the operating theater prior to the start of procedure and was monitored continuously during the procedures. Given severe tracheal stenosis, the patient was placed in a supine position slowly and supplied oxygen with a mask. The oxygen saturation was increased to 98% after ensuring that the patient was relaxed. Anesthesia was induced with intravenous midazolam, 0.05 mg/kg; sufentanil, 0.25 μg/kg; cisatracurium, 0.2 mg/kg; and etomidate, 0.2 mg/kg. The ventilation was successful and oral tracheal intubation with a flexible endotracheal tube having an internal diameter of 6.5 mm was attempted. This method of intubation proved to be difficult due to the significant tracheal obstruction caused by the tumor. To minimize the risk of further obstruction of the airway, we ventilated the patient with the mask again and SPO_2 recovered from 85% to 100% quickly. An attempt using a fiberoptic bronchoscope to guide a flexible endotracheal tube with an internal diameter of 5.0 mm to intubate through the narrow trachea was successful. The whole procedure of intubation using fiberoptic bronchoscope lasted about 3 minutes.

The patient received mechanical ventilation and then underwent surgery. Intraoperatively, the tumor was found at the top of the trachea and near the larynx. The tumor mass measured 30 mm × 25 mm. The chest surgeon performed marginal resection of the tumor and intubated another flexible endotracheal tube with an internal diameter of 7.5 mm from the end of the trachea. Towards the end of the surgical procedure, the surgeon sutured tracheal ends and anterior skin on the suprasternal fossa and then created a permanent tracheostomy. After the surgery, the patient breathed spontaneously and was transferred to intensive care unit for postoperative care. The postoperative course was uneventful and the patient was discharged from hospital 13 days later.

Discussion

Surgical resection is the best treatment for primary tracheal tumors, because it is the only treatment modality that provides the chance of cure.[1,4]

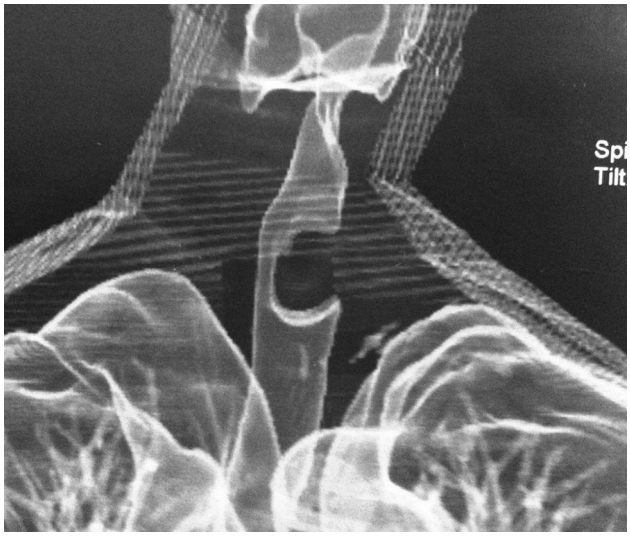

Fig. 1 Reconstructed computed tomography image showing a tracheal tumor that occupied over 90% of the tracheal lumen and caused severe tracheal stenosis.

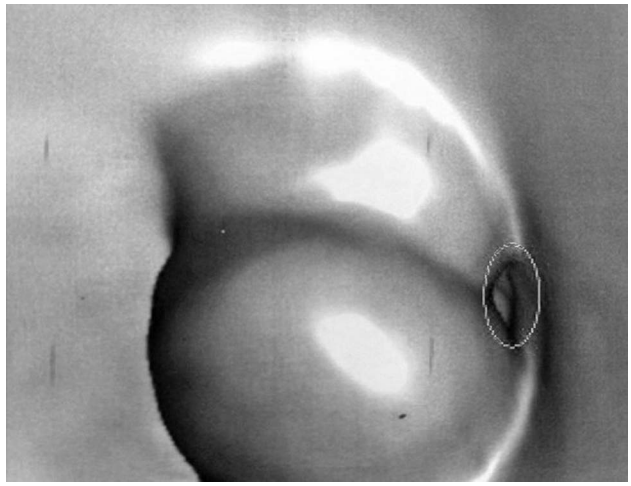

Fig. 2 Fiberoptic bronchoscopy revealed that a soft tissue mass measuring approximately 5 cm in diameter was located 4 cm below the vocal cord. The remaining patent airway was indicated by a blue ellipse.

Therefore, patients with primary tracheal tumors should be properly evaluated and treated by local surgical resection. For patients with a resectable tumor who present severe stenosis and airway obstruction, a 2-step procedure consisting of therapeutic bronchoscopic airway stabilization and surgery is indicated.[2] Since preoperative bronchoscopic evaluation suggested that the tumor was resectable in our patient, he underwent surgical resection on an urgent basis.

Although resection greatly improves prognosis, anesthetic management of patients with tracheal tumors, especially those who have severe airway obstruction, is challenging. Various anesthetic techniques are available to secure a definitive airway in patients who have obstructing tracheal tumors, including bypassing the tumor with a small endotracheal tube, rigid bronchoscopy and tumor removal with biopsy forceps, laser ablation and stenting, high-frequency jet ventilation, and cardiopulmonary bypass.[2,5–8] However, each technique has its own pros and cons, and the method of anesthesia should depend on the degree of obstruction, and the size and location of the tumor.[9] Fiberoptic intubation is a well-documented technique in patients with an anticipated difficult airway.[10] Guidelines for management of anticipated difficult airway[10,11] has stressed the importance of the use of fiberoptic intubation technique in cases with a predicted difficult airway. In our patient, fiberoptic bronchoscopy-assisted intubation was successful after several failed conventional endotracheal intubation attempts, providing further evidence of the usefulness of the fiberoptic intubation technique in management of anticipated difficult airway.

Tracheal tumors often lead to a high degree of airway obstruction. Endotracheal intubation can be impossible and even dangerous because it can cause complete airway obstruction, especially in patients with high tracheal lesions,[3] as it was in our case. In cases of difficult endotracheal intubation due to a severe obstruction, the ability to control the airway is crucial to the management of all problems of the trachea. In general, awake fiberoptic intubation should be selected for patients with a difficult airway in whom anesthesia and/or relaxation could lead to the "cannot ventilate, cannot intubate" situation. The safe way to anesthetize these patients is to maintain spontaneous respiration until the airway is secured. Tracheostomy under local anesthesia is the safest way to manage patients with upper airway obstruction.[12] However, considering that our patient had a history of allergy to local anesthetics and that he refused to accept local anesthesia, we did not use any local anesthetic and performed fast anesthetic induction with muscle relaxant.

When a tracheal obstruction is caused by trauma or inflammation, endotracheal tubes with a smaller size than the measured diameter are the only ones that are allowed for intubation, regardless of the position of the obstruction.[9] Therefore, an accurate estimate of the extent of tracheal obstruction is

essential for the successful management of such type of tracheal obstruction. Unlike circumferential stenosis caused by inflammatory lesions, stenosis due to tumors (are not circumferential in most cases) can be managed using a small endotracheal tube that can be insinuated past a highly obstructive tumor under the guidance of bronchoscopy.[3] In our case, although the mass contained over 90% of the tracheal lumen and caused severe tracheal stenosis, bronchoscopy-assisted endotracheal intubation was successful. Therefore, our case suggests that for patients with a tracheal tumor who can sleep in the supine position, tracheal intubation can be performed directly, even if they have occasional sleep deprivation and severe tracheal obstruction as revealed by imaging techniques.

Active contact bleeding and airway obstruction could be potential emergencies in patients with severe tracheal obstruction who underwent endotracheal intubation. Therefore, airway control is best accomplished in an operating room, where various preventive/emergency devices and measures are readily available.[3,13] Since our patient had an anticipated difficult airway, an assortment of rigid bronchoscopes, dilators, biopsy forceps, and instruments for emergency tracheostomy were prepared. Before anesthetic induction, we carefully observed the patient's status when he was in supine position and made sure that mask ventilation would be favorable before intubation. Furthermore, we prepared the jet ventilation, though complete upper airway obstruction was a contraindication for this technique.[14] In addition, surgeons were on standby to perform tracheostomy and cardiopulmonary bypass in case of an emergency situation.

In conclusion, we document a case of a successful fiberoptic bronchoscopy-assisted endotracheal intubation in a patient undergoing surgical resection of a large, high tracheal tumor causing severe tracheal stenosis. Our case suggests that tracheal intubation can be performed directly in patients with a large, high tracheal tumor causing severe tracheal stenosis.

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